Strengthening innovation-driven inclusive and sustainable development

Asia-Pacific Tech Monitor

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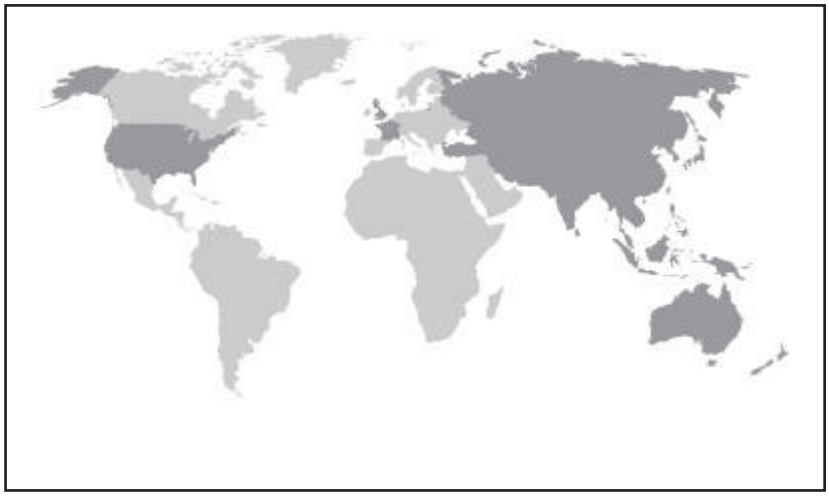
APCTT
Asian and Pacific Centre for Transfer of Technology

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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The **Asia-Pacific Tech Monitor** is a quarterly periodical of the Asian and Pacific Centre for Transfer of Technology (APCTT) that brings you up-to-date information on trends in technology transfer and development, technology policies, and new products and processes. The Yellow Pages feature the Business Coach for innovative firms, as well as technology offers and requests.

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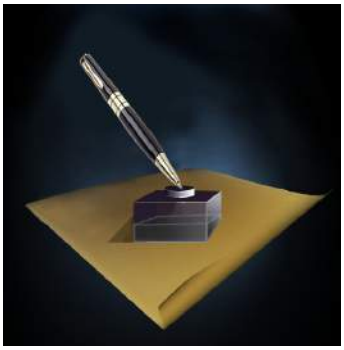

Introductory note

In view of the global economic crisis that affected the economic prospects of many developing countries in the Asia-Pacific region, deeper regional integration through enhancing connectivity has been identified as a key to sustained growth and poverty reduction. Furthermore, economic integration in the region depends heavily on the density and quality of connectivity between countries in terms of physical and soft infrastructure complemented with appropriate government policies, institutions, procedures and capacities. Critical areas in which enhanced regional connectivity is being envisaged are trade and transport facilitation, energy and water security, information and communications technology (ICT) infrastructure, manufacturing, etc.

Recognizing the importance of regional connectivity, the 70th session of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in 2014 is focusing on the theme "Regional Connectivity for Shared Prosperity".

Each country and sub-region in the Asia-Pacific holds certain comparative advantages - whether in raw materials, technology, labor, transport, manufacturing, agriculture, or as a financial hub. Pulling these comparative strengths together through enhanced connectivity would make the region economically prosperous. Therefore, a stronger connectivity would not only strengthen the intra- and inter-regional trade but also generate higher income and prosperity for countries. Strengthening regional connectivity could also be viewed as a stepping stone for the least developed countries (LDCs), land-locked developing countries (LLDCs) and Pacific island countries (PICs) to move up the value chain, boost their growth potential, and gradually converge and integrate their economies at the sub-regional, regional and global levels.

Efforts towards fostering regional connectivity in all areas of economy would require complex and innovative technological solutions for establishing the appropriate physical and soft infrastructure. In this regard, development, acquisition, deployment and adoption of relevant technologies would play an important role in establishing the relevant connectivity infrastructure and addressing the technological issues and challenges. The technological barriers in establishing physical and soft connectivity could be challenging because of incompatibility between countries with respect to the technology policy and regulatory mechanisms, use and adoption of technology, technological competence, quality and environmental standards, etc. Therefore, concerted efforts are needed to establish and maintain the appropriate physical and soft infrastructure for facilitating easier connectivity across countries in the region. Improved cross-border transport and trade facilitation, better infrastructure, stronger connectivity, enhanced institutional cooperation, and exchange of skilled human resources are considered the keys for success of regional integration process.

This issue of *Asia-Pacific Tech Monitor* highlights and discusses the technological challenges, opportunities and strategy for ensuring establishment of stronger connectivity across the Asia-Pacific region.

Michael Williamson
Head, APCTT-ESCAP

ASIA-PACIFIC

REPUBLIC OF CHINA

Innovation index up 6.2 percent in 2012

The China Innovation Index (CII), a barometer of innovation capability, rose 6.2 percent in 2012 to 148.2 points, the country's statistics authority said. Compared with a base number of 100 points for 2005, the new figure represents a compound annual increase of 5.8 percent, the National Bureau of Statistics (NBS) said in a statement.

In April 2013, an NBS research team for the first time released the CII results for the period from 2005 to 2011 amid the country's push to build an innovation-driven society. The index comprises four sub-indices, which measures the country's innovation environment, input, output and effects. The sub-index for environment rose 4.3 percent to 144 points in 2012, showing that the country continued to see a better environment for innovation. The sub-index for innovation input surged 8.2 percent to 152.2, while that for output rose 9.5 percent to 164.2 points.

The Chinese government has underlined the significance of independent innovation on many occasions. China will establish an innovation mechanism that effectively connects enterprises, universities and research institutions, according to a key document unveiled last November for deepening reforms during the next decade.

http://www.ecns.cn

Import duties on "important" hi-tech equipment

The Republic of China will abolish import duties on some "important" hi-tech equipment while reinstating others from March 1, to help accelerate the development of "strategic industries", state news agency Xinhua said. Goods for which import duties have been abolished include oil and gas drilling equipment, off-shore drilling platforms, tankers for liquefied natural gas (LNG) and deep sea prospecting.

Import duties will be reimposed for engineering machinery, equipment for light rail transit and nuclear equipment as Republic of China has the capacity to build these domestically, Xinhua said.

The duty-free equipment will help fight pollution and promote energy development and safe train transport, the report said.

The rules have been issued by six government agencies, including the Ministry of Finance, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the General Administration of Customs, the State Administration of Taxation and the National Energy Administration. The original list of equipment that could be imported duty-free was published in August 2009.

http://www.reuters.com

INDIA

Draft biotechnology strategy

With agriculture and environment ministries finally coming on the same page to promote GM crops if they pass bio-safety standards through field trials, the ministry of science came out with its draft national biotechnology development strategy, 2014, suggesting a road map to that end. The department of biotechnology's revised strategy of 'Vision 2020' highlighted how the GM crops would help achieve "higher productivity and better quality food while reducing resource inputs".

The move may help both agriculture and environment ministries in fine-tuning their joint response to the Supreme Court which will begin its regular hearing on the contentious issue of moratorium on field trials of genetically-engineered crops next month.

The department in its 'Biotech Strategy-II' pitched for a world class regulatory system which can build confidence among the civil society, farmers, consumers and scientific community. Though the same suggestion had come in its first strategic document (Strategy-I) in 2007 when it asked for setting up a Biotechnology Regulatory Authority of India (BRAI), the bill is still pending with a parliamentary panel. The 2014 document has once again recommended it. Making the draft document public, the department on Monday sought "comments" from stakeholders including farmers, scientists and civil society by March 10.

Biotech Strategy-II comes at a time when the government has moved towards field trials of selected varieties of GM crops. Although the agriculture ministry had always been in favor of such trials, the environment ministry under Jayanthi Natarajan took an opposite view.

The draft has suggested improvement in the existing regulatory system, seeking to make the GEAC "scientifically strong, professionally competent, conflict-free, transparent and backed by sound validation infrastructure" — an advice which may go a long way in dealing with loopholes of the present system which has been resisted by civil society for long.

The department also recommended setting up a toxicological center to "generate toxicity, safety data for biological and chemical contaminants and adulterants along with GM foods and traditionally used herbs". The department has also sought to establish India a world class bio-manufacturing hub for developed and developing markets. The vision document deals with matters relating to human health, marine biotech, aquaculture, food and nutritional security, industry biotechnology, bioinformatics, clean energy, and environment.

http://www.timesofindia.indiatimes.com

Patent filing fees doubled for companies

In one of the largest increases, fees for patent filings made with the Indian regulatory authorities have doubled for companies, while those made by individuals have seen a 60 percent increase. Also, to give a leg-up to innovation in small and mid-sized companies and start-ups, a new category of 'small entity' has been introduced as an amendment in the Indian Patent Rules. This is the first major increase in fees for patent filings since 2004, industry experts say. While patent filings for individuals have increased to INR 1,600 by 60 percent, those for large firms doubled to INR 8,000 for every application filed with the Indian Patent Office.

The Patents Amendment Rules 2014 notified recently in the Indian Patents Act by the Ministry of Commerce —

the administrative ministry — has for the first time created the category of a small entity in line with the US patent office. The criteria for "small entity" is an enterprise engaged in the manufacture or production of goods, where the investment in plant and machinery is not over INR 10 crore, and if engaged in providing services, where investment in equipment is not over INR 5 crore. The small entity will pay a fee of INR 4,000 for every patent application.

To encourage e-filing, the fees for physical or across-the counter filing of applications is 10 percent more than those filed online. So, for an individual, the physical or across-the counter fees will be INR 1,760.

http://www.timesofindia.indiatimes.com

JAPAN

Foreign royalty income reaching new heights

Revenue generated from the use of Japanese patents, trademarks and copyrights overseas is on pace to exceed JPY 1 trillion (US$ 9.68 billion) on a net basis for the first time in fiscal 2013. Part of the balance of services, net intellectual property revenue corresponds to Japanese companies' overseas royalty income minus what they pay to use patents, trademarks and copyrights belonging to foreign firms. Japan logged deficits until fiscal 2002, when the trend reversed.

Net intellectual property revenue for the first 10 months of fiscal 2013 doubled on the year to JPY 1.02 trillion, according to the Bank of Japan. With positive numbers also expected for February and March, the full-year balance will almost certainly break the JPY one trillion mark for the first time since fiscal 1996, the earliest year for which comparisons are possible. Broken down by type, net revenue for industrial intellectual property during the first 10 months already outstrips the fiscal 2012 full-year figure by 10% at JPY 1.6 trillion.

One contributing factor is Japanese automakers' collection of licensing fees from overseas subsidiaries for the use of their designs and production technologies. For many, such fees apparently generate income equivalent to 5–10 percent of the value of shipments. And as the companies often receive licensing fees in dollars, the weaker Japanese currency has been pushing up the yen value of this income. In gross terms, copyright and trademark revenues have been on the rise, jumping 40 percent on the year to JPY 160 billion for the 10 months through January.

Some comes from Sanrio's Hello Kitty franchise. Between last April and December, licensing revenue accounted for 44.1 percent of Sanrio's sales — up 15 percentage points from the proportion seen in fiscal 2009. The company has been renting out the brand in Asia and South America as well as in the US. But net copyright income is in the red, with Japanese firms spending JPY 580 billion more to use foreign copyrights than they generated from licensing their own during the period. Japan's reliance on US software is the chief reason, with demand for foreign movies and music also contributing.

http://www.asia.nikkei.com

MALAYSIA

MOSTI to commercialize 60 products

The Ministry of Science, Technology and Innovation (Mosti) is aiming to commercialize 60 products to the value of MYR 800 million under its research grants this year. Deputy Minister Datuk Dr. Abu Bakar Mohamad Diah said this was in line with Mosti's vision of making 2014 its commercialisation year.

During the Ninth Malaysian Plan from 2006 to 2010, 341 products were successfully commercialized with a value of MYR 3.8 billion. On research funds, Abu Bakar said the ministry is allocating MYR 850 million for this year. He said the grants are available under three categories: the science fund with a maximum MYR 300,000 per application, and technology and innovation funds (maximum MYR 3 million each). To date Mosti has approved 341 grants worth MYR 80 million.

http://www.news.malaysia.msn.com

NEPAL

Incentives on cards for factories importing energy efficient machineries

The Ministry of Industry (MoI) is preparing to include a new provision in the Industrial Enterprise Bill for encouraging factories to use energy efficient machineries. Newly appointed Minister for Industry Karna Bahadur Thapa has directed officials to include provision for incentives for factories that import energy efficient technology that not only reduces energy consumption but also minimizes pollution level.

Bishnu Prasad Dhakal, under secretary at MoI, said Minister Thapa has taken the initiative to forward the pill to the parliament after including some new provisions that also include incentive package for industries importing energy efficient machineries. MoI officials, however, are yet to finalize details of the incentive package.

The Federation of Nepalese Chambers of Commerce and Industry (FNCCI) has welcomed the idea. Hemanda Dawadi, director general of FNCCI, said incentives would encourage factories to install new technology reduce their energy bills. Dawadi, however, stressed the need to implement the program and reminded that similar provision of arranging cheaper bank loans for factories to invest on energy-efficient technology has yet to be implemented.

The bill was tabled in the cabinet in November last year for endorsement as ordinance. But the government led by Khila Raj Regmi did not endorse it. The bill, which replaces Industrial Enterprise Act of 1992, is eagerly awaited by the private sector and industrialists as it will implement Industrial Policy 2010. The bill was prepared after holding rigorous public private dialogues from regional to central level.

http://www.myrepublica.com

REPUBLIC OF KOREA

R&D investment by firms

Korean companies are expected to increase their investment in research and development (R&D) this year, bringing the combined investment to be more than three percent of their annual sales

for the first time, a survey by a local think tank showed. According to the Korea Industrial Technology Association (KOITA), 591 firms surveyed said they will increase their R&D investment by an average 12.7 percent from a year earlier in 2014.

Based on the outcome of the survey, KOITA said the total R&D spending by the country's 27,605 firms that have an institute or office specifically dedicated to R&D could reach about KRW 59.5 trillion (US$ 55.73 billion). The amount will represent 3.02 per cent of the firms' combined annual sales, estimated at KRW 1,969.85 trillion, the association said.

The KOITA report said R&D spending by large conglomerates is expected to reach KRW 41.49 trillion, up 11 percent from 2013, while investment by small- and medium-sized firms is expected to jump 16.8 percent on-year to KRW 18.01 trillion.

http://www.english.yonhapnews.co.kr

M&A market to expand by 75 percent

The Korean government will give a much-needed boost to mergers and acquisitions activities in the next three years, setting a goal of expanding the local M&A market. The Finance Ministry announced on Thursday that the government is looking to amend and abolish a number of regulations so as to encourage corporate takeovers and more private-equity-backed M&A deals. The government is targeting to increase the volume local M&A market around KRW 70 trillion (US$ 65 billion) by 2017, from about KRW 40 trillion in 2013, Deputy Prime Minister and Finance Minister Hyun Oh-seok said.

Hyun unveiled a range of measures aiming at improving the local M&A market. The plans agreed by seven other ministries include easing regulations on private equity firms and providing capital for mergers and acquisitions. The Asia's fourth-largest economy still has a relatively small M&A market in terms of deal volume, compared to those of other advanced economies, according to the finance minister.

To boost private equity-backed M&A deals, the government will discard voting right restrictions and also strict disclosure obligations placed on PEFs under the fair trade law, Hyun said. The finance minister added that the government would also make it easier for PEF-owned companies to list their shares on the local stock market. Until now, strict rules on investor protection blocked such companies from going public.

Other steps announced include expanding the size of a fund for the M&A activities of start-ups and small- and medium-sized firms to around KRW one trillion within next three years, and also introducing tax-exemption to M&A deals carried out through a share exchange. Hyun said that the aim of new measures was to ensure growth of venture start-ups and promising small and mid-sized enterprises.

http://www.koreaherald.com

Conglomerates to invest KRW 132.9 trillion in R&D

Republic of Korea's leading companies plan to invest KRW 132.9 trillion (US$ 124 billion) won in research and development and facility upgrades in 2014, a poll showed. The total represents a 6.1 percent increase from KRW 125.3 trillion in 2013, said the Federation of Korean Industries, an association for big businesses. The survey was conducted on the 600 largest companies in terms of sales as of late 2012, with 450 companies responding.

The FKI said that of those that replied, 225 said they planned to increase investments this year compared to 145 that planned to cut back on spending. The remaining 50 companies said their investments will be roughly on par with the previous year.

The poll showed 24.4 percent intend to make investments to strengthen their competitiveness vis-a-vis rivals and give them an edge in the market, with 23.5 percent seeking to make new products and develop new technologies. A further 22.5 percent said they are planning to invest resources to enter new business sectors that promise growth potential, with 17.4 percent saying they will update old facilities.

http://www.koreaherald.com

ETRI tops in royalty income

The state-backed Electronics and Telecommunications Research Institute (ETRI) is expected to earn tens of billions of won in royalties this year thanks to its technology pool with great diversity. The Daejeon-based entity said that its royalty income for 2013, which has yet to be compiled, is expected to be substantial as has been the case of past several years. The revenue includes both up-front and running royalties. "We earned KRW 32.8 billion in royalties in 2010 and the figure jumped to KRW 36.4 billion last year. We are expected to maintain such a high level of royalty income this year too," an ETRI spokesman said.

The ETRI employs more than 1,900 workers and out of them some 50 percent have doctorates while the other 50 percent have Masters Degree. The institute also said that it has created values amounting to KRW 169.8 trillion since its establishment in 1976.

The code-division multiple access (CDMA) technology, which the research outfit co-developed, generated economic benefits of some KRW 54.39 trillion followed by the dynamic random access memory (DRAM). The former refers to a platform to enable secure the wireless telephony services that Republic of Korea opted for faster than other nations while the latter is a memory semiconductor whose market size is immeasurable.

http://www.koreatimes.co.kr

VIET NAM

US$ 110 million for innovation earmarked

The Ministry of Science and Technology will encourage businesses to foster innovation through research. The scheme is part of a project costing US$ 110 million to boost the country's creative industries. The project, to be carried out over five years from 2014, will focus on dynamically and independently reforming the science and technology system. It will also promote technological innovation in businesses and help create science and technology enterprises.

At a workshop held to launch the project late 2013, Minister of Science and Technology Nguyen Quan said many countries had

shown that investment in education, science and technology would foster innovation and create incentives for national development. He said that to renew growth there was no alternative to renovation mostly based on science and technology and high-quality human resources.

In another move, a fund worth more than VND two trillion (US$ 94 million) has been set up to support innovations by business people and enterprises. Additionally, Viet Nam is helping science and technology businesses by offering tax reductions and exemptions. For example, if they are making a profit, they are free from paying tax for the first four years. This will be modified to 50 percent tax for the following nine years.

Enterprises that successfully apply science and technology achievements not only get preferential corporate tax but can also benefit from other preferential policies, said Minister Quan on the VTV programme People Ask, Ministers Answer. For example, businesses renting land cheaply, can get better access to sources of finance.

http://www.english.vietnamnet.vn

Saigon Hi-Tech Park records export growth

Saigon Hi-Tech Park (SHTP) in Ho Chi Minh City is a major highlight in terms of investment attraction, with 60 existing projects and total investment capital of about US$ 2.22 billion, according to Viet Nam Economic News newspaper. Moreover, since it was established in October 2002, its export revenues have amounted to almost US$ 6.476 billion, added the newspaper.

The Ministry of Science and Technology said that ground clearing works at SHTP had almost been completed and that 778.9ha of land had been withdrawn for construction of the park accounting for 97.3 percent of all 801ha. Last year, 21 domestic and 39 foreign investors visited the park to seek investment and cooperative opportunities in micro-electronics, information technology, telecommunications, precision engineering, biotechnology, and others.

The SHTP Authority issued investment certificates to six new projects with total capital of US$ 125.9 million in 2013, representing a 50 percent increase on capital over 2012 despite the decline in the number of new investors. Production revenues reached about US$ 2.296 billion, including nearly US$ 2.282 billion from exports, a 25.9 percent increase, and almost US$ 1.87 billion, a 4.3 percent increase from last year. Since 2002 production revenues have amounted to almost US$ 6.533 billion, including nearly US$ 6.476 billion in exports and US$ 5.794 billion in imports, and creating 17,619 jobs.

Currently 57 businesses and research centers are operational in the SHTP. Apart from world-class high-tech groups and companies such as Intel, Jabil, Nidec, Datalogics and Microchip, the SHTP has received many domestic leading science and technology companies such as FPT, Hutech, CMC and HPT.

Many businesses and research centers in the park have achieved notable success in science and technology research such as Nanogen, which made public its new drug which treats liver cancer in an effective, short and cheap manner. The invention received an exclusive patent in the US and is now under the process of franchise negotiations with multinational companies.

http://www.english.vietnamnet.vn

Viet Nam targets more FDI with new legal framework

Viet Nam plans to improve its legal framework to create a favourable investment environment and help the state better manage these activities, said an official from the Ministry of Planning and Investment (MPI) at a seminar in Hanoi. Since economic reforms began in 1986, FDI has played an important role in international integration and economic development, MPI Deputy Minister Dang Tien Dong said at the seminar.

After Viet Nam entered the World Trade Organisation (WTO), FDI soared, but in 2011, registered FDI saw a year-on-year drop of 21.6% to US$15.6 billion and disbursement of FDI reached only US$11 billion — the same level as in 2010. Registered FDI in 2012 rose 4.8% to US$16.35 billion while disbursement of FDI dropped to US$10.46 billion.

There was a recovery in 2013 with total registered FDI of US$22.35 billion, 36.7% higher than in 2012. Disbursement of FDI also increased 9.9% to US$11.5 billion. However, many experts said the recovery was not sustainable and growth in Viet Nam was lower than other regional countries. In the first four months of this year, FDI fell 41% to US$4.85 billion, whereas disbursement of FDI continued to grow by 6.7% to US$4 billion against the same period last year.

Additionally, almost all FDI projects in Viet Nam are small and medium scale. FDI projects with capital of US$100-500 million accounted for only 1.51% of the total, while those with capital of between US$500 million – US$1 billion accounted for 0.19% and those with over US$1 billion accounted for barely 0.2%.

Do Nhat Hoang, director of the Foreign Investment Agency, said that although Vietnam has a strict licensing process for FDI, management of operations is not strict enough. He suggested the country should reform administrative procedures, improve infrastructure, develop the support industry and focus on training a high-quality workforce. He noted Viet Nam faces challenges in wooing investors, competing with regional and global rivals and simplifying administrative formalities.

To improve the investment climate and State agencies' capacity to manage foreign capital, participants agreed that obstacles in the way of investment procedures should be examined. Director of the Central Institute for Economic Management Nguyen Dinh Cung stressed it is vital to restrict the withdrawal of business permits, adding that relevant agencies should only revoke the permits when necessary.

Chairman of the Viet Nam Association of Foreign Invested Enterprises (VAFIE) Nguyen Mai said that various difficulties in managing foreign direct investment (FDI) enterprises would emerge if regulations on the establishment of such firms, especially those related to fields of business and minimum capital, were not specified.

http://www.english.vov.vn

ASIA-PACIFIC

AUSTRALIA

Using nanotechnology to protect grain exports

University of Adelaide researchers are using nanotechnology and the fossils of single-celled algae to develop a novel chemical-free and resistance-free way of protecting stored grain from insects. The researchers are taking advantage of the unique properties of these single-celled algae, called diatoms. Diatoms have been called Nature's nanofabrication factories because of their production of tiny (nanoscale) structures made from silica which have a range of properties of potential interest for nanotechnology.

"One area of our research is focused on transforming this cheap diatom silica, readily available as a by-product of mining, into valuable nanomaterials for diverse applications — one of which is pest control," says Professor Dusan Losic, ARC Future Fellow in the University's School of Chemical Engineering.

The researchers are using a natural, non-toxic silica material based on the 'diatomaceous earths' formed by the fossilization of diatoms. The material disrupts the insect's protective cuticle, causing the insect to dehydrate. "This is a natural and non-toxic material with a significant advantage being that, as only a physical mode of action is involved, the insects won't develop resistance," says Professor Losic. "Equally important is that it is environmentally stable with high insecticidal activity for a long period of time. Therefore, stored products can be protected for longer periods of time without the need for frequent re-application."

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http://www.adelaide.edu.au

PHILIPPINES

Biodegradable food packaging material through nanotechnology

A team of scientists at the Department of Science and Technology-Industrial Technology Development Institute (DOST-ITDI) has come up with a biodegradable food packaging material that protects food and extends its shelf while being kind to the environment. In a statement, the DOST said green packaging technology will not only help address the disposal of food packaging wastes but will also benefit the packaging and plastic industries in the country.

While plastic food packaging protects and extends the shelf life of food and offers convenience to consumers, plastics are not biodegradable and pose harm to the environment. When disposed off indiscriminately, plastics clog waterways and contribute to flooding. Plastics find their way to oceans, causing serious harm to marine wildlife which mistake them for food.

The biodegradable food packaging material is made possible via the science called nanotechnology in which things are structured at the atomic and molecular levels, Dr. Blessie A. Basilia, Chief of ITDI's Material Sciences Division, said. The biodegradable film is made from starch and clay, both locally available materials, Basilia said.

Clay comes in layers tightly held together, so it is processed first so that it can blend effectively with starch. Clay is treated with ions in a process called ion exchange which results in wider spaces between the layers of the clay. This treated clay is called organoclay or nanoclay, its commercial name.

Nanoclay is blended with thermoplastic starch made from cornstarch to help increase the latter's strength. The clay-plastic blend goes through the same process and equipment in making petroleum-based plastics. The resulting product passed the migration test required for packaging films which means that the materials in the product will not contaminate the food it is in contact with.

Nanotechnology is one of DOST's priority among emerging technologies through its sectoral council Philippine Council for Industry, Energy and Emerging Technology Research and Development which funded and monitored the project.

http://www.news.pia.gov.ph

REPUBLIC OF KOREA

Cancer-treating nanorobots

A group of scientists from Chonnam National University became the first to create a nanorobot that can treat cancer. Unlike chemotherapy, which attacks the entire body and comes with nasty side effects such as damaging healthy cells, nanorobots can seek out cancer cells and destroy them with anti-cancer drugs while leaving healthy cells alone.

"This research offers a new paradigm of overcoming previously limited ways to diagnose and treat cancer with a nanorobot that can actively move and even deliver anti-cancer drugs specifically to cancer cells," Yonhap quoted from a Ministry of Science, ICT and Future Planning press release.

The technology, which has been named "Bacteriobot," is a genetically modified non-toxic *salmonella bacterium* that is attracted to chemicals released by cancel cells. "First of all, the main feature of Bacteriobot is that the robot has a sensing function to diagnose the cancer, and it is attacking the cancer itself as it uses the bacteria's brain while moving toward the tumor region with its flagella," Director of robot research initiative at Chonnam National University, Park Jong-Oh, told Reuters.

Bacteriobot can only detect solid cancers such as breast and colorectal tumors, but scientists hope that they can advance the system in order to treat other deadly diseases. The scientists' development follows a breakthrough made in 2012 by researchers at the Wyss Institute for Biologically Inspired Engineering at Harvard University who managed to develop nanorobots that can target lymphoma and leukemia cells. The experiment was done using 100 billion robots in a petri dish.

Trillions of nanorobots are necessary for live animal trials.

http://www.thediplomat.com

Anti-counterfeit 'fingerprints' made from silver nanowires

Unique patterns made from tiny, randomly scattered silver nanowires have been created by a group of researchers in an attempt to authenticate goods and tackle the growing problem of counterfeiting. The nanoscale 'fingerprints' are made by randomly dumping 20 to 30 individual nanowires, each with an average length of 10 to 50 µm, onto a thin plastic film, and could be used to tag a variety of goods from electronics and drugs to credit cards and bank notes. They have presented in a paper published on 21 March, in IOP Publishing's journal *Nanotechnology*.

According to the researchers, the fingerprints are almost impossible to replicate because of the natural randomness of their creation and the difficulty associated with manipulating such small materials. Lead author of the research Professor Hyotcherl Ihee, from the Korea Advanced Institute of Science and Technology (KAIST) and Institute for Basic Science (IBS), said: "It is nearly impossible to replicate the fingerprints due to the difficulty in trying to manipulate the tiny nanowires into a desired pattern. The cost of generating such an identical counterfeit pattern would generally be much higher than the value of the typical product being protected."

The researchers estimate that the fingerprints could be produced at a cost of less than USD 1 per single pattern, which was demonstrated in their study by synthesizing a solution containing individual silver nanowires, coating the nanowires with silica, doping them with specific fluorescent dyes and then randomly dropping them onto a transferable film made from flexible polyethylene terephthalate (PET).

The fluorescent dyes allowed the patterns, which are invisible to the naked eye, to be visually identified and authenticated under an optical microscope and could add another layer of complexity to the 'fingerprints' if a number of different colored dyes are used. The researchers believe the fingerprints could also be tagged with a unique ID, or barcode, which could facilitate a quick search in a database and ease the process of authentication or counterfeit identification.

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Nano-LEDs brighten nanocircuit prospects

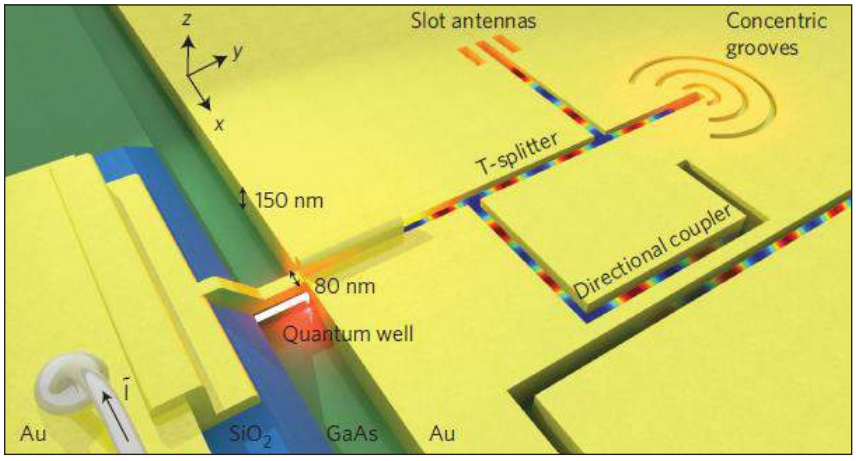
Techniques to integrate electronic and optical circuits are crucial for developing data-handling and transfer devices that are both ultrafast and compact. Now Mark Brongersma, Min-Kyo Seo and a team of researchers in the US and the Republic of Korea have demonstrated for the first time nano-sized light-emitting diodes that can electrically drive an optical nanoscale circuit.

One key challenge for researchers has been to reconcile the length scales typical of optical and electronics circuits. Optical circuits are traditionally larger than their electronic counterparts because the diffraction limit restricts the shrinking of feature sizes below the optical wavelength. Recently, however, researchers have exploited plasmons — quantized oscillations of electrons — to confine light to subwavelength dimensions, which allows the size of optical circuits to be reduced to sizes that match with nanoscale electronics.

"We expect that the demonstration of electrically driven surface plasmonic nanocircuits will be a meaningful step for interfacing high-speed photonic devices and ultra-compact electronic components," explains Min-Kyo Seo, a researcher at Stanford University and the Korea Advanced Institute of Science and Technology.

While plasmonic devices have enabled researchers to create much smaller electronic and photonic devices, there is still an acute need for techniques to electrically drive nanoscale optical circuits. Researchers have previously attempted to use nanolasers as light sources capable of electrically driving optical nanocircuits, but these have a number of limitations.

"One of the key challenges with deep-subwavelength nanolasers is that they feature a lossy metallic (i.e., plasmonic) cavity and this makes it hard to operate such a laser at lower power and at room temperature," explains Mark Brongersma, also from Stanford University. "Our nano-LEDs capitalize on a physical effect known as the Purcell effect to effectively and quickly couple the light out of the metallic cavity into an optical waveguide



Nano-LED driven optical nanocircuit

before too much energy is dissipated in the metal."

The researchers demonstrated that the plasmons could be routed through a T-shaped beam splitter coupled to the nano-LED. They also investigated coupling the plasmon in the slot waveguide to a second waveguide and found that optimal coupling could be achieved when the separation between the waveguide centers was 160 nm.

The researchers highlight a number of applications that could benefit from the integrated nano-LED, including nanoscale sensors and functional elements, such as splitters and couplers. They could also be used in future quantum plasmonic circuitry in which the propagating surface plasmon waves can interact with quantum objects — a quantum dot, molecule, or nitrogen vacancy center — to make unique quantum devices. Other potential applications are optical switches capable of operating at the level of a single photon, and for transporting light on and off computer chips.

http://www.nanotechweb.org

TURKEY

Carpet firm boosts profits through using nanotechnology

Atlas Halı, a Turkish carpet manufacturer, saw its annual profit grow by 350 percent in 2013 over the previous year after inventing "nano carpets," which clean themselves and prevent stains, mold and bacteria from developing. Inspired by the lotus flower's ability to repel water, Turkish engineers from the research and development department of Atlas Halı developed carpets that clean themselves using energy from light. An investment of TL 1.2 million resulted in a type of carpet produced with nanotechnology that destroys organic substances before they can take hold or become a stain. The company increased the number of sales points for their products from 117 to 330 in 2013.

The Bilkent University National Nanotechnology Research Center (UNAM) confirmed these qualities in Atlas nano carpets in a report titled "Self-cleaning using light," and the carpets also passed a test certifying that they do not sustain the growth of bacteria conducted by INTERTEK, a multinational inspection, product testing and certification company. The products also passed the Ministry of Food, Agriculture and Animal Husbandry's "food migration" testing, indicating that organic matter is not absorbed.

http://www.en.cihan.com.tr

EUROPE

DENMARK

Inevitable imperfection produces nanolaser

Nanostructures are inevitably a little bit imperfect, making it impossible thus far to develop optical chips that can control light. However, such structures are proving to be perfect for a whole new set of uses. Although "you can't make a silk purse of a sow's ear," a team from Niels Bohr Institute at the University of Copenhagen and from Technical University of Denmark turned the problem with the imperfect optical chips around, using them to create a nanolaser — a controllable, compact, energy-efficient light source.

The researchers created as perfect a regular structure of holes (which themselves are historically irregular) as possible to control light in certain optical circuits, etching a pattern at a distance of 380 nm into extremely small, clear gallium arsenide (GaAs) photonic crystal membranes (about 25 µm in width and about 340 nm thick).

"It turns out that the imperfect optical chips are extremely well suited for capturing light," said Peter Lodahl, Professor and Head of the quantum photonic research group at Niels Bohr. "When the light is sent into the imperfect chip, it will hit the many small irregular holes, which reflect the light in random directions." The frequent reflections cause the spontaneous capture of the light, which cannot escape. The light is then amplified, "resulting in surprisingly good conditions for creating highly efficient and compact lasers," he added.

The light source is integrated into the photonic crystal itself, consisting of a layer of artificial atoms that emit light. The photons are sent through the crystal membranes, and upon hitting the holes, the light is reflected and channeled into a waveguide. The imperfect nature of these holes causes the light to be thrown back and forth, intensifying it and turning it into laser light on a nanometer scale.

http://www.photonics.com

IRELAND

Breakthrough in battery technology

Researchers at the Materials and Surface Science Institute (MSSI), University of Limerick, have made a significant breakthrough in the area of rechargeable battery technology. There is an ever-increasing demand for portable electronic devices, and improved technology for battery life and stability is a vital factor in device performance. The combined value of the market for rechargeable battery technology is set to grow from USD 11.8 billion in 2010 to USD 53.7 billion in 2020. The research team at UL have developed a technology that more than doubles the capacity of lithium-ion battery anodes and retains this high capacity even after being charged and discharged over 1000 times.

The research published by the journal *Nano Letters* outlines the findings. Lead researcher, Dr Kevin Ryan explains; "We have developed a new germanium nanowire-based anode that has the ability to greatly increase the capacity and lifetimes of lithium-ion batteries. This breakthrough is important for mobile computing and telecoms but also for the emerging electric vehicle market allowing for smaller and lighter batteries that can hold more charge for longer and maintain this performance over the lifetime of the product."

Dr Ryan added; "The typical lithium-ion battery on the market today is based on graphite and has a relatively low capacity. This limits the amount of energy which can be stored. In our research, we used an alternative element, germanium, which is of a higher capacity. The challenge has been that the material expands quite dramatically during charging and falls apart after a relatively small number of cycles. By using nanotechnology, we have found a way to restructure germanium, in the form of nanowires, into a stable porous material that is an ideal battery material as it remains stable over very long time scales during continued operation."

The research team have also ensured that their nanotechnology solution was scalable, low cost and low energy making the technology both greener and commercially viable.

http://www.ul.ie

SWEDEN

Nanoparticle-based coating for aircraft engines

Researchers at University West in Sweden have started using nanoparticles in the heat-insulating surface layer that protects aircraft engines from heat. In tests, this increased the service life of the coating by 300%. This is something that interests the aircraft industry to a very great degree, and the hope is that motors with the new layers will be in production within two years.

To increase the service life of aircraft engines, a heat-insulating surface layer is sprayed on top of the metal components. Thanks to this extra layer, the engine is shielded from heat. The temperature can also be raised, which leads to increased efficiency, reduced emissions, and decreased fuel consumption.

The goal of the University West research group is to be able to control the structure of the surface layer in order to increase its service life and insulating capability. They have used different materials in their work. The ceramic layer is subjected to great stress when the enormous changes in temperature make the material alternately expand and contract. Making the layer elastic is, therefore, important. Over the last few years, the researchers have focused on further refining the microstructure, all so that the layer will be of interest for the industry to use.

Research at University West is conducted in close collaboration with aircraft engine manufacturer GKN Aerospace (formerly Volvo Aero) and Siemens Industrial Turbomachinery, which makes gas turbines. The idea is that the new layer will be used in both aircraft engines and gas turbines within two years.

The surface layers on aircraft engine and gas turbines are called the thermal barrier coating and they are manufactured using a method called thermal spray application. A ceramic powder is sprayed onto a surface at a very high temperature — 7,000OC to 8,000OC using a plasma stream. The ceramic particles melt and strike the surface, where they form a protective layer that is approximately half a millimeter thick.

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THE NETHERLANDS

Researchers develop new microengine

A team of researchers from the University of Twente in the Netherlands, the Russian Academy of Sciences, and Germany's University of Freiburg have developed a micro-engine that burns oxygen and hydrogen, but there's a small problem; they're not sure how the thing works.

Making micro machines means making micro power plants, and with nanotechnology advancing by the day, it's a wonder that they aren't more common. Micro-engines are cheaper to produce than conventional ones, they can do things that larger engines cannot, and they could help their larger cousins operate more efficiently. The problem is that making an engine that is small, powerful, and fast is more elusive than first thought.

The main hurdle to be overcome is building a motor or actuator that can change energy into motion. Getting energy to a micro-machine in the form of electricity is simple enough, but the tricky bit is getting that electricity to do any useful work. This is due to the problem of scale. Electric motors as they scale down generate less and less force. Combustion engines have an even worse time, because on a microscopic scale, the small space of a combustion chamber with its comparatively large surface area carries heat away too fast, so combustion cannot be supported. Though there are alternatives, such as electroactive polymers and electrochemical actuators, these are limited in function and too slow to be practical.

The new 100 x 100 x 5 μm^3 micro-engine is made of layers of polymer membrane 530 nanometers thick. It uses electrodes generating an alternating current to break down water into hydrogen and oxygen, in a chamber formed in the membrane. As the gases mix, they spontaneously combust. As they do so, the electric pulses are switched off momentarily, producing more power in a sort of piston-stroke effect.

Scientists believe that if the details of how the engine operates can be worked out, it opens up the great potential of micromachines for future development.

http://www.gizmag.com

NORTH AMERICA

MEXICO

Catalysts with nanotechnology to reduce vehicular pollution

Looking to reduce the national hydrocarbon emissions, a team of scientists from the Center of Nanosciences and Nanotechnology (CNyN), from the National Autonomous University of México (UNAM), has created a catalyst for the oil industry. Currently, they have developed two types of nanocatalysts according to

the requirements of Pemex in its process of *sulfur* removal, from the area of refinement, with which reducing gasoline and diesel to having only 10 parts per million of sulfur has been achieved, as according to international regulation.

This is pointed out by Sergio Fuentes Moyado, head of project and director of CNyN at UNA, located in the northwest state of Baja California. He adds that after three years of research at an experimental level at the Center and pilot tests at the National Institute of Oil, the nanotechnological catalyst counts with a national patent and is ready for tests at a refinery.

CNyN's technology uses molybdenum disulfide and is part of the fifth generation of catalytic converters, although is the first to be conceived since its origin from nanotechnology.

http://www.phys.org

USA

New sponge can clean up oil spills

In a development arising from nanotechnology research, scientists in Madison, Wis., have created a sponge-like material that could provide a novel and sustainable way to clean up oil spills. It is known as an aerogel, but it could just as well be called a "smart sponge." To demonstrate how it works, researchers add a dash of red dye to diesel oil, making the fuel stand out in a glass of water. The aerogel is dipped in the glass and within minutes, the sponge has soaked up the diesel. The aerogel is now red, and the glass of water is clear.

"It was very effective," said Shaoqin "Sarah" Gong, who runs a biotechnology — nanotechnology lab at the Wisconsin Institute for Discovery in Madison. "So if you had an oil spill, for example, the idea is you could throw this aerogel sheet in the water and it would start to absorb the oil very quickly and efficiently," said Gong, a University of Wisconsin–Madison Associate Professor of biomedical engineering. "Once it's fully saturated, you can take it out and squeeze out all the oil." The material's absorbing capacity is reduced somewhat after each use, but the product "can be reused for a couple of cycles," Gong said.

Researchers in Madison have patented their aerogel technology and are now seeking paper- or petroleum-industry partners to collaborate or fund research to test it on a larger scale. Details of the aerogel discovery were published last month in the Journal of Materials Chemistry. Researchers say the product has the potential to help reduce water pollution that leads to water shortages around the world.

The aerogel absorption technology is the result of a collaboration between the Wisconsin Institute for Discovery and a nanotechnology pilot plant established two years ago at the U.S. Department of Agriculture's Forest Products Lab in Madison.

At the nanotech lab, researchers are working to develop new uses for wood that could provide a boon to Wisconsin's paper industry by finding new markets for forest products. It can also help manage forests and prevent wildfires, supporters of the technology say.

On a nano scale, the aerogel harnesses the absorbent qualities of wood pulp that have made it a key ingredient in diapers. And, wood-derived cellulose nanofibril material in the aerogel is valued because of its strength. A strand of it is as strong as a synthetic fiber such as Kevlar. Cellulose nanofibrils are about 1,000 times smaller than paper fibers.

http://www.news.fredericksburg.com

Researchers develop tiny, efficient LEDs

From computer monitors and digital display boards to smartphones and wearable technologies, many modern electronics utilize LEDs. As these devices get smaller and faster, there is more demand for LEDs that are smaller, stronger, and more energy efficient. To accommodate this trend, University of Washington (UW) scientists have built the thinnest known LED that can be used as a source of light energy in electronics. The LED is based off of flexible two-dimensional semiconductors, making it possible to stack or use in more diverse applications than current technology allows.

"We are able to make the thinnest-possible LEDs, only three atoms thick yet mechanically strong. Such thin and foldable LEDs are critical for future portable and integrated electronic devices," says Xiaodong Xu, a University of Wisconsin Assistant Professor in materials science and engineering and in physics. Most consumer electronics use three-dimensional LEDs, but these are 10 to 20 times thicker than the LEDs being developed by the UW.

"These are 10,000 times smaller than the thickness of a human hair, yet the light they emit can be seen by standard measurement equipment," says Jason Ross, a University of Wisconsin materials science and engineering graduate student. "This is a huge leap of miniaturization of technology, and because it's a semiconductor, you can do almost everything with it that is possible with existing, three-dimensional silicon technologies." Xu and Ross co-authored a paper about this technology in Nature Nanotechnology.

http://www.buildings.com

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Open Innovation System: Conceptual Framework and Current Practices

TECHNOLOGY TRANSFER FOR A GREEN ECONOMY IN SOUTH ASIA

AN INNOVATIVE APPROACH

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Abstract

Today, most of world's poor reside in developing countries, mainly South Asia, where environmental degradation, unsustainable resource consumption and the impacts of climate change are creating substantial risks for the poor and the vulnerable, threatening to push millions into extreme poverty. Considering that South Asia is highly vulnerable to the impacts of climate change, the need for climate-friendly green technologies is extremely high in all South Asian countries. Unfortunately, technology transfer, mainly green technologies from developed countries to South Asian countries has been limited by the contentious issue of IPRs. Given the lack of green technology in South Asia, it is imperative for South Asian countries to explore new innovative ways to facilitate the transfer of greener technologies. In this regard, South Asian countries should leverage the skills and talent of their diaspora for technology development in the region by efficiently and successfully mobilizing diaspora resources.

Why green economy?

In recent years, developing countries have experienced unprecedented growth and propelled millions out of poverty. However, "the rise of the South" not only brings the promise of economic prosperity for many of the world's poor; it also increases pollution, emission of greenhouse gases (GHGs) and environment degradation. Thus, maintaining the delicate balance between economic development and environmental sustainability is one of the biggest challenges facing the world today. Against a backdrop of continuing increase in the emission of GHGs which are responsible for climate change, South Asian countries need to explore their options in order to develop a low-carbon path that can provide sustainable and equitable economic growth, and abate GHG emissions. South Asia is considered to be one of the most vulnerable regions to climate change and is expected to bear a significant share of the consequences of the global impacts associated with climate change. Moreover, climate change is already having a negative impact on the agriculture production of South Asian countries and affecting the lives and livelihoods of millions of poor people in the region.

For South Asia, which is home to a majority of the world's poor population and where agriculture contributes to 17.8 percent of GDP (2012) but accounts for more than 50 percent of total employment (2010),[1] climate change is not just an environmental phenomenon but also an economic and social issue. Since the country's poor depend significantly on rain-fed agriculture and even higher live in settlements that are highly exposed to the impacts of climate change, high level of GHG emission and the rapidly changing climate poses a significant threat to the well-being of the majority of the population.

In such circumstances, national transition into a "green economy" is an attractive option for all South Asian countries. According to the United Nations Environment Programme (UNEP), green economy is one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP 2010).

Green economy and technology transfer in South Asia

For South Asia, reducing GHG emissions and making the transition towards a green economy will require green sectors and industries, cleaner energy sources, efficient resource management techniques and green technologies. Note that green technologies can be high-tech and complex such as photovoltaic cells to harness sunlight more efficiently, and the application of biotechnology to develop drought-resistant crops; or seemingly simple such as wind turbines, and drip irrigation systems that can increase the efficiency of water use in agriculture. Regrettably, South Asian countries lack access to green technologies, which in the context of green economy is critical in effectively responding to the challenges of climate change without jeopardizing economic growth.

Though green technologies are available for adoption, the ownership of such technologies is highly skewed towards developed countries. But despite the availability of green technologies in the developed world, international attempts to facilitate the technology transfer[2] to South Asia has been a failure, mainly due to the inadequate protection of intellectual property rights (IPRs) in the region. Many

[1] World Bank Data Bank, accessed November 29, 2013, *http://www.data.worldbank.org.*

consider technology transfer to South Asia as a potential risk to IPRs and fear that it could consequently decrease their competitive advantage. Hence, the challenge is to facilitate green technology transfer to South Asian countries where they can be put to use so that these countries can reduce GHG emissions and pursue sustainable economic development.

Unfortunately, the debate on green technology transfer is extremely complicated due to the contentious issue of IPRs, in particular the agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) that is aimed at creating uniform IPR protection across developed and developing countries alike. While developed countries see IPR as an incentive for innovation and stress the importance of IPRs in green technologies, developing countries see it as a potential barrier to the transfer of green technologies. For instance, firms in India faced difficulties in acquiring climate-friendly technologies to replace chlorofluorocarbon (CFCs), an ozone-depleting substance with acceptable substitutes HFC-134a which had been patented by foreign companies (Shashikant and Khor 2010). The patent holder, transnational company quoted high price of US$ 25 million for access to the technology, thus forcing the Indian firms to either pay the high royalty fees to produce it locally or lose international market (*ibid*). In another case, Indian firms faced IPR related barriers in the transfer of light emitting diode (LED) lighting technology; even today, the cost of chip manufacturing and resolving IPR issues is substantially high compared to importing the chip (*ibid*).

Considering the unresolved issue of IPRs, the focus of the international community has been on providing additional funding to provide incentives for innovation and technology transfer to developed countries. Currently, the most important international financial mechanism for the transfer of green technologies to developing countries is the Clean Development Mechanism (CDM). Created under the Kyoto Protocol, the mechanism stimulates sustainable development and emission reduction in developing countries, while giving industrialized countries some flexibility is meeting their emission reduction targets.

Given the widespread implementation of CDM projects in many Asian countries, a key question is whether CDM projects actually lead to technology transfer. Many argue that technology transfer is indeed possible through CDM projects. However, it is necessary to realize that it is not possible *ex ante* to know the extent to which a particular CDM project led to technology transfer. More importantly, the focus of most CDM projects implemented in South Asia have mainly been on "hardware" such as equipment and infrastructure, and do not include the much more important transfer of "software" such as knowledge, know-how, skill development, entrepreneurship support, etc (Watson *et al*. 2012). Because the technology transferred through the import of machinery and equipment is embedded in the product, South Asian countries have been unable to improve their innovation and technology absorption capacity, and are thus unable to reap the full benefits of technology transfer. Hence, it is essential that the transfer and use of more efficient equipment and techniques be accompanied by knowledge transfer on usage and maintenance in order to foster ownership. In this context, it is also important to highlight that less than half of the total CDM projects involve technology transfer (Dechezlepretre *et al*. 2008; Seres 2008). Also, the geographical distribution of CDM projects is highly concentrated in few countries, mainly India and China which collectively hosts near 70 percent of CDM projects in the world (FICCI 2012).

Moreover, in the context of international negotiations on climate change, the focus has been on the transfer for mitigation technologies that aims to reduce GHG emissions. But since South Asia is already dealing with adverse effects of climate change, the region desperately requires adaptation technologies to cope with the consequences of climate change, reduce vulnerability and enhance resilience.

Additionally, most of the donor programs and climate targeted development assistance to SMEs are focused on hardware and far less on skill development, training and entrepreneurship support (Usui *et al*. 2011). Because SMEs and entrepreneurs in developing countries have limited knowledge about integrated and systematic methods to improve sustainability performance, skills and awareness (knowledge transfer) is the key missing links to harness green growth in South Asia (*ibid*).

Given the landscape for technology transfer to South Asia, it is vital for policy mechanisms and initiatives to consider context-specific needs-based approach for the transfer of green technologies to the region. Green technology transfer need to be considered within South Asia's development needs — including a focus on poverty alleviation. More importantly, technology transfer will be more effective in South Asia if blended with indigenous knowledge and technologies because many imported technologies are not suitable and may need to be customized. For instance, India's import of wind turbines designed for sub-zero temperatures, dust free-environment and European wind flows were unsuitable in India. In this context, technologies transferred in the form of "black box" are often not useful because they cannot be indigenised (SciDevNet n.d). Consequently, it is essential that technology transfer and the use of more efficient equipment and techniques be accompanied by

[2] In its broadest sense, as defined by Intergovernmental Panel on Climate Change (IPCC), "technology transfer encompasses the broad set of processes that cover the flows of knowledge, experience, and equipment for mitigating and adapting to climate change among different stakeholders. These include governments, international organizations, private sector entities, financial institutions, NGOs and research and/or education institutions. It comprises the process of learning to understand, utilize, and replicate the technology, including the capacity to choose it, adapt it to local conditions, and integrate it with indigenous technologies."

knowledge transfer on the usage, maintenance and an in-depth understanding of the imported technologies.

The dependence on developed countries for technology transfer is leading to loss of time and preventing South Asian countries from making the much needed transition into a green economy and addressing the challenges presented by climate change. Instead of waiting endlessly for the transfer of green technologies from developed countries, it is necessary to promote regional cooperation to make the transition into a green economy by sharing expertise on how to increase agriculture productivity, providing technical assistance in resource management and collaborative scientific research. Importantly, it will be beneficial for South Asian countries to focus on the transfer and diffusion of IP-irrelevant technologies, mainly sustainable agriculture practices such as rain water harvesting, drip irrigation, etc., and other indigenous technologies rather than only pursuing the global agenda of technology transfer of technologically advanced IPR protected technologies. Additionally, South Asian countries should resort to indigenous technologies and domestic innovation, and attempt to address the need of green technology transfer by harnessing one of its most valuable assets — the diaspora.[3]

Diaspora and technology transfer

South Asia has traditionally been an important source of migrants — both within the region and to other countries in the world. Every year, more than 1.5 million workers migrate from South Asia (IOM n.d). While the low-skilled workers go to the Gulf, high skilled South Asian migrants mainly head for Australia, Europe and US; near 40 percent of South Asia's migrants reside in Australia, Europe and US (World Bank 2010).

The presence of South Asian diaspora in some of the most developed countries in the world provides an economic opportunity that goes beyond remittance. Specifically, South Asian diaspora can be harnessed to promote and support sustainable economic growth in the region, mainly through their active engagement in knowledge and technology transfer. Unfortunately, the understanding of the role of skilled diaspora in contributing to technological development of their country of origin is limited, despite the role of science and technology (S&T) in human as well as economic development.

In this context, we need to see South Asian diaspora as "brain gain" rather than "brain drain" (Kapar 2001). The technological success of India and China, both of whom have substantial pool of skilled diaspora, demonstrate that even the loss of human capital has an upside. For example, the success of Indian diaspora in Silicon Valley has forever changed how the world views India, which has facilitated the huge inflow of foreign direct investment (FDI) into India, mainly in the ICT sector. In fact, India is among the few countries where skilled diaspora has played a pivotal role in India's technological development. The success and impact of Indian diaspora is most notable in the information and technology (IT) industry. After migrating to the US in 1960s and 1970s, many skilled Indian diaspora members had become scientists, doctors, professors, entrepreneurs, venture capitalists and high-level executives in big US universities and companies by 2000s (Pandey *et al*. 2004). These successful professionals began to coalesce since many them were alumni of same colleges and universities in India. Quickly, some of these relationships matured such as the Indus Entrepreneurs (TiE) and Silicon Indian Professional Association (SIPA) (*ibid*). Originally developed as Silicon Valley Organizations to provide mentoring to promising expatriate IT professionals, TiE has now become a worldwide network of Indian professionals and has thus far had a substantial influence in Indian IT industry as well as government policies to some extent (*ibid*). Moreover, the contribution of Indian diaspora continued with mentoring of early stage companies in India. Since IT companies in India required project management and business expertise, the Indian diaspora started schools like the International School of Business and many professors teaching in universities in US, UK and Canada began teaching in India during their term sabbatical, a practice that is still common today (*ibid*).

Additionally, given the magnitude of South Asia's diaspora networks, if harnessed properly, the diaspora can make significant contributions to the transfer and diffusion of green technologies and sustainable practices. South Asian diaspora can provide the region with better access to technologies and skills through professional associations, diaspora knowledge networks, temporary assignment of skilled diaspora members in origin countries, distance teaching, and the return of emigrants with enhanced skills. In this context, the contribution of Sri Lankan diaspora in the establishment of Sri Lankan Institute of Nanotechnology (SLINTEC) in 2009 is a noteworthy mention. SLINTEC, a private-public partnership aims to position Sri Lanka as a leading destination for nanotechnology research and development, and works to attract expatriate Sri Lankan scientists by creating a platform where people from the world over can converge and collaborate to bring nanotechnology to life. In its infancy, 4-member panel of "overseas minds" guided this unique project and the local team.[4]

With regards to diaspora engagement through knowledge networks, a diaspora knowledge network called the Indus Entrepreneurs (TiE) has been highly successful. Founded in 1992, TiE's focus on entrepreneurship incorporates mentoring programs lead by industry experts (diaspora member) aimed at women, young entrepreneurs, start-up

[3] Diaspora refers to a community of expatriates who are dispersed around the world, outside their home country but maintain a connection with their homeland.

[4] "Nanotechnology products in three years", *The Sunday Times*, February 08, 2009, accessed November 29, 2013. *http://www.sundaytimes.lk/090208/FinancialTimes/ft308.html.*

ventures and more. More recently, the TiE Bangalore Special Interest Group (SIG) on Clean Tech has also been launched with the aim to facilitate mentoring, networking and discussing trends in technology and business in the area of clean technology such as wind power, solar power, hydropower, energy efficiency, waste treatment and management, among others.

Diaspora knowledge networks "govern the transfer of various types of knowledge, such as intellectual property, know-how, software code, or databases, between dependent parties, across the economy" (UNCTAD 2012a). Knowledge networks such as TiE are an excellent mechanism for the transfer and diffusion of knowledge and technologies appropriate for domestic needs. The knowledge sharing between diaspora and local actors in origin countries may incorporate various forms of learning and knowledge creation, such as R&D, intellectual property, technology licensing, know-how, joint ventures and alliances, technology sharing and best practices. For instance, facilitated by diaspora knowledge networks, the decoding of jute genome in Bangladesh with the direct involvement of the Bangladeshi diaspora is a good example of the effectiveness of knowledge networks in overcoming IPR issues (*ibid*).

Given South Asia's poor capacity for green technology innovation, the region needs communities that support innovation and risk-taking. In this regard, South Asian diaspora entrepreneurs are uniquely positioned to recognize opportunities in their country of origin, and to exploit such opportunities. Diaspora entrepreneurs offer exposure to new ideas and markets, and can also steer business ventures and investment capital to South Asia. For instance, in 2004, 19 out of the top 20 Indian software businesses were founded by or managed by professional from the Indian diaspora (Agunias *et al*. 2012). Considering the role of the diaspora in building knowledge-based industries in India, it is clear that migrant entrepreneurs can play an important role in helping to develop firms in their home country and also serve as a two way link for market knowledge, connections and technology transfer across countries. This has been tried successfully in South America, on a regional basis through the MERCOSUR Entrepreneurial Portal (UNCTAD 2012a).

Thus far, the focus has been on how South Asian diaspora in developed countries can facilitate technology transfer from developed countries to South Asia. But considering that regional migration is high within South Asia due to the porous regional borders, there exist ample opportunities for regional transfer of green technology which offers the potential to increase productive efficiency and mitigate and adapt to the impacts of climate change.

Many South Asian migrants head to India, a major destination country in the region. Given its relatively advanced technological and economic capabilities, India has a pivotal role in the transfer of technology in South Asia. Not only is India the largest emitter of GHG in the region, it leads other South Asian countries in the development and transfer of green technology (Saxena 2012). As one of the forerunners in renewable energy technology sectors among developing countries, particularly in solar and wind power, India successfully launched the Lighting a Billion Lives initiative (LaBL) in 2008 to deliver energy services through the provision of high-quality, cost-effective solar lanterns. Since the initiative was launched in 2008, around 35,000 rural households in India have replaced their kerosene lamps with clean and environmentally friendly solar lanterns. India has shared this successful experience with other developing countries, particularly Uganda which now is in the process of expanding the LaBL initiative in the country (UNCTAD 2012b).

Initiatives such as LaBL have significant implications to other countries in South Asia. India's successful experience in technology and innovation intensive sectors such as pharmaceuticals, biotechnology and ICT is highly relevant to other countries in the region. Moreover, the geographical and cultural proximity offers tremendous scope in terms of acquisition, adoption, assimilation, and adaptation of technologies developed and operated in countries within the region.

Similarly, there exist technologies in other South Asian countries. Ecotourism in Nepal, use of improved cooking stoves[5] and implementation of floating gardens[6] in Bangladesh, pico-hydro project in Sri Lanka, etc. are some green practices and technologies that have huge regional implications. In this regard, diaspora with South Asia can to some extent facilitate the diffusion of such indigenous practices within the region.

Engaging the diaspora

Having realized the potential of diaspora in the economic development and the transfer of knowledge and technology to origin countries, many developing countries, mainly in Southeast Asia have already made significant efforts to harness its diaspora. For instance, Thailand's Reverse Brain Drain Project connects Thai institutions with Thais living abroad to encourage and increase collaboration on various technology focused projects.[7]

Similarly, countries within South Asia are also beginning to implement policies and initiatives to boost flows of financial resources, skills and technology from their diaspora. Among the few initiatives that have been undertaken in South Asia to harness the diaspora are the initiatives implemented by the Indian Ministry of Science and Technology (MoST) to attract Indian scientists who have settled in various parts of the world for pursuing scientific research in India in their respective field of expertise as well as in home country research programs. Under the initiative, a website "S&T

[5] For more information go to: *http://www.unep.org/ccac/Portals/24183/docs/Bangkok_SLCP_Feb_2013/Session_2_Review_of_Mitigation_Options_in_Asia_and_the_Pacific/Cookstoves/Improved%20Cook%20Stoves%20in%20Bangladesh%20-%20Erich%20Otto%20Gomm%20-%20GIZ.pdf.*

[6] "Floating garden" is a technology which allows farmers to grow food on flooded land.

[7] *http://www.ilo.org/dyn/migpractice/migmain.showPractice?p_lang=en&p_practice_id=43.*

Professionals of Indian Diaspora" has been created; aimed at capturing willingness and harnessing contributions of Scientists and Technologists of Indian Origin based abroad (STIOs).[8] Also, the Department of Science and Technology (DST) and the Department of Biotechnology (DBT) in India have both been implementing schemes to encourage researchers and scientists working abroad to find work opportunities in India.[9] Similarly, India's new science, technology and innovation (STI) policy aims to stimulate high level of domestic research and innovation by forging international alliances and collaborations. Already, bilaterally, joint research and higher education partnerships between the UK and India have substantially increased over the past five years and countries such as the US, Germany and Canada have deepened research links with India (Mishra 2013).

Sri Lanka has also undertaken similar initiatives; the National Science Foundation Sri Lanka (NSF) under the purview of the Ministry of Technology and Research is doing its utmost to harness the knowledge of expatriate scientists through schemes such as Overseas Special Training Programme (OSTP) and International Partnerships for Science and Technology (IPSAT). The IPSAT programme facilitates expatriate scientists, engineers, S&T policy makers and research personnel to undertake collaborative research assignments for a stipulated period in Sri Lanka. On the other hand, the OSTP is targeted towards facilitating local scientists, researchers, engineers, etc., to participate in training and short term research visits abroad.[10] More recently, in 2012, NSF in collaboration with United Nations Educational, Scientific and Cultural Organization (UNESCO) organized a Global Forum of Sri Lankan Scientists to facilitate knowledge transfer between expatriate and local scientists, and to initiate partnerships. The participants upon returning to their respective organizations jointed a virtual forum to continue collaborate and execute on various projects identified during the event.[11]

Despite the many initiatives (government and private) to harness the diaspora for economic development, it is necessary to realize that engaging the diaspora in nation building and national development is extremely challenging. While many initiatives have been launched within South Asia to engage the diaspora members, the success and the development impact of such initiatives are questionable; given that the existing diaspora networks are fragmented and disorganized, and in some cases divided along ethnic, religious and political lines. Moreover, many are unaware or left out of the national process in developing their nation. Many government as well as private initiatives and projects have failed likely due to the failure to actively engage diaspora members in national policy making and development agenda. Thus, it is necessary to create a strong bond, and more importantly to sustain and strengthen the existing bond between the diaspora members and their home country. Fortunately, the government of India has identified this missing link and made an effort to encourage the participation of its diaspora members in India's development efforts. India's pioneering effort in this regard is the annual celebration of "Pravasi Bharatiya Divas (PBD)" to mark the contribution of Overseas Indian community in the development of India. By recognizing the contribution of the diaspora and honouring those with exception merit with the prestigious Pravasi Bharatiya Samman Award, PBD fosters diaspora engagement and subsequently provides a platform to the overseas Indian community to engage with the Indian government and the people for mutual benefit.

Along with such initiatives to harness the diaspora, creating a legal framework for positive diaspora engagement is also equally necessary. In order to effectively harness the diaspora to facilitate the transfer of technologies which are compatible with green growth, diaspora have to be incorporated into a web of privileges and obligations connecting them to their countries of origin. Besides the institutionalisation of democratic space, flexible citizenship laws, particularly the provision for dual citizenship can encourage greater diaspora participation in their origin countries by facilitation travel, providing access to public services and social benefits. Bangladesh, Maldives and Pakistan are the only countries in South Asia that allow dual citizenship, meanwhile Sri Lanka is in the process of making amendments to the Immigration Act to facilitate dual citizenship. Moreover, Pakistan's National Database and Registration Authority issues the Pakistan Overseas Card (POC) to its diaspora members that allows visa-free entry into Pakistan and indefinite stay in the country (Agunias *et al*. 2012).

Offering reduced income tax rates for returning citizens who have worked abroad for a certain number of years is another popular means of engaging the diaspora. For instance, Malaysia's Talent Corporation hopes to attract skilled human capital through its Returning Expert Program which provides tax exemptions for household and car imports, but also guarantees a flat tax rate of 15 percent on employment income for five years (Agunias *et al*. 2012).

Conclusion

Given the need for technology transfer as well as climate change mitigation and adaptation methods in South Asia, the region should take advantage of South Asian diaspora and seek to fill the technological void in the region with regards to green technology. South Asian countries should persuade skilled emigrants to devote

[8] Refer to S&T Professionals of Indian Diaspora website - *http://stio.nic.in/*.

[9] "India Lists Funding Efforts to Attract Its Overseas Scientists Back." *Travel Impact Newswire*, March 9, 2013, accessed November 25, 2013. *http://www.travel-impact-newswire.com/2013/03/india-lists-funding-efforts-to-attract-its-overseas-scientists-back/#ixzz2i9X0pCOv*.

[10] For more information refer to the Global Forum of Sri Lankan Scientists, accessed October 13, 2013. *http://www.scitechforum.lk/index.php/about-us/about-global-forum*.

[11] "Global Forum takes off." *Global Forum of Sri Lankan Scientists*, July 12, 2012, accessed October 13, 2012. *http://www.scitechforum.lk/index.php/home/128-global-forum-has-taken-off-*.

some portion of their professional lives to endeavors in their home countries. Moreover, countries should attempt to tap the skills and knowledge of the diaspora by establishing knowledge sharing and enhancing network and other initiative that include mentor-sponsor programs, joint research projects, distance teaching and e-learning, and short-term visits and assignments. Concomitantly, governments should provide democratic space, as well as create a legal framework and provide incentives to attract and encourage diaspora members to contribute to knowledge and technology transfer.

But more importantly, to fully exploit the true potential of South Asia's diaspora in facilitating the transfer of technology, countries will have to survey the human resources available in their diaspora, create active networks, and develop specific activities and programs (Ratha and Plaza 2011). Additionally, it would be beneficial to create a database of all overseas professionals including their skills and their willingness to participate in the process of facilitating knowledge and technology transfer back to their home countries. Public access to such a database will enable the government, private sector and civil society organizations to identify those members of the diaspora that fit into their specific development agenda, which would increase the effectiveness of all initiatives and efforts to engage with the diaspora members.

Additionally, it is also important to strengthen coordination across the array of different stakeholders who undertake initiatives and programmes to leverage diaspora knowledge for the benefit of the home country development; since many current initiatives undertaken by individuals, diaspora associations and NGOs, home or host country governments and international organizations are implemented in an uncoordinated way. Unfortunately, while many South Asian countries acknowledge the importance of engaging the diaspora for sustainable development, many lack the resources to actually design effective policies and implement them. In this regard, the international community, in particular, the destination countries should consider establishing an international support measure to harness diaspora knowledge to build productive and innovative capacities in South Asian countries.

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REGIONAL CONNECTIVITY FOR SHARED PROSPERITY IN NORTH-EAST INDIA

CHALLENGES AND OPPORTUNITIES FOR SOUTH AND SOUTH-EAST ASIA

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Abstract

Connectivity and infrastructure are essential components of promoting sustainable development especially in geographically land-locked and hilly regions. This article explores the prospects of regional connectivity for shared prosperity in the context of India's North-East region that happens to share borders with Bangladesh, Bhutan, China, Nepal, and Myanmar. While briefly surveying the current scenario of shared connectivity, it deals with various measures at bilateral and multilateral levels to augment the regional connectivity with the North-East region through ambitious corridors and their long-term impact on the development and prosperity in the South and South-East Asian region. It also briefly deals with the potentials and prospective role of the small and medium enterprises in facilitating regional connectivity and thereby contributing to the sustainable development and prosperity in South and South-East Asia via North-East region of India.

Introduction

India's North-East Region (NER) comprises eight States — Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. Occupying eight percent of India's geographical spread, the region is home to only four percent of the country's population, with substantial portion of the population, nearly 68 percent of the population of the region living in the State of Assam alone. There are variations in the density of population which varies from 13 per sq. km. in Arunachal Pradesh to 340 per sq. km. in Assam. With the exception of Assam, all other States of the region have predominantly hilly terrain which is inhabited by an overwhelming proportion of tribal population ranging from 19.3 percent in Assam to 94.5 percent in Mizoram. The North-East region has over 160 scheduled tribes and over 400 other tribal and subtribal communities and groups.

The North-East Region (NER) lags behind in comparison with the rest of India in socio-economic indicators. The annual per capita income of NER is below against the rest of India average. The percentage of the population below-poverty-line (BPO) in NER is higher than the national average. However, the average literacy rate in the region is higher than the national average, which provides a good pool of educated human which provides a good pool of educated human. Nevertheless, this literacy rate has not translated into higher employability or productivity.

The NER is richly endowed with natural resources. It is identified as one of the world's biodiversity hotspots. Being home to species-rich tropical rain forests, the region supports diverse flora and fauna and several crop species. The NER's forest cover constitutes 52 percent of its total geographical area. Accordingly, the availability of arable land in the region is limited. This adversely impacts on the cost of delivering public services to the sparse population. Reserves of petroleum and natural gas in the NER constitute a fifth of the country's total potential. Besides, this region is also endowed with minerals like oil and natural gas, coal, limestone, dolomite, graphite, quartzite, sillimonite, etc. The region has a very high potential to generate hydropower, i.e., about 80 percent of the total hydropower potential in the country.

The geographical region of North-East India is situated in the tri-junction of South, South-East and East Asia and as such it possesses a strategic importance of its own in the shifting regional economic paradigms. The NER shares more borders with adjacent neighboring countries rather than with the mainland with which it is connected with a corridor at Siliguri. The NER shares international borders with adjacent countries of Bangladesh, Bhutan, China, Nepal and Myanmar as shown in Table 1.

The NER significantly shares more borders with adjacent neighboring countries rather than with the mainland with which it is connected. It has international borders with Myanmar (1643 km), Bangladesh (1880 km), China (1300.25 km) and Bhutan (516 km) and Nepal (97.8 km). It is in this context that NER is perceived as vital transit for many of the newly formed subregional groupings with a vast amount of untapped potential, which is yet to be developed fully. The region entails profound potential of emerging as the main decisive factor for the successful implementation of India's Look East Policy (LEP). However, for want of any proper physical connectivity

with South-East Asia, this potential has remained untapped.

India's trade with South-East nations or ASEAN nations, which stood at US$ 2.90 billion in 1993, grew to US$ 80 billion in 2012, and by 2015 it is likely to be augmented to US$ 125 billion. Broadly speaking, India's total trade with ASEAN accounts for 10 percent of India's trade, and three percent of ASEAN's total trade (Economic Times, 29 October 2013). Undoubtedly, India's trade with neighboring countries and ASEAN nations, including Myanmar, has registered phenomenal growth in recent years; nevertheless, the share of geographically contiguous areas of India's North-East region in this trade growth has been almost minimal. In other words, India's expanding engagement with South and South-East countries has not benefited the North-East region as it should have been owing to its strategic and geopolitical significance.

Figure 1: Map of north-east region of India

Source: www.geocurrents.info

Connectivity and infrastructure development

It is in this context that the Government of India in its *NER Vision 2020* report unveiled in 2008 emphasized the urgency for redesigning the development process in NER so as "to ensure that the region plays the arrow-head role it must play in the vanguard of the country's Look East Policy" (*NER Vision 2020*). It is noteworthy that all the eight states of the NER possess different developmental prospects and resources to support their efforts in contributing to the regional as well as national economy. Despite its huge untapped natural resources and its acknowledged status as the eastern gateway for India's 'Look East Policy', the NER has remained alienated from the economic resurgence that the rest of the country is experiencing for the past few decades. Apart from a protracted spell of insurgencies in some states and persistent violence, the overall conditions in the region have generally been characterized by as a low-level equilibrium of poverty, non-development, civil conflict, and lack of faith in political leadership.

Most of the states in the NER, while having unique characteristics in some respects, possess identical economic and geographical attributes. Undoubtedly, the region is endowed with vast natural resources in terms of forests, biological diversity, hydro-electricity potential; nevertheless, it has remained largely underdeveloped. Poor infrastructure and limited connectivity, both within the region as well as with the rest of the India are regarded as key constraints to the growth. "The region, connected to the rest of India by a narrow stretch of land called the 'chicken's neck', needs infrastructure to support and ensure significant investments and developmental aids" (*India's North East*, 2013).

Table 1: State-wise length of international border of NER (in km)

States	Bangladesh	Bhutan	China	Myanmar	Nepal	Total
Arunachal Pradesh	0	217	1080	520	0	1817
Assam	263	267	0	0	0	530
Manipur	0	0	0	398	0	398
Meghalaya	443	0	0	0	0	443
Mizoram	318	0	0	510	0	828
Nagaland	0	0	0	215	0	215
Sikkim	0	32	220.35	0	97.80	350.15
Tripura	856	0	0	0	0	856
Total	**1880**	**516**	**1300.25**	**1643**	**97.8**	**—**

Source: Government of India, MDONER, "State-wise length of international border of NER", available at http://mdoner.gov.in/content/international-border

The connectivity through infrastructure development for augmenting economic engagements between India and the ASEAN nations through Myanmar as well as other adjacent neighboring countries of Bangladesh, Bhutan, and Nepal via the North-East states is imperative. In order to understand the current scenario of trade and infrastructure along with future prospects, a brief appraisal of border trade and infrastructure network in the North-East deems appropriate here.

Border trade

Cross-border trade has emerged a vital component of the economies of the North-Eastern states. India seeks increased economic engagement with ASEAN and other neighboring countries through the gateway of the NER, which is located at a crossroads between three major economies — East Asia, South Asia and South-East Asia. The role of the NER in the growing economic engagement and trade ties with South-East Asia and China in the recent years has been marginal in terms of its contribution to trade and as a trade route. The share of the North-East in India's overall exports is almost negligible.

According to a Planning Commission report on North-East's border trade with the neighboring countries, it becomes discernible that the region mainly exports primary products like boulder stone, limestone, fruits, tea, coal, etc. "Nearly 94 percent of exports from the region consist of tea and coal. On the other hand, manufactured goods have a negligible presence in the export basket. Even the manufactured goods produced in areas other than North-East are not very significant in official border trade" (Planning Commission, 1997).

The industrial sector in the NER is called upon to develop goods to be exported to the neighboring countries in order to benefit from the cross border trade initiatives. Establishment of processing industries can facilitate manufacturing quality goods, which can be offered in international markets at acceptable prices. Infrastructure and connectivity improvements in terms of strategic roads to border areas as well as Integrated Check Posts and border trade points need to be developed and this would also lead to reduced informal trade between NE and the neighboring regions (*India's North-East*, 2013).

Trade with Bangladesh

The statistics on India's trade status with Bangladesh, as revealed from a World Bank report, show that over 15% of Bangladeshi imports come from India and as such Bangladesh has a large trade deficit with India; this is offset by surpluses with other countries. Besides, Bangladeshi exports to India, which account for less than one percent of total India's imports, receive tariff concessions (under SAFTA). Ironically, illegal trade between the two countries amounts to three-fourths of regular trade (World Bank, 2006). It is usually argued that strengthening of economic ties with Bangladesh will be mutually beneficial. Four North-Eastern states — Tripura, Meghalaya, Mizoram and Assam — share a 1,880 km border with Bangladesh, and a large number of people reside just along the border. The NER markets are advantageous for Bangladesh to sell its products, while the former can elicit investments.

The states of the NER can benefit from their strategic location by bargaining for investments in lieu of opening its markets to Bangladesh. Maintenance of a steady growth rate around six percent successively for the past some years by Bangladesh make it a strong contender for emerging as a middle income country by 2020. The geographical proximity of the NER makes it lucrative destination for Bangladesh to invest in areas such as hydelpower, an area in which it has already expressed its interest since it will have to invest very less in transportation. Another advantage that can accrue to the NER States is in terms of importing goods from Bangladesh which will be cheaper than products which are brought into the region from other parts of India as the cost of transportation will be nominal.

Recently Bangladesh and India have decided to set up a number of 'Border Haats' or border markets along the boundaries, which, when opened, are expected to witness bilateral trade worth US$ 20 million every year. India and Bangladesh set up the first such 'Border Haat' at Kalaichar in West Garo Hills district of Meghalaya last year. The border haats or bazaars will be established within five km on either side of the international border. The border haats would be allowed to sell local agricultural and horticultural products, small agriculture and household goods, e.g., spices, minor forest products (excluding timber), fresh and dry fish, dairy and poultry products, cottage industry items, wooden furniture, handloom and handicraft items, etc. No local tax would be imposed on the trading, and both Indian as well as Bangladeshi currencies will be accepted (Economic Times, 3 November 2010).

The potential corridors identified through Bangladesh in the *NER Vision 2020* report inter alia include connecting Meghalaya with Bangladesh at Dauki, Shella, Baghmara, Burengapara and Mahendraganj, and similarly Tripura at Kalkalighat, Kamalpur, Khowai, Ranir Bazar and Sabrum will develop international linkages with Bangladesh. This will facilitate alternate routes between these two states, with rest of the country, access to the Asian Highway network and connectivity of major cities in Bangladesh. Potential routes between Meghalaya, Bangladesh, Assam and Tripura are:

- Dauki (Meghalaya)-Jaintipur-Sylhet-Fenchuganj-Silua (all in Bangladesh) and Kalkaliganj (Assam);
- Shella (Meghalaya)-Sylhet-Fechuganj-Silua (all in Bangladesh) and Kalkaliganj (Assam);
- Dauki (Meghalaya)-Jaintipur-Sylhet-Fenchuganj-Kamalganj (all in Bangladesh) and Kamalpur (in Tripura);
- Shella (Meghalaya)-Sylhet-Fenchuganj-Kamalganj (all in Bangladesh) and Kamalpur (in Tripura);
- Dauki (Meghalaya)-Jaintipur-Sylhet-Fenchganj-Kamalgan-Shahistaganj (in Bangladesh) and Khowai (Tripura);
- Shella (Meghalaya) Sylhet-Fenchuganj-Kamalganj-Shahistaganj (in Bangladesh) and Khowai (Tripura);
- Dauki (Meghalaya)-Sylhet-Habiganj-Shahistaganj (in Bangladesh) and Khowai (Tripura);

- Shella (Meghalaya)-Sylhet-Habiganj-Shahistaganj(Bangladesh) and Khowai (Tripura);
- Bagmara (Meghalaya)-Durgapur-Jari Jhanjali-Shamganj-Bhairb Bazar-Camila, Ramgarh (Bangladesh) and Sabrum (in Tripura);
- Burengapura (Meghalaya)-Piarpur-Begunbari-Dhaka-Camila-Ramgar (all in Bangladesh) and Sabrum (Tripura); and
- Mahendraganj (Meghalaya)-Nandia-Piarpur-Begunbari-Dhaka-Camila-Ramgarh (all in Bangladesh) and Sebrum (Tripura) By linking Mizoram at Tiabung with Bangladesh, a much shorter route between Mizoram and Tripura (at Sebrum) could be developed. Apart from this, alternate routes between Mizoram and Meghalaya can be developed through Bangladesh (via Chittagong and Dhaka).

Trade with Myanmar

India and Myanmar are likely to double the bilateral trade to US$ 3 billion by 2015 by ensuring greater cooperation in sectors such as oil and gas, infrastructure, agricultural products and pharmaceuticals. Both countries have also decided to increase two-way trade through the land route by strengthening the necessary infrastructure. India and Myanmar have implemented the India-ASEAN Free Trade Agreement (FTA) since 1st September, 2010. India had also implemented the Duty Free Tariff Preference (DFTP) scheme for Myanmar in January 2009, under which Myanmar would gain market access for 94 percent of India's products at zero duty (Business Standard, 28 September 2011).

The border trade agreement between India and Myanmar, which was signed on 21 January 1994, allowed only 18 kinds of goods. In 2008, both the countries expanded the tradable items from 18 to 40. In December 2012, the Directorate General of Foreign Trade (DGFT) raised the number of border trade items to 62. Rice, wheat, corn, medicines and 18 other items were added to the list of goods for trade. The other newly added items include agricultural tools, bicycles, coal, garments, edible oil, electrical

Figure 2: Cross-border trade for North-Eastern States of India

appliances, steel products, tea, beverages, motor cycles and spare parts, semi precious stone, sewing machines and three wheelers/ cars below 100cc (De, Prabir 2013).

India has regarded Myanmar as a significant neighbor which can play important role in breaking the geopolitical isolation of the NER and provide a congenial entreport to South-East Asia. Accordingly, India in its *NER Vision 2008* report accorded top priority in promoting trade and investing in infrastructure on both sides of the India-Myanmar border. Several agreements have been signed between both the countries in recent years to meet these goals. During Indian Prime Minister's visit to Myanmar in May 2012, memoranda of understanding (MoUs) were signed not only to enhance border development, but also to increase connectivity between the two countries and through Myanmar with Thailand and the Indo-Chinese states.

India's recent initiatives to strengthen trade at border with Myanmar inter alia include upgrading the status of border trade to normal trade, widening of the road from Imphal to Moreh, link road from Champai to border in Mizoram, and international connection of Arunachal Pradesh at Pangsu pass as well as Nagaland at Lungwa.

Development of infrastructure in the NER is reportedly on the priority list of India and India has also agreed to upgrade an extensive network of roads and bridges in Myanmar that will effectively connect the NER not only with the rest of India, but with Thailand as well by 2016. Efforts are also underway by both sides to exploring the possibility of setting up train routes through both the countries.

The utility of various projects related to the trilateral highway as a component of the Asian highway assumes added

significance. It aims at connecting India's north east with Thailand via Myanmar. There has been an agreement between India and Myanmar on the construction and upgrading of the Kalewa-Yargyi stretch of the trilateral highway. This project entails triangular road diplomacy between India, Myanmar and Thailand, with a vision of inter-linking the Indian Ocean with the South China Sea. It is a component of the Asian highway, which is scheduled for completion by 2016. This highway project can be interlinked with other critical projects, which are likely to be completed as part of the 'Look East' policy such as the Kaladan Multimodal Transit Project and Trans-Asian Railways.

Trade with Bhutan

Indo-Bhutan bilateral trade is of over INR 6,000 crore with near INR 4,000 crore of India export that constitutes over 70 percent of Bhutan's total import. Out of the rest, 80 percent of Bhutan's export value to India is for hydropower of which also India is the largest buyer. Apart from the trade with India, Bhutan is dependent on Indian passage for its third country trade too because of its land locked location in the lap of Himalaya. Bhutan's border areas with India stretch from Northern West Bengal to eastern Assam. Under a free trade agreement between the two countries, the existing one is effective since 2006 for 10 years. Bhutan enjoys duty free transit of Bhutanese merchandise for trade with third countries too. Bhutan's bypass route to Passakha and Samdrupjongkhar industrial estates in Bhutan can give faster access to deep Bhutan including Thimphu. In addition, Matanga industrial estate in Samdrupjongkhar district in Bhutan is being planned to be directly connected to Bokajuli in Assam by passing Samdrupjongkhar town (Sarkar, 2014).

The *NER Vision 2020* document envisages that by connecting Jashingang Dzong in Bhutan with Aruanchal Pradesh and Assam three alternate routes will be developed. The first route from Tawang (in Arunachal Pradesh) to Jashingang Dzong (in Bhutan) — Darranga (in Assam) will provide an alternate route between Arunachal Pradesh and Assam. Secondly, route from Tawang (in Arunachal Pradesh) to Jashingang Dzong-Mongar-Dzong-Kogkha-Tongsa and Dzong-Shemgang Dzong-Gelekphu (all in Bhutan — Rani Khata (Assam) will provides another alternate route between Assam and Arunachal Pradesh. The third route from Tawang (in Aruanchal Pradesh) to Jashingang Dzong-Mongar-Dzong-Kogkha — Jongsa will link Dzong — Punakha — Gasa — Dotanang — Pokangnag — Thimphu — Kyapcha — Chanakha (all in Bhutan) with Jairgaon in West Bengal.

Japan's interest

India has invited Japan to invest in and build overland infrastructure in areas of North-East region in India. Japanese companies will have the opportunity to help the development of the northeast specially to build roads, and aid agriculture, forestry and water supply and sewerage in these states. Japanese companies have also been invited to help develop a new port in Chennai, which would be used to improve India's sea-route connectivity. Japanese assistance for Chennai port is also aimed at giving teeth to a new sea-based route that would start in Chennai, and end in Dawei port in Myanmar's Tanintharyi region. The port is being developed by Thailand.

In 2012, Thailand had promised India that it would pump in US$ 50 billion into Dawei. The development of a new port in Chennai would serve to connect the industrial centers of Southern and Western India with Sout-East Asia. In addition, Japan's investment in the Bangalore-Chennai industrial corridor would find easy outlet from Chennai. As part of the trilateral dialogue between India, US and Japan, a trilateral highway linking India, Myanmar, and Thailand is likely to see more Japanese and US interest. This is an India-led project due for completion in 2016, but by itself, India is unlikely to make the target (Bagchi, 2014).

Role of SMEs

The SMEs, comprising over 90 percent of total enterprises in most of the economies around the globe, are credited with generating the highest rates of employment growth and account for a major share of industrial production and exports. The SMEs play a pivotal role in India too in the overall industrial economy of the country. This makes the SMEs significant for realizing the objectives of growth with equity and inclusion.

Guwahati in Assam is well placed in terms of entrepreneurship development when compared to the other states in the Northeast owing to its upscale market and good road/rail connectivity and as such it is naturally placed to lead the entrepreneurial activities and attracting large scale investments. Other North-Eastern states also present congenial atmospheres for SMEs and the local populace prefers light industries, as opposed to heavy and polluting industries that create big tussles among the different stakeholders of the industries concerned and harm the ecosystem. A recent study named *State Level Reforms — Increasing Investments in North East* jointly undertaken by FICCI and the Konrad Adenauer Foundation (KAF) underlines the condition for constructive dialogue and engagement with policymakers and the administrative machinery in Northeast and the steps that need to be taken to harness the true potential of the region. The availability of the promising opportunities in the Northeast has spurred industry chambers like CII, FICCI to focus increasingly on this region to score well by infusing energy in SMEs, supported by local entrepreneurial skills. The expansion of SMEs in the Northeast will proportionally generate quality employment and will also check outbound migration.

Broadly speaking, all the states of the North-East region, despite having many commonalities, are distinct in their own ways. Thus, keeping this diversity in mind is also essential for policy makers and prospective entrepreneurs. Under the existing circumstances, a greater adjustment is called for from industries for the local conditions prevailing in the entire North-East. With the expansion of infrastructure and completion of corridors, the growth of SMEs will be the one among many desirable outcomes, which is going to shape the future of the very promising North-Eastern region of India (Kumar, 2014).

Viewed in a broad perspective, the SME sector has been faced with a vast array of problems like the purchase of raw materials, manufacturing of products, marketing of goods or raising finance. The SMEs are faced with

intensified competition — both in domestic and overseas markets. The SMEs in India, while trying to cope with these challenges, are also making efforts to improve and sustain competitiveness through rational cost optimization, improved quality, offering better choices by introducing innovative measures and upgraded technology.

According to a CII-PWC report-*Innovation-Changing the MSME landscape*: "Statistics are already emerging on the increasing importance of innovation and its scale and scope among the country's firms today" (Thakur, 2013). Also, a National Knowledge Commission of India study reveals that 42 percent of large firms and 17 percent of MSMEs have introduced 'new to the world' innovations during the course of their business. 17 percent of the large companies rank innovation as the top strategic priority and 75 percent rank it among the top three priorities. So innovation is an area, where light industries are making the voyage with positive outcomes. The SMEs functional in the Northeast should also make strides to catch up with this essential trend (*Ibid*).

An impressive growth in the service sector has helped in the sustenance of high annual growth rate in excess of eight percent in the Northeast in the past decade. As early efforts of unsystematic heavy industrialization mostly failed in the region, manufacturing became dominated by SMEs in due course of time. The state of Assam is better in terms of entrepreneurship development when compared to the other states in the North-East. With an upscale market and good road/rail connectivity, Guwahati is naturally placed to lead the entrepreneurial activities and attracting large scale investments. But it is also true that the rest six states also present favorable atmospheres for SMEs, as the concern for environmental degradation is quite high among the local population.

In the wake of promising growth opportunities being afforded by Northeast, the national industry chambers such as CII, FICCI are increasingly focusing on this region to score well by infusing energy in SMEs, supported by local entrepreneurial skills. The spread of SMEs in the North-East will proportionally generate quality employment and will also check outbound migration. The growth of SMEs will be the one among many desirable outcomes, which is going to shape the future of the very promising Northeastern region of India.

Conclusion

Deficit of connectivity and infrastructure have kept the momentum of growth at a low pace in the North-East region of India. Apart from the land-locked location and hilly terrain, the region has the advantage of sharing borders with adjacent neighboring countries which is both a boon and bane. The protracted spell of insurgencies and attendant violence has thwarted local governments' efforts at promoting development which requires peace at home. However, this situation is undergoing transformation for the better. Keeping in view the interest and anxiety shown by some ASEAN nations, particularly Thailand and Myanmar to forge connectivity and expand economic engagement with India through NER, India should avail of this opportunity.

Myanmar is India's gateway to ASEAN as it is the only country of this grouping which has a land and maritime boundary with India. With India becoming a summit level partner of ASEAN and a member of the East Asia Summit, improved relations with Myanmar will be beneficial in many respects.

Nevertheless, with better connectivity and implementation of various development projects, the Asian Highway will enable the region to become a business hub of South Asia. Economic linkages already exist by virtue of the prevailing trade between India and Myanmar, concrete economic benefits are likely to accrue to the region with establishment of border haats. In addition, internal trade routes have the potential to enhance accessibility to subregional markets that connect Bangladesh, Myanmar and Bhutan. The pivotal role of the SMEs is imperative for boosting manufacturing goods in accordance with the raw materials locally available and the markets for the manufactured goods in the adjacent countries.

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SUPER GRID IN NORTH-EAST ASIA THROUGH RENEWABLE ENERGY

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Abstract

Objectives of Super Grid is to construct large scale renewable power plants and transmission network in Gobi desert for sharing generated electricity with neighboring countries in North-East Asia. In addition, the driving force for Republic of Korea is the need for energy independence, moving away from the dependence on fossil fuel import and nuclear power plant. Currently moving from the price-feasibility to feasibility study, the challenge is to build consensus among the participating countries and stakeholders.

Introduction

Energy remains as the key driver of social and economic development at national and international level. The energy demand is growing very fast. To meet such high energy demand without damaging the environment, significant increase in the share of renewable energy among all kinds of energy resources is happening.

It is very fortunate that many of developing countries in Asia and Africa have abundant resources of solar energy, low-cost desert and arid land. Wider utilization of renewable energy should provide the foundation for not only reliable energy supply, but it may also bring renaissance in the development of energy in developing countries. It can significantly contribute to enhancing their social and economic development.

Renewable energy is becoming more important in the Republic of Korea with rapidly changing domestic business environment due to frequent fluctuation of international petroleum price and UN framework convention on climate change.

Though Republic of Korea has started to focus on renewable energy industry later than other advanced countries, it is expected that the industry would be a national growth engine in the near future as the Korean government has made maximum efforts to support renewable energy technology development and deployment in order to realize Green Growth.

Significant technology advances and dramatic cost reductions have been achieved in renewable energy over last decade in the Republic of Korea. It is clear that supporting high level research and facilitating exchange of information and experiences are crucial. If renewable energy technologies are to be continually expanded, its costs would reduce. Technology cost reduction can be realized through the active collaboration of all stakeholders on local, regional, and global level.

Status of renewable energy in Republic of Korea

Because of rapid economic growth accelerated by the heavy and chemical industries, the Republic of Korea's energy consumption has increased rapidly since the mid-1970s. Total primary energy consumption (TPES), which stood at 43.9 million tons of oil equivalent (toe) in 1980, increased more than six-fold to 275.7 million toe in 2011. Republic of Korea became the 10th largest energy consuming country in the world. Energy consumption per capita in the Republic of Korea also increased rapidly from 1.1 toe in 1980 to 5.1 toe in 2011. But its energy resources are limited to low-quality anthracite with small amount, which accounted for less than one percent of total primary energy supply. With poor indigenous energy resources, the Republic of Korea has to import almost entire required energy. The dependency on imported energy was 96.4 percent in 2011 and the cost of energy import amounted to US$ 1,725 billion, which accounted for 32.9 percent of total inbound shipments.

Oil Demand of Republic of Korea has been growing rapidly since 1970s, except the two oil crises period of 1973 and 1979. Coal demand has also increased by annual average increasing rate of 5.2 percent for the past 30 years, due to the large amount of industrial use including power generation. But the main use of domestic anthracite has been shifted dramatically from residential sector to industrial sector. Natural gas was imported from 1986 in the form of LNG and it accounted for 17 percent of the primary energy consumption in 2011.

Energy conservation and efficiency policies for reducing energy consumption aim at all components of energy system ranging from primary energy production to end-use. In public procurement, the government gives preference to commodities produced using clean energy technology. Despite nationwide efforts by the government to encourage energy conservation and energy efficiency, increasing demand of energy is expected to persist in the future due to the rapid growth of national economy.

At the end of 2011, the amount of new and renewable energy (NRE) supply

was 7,583,000 toe, which comprised 2.75 percent of the total primary energy consumption, 275,688,000 toe. Of the total supply of NRE, waste utilization contributed the largest proportion with 67.54 percent, followed by hydro power with 12.73 percent, and other types of renewable energy with 19.73 percent. NRE power generation has also increased rapidly, PV and wind, in particular. In terms of PV, power generation has increased nearly 30 times to 917,198 Mwh in 2011 from 31,022 Mwh in 2006, and wind has increased to 862,884 Mwh from 238,911 Mwh. Fuel cell appeared as an electricity source in 2006 and its output in 2010 was almost 44 times higher than that of 2006, achieving 294,621 Mwh. Total NRE power generation accounted for 17,345 GWh which is about 1.24 percent of total 501,527 Gwh of electricity generated in 2011 (Figure 1).

According to the statistics of the OECD, annual average growth rate of renewable energy by 6.8 percent in the Republic of Korea was 14th among OECD countries during 2008–2011, but in 2011, the penetration rate of 1.6 percent was ranked the lowest among the OECD countries. The average of technical standard is 86.2 percent compared to Europe countries, which is about 10 percent lower than Japan and about five percent higher than China. It must invigorate the system export-oriented business model to overcome the gap between these technologies and price competitiveness and weakness of domestic foundation market. Especially in order to improve the share of renewable energy technology in global market, it must be performed not only to strengthen price competitiveness and technology deployment but also implementation of the Super Grid technologies for the expansion of application and development of new utilization technology.

The third basic plan for NRE technology development and deployment established in December 2008, which handles Republic of Korea's medium-long term target for NRE development and deployment, provides action plans and basic strategies. It aims at facilitating the NRE

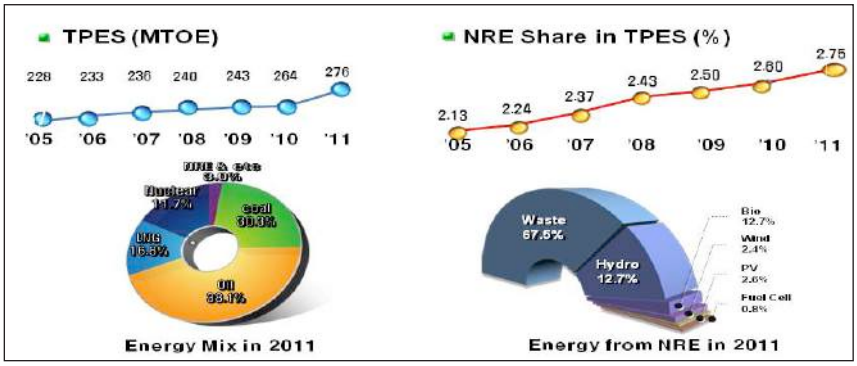

Figure 1: Energy Consumption in Republic of Korea

Source: Korea Energy Management Corporation, Nov. 2012

industries into a new growth engine for the Korean economy.

The background of basic plan is as follows:

- It divides into the fields of NRE focusing on accomplishment of the supply and R&D activities and suggests supply goals with concrete standards to meet international trends and domestic goals;
- The fundamental direction of the plan is to classify renewable energy sources into deployment-oriented groups: wind, bio-energy, waste and geothermal;
- R&D-oriented group: PV, hydrogen and fuel cell; and
- Responding to the climate change and exhaustion of fossil fuels.

According to the Business As Usual (BAU) scenario of the basic plan, the NRE share of primary energy supply will account for 3.6 percent in 2015, 4.2 percent in 2020 and 5.7 percent in 2030, and by the target scenario, the NRE share of primary energy supply will account for 4.3 percent in 2015, 6.1 percent in 2020 and 11 percent in 2030.

Achievement of renewable energy in each area from 2007 to 2011 has been increased sharply.

The number of manufacturing companies in the NRE industries in the Republic of Korea has increased from 100 in 2007 to 224 in 2011. It means it has increased 224 percent with an annual growth rate of 45 percent. The number of companies by resources as of 2011 was 98 PV companies, 48 bio-energy companies, and 38 wind companies.

The number of employees in the NRE industries has increased from 3,691 employees in 2007 to 17,161 in 2011. It is an increase of 4.6 times with the annual growth rate of 92 percent. As PV and wind power industries are expected to become a core growth engine for the future, the employment effect will also be significant in these fields.

The sales of the NRE industries have increased from US$ 1.25 billion in 2007 to US$ 14.5 billion with an increase of 14.5 times, and the export sales have increased from US$ 0.78 billion in 2007 to US$ 8.42 billion in 2011 with an increase of 79.5 times (Figure 2).

As an effort to improve the energy supply and demand condition and to promote the development of regional economies by supplying region specific NRE that are environment-friendly, the government has been promoting regional deployment subsidy program designed to support various projects carried out by local governments.

The government provides subsidy for NRE facility users to accelerate NRE deployment. The objective of the subsidy program is to create an initial market for new technologies and systems developed domestically, and to establish and activate the deployment infrastructure for technology and equipment commercialization. These subsidies are classified into two categories: (1) test-period deployment subsidy, and (2) the general deployment subsidy. The

Figure 2: Achievement of NRE in Republic of Korea

Source: Green Growth Korea, June, 2012

government provides the subsidy up to 50 percent of installation cost for commercialization of these systems.

International cooperation with North-East Asian countries

Renewable energy has been currently considered as an effective mean for the climate change protection as well as major driving force for sustainable economic growth. Recognizing such importance of renewable energy, the Korean government has been involving in a variety of international cooperation activities with international organization and various overseas counterparts.

The Government has maintained close relations with neighboring countries in North-east countries, mainly China, Japan, and Mongolian organizations to exchange information and develop collaborative programs. In order to promote cooperative programs, joint seminars, business matchmaking, cooperation agreements and to carry out joint research projects development, inter-governmental collaboration committees are organized.

Many joint seminars have been organized to build up relations with those countries by exchanging current key policies and technological information in various areas such as PV, wind energy, solar thermal, and biomass. With regard to follow up actions for these partnerships, this would be a great opportunity to identify beneficial areas in the field of NRE.

In order to construct Super Grid in Gobi desert, promotion of international cooperation, establishment of cooperation network among North-East Asian countries is required. However, North-East (NE) Asian countries show many differences in the frequency and transmission voltage of electricity as well as power consumption amount and power generation capacity. Because of the poor power status and the size of the economy, North Korea and Mongolia, especially, would require Super Grid immediately for interconnection to power system with one of the North-East Asian countries (Figure 3).

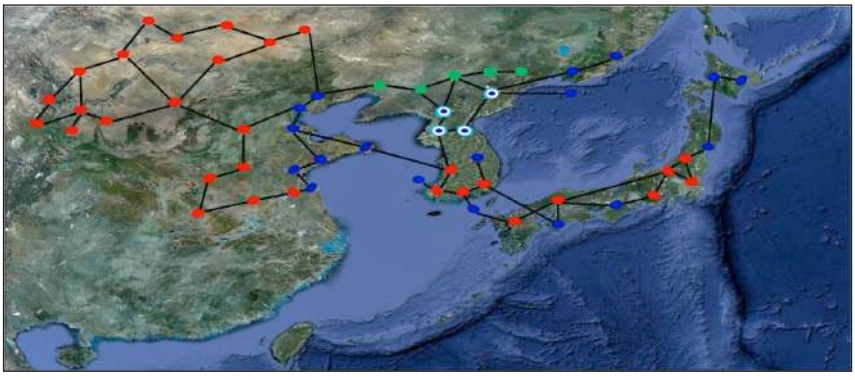

Figure 3: Super Grid in North-East Asia

Source: J. Song : International Conference on RE cooperation & Grid integration in NE Asia, Nov. 2012

The historical background of international cooperation on renewable energy begins in 1995. Since 1995, Republic of Korea-Japan and Republic of Korea-China have been holding a joint seminar on renewable energy among North-East Asian countries. A joint forum on renewable energy (RE) was held in Seoul, and an International RE Conference and Exhibition took place in Busan in 2003. Also, Asia-Pacific Forum on RE (AFORE) and Global Photovoltaic Conference (GPVC) were held in 2011. NE Asia Consortium for Super Grid in Gobi desert was launched in 2012. AFORE is a regular event which began in 2008, and the main topics of the forum are renewable energy in terms of policy and strategy, technology toward low carbon sustainable society, but not limited to these topics only.

Symposium on Super Grid was held in 2012. Four countries such as Republic of Korea, China, Japan, and Mongolia have agreed for establishment of consortium for Super Grid in NE Asia and signed at this symposium. Joint seminar and cooperation plan were discussed on February 2013.

During the international joint workshop on Super Grid, a consortium and a working group were composed with representatives of each four NE Asia countries in March 2013 and ADB financial support proposal was completed at a round table discussion for Asian Super Grid which was held in Seoul in May 2013.

The consortium will have a steering committee consisting of four member countries such as Republic of Korea, China, Japan, and Mongolia and a working group will consist of representative experts of each technical areas from member countries and relevant international institutions such as IEA/PVPS, IRENA, ADB, DESERTEC as observers.

For the promotion of the Super Grid, the Republic of Korea is running the demonstration test through operating supervisory control system with IT technology. China constructed Super Grid on the basis of demonstration experiences of large-scale PV, wind farm, HVDC, etc., and Japan

developed a proposal of business model based on mega solar project including Asia Super Grid Plan after Fukushima nuclear disaster. Mongolia established monitoring centers at Super Grid candidate area to measure and collect whether data collection.

The main concept of Super Grid is related to electricity transmission system, based on HVDC, designed to facilitate large scale sustainable power generation in desert area for transmission to the center area of consumption.

Core Technologies of Super Grid are as follows: (1) Large scale RE power generation in Gobi desert, (2) IT, WAMS, ESS, HVDC, and (3) Electricity transmission. Expected effects of Super Grid through the international cooperation in North-East Asia countries are technical benefits, economic benefits, social benefits and environmental benefits. The key challenges could be the following: (1) Consensus among participating countries and system sustainability, (2) Developing implementation road map with action plan with member countries, and (3) To develop managing rules and organizations needed.

The VLS-PV systems can play an important role as well as wind farms for clean and safe power generation. At present, a practical project proposal for "Super Grid in Gobi desert" has been proposed to raise funds for a feasibility study, and the study will implement site selection, field test and demonstration, economic and socio-environmental effects analysis, among others.

Conclusion

In the near future, renewable energy should become an economically viable option to meet the electricity needs of communities in remote or mountainous regions around the world where conventional power plants cannot be built. The rate of deployment of renewable energy is greatly influenced by the perception of general public and utilities, local, national and international policies, as well as the availability of suitable standards and codes to govern it.

In long term period with a solid strategy for implementing Super Grid in desert area, further expansion of large scale renewable power generation can provide increasing energy demand of the North-East Asian region in a sustainable way. In addition, diffusion of the various kinds of high-tech knowledge and experiences, know-how will be transferred to local renewable energy institutes, utilities and energy companies in order to keep track of worldwide technology developments, technology exchange between universities and scientific institutes in North-East Asian region countries.

To realize our dream, we must try to build consensus with convergence, integration and harmonization based on neighborhood. ■

DEVELOPMENT OF SUBMARINE CABLES IN ASIA-PACIFIC

CHALLENGES AND OPPORTUNITIES

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Abstract

While the role of international telecommunication has been more emphasized in recent days, there is still a digital gap between countries in Asia-Pacific; mainly due to gap in economy, technology, and education. Many parties take progressive action in construction of submarine cable network and other network infrastructure in order to improve accessibility and connectivity of countries that have gap in Information and Communication Technology (ICT).

Along with technical consultation on ICT, KT focuses on building stronger international network infrastructure through submarine cable, which will provide opportunities to become a gateway for international telecommunication in Asia-Pacific. We believe that these actions will contribute to the mitigation of digital divide and bring positive impact on people's quality of live and economy of Asia-Pacific countries.

Introduction

Economic activities once bound by domestic borders, are now facing increasing instability and stagnation in growth due to the looming global economic depression for many years. For such reasons, many corporations are looking towards the global market for sustainable growth and stability.

While the development of transportation and distribution systems have provided the foundation for businesses to enter the global market, advances in telecommunication and the internet have been catalyst for dissolving borders between nations and combining them into a single global market.

In the modern world, on the one hand, telecommunication and infrastructure levels directly impact the economic statue of countries, the gap, on the other hand, between countries are becoming larger due to increasing effectiveness of computers and the Internet which can be easily monopolized, resulting in an even larger digital divide between the developing and developed countries. This is especially true in the case of Asia where the information technology levels between countries are heavily polarized (Table 1).

Accordingly, many countries in Asia are making efforts to develop telecommunication technologies and build network infrastructure to improve their economic stature in the region. Institutes such as OECD, UN, UNDP, and the World Bank have been discussing investments in telecommunication sector along with roads, railways, electricity, energy related Social Overhead Capital (SOC) projects for many years. Efforts to reduce the gap between countries in the Asia-Pacific region have been continuously discussed in G8 Summits and international committees such as the UN, ASEM and APEC.

Among various types of network infrastructure, constructing submarine cable network is one of the critical components, which actually accounts for more than 99% of international telecommunication in the real world. This article aims to explain the trends in telecommunications, especially the submarine cable, and also the role and responsibility of KT in Asia-Pacific as an international telecommunication gateway.

Global trends in telecommunications

The advent of new products and services changed the existing paradigm of international telecommunication. A decade ago, overseas telephone call had the major portion for international telecommunication. However, rapidly growing internet traffic boosted the expansion of the international network.

From the view of product side, mass adoption of smartphones in the mid-2000 such as iPhone and BlackBerry initiated a sharp rise of international traffic. Along with smartphones, release of different types of devices such as tablet PC and notebook impacted how people use the internet. In 2011, the number of wireless connections was almost double the fixed broadband users in Organization for Economic Cooperation and Development (OECD) countries.

In the service side, social networking service affected how people interact and communicate through internet. Many types of digital contents such as video, music, and film provided by media contents providers also impacted the international traffic increase (Figure 1). Moreover, since late 2000s, broadband internet became a ubiquitous service that majority of companies and households could experience. In 2011, almost all companies in OECD countries used internet which allowed them to operate business and create new opportunities. In the same year, around 70 percent

Table 1: Asia-Pacific ICT Development Index

National	Year 2011		Year 2010		National	Year 2011		Year 2010	
	Rank	Index	Rank	Index		Rank	Index	Rank	Index
Republic of Korea	1	8.56	1	8.45	China	78	3.88	79	3.58
Japan	8	7.76	8	7.54	Viet Nam	81	3.68	86	3.41
Hong Kong (Province of China)	11	7.68	12	7.39	Thailand	92	3.41	89	3.29
Singapore	12	7.66	10	7.47	Philippine	94	3.19	94	3.04
Macao	14	7.51	13	7.38	Indonesia	95	3.19	94	3.04
Kazakhstan	49	5.27	56	4.63	Uzbekistan	102	3.05	104	2.77
Malaysia	58	4.82	57	4.63	Cambodia	121	1.96	119	1.88

Source: Measuring the information 2012, ITU

of households in OECD countries had access to internet in relatively low cost (Figures 2–3).

Changes in products and services allowed people to experience and communicate utilizing various mediums with seamless connectivity. This was possible through increased network coverage, transfer capacity, and speed. Consequently, these changes had direct impact on the quality of lives and global economy, which reflected the importance of international telecommunication.

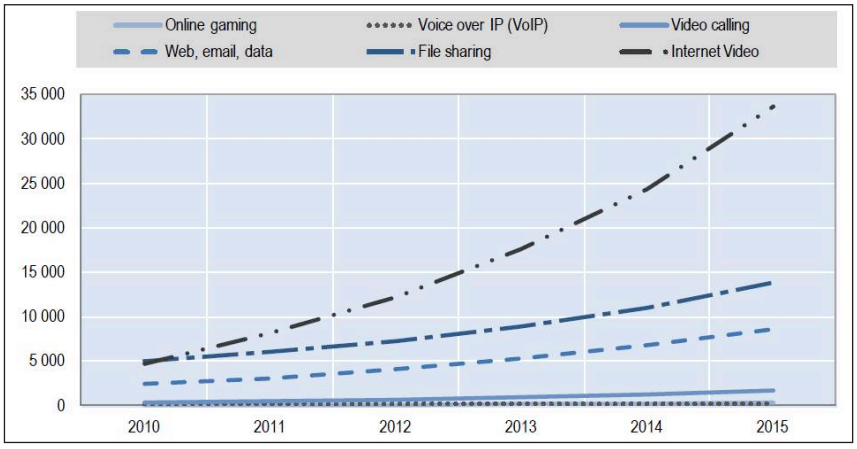

Figure 1: Global consumer internet traffic, 2010–15

Source: Internet Economy Outlook 2012, OECD

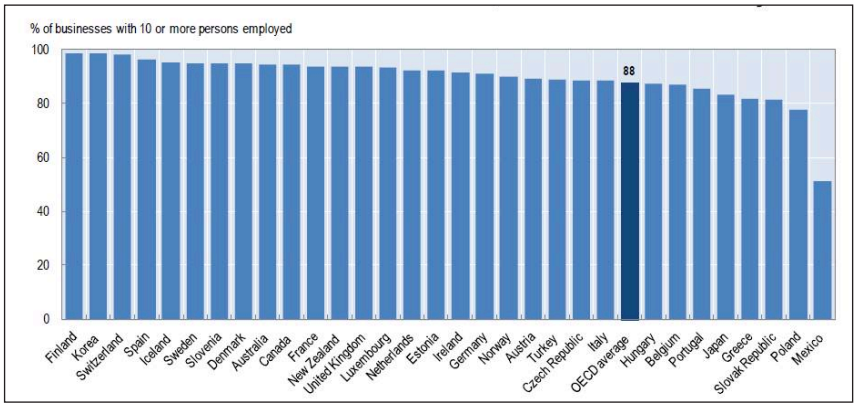

Figure 2: Businesses with a broadband connection, 2011 or latest available year

Trends in Asia-Pacific

Internet traffic in the Asia region is growing faster relative to US and Europe with less dependency than ever before. It is also observable in Asia that the focal point of internet traffic coincides with countries or locations where there is a high density of submarine cable landings or connections (Figure 4).

This growth pattern is generated by the increase in cloud services and construction of data centers in Asia-Pacific. Advent and spread of smart devices and social networking services have facilitated the need for new data centers all over the world, and while previously, technology companies have focused their foot prints mostly in US and Europe areas, they are now becoming more and more interested in Asia due to rapid growth in their customer base. Currently, in Asia, there is an ongoing competition between governments to facilitate new data centers in their countries with expectations to become the next internet hub in Asia. Companies such as Google, Facebook and Microsoft have already actively begun construction and deployment of their own networks for cost effective delivery of contents.

Hosting new data centers and providing various services including cloud service can be achieved through building a

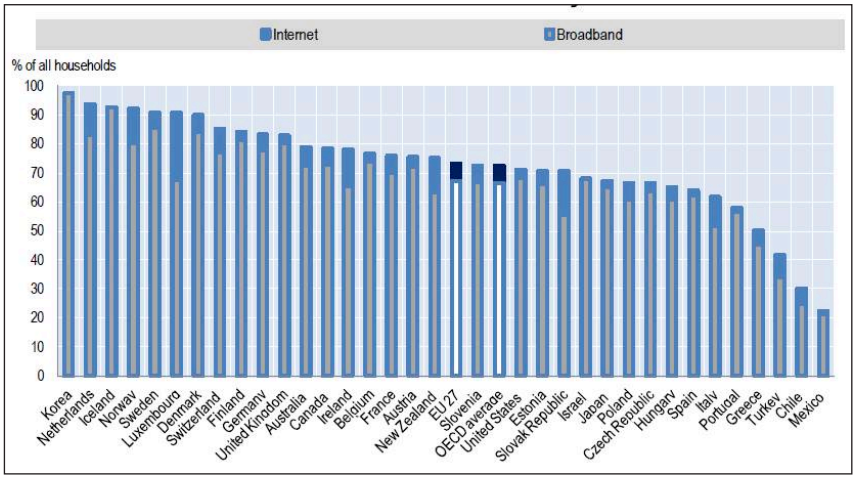

Figure 3: Internet access and broadband connections in OECD households, 2011 or latest available year

Source: Internet Economy Outlook 2012, OECD

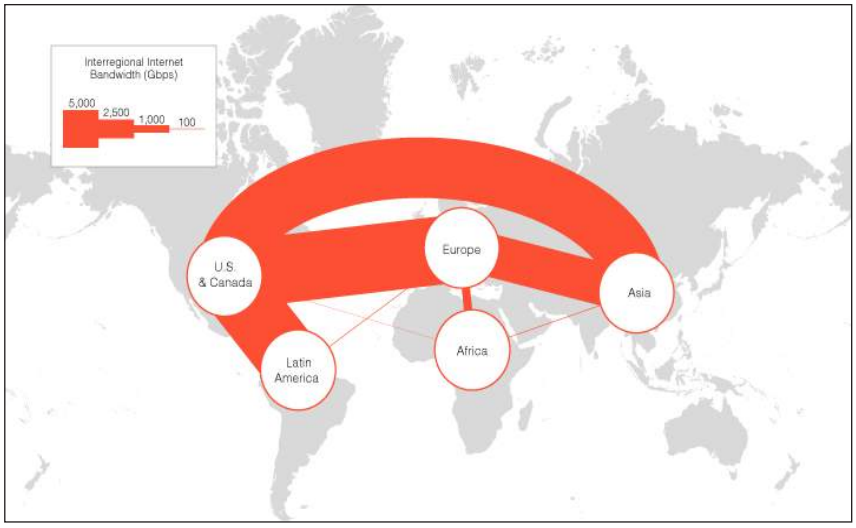

Figure 4: International internet bandwidth

Source: TeleGeography, 2013

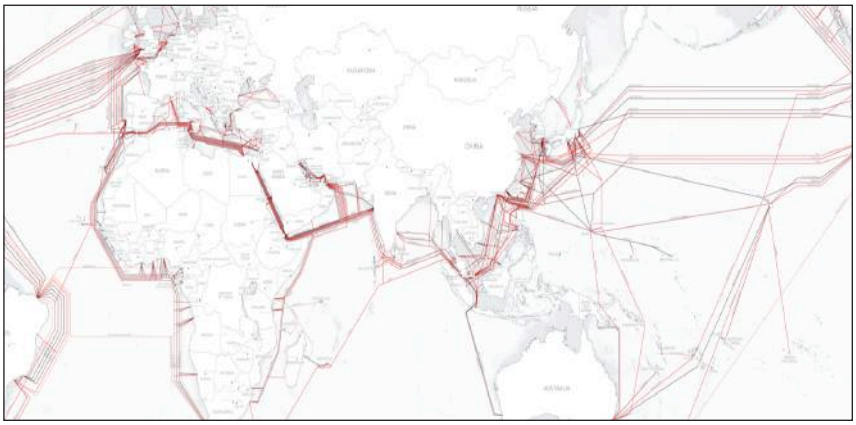

Figure 5: Submarine cable map

Source: Submarine Cable Map, TeleGeography

network infrastructure such as submarine cable network, which is the basis for realizing these products and services.

Importance of submarine cables

Observing today's international networks, it is quite evident that expanding international networks are important and that submarine cable accounts for the core of building block of such international networks. Basically, almost every country around the globe is linked somehow to the submarine cable networks (Figure 5).

Development of technology significantly transformed how the submarine cables are utilized for international telecommunication. It was common in 1990s that international calls are the major part that used the resource of submarine cable network. Nevertheless, in modern times, its effects are enormous on people, companies, industry, and the society through internet.

Traditionally, it was telecommunication companies' scope to construct submarine cable networks. But as many companies realized the importance of having strong international networks, companies from different field participated or invested in the submarine cable networks. Companies which have core competency in e-commerce, software, media contents and internet, also actively participate in building international network (Table 2).

Submarine cables in Asia-Pacific

Overview

Looking at the major cable systems in Asia, we found out that Singapore and Japan are among the most favorable locations for network connectivity. There are currently about 28 cables systems in operation in Asia, summing up to 375,000 km in length and 77 Tbps in capacity connecting Asia with Europe and US. Of these, 38 percent is transpacific, 14 percent Europe and 48 percent bandwidth within Asia. The actual bandwidth in use is estimated to be near 30 percent, which is 23 Tbps (Figures 6–7).

- Transpacific: 10 cable systems at 28.9 Tbps;
- Europe: 6 cable systems at 11.2 Tbps; and

- Intra-Asia: 9 cable systems at 37.1 Tbps (Figures 6–7).

It is also expected by that by 2014, traffic requirements in Asia will increase by 80 percent equating to another 60 Tbps to the current amount (Table 3).

Procurement methods

Most telecommunication operators invest directly or via consortium in submarine cable systems to acquire international bandwidth.

- **Consortium:** Joint investment and operation of a submarine cable system. Many cable systems are built via partnership between telecommunication operators of each country forming a consortium rather than built independently;
- **IRU purchase:** IRU deals generally ensure indefensible right of use for a period of 15–20 years with predefined cost for operation and maintenance. Due to its long terms, it becomes ineffective for legacy cable systems with high operation and maintenance cost; and
- **Lease:** Capacity is leased from a private owner, a consortium or the IRU Purchaser for a short period of time at a negotiated price.

Submarine cable activity by country

Status of Submarine cable systems in each country are as follows:

- **China:** There are three telecommunication operators owning submarine cable systems in China. In 2011, China Telecom had 661Gbps of submarine cable capacity and 13 global points of presence (POPs), China Unicom had 357 Gbps and 10 POPs, China Mobile had 49 Gbps and 2 POPs. All three operators continuously invest in submarine cable system construction to resolve the traffic congestion caused by exponential growth.
- **Singapore:** SingTel is actively involved in the construction of submarine cables. SingTel owns Sea-Me-We-3, Sea-Me-We-4, APCN, APCN-2, China-US, Japan-US, C2C, i2i and Southern Cross. In particular, SingTel has 40 percent, Telecom NZ 50 percent and Verizon 10 percent share in the Southern Cross cable. Southern Cross is one of the rare cables which sell capacity to outside parties and share the profits among original owners.
- **Australia:** Telstra constructed a new cable system between Sydney and Hawaii in 2008 with 1.3 Tbps capacity and spanning 9,000 kilometers. Telstra maintains a 50:50 JV with Reach in Hong Kong for the maintenance of submarine cable systems.
- **Malaysia:** Telekom Malaysia is dominant in submarine cables with AAG, APCN-2, China US Cable Network, JuSCN, SMW3, SMW4, DMCS, SAFE and SAT3/WASC systems and driving new projects such as ASE and BDM. Telekom Malaysia also acquires capacities on

Table 2: Companies on international network infrastructure investment by region

	Amazon	Facebook	Google	Microsoft	Netflix	Yahoo
Africa						
Nigeria			•			
South Africa			•			
Asia-Pacific						
Australia	•		•	•		•
China	•	•	•	•		•
India			•			
Japan	•		•	•		•
Korea, Rep.				•		•
Malaysia		•	•			
Singapore	•	•	•	•		•
Taiwan			•	•		

Source: TeleGeography

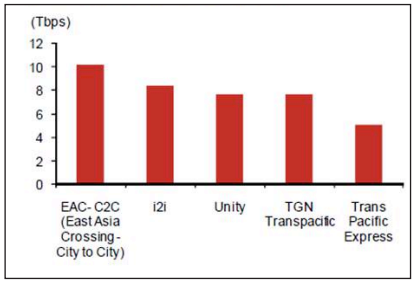

Figure 6: Top-five Asian cables by capacity

Source: Company reports, press articles, Nomura research

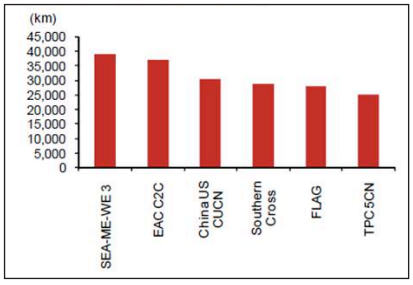

Figure 7: Top-five Asian cables by length

Source: Company reports, press articles, Nomura research

Table 3: Proposed cable systems in Asia

Upcoming systems	Investment USDmn	Countries landed in	Length kms	Capacity	Launch
Asia Pacific Gateway	na	Malaysia, Singapore, Thailand, Vietnam, Hong Kong, the Philippines, Taiwan, China Mainland, Japan and Korea	8,000	4.0 Tbps	2011
Submarine Cable Asia Network	na	Indonesia, Hong Kong	4,300	1.9 Tbps	2011
TGN EurAsia	250	India, Egypt, France	9,280	1.3 Tbps	2011
Southeast Asia Japan Cable SJC	400	China, Hong Kong, Philippines, Japan and Singapore	8,900	23.0 Tbps	2012
Asia Submarine-cable Express	430	Japan, Malaysia, Singapore,Hong Kong and Philippines	7,200	15.0 Tbps	2012
West Asia Crossing	150	India, Singapore, Malaysia	8,000	8.0 Tbps	2012
Dhiraagu Domestic Submarine Cable Network	22	Across the Maldives islands	1,017	20 Gbps	2012
Pacific Fibre	na	Australia, New Zealand, USA	12,750	5.1 Tbps	2013
FLAG NGN-Eagle	na	Japan, USA	na	na	na
Total			59,447	58.3 Tbps	

Source: Wikipedia, Frost and Sullivan, News websites

systems at competitive cost which it has not investment via joint bulk purchase with competing operators such as DiGi, Axiata, and Maxis.

- **Indonesia:** PT Telkom and Indosat are in charge of submarine cable connections. PT Telekomunikasi Indonesia International (TII) which is a subsidiary of PT Telkom is under the construction of a new cable system named TIS in collaboration with SingTel and CAT connecting Singapore, Thailand and Indonesia. They were also involved in AAG, SJC, and JaKaLaDeMa cable.
- **Philippines:** PLDT and Globe are investing in submarine cables. PLTD has involved in 11 cable systems and landed four systems in Philippines. Globe has invested in five cable systems and recently contracted the SJC system.
- **Thailand:** CAT is heavily involved in submarine cable investment including US$ 67 million in AAG. CAT also has plans to invest US$ 90 million in the Gulf cable project connecting Thailand and the Gulf area. TOT is concentrating on connecting domestic islands and started investment on international submarines beginning with SJC (the South-East Asia Japan Cable system). Although they have the licenses required for international telecommunication business, due to their limited requirements, they prefer to lease capacity instead of making large investments in submarine cable projects.
- **Republic of Korea:** KT is most active in submarine cable investment and operations. KT also has 37 percent share in its subsidiary KT Submarine which is responsible for submarine cable repair and installation in the Asia-Pacific area. KT has ownership in FLAG Europe-Asia network; Sea-Me-We-3, China-US link, APCN-2, Republic of Korea-Japan Cable Network, Trans-Pacific Express and eight other submarine cables. Other Korean telecommunication operators such as SKBB and LGU+ generally lease capacity for their international traffic.

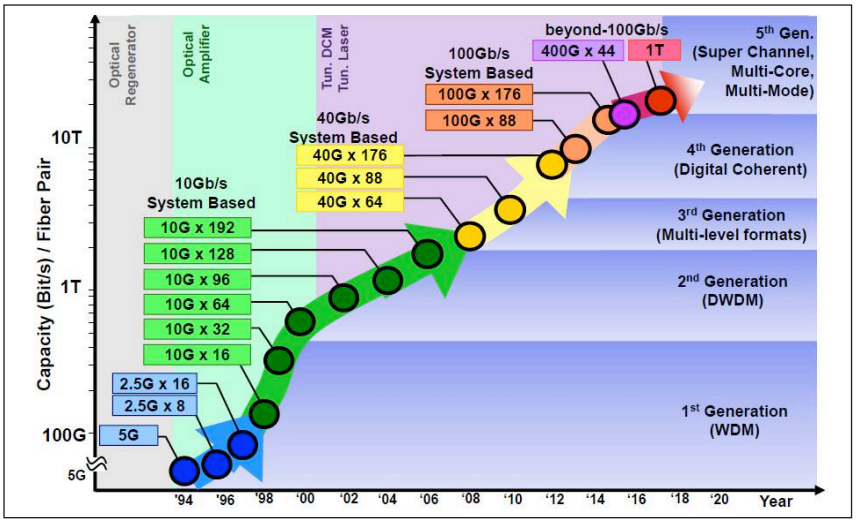

Figure 8: Evolution of capacity and technology in submarine cable

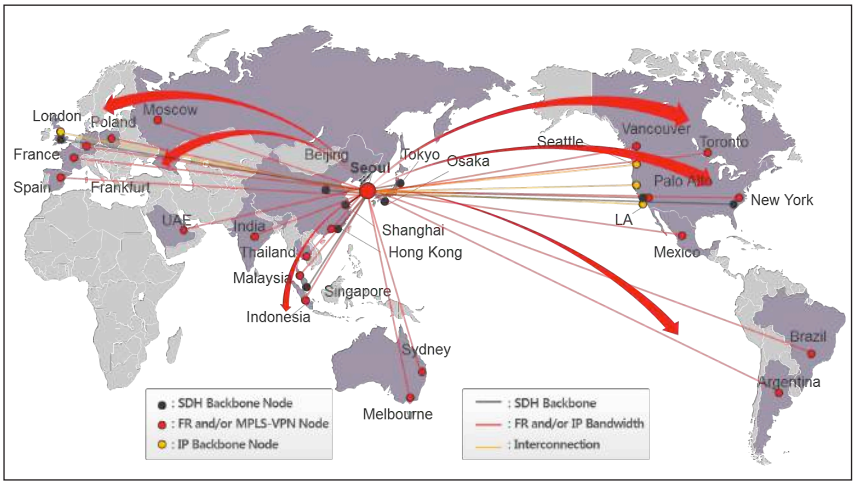

Figure 9: Internet services of KT Corporation

Technologies

Advances in information technology and development of related industries have allowed the telecommunication industry to become more effective in providing fast and reliable telecommunication networks throughout the world. Likewise, submarine cable systems were only able to transmit 2.5 Gbps per wavelength a few years ago, but now can transmit 10 Gbps per wavelength. Furthermore, new cable systems under planning or construction are now aiming to adopt 40 Gbps or 100 Gbps transmission technologies from day one and legacy systems are now being upgraded with such technologies to increase cost per bit (Figure 8).

KT's role in Asia-Pacific

KT Corporation is the leading internet service provider in the Republic of Korea with numerous submarine cable systems directly connecting inland and other countries including the US, China, Japan, Singapore as well as to countries in Europe (Figure 9). KT is also one of the major data center operators in Republic of Korea and abroad, providing secure and effective co-location and managed services to various contents' providers and other customers.

Based on such extensive footprint and experiences in the Asia region, KT is making various efforts to close the information gap between the developing and

developed country by improving connectivity through projects such as the APG (Asia-Pacific Gateway) submarine cable system linking nine countries in Asia and promoting carrier neutral internet exchange points such as the BIX (Busan Internet Exchange) to support better interconnectivity.

Through such projects as the APG and the BIX, KT aims to achieve a more secure and diverse network to be accessible by everyone and advocate polices to ensure that everyone is well connected to meet the requirements of their customers.

KT is especially cautious of potential catastrophic natural disasters which may seriously disturb the basic telecommunication network infrastructure upholding the economic relations and essential communications between countries, such as the mega earthquakes that occurred in the near seas of Taiwan (Province of China) and Japan several years ago. Natural disasters of such scale are beyond human prevention and have the potential to completely undermine the fundamental foundations upon which we base our everyday lives on (Figure 10).

In order to prevent such risks, KT has been actively increasing network diversity through new submarine cable systems and providing data center backup and restoration services in Republic of Korea, where it is safe from such natural disasters.

Aside from natural disasters, political risks such as regulations against free speech, media censorship and mistreatment of personal information is also an important factor for businesses to consider. This is especially important for new businesses models where ensuring free flow of information is absolutely mandatory for their businesses to thrive.

For such geographic and political reasons, Republic of Korea has been considered by many global companies as a potential location to build their data centers and expand their networks. KT has been actively supporting such companies in terms of technology, polices and government relations. It continuously strives to expand international network by hosting new data centers and contents' providers so that the connectivity from developing countries on high-quality contents increases.

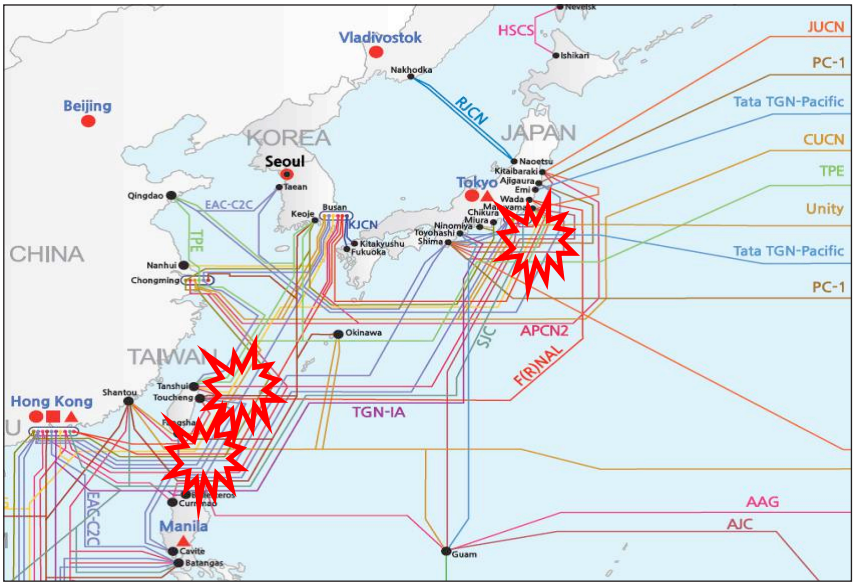

Figure 10: Mega earthquakes and submarine cable routes in Asia

Source: Mega Earthquakes & Submarine Cable Routes in Asia. KT Corporation, 2012

KT also utilized its advanced Information and Communication Technology (ICT) and experiences in telecommunication industry by providing technical consultation to developing countries that need guidance. Few of the precedent cases on the technology consulting are: Consulting on Brunei's national data center (2012), Development of WiMAX and LTE technologies in Uzbekistan (2012), and adoption of 4G LTE infrastructure in Rwanda (2013). Furthermore, KT has implemented educational programs on ICT to developing countries in order to promote understanding on ICT and its boundless possibilities.

KT will continuously enhance international telecommunication environment and contribute on providing effective solutions for closing the digital divide through an international telecommunication hub in Asia-Pacific.

Conclusion

In today's world, the ability to communicate easily and efficiently is most vital for every country to prosper. Therefore, having reliable telecommunication network infrastructure brings great benefits to a country. Many countries around the globe are now aiming to construct new submarine cable to directly connect their countries aiming to become a regional network hub in hopes of attracting new businesses and investments. According to analyst reports, it was found that approximately US$ 56.3 billion has been used to construct submarine cables up until the year 2012. There is numerous new submarine cable constructions under planning or in progress currently and 24 of them are expected to inject US$ 3.1 billion by 2014 to complete the construction. Submarine cable projects are distributed from Latin America all the way to South-East Asia, and it is crucial that governments and corporations of each country make the necessary investments in submarine cables for advances in information technology (Figures 11–12).

New submarine cable construction project by continent

Constructing an international telecommunication infrastructure is essential for reducing the information gap between countries. This will not only affect the development of telecommunication industry, but also on all the relevant industries. Therefore, broad cooperation between regional and economic cooperation organizations is needed in building an

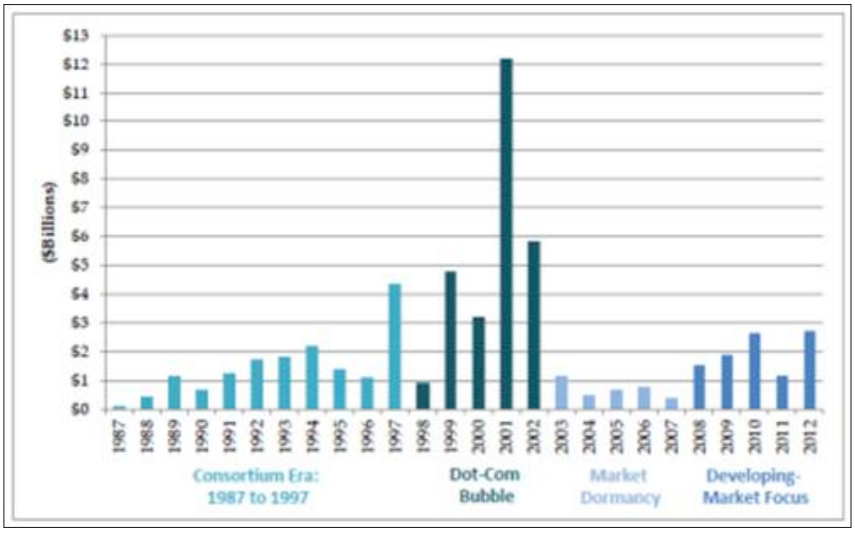

Figure 11: Yearly submarine cable construction costs (Unit: $Billions)

Source: Terabit Consulting, 2013

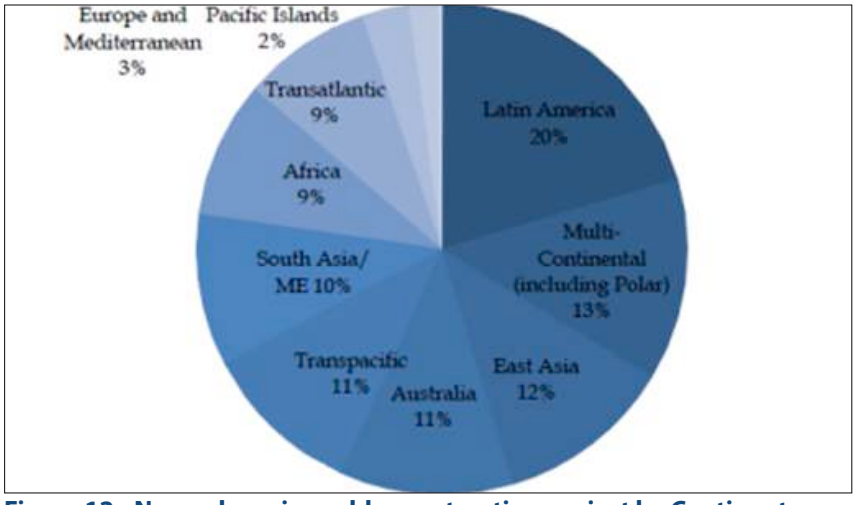

Figure 12: New submarine cable construction project by Continent

Source: Terabit Consulting, 2013

international telecommunication network to mitigate the gap in the availability of information.

Recently, in APAC there are numerous trans-pacific network projects on progress. Many ongoing projects are mainly for the connectivity between North-East Asia and the US. To mitigate the information gap between Asian countries, more intra-Asia cable network projects should be developed and invested. Landlocked countries having difficulties accessing the sea should consider building cross-border communication network along with road construction.

A better network infrastructure will provide vast opportunities for new internet-based businesses and encourage new investments and job creation. Each country should take lead in realizing such goals by making appropriate investments in international infrastructures which will provide the foundation for future economic growth.

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Information Superhighway Map

Ground-breaking new maps of the Global Information Superhighway, which will help bridge the digital divide in Asia-Pacific, were today jointly released by the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) and the International Telecommunication Union (ITU). The interactive terrestrial transmission information superhighway maps will show policy makers and investors where the missing links in terrestrial transmission are across the region, assisting ESCAP in its efforts to bring affordable information and communication technology (ICT) and broadband connectivity for all.

The ITU Interactive Terrestrial Transmission/ESCAP Asia Pacific Information Superhighway Maps are available at http://www.unescap.org/idd/maps/asia-pacific-superhighway

PATHWAY TO LOW CARBON TRANSPORT IN ASEAN REGION

TOOLS TO ENVISION THE ROADMAP

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Abstract

The Institution for Transport Policy Studies (ITPS), in cooperation with Clean Air Asia and with the support of the Nippon Foundation, has been conducting an international study project called "Long Term Action Plans for Low Carbon Transport in ASEAN". The aim of this study is to propose long term action plans to realize low carbon transport in the ASEAN region. As one of the outputs of the study project, two tools, called the "Visioning tool" and the "Backcasting tool", have been developed. Based on the study project, this article summarizes our methodology for evaluating reduction effects of CO_2 emission in the transport sector of the ASEAN region by mitigation policy implementation and our above mentioned two tools to envision a roadmap toward a low carbon transport society in accordance with the methodology. These tools will make it possible for ASEAN countries to establish appropriate CO_2-mitigating policies and to assess these policy's impacts.

Introduction

Due to the continuous population increase and the growth of emerging economies, transport demand all over the world will certainly increase. Also the Greenhouse gas (GHG), notably CO_2 emissions from the transport sector also will increase along with transport demand, if additional GHG mitigation measures are not to be applied. For instance, the International Energy Agency (IEA) predicted that CO_2 emissions from transport account for approximately a quarter of anthropogenic CO_2 emissions and that the CO_2 emissions from the transport sector are estimated to reach as much as twice present levels by 2050. According to IEA, the CO_2 emissions from transport in developed countries will be more or less stabilized at the current level, while the share of emissions from non-OECD countries, which is currently only about 35 percent, will be approximately (around 66 percent) by 2050. On the other hand, according to the Intergovernmental Panel on Climate Change (IPCC), GHG must be reduced to at least half the current level by 2050, or be reduced by up to 80 percent depending on the cases, to stabilize the climate (to cap the temperature increase equal to or below 2°C). Of course, this target to stabilize the climate is for all sectors, not only for the transport sector; however, it has already been accepted as a global target in The Cancun Agreements agreed at UNFCCC COP 16, 2010.

Meanwhile, transport in the ASEAN region is facing various issues now that will continue in the future. The first issue is the increasing demand for transport which accompanies economic growth, in particular an increased use of automobiles aggravated by the lack of alternative appropriate transport modes. Because of this, a large increase in CO_2 emissions is expected. Also, the social background of the ASEAN region is worthy of note. Ten countries now belong to the ASEAN, and it can be said that each country is in a different stage of economic and social development. Further, geographical conditions are also different, as in the continental Thailand, Viet Nam, and Myanmar, or as in Indonesia and the Philippines which are surrounded by the ocean. For this reason, it will be essential to discuss appropriate policy solutions suited to each country.

From the global context and ASEAN context of transport, and the many issues being faced, including the GHG emissions from the transport sector resulting from increased transport demand in the future, the Institution for Transport Policy Studies (ITPS) has embarked on an international study project called "Long Term Action Plans for Low Carbon Transport in ASEAN" to propose a long term action plan to reduce CO_2 emission from the transport sector drastically, by working with Clean Air Asia, local experts and stakeholders, the with the support of the Nippon Foundation. Based on this study project, this article summarizes the methodology for evaluating CO_2 emission and our two tools to envision a roadmap toward a low carbon transport, Visioning tool and Backcasting tool, according to the evaluation methodology.

As mentioned above, the scope of the study covers all ASEAN countries (Singapore, Indonesia, Malaysia, the Philippines, Thailand, Viet Nam, Laos, Myanmar, Cambodia, and Brunei). The study focuses on CO_2 emitted from transport as its target for assessment, and the scope of policies covered by the study has been confined to "transport policies", therefore, this study does not deal with policies in other sectors, such as energy policy.

From viewpoints of environmental equity, the reduction target of this study

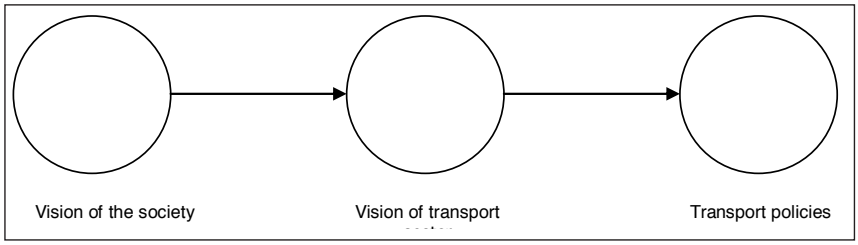

Figure 1: Flow of the study

is set as the CO_2 emissions of 0.33 t-CO_2/person/year in 2050. Since the current world average is approximately 1 t-CO_2 according to IEA estimation and population statistics, the half of 1 t-CO_2 is 0.5 t-CO_2. However, the population of the world will be approximately 1.5 times larger according to the estimation by the United Nations. Therefore, to reduce CO_2 emission from the transport sector globally to half, we have decided that the target per capita CO_2 emission should be 0.33t-CO_2.

How difficult is it to meet the target? Currently, the Philippines, Indonesia and Viet Nam emissions are approximately at that level. Also, Thailand, Malaysia and Singapore have already exceeded this value. Technological developments in the transport sector, such as hybrid vehicle and electric vehicle, will mitigate some CO_2 emissions. However, the amount of reduced CO_2 emission by only one technology would not be enough to meet the target, according to the result of the previous study.[1]

Methodology

Figure 1 shows the basic concept of the overall flow of this study. The study adopts, as a precondition, a process that considers as to what type of transport is required for what kind of society, as well as what policies are required to realize such transport scenario. Conditions have been set throughout this chain of process with regard to the level of CO_2 emission from transport, and policy options were selected under such conditions.

The study adopts two approaches in this chain of processes, namely backcasting and visioning. Explanations of these two approaches are provided below.

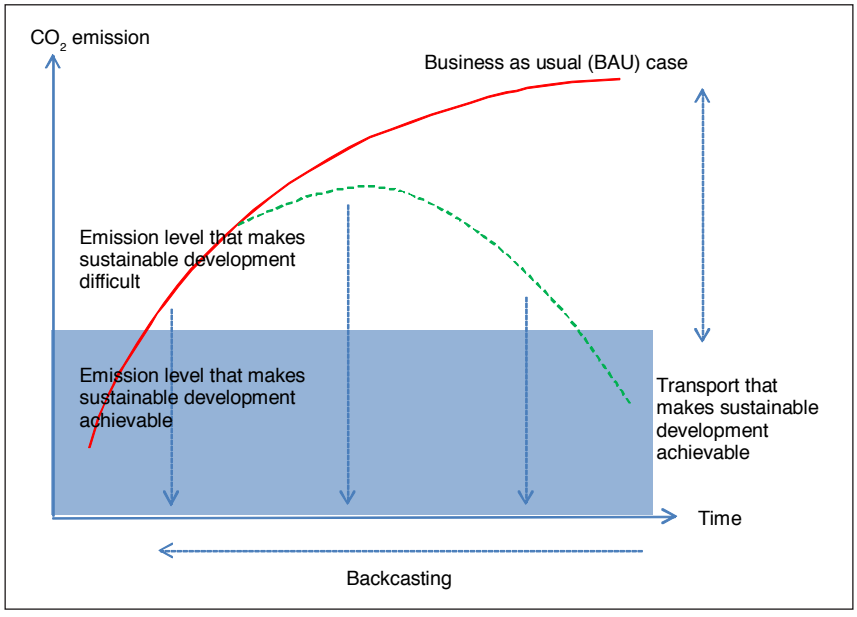

Figure 2: Concept of backcasting approach

Backcasting approach

The backcasting process is an approach whereby a target is set first, after which policies required to achieve the target are derived. Figure 2 illustrates this concept. The Business as Usual (BAU) case in the figure represents the extension of the current trend; the right end of the red curve would be the level of CO_2 emission in the target year if no measures were taken. In the backcasting approach, a reduction target is set right below the point mentioned above, and the way toward this target is drawn (as shown in a green dashed line in the figure). It is an approach that examines what is required to reach the target. The backcasting approach is an ordinary approach commonly used in our day-to-day life, and in recent years, it has gradually been adopted specifically for determining long term policy objectives.[2]

In the backcasting approach, the target is externally set. That means it is not based on preconditions. Thus the target will not be affected by drastic future changes or uncertainty. However, this advantage could, conversely, lead to suspicions on the target initially set. In order to remove this suspicion concerning feasibility, which is a weakness of backcasting, forecasted figures are used in some of the preconditions.

Visioning approach

Visioning is the process to draw two images, one of the society and another of transport, within the process explained in the previous section. These two images are preconditions for backcasting, and they provide reference information to help users understand, at the time of selecting a policy, the type of society in which it would be selected. Below we will explain the two images and the scenarios into which they will be incorporated.

The purpose of setting a vision of the society is to derive future transport images. In other words, to derive the type of transport that would be needed, as we project the transport situation 40 to 50 years from now. This is based on the understanding that transport demand is a derived demand of the society

[1] "International Study of Transport Systems in a Low Carbon Society", with supported by Nippon Foundation. For more detailed information, please refer Matsuoka, I. and Allen, H. (2011).

[2] For example, Vibat (http://www.vibat.org) adopt backcasting approach in transport sector.

and economy. To envision the desirable transport, not only quantitative information, such as population and GDP estimation, but also qualitative information, such as the characteristics of people, the nature of land use, and the major industries, are required. The first step of visioning is to draw a picture of the society itself, which lies as the foundation upon which transport moves.

Similar to the vision of the society mentioned above, the vision of transport is important to consider in order to effectively address the next step of selecting appropriate transport policies. The image is not only a simple quantitative result (e.g., transport volume), but also includes qualitative information such as the transport modes used, their quality (comfortableness, safety, etc.), and environmental impact.

CO2 emission estimation

To estimate CO_2 emissions from transport sector, the ASIF framework (Schipper, L. and Marie-Lilliu, C., 1999) is applied in this study. The framework consists of four factors; activity, structure, intensity, and fuel type. CO_2 emission is obtained by the products of these factors. And to meet the target, there are three major policy categories, so called Avoid-Shift-Improve (Dalkmann and Brannigan, 2007). In other words, there is the "Avoid Policy" to reduce wasteful and inefficient transport volume, the "Shift Policy" to encourage eco-friendly transport modes, and the "Improve Policy" which is to improve the fuel economy and introduce new generation vehicles. And the backcasting approach considers what kind of policies would be appropriate in accordance with future social and transport images and how much these selected policies should be implemented to meet the target in the future (Figure 3).

Policy evaluation

The methodology to judge whether assessed policies are able to meet the target is to subtract the CO_2 mitigation effects of each policy from the BAU scenario which are inputted as given. Therefore, each policy has to hold its CO_2 mitigation effect as a parameter. And it is possible to consider the timing of policy introduction by setting the introduction year and period (Figure 4).

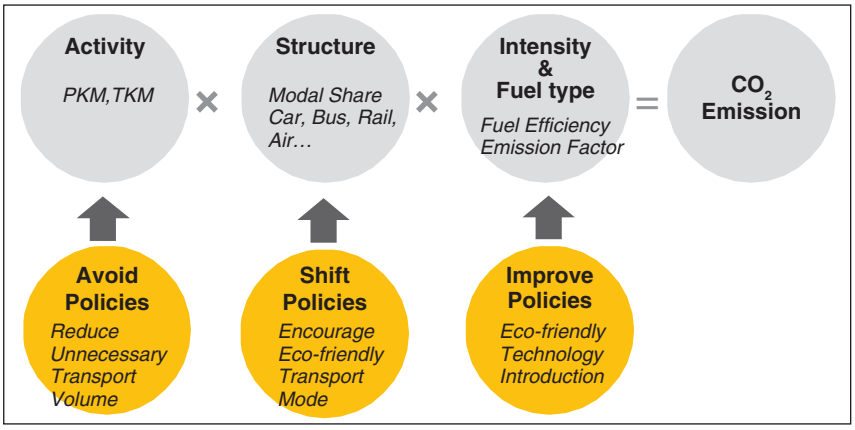

Figure 3: ASIF framework and ASI policy categories

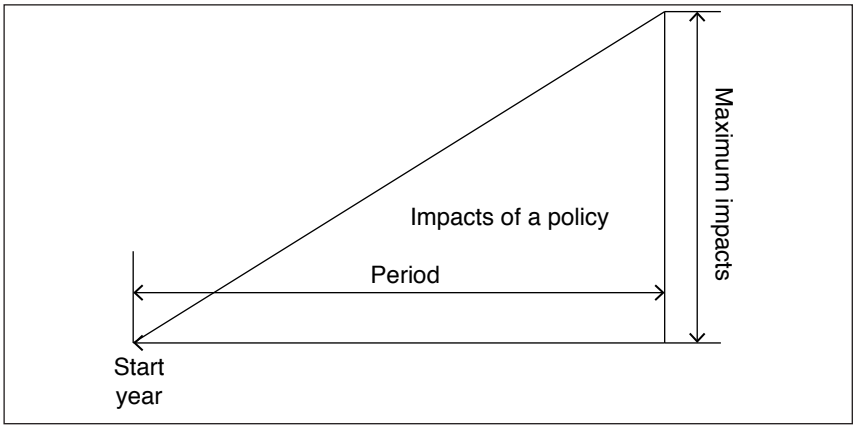

Figure 4: Image of policy introduction impacts

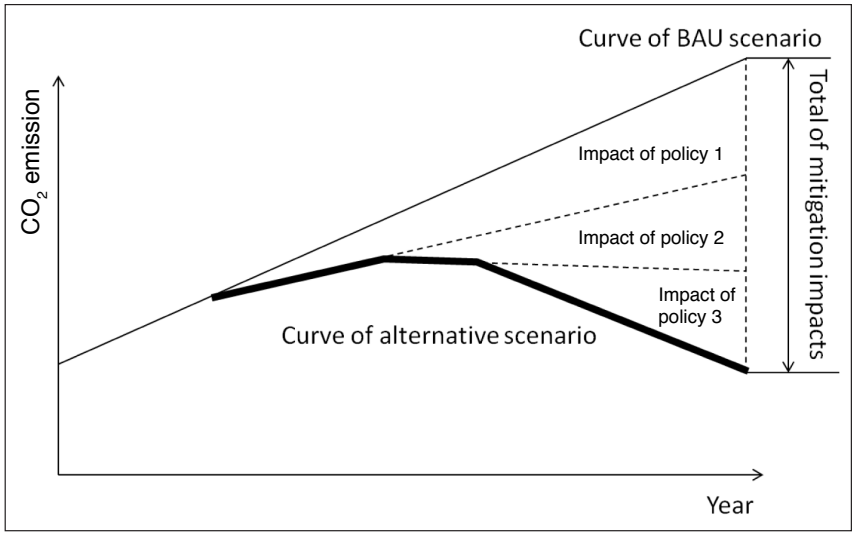

Figure 5: Image of effects of policies implementation

The CO_2 mitigation effect of introduced policies is obtained by subtraction of the "wedge shape", which represents the mitigation amount of each policy, from the BAU scenario (Figure 5).

Development of visioning tool and backcasting tool

As one of the important outputs of the study, the visioning tool and backcasting

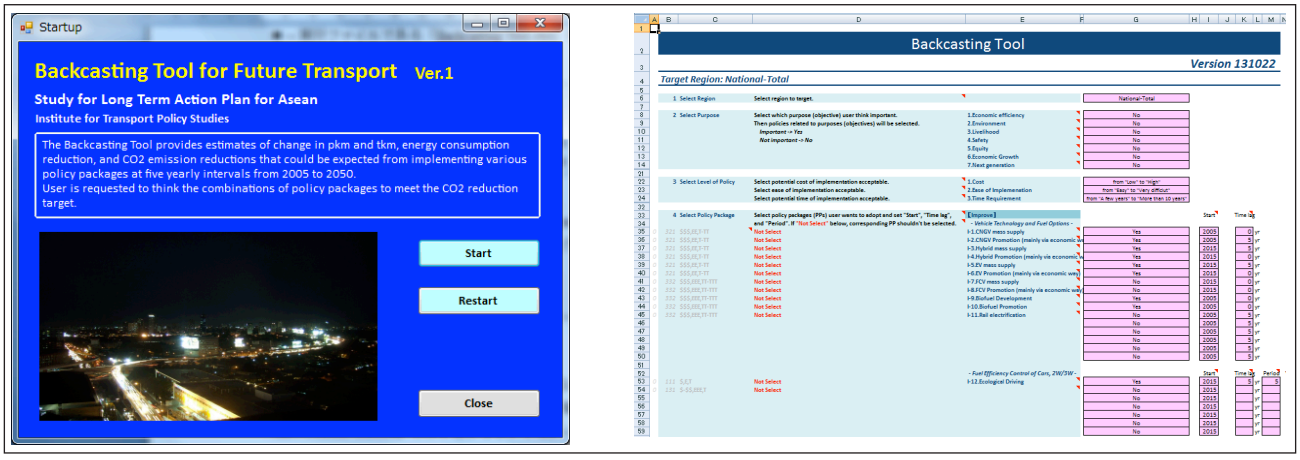

Figure 6: Backcasting tool (GUI version on the left side and excel version on the right side)

tool (Figure 6) have been developed in accordance with the methodology shown as above. These two tools will be provided openly to the public for free.

The visioning tool is a tool to support the users to envision future social and transport images of a target country or region. Previously, such future visions have been made by meeting with stakeholders and experts. In this study, in order to draw these future images, the local experts and concerned parties were invited to hold meetings to envision future images. Web surveys were also conducted for the same sake. Based on the results from such meetings and surveys, the policy packages were selected. To facilitate the visioning process, the visioning tool has been developed, by inputting the logics of the linkage between societal factors and transport and results of the meeting and web surveys. Therefore, users are able to get the future social and transport image and recommended policies in accordance with the image to answer the questionnaires of the visioning tool (Figure 7).

The backcasting tool is a tool to assist to assess the impacts of introduced mitigation policies in accordance with the ASIF framework. This tool contains much data, such as the baseline of each ASEAN country, the candidate policy packages shown in Table 1, and introduction effects of each policy considering the past results and studies. And users are able to obtain the CO_2 emission reduction effects and policy roadmaps by selecting the policy packages which would be suitable for the user's country and inputting their implementation start year and period, amount of implementation, such as introduction amount of next generation vehicles and shift rate to eco-friendly transport mode (Figure 8 and 9). Another characteristic is that users are able to assess by each region such as large cities, small cities and intercity transport, etc.

CO_2 emission and mitigation policies

This section summarizes the results of CO_2 reduction estimation by selected policy implementation and estimated by the backcasting tool. For more details, refer to the ITPS report which will be published soon.

Table 1: ASI policies

	Definition	Examples
Avoid policies	Reduce transport volume by reducing trip number	• ICT utilization • Tele-activity
	Reduce transport volume by reduce trip length	• Pricing regimes, fuel price taxation • Urban and land use planning
Shift policies	Encourage eco-friendly transport mode usage	• Bus/BRT usage promotion and infrastructure development • Rail/LRT usage promotion and infrastructure development • Ship usage promotion and infrastructure development
Improve policies	Introduce more fuel-efficient technology	• Mass supplying and usage promotion of CNGV, HV, EV and FCV • Biofuel development and promotion • Fuel efficiency improvement of rail, air and ship
	Drive vehicles by more fuel-efficient way	• Ecological driving

Baseline

The total transport CO_2 emissions in 2005 were 188.2 million t-CO_2 in the whole of ASEAN. In terms of the current CO_2 volume, Thailand is the highest contributor to the total (28 percent). In terms of modes, passenger four-wheeled vehicles contributed 43 percent of the total CO_2 in 2005. Motorcycles and three-wheelers contributed 13 percent. Road freight vehicles contributed 25 percent of the total CO_2. The weighted average CO_2/capita in 2005 is 0.422 t-CO_2/capita.

BAU scenario

The total CO_2 emissions in 2050 are expected to increase by 822 million t-CO_2. This means that the 2050 transport CO_2 will grow 4.36-fold as compared to 2005. Emissions from buses are expected to grow the fastest (3.9 percent per annum), similar to SUVs and LVs. Motorcycle emissions will grow at 3.5 percent per annum while passenger car emissions (sedans) will grow at 2.8 percent per annum. Emissions from light-duty trucks will still grow the fastest for the freight sub-sector at 3.6 percent per annum, while emissions from rail will increase at 3.2 percent. In terms of contribution to the whole transport CO_2 emissions, four-wheeled passenger vehicles (cars, LV, SUVs) are estimated to contribute 46 percent of the CO_2 emissions in 2050 under the BAU scenario. Trucks (light and heavy duty) will contribute 23 percent of the CO_2 emissions in BAU 2050. The resulting weighted CO_2 emissions per capita in 2050 are 1.36 t-CO_2/capita, increasing more than three-fold from the 2005 value (Figure 10).

Figure 7: Outputs of visioning tool (Above: story line, below: policy recommendation accordance with story line)

Alternative scenario

The selected policy packages for each country were applied into the backcasting tool mentioned above to estimate the emission reduction potential in 2050. Table 2 shows a summary of the policies that were applied into the backcasting tool. Table 2 also indicates that selected Shift and Improve policy packages have some difference between each county, however, Avoid policy should

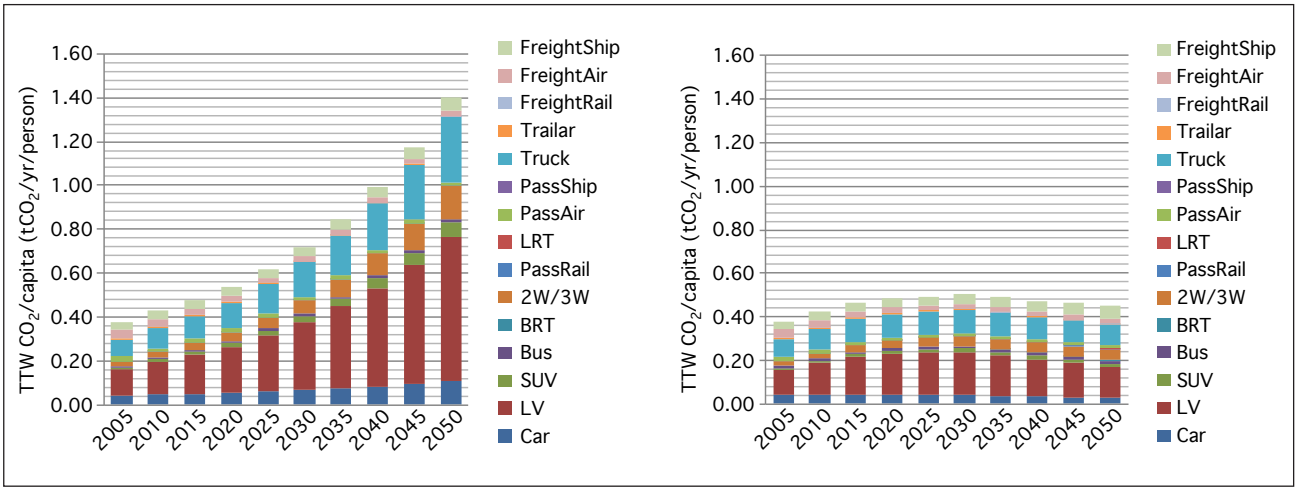

Figure 8: CO_2 emission simulations by backcasting tool (BAU scenario on left side and alternative scenario on right side)

【Improve】	Selected	Start	Time lag	Yr for effect	Period	Yr for max	Increment	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
- Vehicle Technology and Fuel Options -																	
I-1.CNGV mass supply	Selected	2005	0	2005				■	■	■	■	■	■	■	■	■	■
I-2.CNGV Promotion (mainly via economic way)	Selected	2005	5	2010				→	■	■	■	■	■	■	■	■	■
Car	Car(CNG)			2015,	10,		0.05,	0%	0%	0%	3%	5%	5%	5%	5%	5%	5%
LV	LV(CNG)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SUV	SUV(CNG)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus	Bus(CNG)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BRT	BRT(CNG)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck	Truck(CNG)			2010,2015,	25,15,		0.3,0.15,	0%	0%	0%	11%	22%	33%	39%	45%	45%	45%
Trailar	Trailar(CNG)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-3.Hybrid mass supply	Selected	2015	5	2020						→	■	■	■	■	■	■	■
I-4.Hybrid Promotion (mainly via economic way)	Selected	2015	0	2015						■	■	■	■	■	■	■	■
Car	Car(HV-Gasoline)			2010,	5,		0.1,	0%	0%	10%	10%	10%	10%	10%	10%	10%	10%
LV	LV(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SUV	SUV(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus	Bus(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BRT	BRT(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck	Truck(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Trailar	Trailar(HV-Gasoline)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Car	Car(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
LV	LV(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SUV	SUV(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus	Bus(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BRT	BRT(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck	Truck(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Trailar	Trailar(HV-Diesel)							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5.EV mass supply	Selected	2015	5	2020						→	■	■	■	■	■	■	■

→ : PP has b
■ : PP has b
■ ■ : PP ha:

Figure 9: Policy roadmap

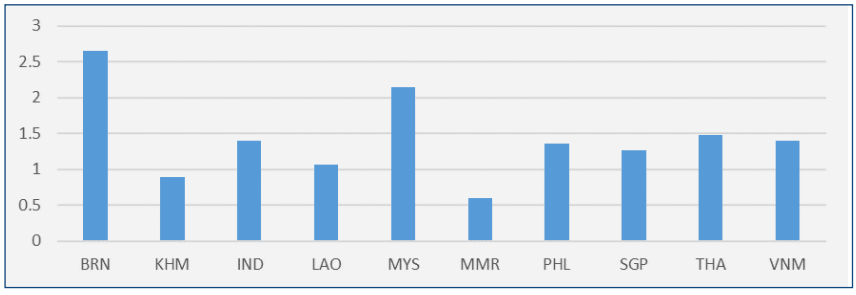

Figure 10: Transport CO_2 emissions per capita: BAU (t-CO_2/person)

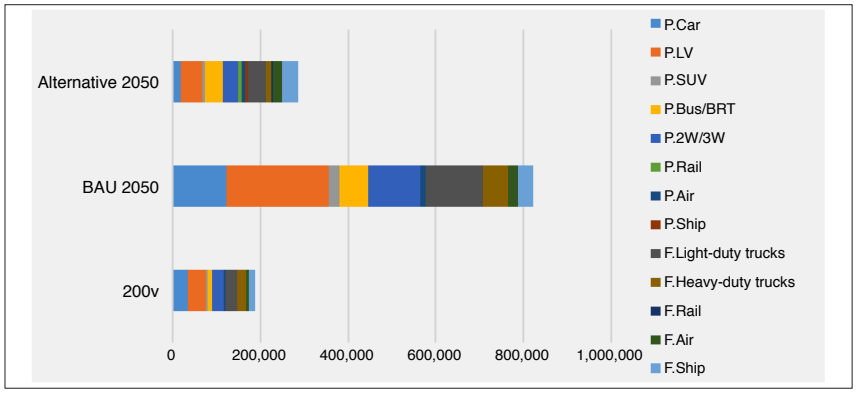

Figure 11: Transport CO_2 emissions by transport mode (thousand t-CO_2)

be applied in all countries to meet the 0.33 t-CO_2/capita target. By the effects of Avoid policies, passenger transport volume (PKM) is expected to be reduced by 49% and freight transport volume (TKM) will be reduced by 41 percent from BAU scenario in 2050.

The total CO_2 emissions in the alternative 2050 scenario is 286.7 million t-CO_2, 65 percent lower than the BAU 2050 value. This means that transport CO_2 emissions would have to be limited to a 0.9 percent annual growth up to 2050. The scenario calls for negative growth rates for car emissions (–1.2 percent) and heavy-duty trucks (–1.1 percent). The alternative scenario shows that the weighted CO_2 emissions per capita in 2050 can be reduced to 0.47 t-CO_2/capita (from 1.36 in the BAU 2050 scenario). However, this is still above the target of 0.33 t-CO_2/capita. Future applications of the tool would need to look into additional policies, but would have to be assessed as nationally appropriate.

To meet the target of 0.33 t-CO_2/capita is possible, but significant efforts will be required. For example, the Philippines, of which per capita CO_2 emission of alternative scenario is approximately 0.457 t-CO_2, need to double their efforts, e.g., more than doubling passengers shifting from 2W/3W to bus and rail and a significant shift of freight transport from truck and air to rail. In addition, an increased and significant number of vehicles utilize electricity. All these are hinged on the assumption that the country can carry out infrastructure development to meet the target (Figures 11–12).

Conclusion

Our two tools will make it surely possible for ASEAN countries to consider appropriate policies and to assess the mitigation impacts by introducing them. Furthermore, the tools are able to be customized by users with inputting new data and policy settings, etc. This means that impacts of technological innovation in the future will also be able to be assessed by these tools. We hope that the tools will be developed further by incorporating new data, new policy options and new technological innovations and so on.

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Table 2: Summary of policies applied in the backcasting tool

	BRN	KHM	IND	LAO	MYS	MMR	PHL	SGP	THA	VNM
Avoid										
Pricing regimes	○	○	○	○	○	○	○	○	○	○
ICT	○	○	○	○	○	○	○	○	○	○
Tele-activities	○	○	○	○	○	○	○	○	○	○
Travel plans	○	○	○	○	○	○	○	○	○	○
Improved travel awareness	○	○	○	○	○	○	○	○	○	○
Urban and land use planning	○	○	○	○	○	○	○	○	○	○
Fuel price control	○	○	○	○	○	○	○	○	○	○
Shift										
Passenger — to bus	○	○	○	○	○	○	○	○	○	○
Passenger — to rail	○	○	○	○	○	○	○	○	○	○
Passenger — to water			○	○	○	○			○	
Freight — to rail		○	○		○	○			○	○
Freight — to ship		○	○						○	○
Improve										
CNG	○	○	○	○	○	○	○	○	○	○
Hybrid vehicles	○	○	○	○	○		○	○	○	
Electric vehicles			○	○	○		○	○		
Fuel cell vehicles	○		○					○	○	
Biofuel	○	○	○		○	○	○		○	○
Eco-driving	○	○	○	○	○	○	○	○	○	○
Air fuel efficiency improvement	○		○				○	○		
Ship fuel efficiency improvement			○				○	○		
Rail electrification		○	○	○	○	○			○	○

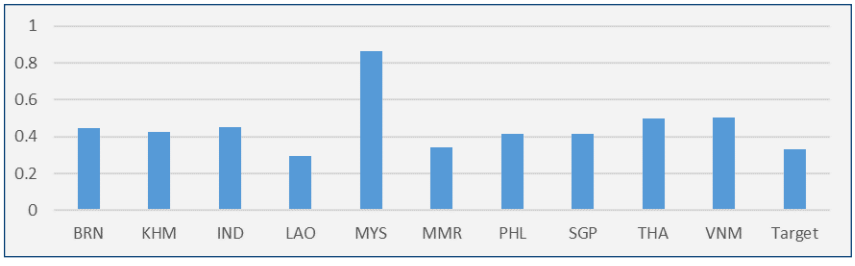

Figure 12: Transport CO_2 emissions per capita: Alternative scenario (t-CO_2/person)

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CBEES Senior Editor
Asia-Pacific Chemical, Biological & Environmental
Engineering Society (APCBEES)
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E-mail: iceeb@cbees.org
Web: http://www.iceeb.org

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Fax: +91-22-278-12578

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Tel: +02-942-8528; Fax: +02-942-8527
E-mail: manager@fostat.org

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E-mail: julian.thomas@ubm.com
Web: http://www.renergyteda.com

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Director of Research and International,
Cooperation Bureau, DDPM
The 6th AMCDRR Secretariat Office
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Ministry of Interior, The Royal Thai Government, Thailand
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www.techmonitor.net

Mitigating business risks

Business Knowledge Resource Online, India

http://www.business.gov.in

Every business organization involves some element of risk. Risk implies uncertainty of profits or danger of loss due to some unforeseen events in the future. An entrepreneur may encounter risks in every area or function of a business. For example, in production, risks may arise due to irregular supply of raw materials, break down of machinery, labor unrest, etc., in marketing, risks may occur on account of price fluctuations, change in tastes and fashions, errors in sale forecasting, trade cycles, etc. In addition, there may be loss of assets of a firm due to fire, flood, earthquake, riots, war or political unrest which may cause unwanted interruptions in business operations. Thus, business risks may take place in a variety of forms. Though risks are universal, but all business enterprises do not face same type and degree of risks. They may vary according to the nature and size of a business.

These risks are inevitable in a business and cannot be eliminated completely but they can be controlled through proper preventive and corrective measures of risk management. The process of management of risk involves:

- Identification of the risks;
- Evaluation of the risks;
- Choice of the right method for handling of risks; and
- Evaluating the aftermath of the chosen method.

Hence, an entrepreneur can face the risks effectively by anticipating their nature and causes and adopting appropriate techniques in order to minimize their negative consequences.

Also, gains in a business are inseparably linked to these inherent risks. In other words,' no risks, no gains' is a fundamental principle of a business. Hence, high profits of the big business houses are the rewards for successful management of the business risks by their entrepreneurs.

Types of business risks

Business risks are of a diverse nature and arise due to innumerable factors. These risks may be broadly classified into two types, depending upon their place of origin.

- Internal risks are those risks which arise from the events taking place within the business enterprise. Such risks arise during the ordinary course of a business. These risks can be forecasted and the probability of their occurrence can be determined. Hence, they can be controlled by the entrepreneur to an appreciable extent.

  The various internal factors giving rise to such risks are:

  - Human factors;
  - Technological factors; and
  - Physical factors.
- External risks are those risks which arise due to the events occurring outside the business organization. Such events are generally beyond the control of an entrepreneur. Hence, the resulting risks cannot be forecasted and the probability of their occurrence cannot be determined with accuracy.

  The various external factors which may give rise to such risks are:

  - Economic factors;
  - Natural factors; and
  - Political factors.

Methods of handling business risks

Risks in any business are inevitable and they cannot be eliminated completely. But an entrepreneur can control and minimize their negative consequences by adopting a suitable risk management strategy. The various methods that may be used for handling business risks are as follows:

- An entrepreneur can avoid some of the risks by analyzing the potential results (losses or gains) of the activity that gives rise to those risks. The risk is worth taking if the outcome ultimately benefits the firm. Otherwise, such an action should be avoided as far as possible. The risk may be avoided by substituting the risky process with a relatively safer alternative.
- If the entrepreneur cannot avoid the risk, he should try to control and minimize the losses arising from the risk. This can be done through efficient planning and proper risk management techniques.
- An entrepreneur must assume the possibility of certain risks which are inherent in any form of business organization. Such risks can be handled through proper planning and adopting two possible strategies. These are:
  - Shifting the risks to the people who are skilled in managing them and are willing to bear them. The risks may be transferred or shifted through Hedging, Underwriting and Sub-contracting.
  - Sharing the risks with other people so as to minimize the burden on the firm. Generally pooling of the investment of a large number of persons into the organizations helps in spreading the risks over a large number of shareholders. However, insurance is the most important and prevalent device for risk sharing.

Branding businesses in Malaysia

SME Corp., Malaysia
http://www.smeinfo.com.my

What is branding?

A brand is the identity of a specific product, service or business. A brand can take several forms, including a name, term, sign, symbol, color combination or slogan. A brand is a persistent, unique business identity intertwined with associations of personality, quality, origin, liking and more.

Branding is the process of creating and evoking distinctive and lasting perceptions and experiences in the minds of consumers.

For example, the brand name Nike is well-known throughout the world; people can identify the name and logo even if they have never bought any of their products.

However, not only is the company name a brand, but the logo (the 'tick' symbol) is also a strong piece of branding in its own right. The majority of people who are aware of the company can also identify it (or its products) from this symbol alone.

Brand elements

- A clear brand identity;
- A strong brand culture;
- A meaningful brand experience;
- Deliver emotional values; and
- Build valuable relationship.

Benefits of branding

There are no translations available.

- Achieving economies of scale (production and distribution) with increase in product demand;
- Lowering marketing and advertising costs;
- Setting the foundation for future expansions domestically and globally; and
- Promoting product differentiation and customer loyalty.

Promoting branding

There are no translations available.

SME Corporation, Malaysia

SME Corporation Malaysia has developed the National Mark of Malaysian Brand which was launched in March 2009. It brings with it the attributes of quality, excellence and distinction of products and services by Malaysian companies. Through this effort, the Government hopes to change the perception that local products and brands are of lower quality, reliability as well as low packaging standards than the big brand names.

Participating Malaysian companies will be evaluated using stringent standards, whereby auditing and monitoring measures will be put in place to ensure adherence to the set quality standards. If successful, the products or services will be given the right to carry the Malaysian Brand.

Initiatives under the Programme are as follows:

- The National Mark of Malaysian Brand;
- Annual Branding Entrepreneurs Conference (BEC);
- Workshops on Brand Manual for Malaysian Brand Certification;
- Branding Innovation Centre at Limkokwing University of Creative Technology (LUCT); and
- Branding and Packaging Mobile Gallery.

In order to retain the Mark, auditing and monitoring measures will be done periodically to ensure adherence to the criteria set. Finally, various trade promotion activities will be undertaken to promote brands that have been awarded the National Mark of Malaysian Brand and the recognition of the National Mark of Malaysian Brand itself.

For more info, please visit *http://www.smecorp.gov.my*

MATRADE

Malaysia External Trade Development Corporation (MATRADE), was established in March 1993 as a statutory agency under the Ministry of International Trade Industry (MITI).

As Malaysia's national export promotion agency, MATRADE is responsible for assisting Malaysian companies succeed in the international market. MATRADE's vision of making Malaysia the premier exporting nation is paired with its mission to develop and promote Malaysia's exports to the world.

MATRADE serves to promote Malaysia's external trade with particular emphasis on the export of manufactured and semi-manufactured products and services. In addition, MATRADE formulates and implements export marketing strategies and trade promotion activities to increase Malaysia's exports, undertake market research, and create a comprehensive database of information for the development and improvement of Malaysia's trade.

MATRADE also organizes training programs to enhance the international marketing skills of Malaysian exporters, promote and

assist in services related to trade, and protect Malaysia's international trade interest abroad.

One of the initiatives undertaken by MATRADE to develop and promote Malaysian products and services globally is through the creation of Online Directory of Malaysian Brands. This directory showcases the brand names of Malaysian companies who are recipients of the Brand Promotion Grant (BPG).

The Malaysian Brands Directory profiles Malaysia's premier brands to the world — highlighting brands that feature strong positive values, superior innovations and global appeal.

For more info, please visit *http://www.matrade.gov.my*

KPDNKK

The Buy Malaysia Campaign is a result from the Buy Malaysian Made Campaign which was launched in 1998. The campaign is to encourage consumers to buy Malaysian-made products at reasonable prices and to increase awareness among the public concerning the products and services offered in Malaysia that are at par with the international standard and retailed at reasonable prices.

For more info, please visit *http://www.kpdnkk.gov.my*

FAMA

Malaysia Best has created an endorsement brand that shows the Malaysian identity to increase sales and profile of agriculture-based products in domestic and global markets. It is aimed to:

- Create one brand that is effective and as a whole by the Ministry for domestic and global markets.
- Assist to upgrade the agriculture-based products for the international market.
- Enhance the practice and international demand for the agriculture-based products.

For more info, please visit *http://www.famaxchange.org*

Protecting your brands

MyIPO facilitates the dissemination of information and promotional publicity of intellectual property rights (IPR). The activities had contributed not only toward enhancing IPR awareness among Malaysians and enhancing MyIPO's image, but also fostering valuable networking and partnerships through the various programme organized jointly with key stakeholders throughout the country.

Currently, MyIPO provides the following services:

- Patent;
- Trademark;
- Industrial Design;
- Geographical Indications;
- IC Layout Designs; and
- Copyright.

For more info, please visit *http://www.myipo.gov.my*

Image-based search for trademarks, other brand information

The World Intellectual Property Organization (WIPO) has unveiled a one-of-a-kind image-search function for its Global Brand Database, adding a new feature that allows users to upload an image to search for visually similar trademark and other brand-information records from among the millions of images in the collection.

The image-search functionality, which is the first such application among free, public intellectual property databases, was presented on Saturday, May 10, 2014 at the International Trademark Association (INTA) annual meeting in Hong Kong (Province of China). It adds an important new search possibility for the Global Brand Database's users, who often wish to see if a logo, trademark or other similar image is separately registered for use. The new, easy-to-use image-search technology supplements the database's other querying criteria, including Vienna Classification codes, brand-holder names, country of origin and others. With this new addition, for example, a user can simply upload a proposed logo and quickly return records — sifting through more than 4 million images from 15 national and international collections — of other protected images that may bear a resemblance.

For further information, contact:

Media Relations Section
World Intellectual Property Organization
Tel: +41-22-338-8161/338-7224
Fax: +41-22-338-8140
Web: http://www.wipo.int

Viet Nam law on technology transfer

Viet Nam Government Portal, Viet Nam
http://www.chinhphu.vn

Salient Features on Technology Transfer Contracts

Article 14. Principles of entry into and performance of a technology transfer contract

- A technology transfer contract shall be entered into in writing or in other equivalent forms, including telegram, telex, fax, data message, or other forms as provided for by law.
- Language used in a technology transfer contract shall be agreed by the contractual parties; a contract in Vietnamese is required for transactions conducted in Viet Nam. The Vietnamese and foreign-language versions have the same validity.
- A technology transfer contract shall be entered into and performed in accordance with this Law, the Civil Code, the Commercial Law and relevant laws.

Article 15. Contents of a technology transfer contract

Parties to a technology transfer contract may reach agreement on the following:

- Name of the contract, which clearly indicates the name of the transferred technology;
- Transferred subject matters of technology, and products to be created by the technology;
- Transfer of the right to own or the right to use a technology.
- Mode of technology transfer;
- Rights and obligations of the parties;
- Payment price and mode;
- Effective time and validity duration of the contract;
- Definitions and terms referred to in the contract (if any);
- Technology transfer plan and schedule, place where the technology transfer is affected;
- Responsibility to warranty the transferred technology;
- Fine for a breach of the contract;
- Liability for a breach of the contract;
- Applicable law in the settlement of disputes;
- Dispute settlement body; and
- Other agreements which are not in contravention of Vietnamese law.

Article 16. Transfer of the right to own a technology

- Transfer of the right to own a technology means the full transfer by the owner of a technology of the right to possess, the right to use and the right to dispose of that technology to another organization or individual in accordance with Article 18 of this Law.
- When a technology is a subject matter having its industrial property rights protected, the transfer of the right to own that technology shall be conducted simultaneously with the assignment of industrial property rights in accordance with the law on intellectual property.

Article 17. Transfer of the right to use a technology

- Transfer of the right to use a technology means the permission by an organization or individual defined in Article 8 of this Law for another organization or individual to use a technology in accordance with Clause 2 of this Article and Article 18 of this Law.
- The parties shall agree on the scope of transfer of the right to use a technology, covering:
  - Exclusive or non-exclusive use of the technology;
  - Whether or not re-transfer of the right to use that technology to a third party is permitted;
  - Domain in which the technology is used;
  - The right to innovate that technology and the right to receive information on technology innovation;
  - Exclusive or non-exclusive distribution or sale of products created by the transferred technology;
  - Territories where products created by the transferred technology may be sold; and
  - Other rights related to the transferred technology.
- When a technology is a subject matter having its industrial property rights protected, the transfer of the right to use that technology shall be conducted simultaneously with the assignment of industrial property rights in accordance with the law on intellectual property.

Article 18. Modes of technology transfer

- Transferring technology-related documents.
- Providing training for the transferee of a technology to master the technology in the duration indicated in the technology transfer contract.
- Sending specialists to provide technical assistance to the transferee of a technology in applying the technology to production, for the purpose of achieving the quality of the

technology and products according to the criteria and schedule indicated in the technology transfer contract.

- Other modes as agreed upon by the parties.

Article 19. Effective time of a technology transfer contract

- Except for the case specified in Clause 2 of this Article, the effective time of a technology transfer contract shall be agreed by the contractual parties; if the parties make no agreement on the effective time of the contract, it is the time the last party completes the contract-signing procedures.
- A contract on the transfer of a technology on the list of those restricted from transfer becomes effective only after a State competent agency grants a technology transfer license.

Article 20. Rights and obligations of the technology transferor

- The technology transferor has the following rights:
  - To request the technology transferee to strictly fulfill the commitments in the contract;
  - To request a competent state agency to protect the lawful rights and interests relating to the transferred technology;
  - To get full payments and enjoy other rights and interests as agreed in the contract; to enjoy the preferences provided for by this Law and relevant laws;
  - Unless otherwise agreed upon by the parties, to request the technology transferee that fails to strictly perform the obligations defined in the con- tract to take remedial measures or pay damages; and
  - To lodge complaints about or initiate lawsuits against breaches of contract in accordance with law.
- The technology transferor has the following obligations:
  - Unless otherwise agreed upon by the parties, to ensure that the technology transfer right is lawful and not restricted by the right of a third party;
  - To strictly fulfill the commitments in the contract; and pay damages to the technology transferee or a third party for the transferor's breach of contract;
  - To keep information confidential in the course of negotiating and entering into a technology transfer contract at the request of the negotiating partner(s);
  - When detecting technical problems which make technology transfer results unsatisfactory as prescribed in the contract, to notify the technology transferee thereof and take appropriate remedies and pay damages to the technology transferee or a third party for the transferor's failure to strictly fulfill the commitments in the contract;
  - To apply for a technology transfer license in case of transfer from Viet Nam to abroad technologies on the list of those restricted from transfer;
  - Not to reach agreement on anti-competition clauses banned under the Competition Law; and
  - To perform the financial obligations and other obligations in accordance with law.

Article 21. Rights and obligations of the technology transferee

- The technology transferee has the following rights:
  - To request the technology transferor to strictly fulfill the commitments in the contract;
  - To request a competent state agency to protect the transferee's lawful rights and interests related to the transferred technology; and
  - To hire domestic or foreign organizations or individuals to provide technology transfer services in accordance with law.
  - Unless otherwise agreed upon by the parties, to request the technology transferor to take remedial measures or pay damages in case of the technology transferor's failure to strictly perform the obligations defined in the contract;
  - To lodge complaints about or initiate lawsuits against breaches of contract in accordance with law; and
  - To enjoy the preferences provided for by this Law and relevant laws.
- The technology transferee has the following obligations:
  - To strictly fulfill the commitments in the contract; to pay damages to the technology transferor or a third party for the transferee's breach of contract;
  - To keep technology-related information and other information confidential in the course of negotiating and signing a technology transfer contract at the request of the negotiating partner(s);
  - To apply for a technology transfer license in case of transfer from abroad into Viet Nam technologies on the list of those restricted from transfer; and
  - To perform the financial obligations and other obligations in accordance with law.

Article 22. Payment prices and modes in technology transfer

- The payment prices in a technology transfer contract shall be agreed by the contractual parties.
- Payment may be made by one or several of the following modes:
  - Payment in a lump sum or installments in cash or in kind;
  - Conversion of the technological value into capital contributed to an investment project or to capital of an enterprise in accordance with law;
  - Other modes as agreed by the parties.

Article 23. Procedures for licensing the transfer of technologies on the list of those restricted from transfer

- Organizations or individuals that wish to receive or transfer technologies on the list of those restricted from transfer shall send their dossiers as specified in Clause 1, Article 24 of this Law to a State agency competent to license technology transfer.
- Within thirty days after receiving a valid dossier, the state agency competent to license technology transfer shall make a written approval; in case of disapproval, it shall give a written reply, clearly stating the reason therefore.
- After obtaining the written approval of the competent state agency, organizations or individuals that wish to receive or transfer technologies shall sign technology transfer contracts.
- After signing a technology transfer contract, one of the signatories to the contract shall send the dossier specified in Clause 2, Article 24 of this Law to a state agency competent to license technology transfer.
- Within 10 days after receiving a valid dossier, the state agency competent to license technology transfer shall assess the technology transfer contract's conformity with the contents of the written approval in order to decide on the licensing; in case of refusal to license, it shall give a written reply, clearly stating the reason therefore.
- In the course of performance of a technology transfer contract, if wishing to modify the contents in the technology transfer license, one of the signatories to the contract shall apply for a new license.

Article 24. Dossiers of application for approval of, and dossiers of application for licensing of the transfer of technologies on the list of those restricted from transfer

- A dossier of application for approval of the transfer of a technology on the list of those restricted from transfer comprises:
  - An application for approval to sign a technology transfer contract;
  - A document on the applicant's legal status; and
  - Explanatory documents on the technology as specified by the Ministry of Science and Technology.
- A dossier of application for licensing of the transfer of a technology on the list of those restricted from transfer comprises:
  - An application for a technology transfer license;
  - A competent state agency's written approval of the technology transfer;
  - Documents evidencing the legal status of the parties to the technology transfer contract;
  - The original or a copy of the technology transfer contract; and
  - A list of technological documents or equipment (if any), enclosed with the technology transfer contract.

Article 25. Right to, and procedures for, registration of a technology transfer contract

- Parties to a technology transfer contract may register their contract at a competent state management agency in charge of science and technology in order to enjoy the preferences provided for by this Law and relevant laws.
- A dossier of registration of a technology transfer con- tract comprises:
  - An application for registration of the technology transfer contract; and
  - The original or a copy of the technology transfer contract.
- Within 15 days after receiving a valid dossier, the State competent management agency in charge of science and technology shall consider and decide to grant a technology transfer contract registration certificate.

Article 26. Obligation to secure confidentiality in granting technology transfer licenses or technology transfer contract registration certificates

Agencies and individuals responsible for granting technology transfer licenses or technology transfer con- tract registration certificates shall keep confidential technological secrets or business secrets stated in dossiers of application for technology transfer licenses or dossiers of registration of technology transfer contracts.

Article 27. Handling of breaches of a technology transfer contract

- Sanctions imposed on organizations or individuals that breach technology transfer contracts include:
  - Fine for breach;
  - Payment of damages;
  - Forced performance of the contract;
  - Suspension of the performance of the contract;
  - Termination of the performance of the contract;
  - Cancellation of the contract; and
  - Other measures agreed by the parties which are not contrary to the basic principles of Vietnamese law, international trade practice, or treaties to which the Socialist Republic of Viet Nam is a contracting party.
- For immaterial breaches of a technology transfer contract, unless otherwise agreed upon by the parties, suspension of the performance of the contract, termination of the performance of the contract or cancellation of the contract may not be applied.
- Unless otherwise provided for by law, the parties may reach agreement on limitations on the extent of the liability to pay damages for a breach of the technology transfer contract.
- Sanctions specified in Clause 1 of this Article shall be applied in accordance with law.

Patent rights and licensing in Thailand

Thailand Board of Investment, Thailand

http://www.boi.go.th

Term of patents and patent holder rights

Term

- The term of an invention patent is 20 years from the date of filing an application in Thailand, and is not renewable. The term of protection for a petty patent is 6 years from the date of filing an application in Thailand, which can be extended twice, for two years each.
- The term of a design patent is 10 years from the date of filing an application in Thailand.

Rights

- During the period of the validity of the patent, the patent holder has the exclusive right to produce, use, sell and have for sale, offer for sale, and import the patented invention or design. Any act of violation performed before the patent is granted, that would otherwise constitute an infringement of the patent, is not deemed an infringement.
- A patent holder has an exclusive right to use the words "Thai Patent", or an abbreviation or translation thereof.
- A patent holder may assign the patent to another holder.
- A patent holder may grant a license to another person, subject to restrictions:
  - The patentee shall not impose upon the licensee any condition or restriction or any royalty covenant that is an unfair restraint of competition. Conditions, restrictions or covenants that unfairly restrain competition shall be prescribed by a Ministerial Regulation;
  - A patent holder may not require a licensee to pay a royalty or royalties after the validity of the patent has expired;
  - Conditions, restrictions, or royalties which are contrary to the above two points are null and void; and
  - Any assignment of patent or license contract must be in writing and officially registered with the authority.

Compulsory licensing

An application for a compulsory license may be made under the following circumstances:

- If, after three years from granting of patent or petty patent or four years from date of application, whichever is later, the patentee or petty patentee has not enforced his/her lawful rights (Section 46 of the Thai Patent Act B.E. 2542).
- If the exercise of the patent rights of one party (the junior patentee) may infringe another patentee (the senior patentee) provided that:
  - The junior patentee's invention must be a substantial technological advancement which is beneficial to the economy, compared to the invention under the patent for which the license is being sought;
  - The senior patentee receives a cross-license to exploit the junior patentee's patent rights; and
  - The junior patentee shall not assign a legal license to anyone unless it is an assignment together with his own patent (Section 47 and Section 47 BIS of the Thai Patent Act B.E. 2542).
- A Ministry or a Department may exploit an exclusive right by itself or by designating another person in a patent for the benefit of public utilities or national defense; the preservation or acquisition of natural resources or the environment; the prevention of severe shortage of food or medicine or other necessities for living; or other public interests (Sections 51 and 52 of the Thai Patent Act B.E. 2542).

Foreign patents

A foreign patent that has not been granted a separate patent in Thailand receives no protection under the Patent Act. However, foreign patent holders or owners of rights to inventions or designs in foreign countries may enter into business transactions with parties in Thailand and seek equivalent protection through contractual obligations in the form of a licensing agreement.

Since foreign patents, inventions and designs receive no protection under the Patent Act, no civil or criminal action can be taken against a third party who produces or sells a patented product in Thailand without paying fees to the holder of the foreign patent or who applies in Thailand for a patent on an invention or design already patented in other countries. Nevertheless, legal solutions to such conflicts may be available under separate legislation.

What banks need to know about you?

Small Industries Development Bank of India (SIDBI), India
http://www.smallb.in

Be as open and transparent with your bankers or financial advisers as you can. This will enable them to grasp the full situation and to give you appropriate advice. To withhold important information, such as possible liabilities with other lenders or the fact that you have already pledged your assets, will inevitably cause difficulties at a later stage. Then you will have only wasted time and probably closed the door to future dealings with the bank.

General credentials

If the lender does not already know you well, it is best to have background information ready. This may include:

Letters of introduction

If you are not yet known in your business community, you may find it worthwhile to seek the sponsorship of someone respected by other business people who are sufficiently acquainted with you. A short letter, setting out your achievements and testifying to your good character and integrity, is a traditional method of introduction. Its effect will be positive if the referee is a person well regarded in the business community.

Your profile

This is a resume or curriculum vitae, setting out your educational achievements, professional training, qualifications, employment record and achievements. It need not be longer than a page or two. Your profile helps your bank to assess your capacity for conducting trade, producing goods and services for export, and managing people.

Attach any certificate or reference from former employers if you feel this is relevant and will help to show up your experience and capacities, especially if the employer is known and respected, and has written favorably about you.

Brochure of your business

Do not hesitate to hand out your company brochure. This should state your type of business, your products and how long you have been trading. A list of clients or customers is helpful. If the list is confidential, say so when you give it to your banker. If you are in partnership or have directors in your company, state who they are and draw up a very brief resume on each, particularly if they have a good reputation in the business community.

Bank and other references

If the institution is not your current bank, provide bank references that will enable the institution to check your credentials, particularly for regularity of payments, past borrowing record and general standing. The names of your accountants and lawyers may also be helpful.

Proof of company ownership or registration

Some countries require evidence that the company in whose name you want to borrow belongs to you or has been duly registered. You may also be required to provide a sworn list of assets and liabilities in the absence of audited or approved accounts. Try to find out beforehand whether there are eligibility criteria for which you need to produce documents or statements, particularly when approaching government or state-owned institutions providing special facilities for exporters.

Financial situation

A lender will expect up-to-date financial information on your business. The standard financial reports you should have ready are:

- **Balance sheet, profit-and-loss account, and cash-flow statement**
  These should have been audited by a firm of chartered accountants, or certified by an independent accountant and approved by a resolution of your board of directors. Otherwise, you may have to produce evidence that your accounts are a true and fair reflection of your financial situation.

- **Budget for the current or coming year**
  This document should show your projected sales and revenues for the current period or the coming year, as well as your operating costs and overheads. You should also have a separate paper showing your planned capital expenditure, if any. Your budgeted (or estimated) revenue should be sufficiently detailed to be credible. In other words, the figures must not simply be wishful thinking but based on firm and tentative orders to which you may add orders anticipated on the basis of past performance.

- **Commercial information details of orders booked**
  If you are requesting credit to fulfill a large or profitable new contract, have all documents, correspondence, quotations from suppliers, draft contracts with buyers and suppliers, and your own costing and calculations ready for discussion. This is all the

more important if your order is for export. The credit facility you obtain from your bank will almost certainly need to tie in with the payment methods that you use with your suppliers or that are stipulated by your overseas buyers. Do not sign any firm contract with suppliers or customers before you have discussed credit and payment methods with your bank.

- **Business plan**
  An up-to-date business plan for your company, showing intended capital investments and forecast revenue and expenditure for the coming three to five years, is an excellent document to produce during discussions with your banker or financial adviser. If you do not have such a plan, you may find it useful to draw one up. It will be of great value Ito you personally, and will add to your credibility when you discuss your credit request with lenders.

- **Feasibility study**
  Feasibility studies are usually carried out in connection with medium- or long-term projects and are consequently prepared, among other reasons, as an aid to raising medium- to long-term project loan finance. You may wish to start a new project or expand an existing activity, and need capital to finance the additional capital goods required (e.g., machinery, tooling, spares and raw materials). You will need a feasibility study to present to your banker. You will also need to give copies of draft or actual loan agreements with other lending institutions. These are important because the loan agreements may stipulate that you cannot borrow from another lender unless the loan is subordinated to them.

Guarantees or collateral you can offer

Not many lenders will grant you a loan without security. What guarantees or collateral can you offer?

The terms security and collateral mean the same

Security is provided to the lenders by pledging assets which they can seize and sell off if you do not pay back the loan. Other forms of guarantees are an insurance policy to the benefit of the lender, or an undertaking by a third party to repay the loan, should you default. You can even obtain a guarantee from one bank to borrow from another. This is current practice if you borrow from a bank overseas. The guarantee is given to the foreign bank by a local bank that can more easily take a charge on your assets than the foreign bank. The most common form of security is a charge (pledge) on fixed assets, particularly land and property.

Other fixed assets can also serve as security

Machinery, equipment, vehicles, and other fixed assets are also considered a security for their loans by the lenders. Investments are sometimes acceptable, particularly if they can be easily realized (sold). These are evidenced by share certificates of companies listed on the stock exchange, bonds, debentures, treasury bills, etc.

You can pledge current assets; stocks of raw materials, finished goods, commodities for export, even receivables. The easiest net asset to pledge is cash. This is called cash collateral.

Financial institutions rarely lend the full value of the security taken

The reason is plain enough: Should they sell the security because of a payment default, the price they obtain may be less than the value of the loan. The amount of cover needed for loans varies from country to country and asset to asset. In some cases, you may have to pledge assets worth two or more times the amount of the loan.

IFCI Venture Capital Funds — An Indian experience

IFCI Venture Capital Funds Ltd, India
http://www.ifciventure.com

Over the years, IFCI Venture acquired expertise and experience of investing in technology-oriented and innovative projects. Since its inception, it has provided finance to over 400 ventures and supported commercialization of over 50 new technologies. It has pioneered efforts for widening entrepreneurial base in the country and catalyzed the introduction of Venture Capital activity in India.

- Management of PE/VC Funds
- Advisory Services
- Short term lendings

Management of PE/VC funds

IFCI Venture Capital Funds Limited (IFCI Venture) has launched three new funds in emerging sectors of the economy namely:

- India Automotive Component Manufacturers Private Equity Fund -1-Domestic (IACM-1-D) with a target corpus of Euro 60 million equivalent to INR 330 crore. This Fund will be dedicated for investment mainly in Indian Automotive Component companies and in other related/ emerging sectors.
- India Enterprise Development Fund (IEDF), a Venture Capital fund set up with target corpus of INR 250 crore to invest in knowledge based projects in key sectors of Indian economy with outstanding growth prospects.
- Green India Venture Fund (GIVF), a Venture Capital fund setup with a target corpus of Euro 50 million with the objective to invest in commercially viable Clean Development Mechanism (CDM), energy efficient and other commercially viable projects with an aim to reduce negative ecological impact, efficient usage of resources such as energy, power etc and other related sectors/projects.

Advisory services

IFCI Venture provides Advisory Services to Companies/Entrepreneurs throughout the Investment cycle from deal identification to exit planning.

Deal identification

- Sourcing potential investment opportunities across various sectors for the investors, corporates, financial institutions.

Development of business plan

- Preparation of business plan and implementations strategy for budding entrepreneurs.

Deal evaluation

- Preliminary evaluation and analysis of deal.
- Preparation of feasibility report and recommendation.

Deal due diligence

- Detailed study of the company and enterprise valuation.
- In depth product and market research.
- Thorough financial analysis.

Deal structuring

- Designing appropriate structure to achieve investment objective.
- Recommending suitable financial instruments.

Investment

- Negotiation strategy/Support.
- Assisting in investment-related formalities.

Investment monitoring

- Independent monitoring of investment portfolio.
- Advising any alteration/transformation in exiting investments.

Exit planning

- Providing exit valuation.
- Advising suitable exit options and facilitating the exit process.

IFCI Venture with its background in equity investment, understanding of critical factors, is an apt partner to carry out in-depth due diligence and appraisal of business plans. Additionally, IFCI Venture provides inputs for strengthening the investment structure. IFCI Venture enjoys industry linkages that enable it to regularly gather critical intelligence/information for undertaking business and investment evaluations.

Being a Private Equity, as well as, Venture Capital investor, IFCI Venture possesses expertise in assessment of investment proposals, deal structuring and exit mechanisms.

India Inclusive Innovation Fund

National Innovation Council, India
http://www.innovationcouncil.gov.in

The National Innovation Council (NInC) and the Ministry of Micro, Small and Medium Enterprises (MSME) jointly announced the creation of the India Inclusive Innovation Fund (IIIF). IIIF, which has been approved by the Union Cabinet, was conceived and architected by the NInC as a unique concept which seeks to combine innovation and the dynamism of enterprise to solve the problems of citizens at the base of the economic pyramid in India.

Speaking about the Fund, Sam Pitroda, Chairman of NinC and Advisor to the Prime Minister on Public Information, Infrastructure and Innovation said, "The needs of the people at the base of the economic pyramid are today served by philanthropy and government grants/subsidies which can never be either adequate or scalable. IIIF seeks to leverage the model of Venture Capital to transform the lives of the less privileged".

The IIIF seeks to create a new class of capital which helps set up and scale entrepreneurial skills and innovation which address the needs of the base of the economic pyramid. The Fund will invest in innovative ventures that are scalable, sustainable and therefore profitable but address social needs of our less privileged citizens in areas such as healthcare, food, nutrition, agriculture, education/skill development, energy, financial inclusion, water, sanitation, employment generation, etc.

The Fund will be registered under SEBI's Alternative Investment Fund Category I guidelines with an initial corpus of INR 500 crores, with the Ministry of MSME committing to 20 percent (INR 100 crore) and the balance being given by Banks, insurance companies, overseas financial and development institutions. The Fund will endeavor to provide modest financial returns, while ensuring significant social impact to the community. The Fund's eventual aim is to expand the corpus to INR 5,000 crore over the next 24 months.

Lack of Capital is one of the major reasons why ventures and entrepreneurs seeking to address the needs at the base of the economic pyramid have failed to take off. IIIF seeks to address exactly this gap and therefore at least 50 percent of its investments initially will be to enterprises that fall in the MSME stage. It has been observed globally that new enterprises have the highest potential for job creation and hence IIIF will seek to address this aspect as well.

The IIIF will also partner the entire ecosystem in this space, including incubators, angel groups, and also public R&D programmes and laboratories to support the commercialization and deployment of socially relevant innovative technologies and solutions.

The Government will not be involved in the day to day operations of the Fund, which will be entrusted to an Asset Management Company (AMC), set up as a Section 25 not-for-profit company. The AMC will appoint a professional management team for this purpose as also an Investment Committee comprising professionals of repute, which will take all investment/divestment decisions. A Governing Council comprising government nominees as well as eminent persons from the fields of public service, industry, finance, entrepreneurship, etc., will provide oversight and ensure the Purpose of the Fund is maintained. The AMC will also build a mentoring network, enable incubation and provide training and skills development programmes to entrepreneurs and IIIF assisted companies.

WIPO GREEN Database

WIPO GREEN consists of an online database and network that brings together a wide range of players in the green technology innovation value chain, and connects owners of new technologies with individuals or companies looking to commercialize, license or otherwise access or distribute a green technology. WIPO GREEN database assembles in one place technologies at all stages of development, from upstream research to marketable products (and everything in between). These technologies are available for license, collaboration, joint ventures and sale.

For more information, access:

https://www.webaccess.wipo.int/green

Innovation Voucher programme of Malaysia

MSC Malaysia
http://www.mscmalaysia.my

MSC Malaysia Innovation Voucher is a programme designed to increase collaboration between Malaysia's public and private Institutions of Higher Learning (IHL) and Research Institutions (RI) with MSC Malaysia status companies, so as to tap into each other's capabilities and strengths. This serves to create a cultural shift in the business community's approach to innovation as companies can tap into experts/talents residing outside the company. The innovation voucher is a financial incentive worth of MYR 10,000 awarded to qualified MSC Malaysia status companies to support collaborative R&D projects from the approved collaborators. These collaborative R&D activities would then facilitate the transfer of know-how from the collaborators to the MSC Malaysia status companies and vice versa. In turn, this will lead to the production of innovative prototypes, quality products and potential Intellectual Property (IP) creation.

The objectives and desired outcomes of the Innovation Voucher are:

- To increase the number of collaborations in research and innovation between MSC Malaysia companies and IHLs/RIs/COEs;
- To increase the number of innovative proof-of-concepts (POCs), products, services and solutions from MSC Malaysia. Potentially, it will lead to increase in technology commercialization and sales growth of the companies;
- To increase in potential creation of IP (intellectual property); and
- To support the development and strengthening of triple helix model fundamental to National Innovation, contributing to national competitiveness.

Eligibility

- The Applicant must be a Local MSC Malaysia Status Company with at least 50% Malaysian shareholding.
- Must have completed SCORE+ exercise.

Programme details

- The total project cost funded by one Innovation Voucher should be at least RM15,000 with the company's financial contribution of at least MYR 5,000.
- Voucher is valid for one year only.
- Innovation Voucher supports collaborative projects in line with the list of approved technology areas and list of eligible services.
- The collaboration must be procured from participating Research Institutions or Institutions of Higher Learning or Centers of Excellence as approved by MDeC.

List of eligible services supported by Innovation Voucher programme

1) Technical Advisory, Feasibility, and Support Services

- Early stage R&D, IC design services, prototyping.
- Development of new product/solution/services/process.
- Process design, process improvement development and optimization for yield enhancements and increased productivity.
- Product testing (interoperability test/reliability and robustness test/performance test/usability test/ CE test/Electromagnetic Compatibility Test).
- Industrial design to improve the aesthetic, ergonomics and usability of products.
- Enhancement of User Experience (UX) of the product/solution.

2) Technical Skills Enhancement

- Specific technological training courses customized to the technology needs of the company, i.e., workshops and courses for upgrading technology capabilities. For example, training on mask layout, accelerated integrated circuit design, circuit validation, embedded software and firmware design.
- Semiconductor Failure Analysis Competency Development.
- Semiconductor Material Engineering Competency Development.

The technical skills enhancement must be procured together with any of the technical advisory services which will lead to Proof Of Concept (POC), prototype or world class qualified product.

Greentech Malaysia — Promoting green technology

Malaysian Green Technology Corporation, Malaysia

http://www.greentechmalaysia.my

Malaysian Green Technology Corporation (GreenTech Malaysia) is a not-for-profit organization under the purview of the Ministry of Energy, Green Technology and Water Malaysia (KeTTHA). GreenTech Malaysia's purpose is to catalyze green technology deployment as Malaysia's strategic engine for socio-economic growth. GreenTech Malaysia aims to position the country as a hub for green technology by 2020 and subsequently transform Malaysia into a Green Community by 2030.

Since 2010, GreenTech Malaysia has been tasked by KeTTHA to spearhead the implementation of projects and activities pertaining to the Green Technology Policy. Various initiatives such as the National Green Technology and Climate Change Council (MTHPI), ASEAN Energy Manager Accreditation Scheme (AEMAS), Green Technology Roadmap, Green Technology Financing Scheme (GTFS), Green Township and Green Labeling (GreenTAG) were implemented to generate more awareness of green technology applications in Malaysia.

As the focal point for green technology development in Malaysia, we provide facilities and services in consultancy, research and training to spearhead the realization of the national green technology agenda with these strategic focus areas:

- Promoting and creating awareness on green technologies;
- Enhancing human competency and capacity in green technology applications;
- Developing sustainable and widespread green technology markets;
- Strengthening local green technology industry; and
- Formulating support policies and financing frameworks to promote green technology growth.

Promotion

- MyHIJAU Directory on eco-products, services and networking opportunities for manufacturers, businesses and organizations;
- MyHIJAU Careers portal provides green job vacancies;
- MyHIJAU roadshows to enhance national green technology awareness to the public;
- IGEM — Co-organizer for the International Products Exhibition and Conference Malaysia; and
- Green Technology Publications.

Coordination

- Working Committee Secretariat under the Green Technology and Climate Change Council (MTHPI);
- Evaluating Clean Development Mechanism (CDM) energy project applications in Malaysia;
- Overseeing Green Technology Financing Scheme (GTFS) applications;
- Managing GreenTAG Endorsement Programme, a collaboration with SIRIM QAS International Sdn. Bhd. to manage the Eco-Labelling; and
- Green Technology Roadmap, Electric Vehicle Infrastructure Roadmap as well as the Low Carbon Cities Framework to the Government project manager.

Collaboration

- Country Coordinator for Malaysia in the ASEAN Energy Management Scheme (AEMAS). Our energy auditors have conducted more than 80 energy audits for government, industrial and commercial buildings since 1999; and
- Developing Human Capital potential in green technology field through MyHIJAU Academy — a partnership with local universities and strategic partners to develop green modules and conducts project-based trainings.

Policies

The National Green Technology Policy was successfully launched by the Prime Minister YAB Dato' Sri Mohd Najib Tun Abdul Razak on 24 July 2009. The National Green Technology Policy is built on four pillars — Energy, Environment, Economy and Social.

Regulations

Regulations enacted by several ministries including the Ministry of Natural Resources and Environment (RE) and Ministry of Housing and Local Government (KPKT) are among efforts initiated by the government to standardize, preserve and control all aspects of technology and environment.

Incentives

Corporations have realised the benefits of green technology particularly in minimising energy costs, consequently reducing carbon footprints. Companies are now implementing a greener approach by lessening their waste through recycling and paperless procedures.

Viet Nam strategy on cleaner industrial production to 2020

Viet Nam Government Portal, Viet Nam
http://www.chinhphu.vn

Perspective

- To realize the "National Strategy on Environment Protection to 2010 and vision to 2020", the "Strategic Orientations for Sustainable Development in Viet Nam" and orientations for the development of industries.
- The State encourages and provides technical supports to the cleaner production voluntarily adopted by industrial production establishments through making use of their own internal forces in order to fulfill environmental targets and economic interests.
- Cleaner industrial production is realized through enhancing State management over environment protection and increasing industrial production establishments' awareness of interests that their cleaner production brings about

Objectives

- **Overall objective:** Cleaner production must be observed in all industrial production establishments in order to better the use of natural resources, materials, and fuels; minimize emission and curb pollution; protect and improve the quality of environment, human health and secure sustainable development.
- **Specific objectives:**

  (a) From now to 2015

  - 50% of industrial production establishments shall become aware of benefits of cleaner industrial production;
  - 25% of industrial production establishments shall adopt cleaner production; these establishments shall save 5–8% of energies, materials and fuels consumed per product;
  - 70% of Departments of Industry and Trade shall have qualified staff specializing in guiding the application of cleaner production in industrial establishments.

  (b) From 2016 to 2020

  - 90% of industrial production establishments shall become aware of benefits of cleaner industrial production;
  - 50% of industrial production establishments shall adopt cleaner production; these establishments shall save 8-13% of energies, materials and fuels consumed per product; 90% of large and medium-scale enterprises shall have units specializing in cleaner production;
  - 90% of Departments of Industry and Trade shall have qualified staff specializing in guiding the application of cleaner production in industrial establishments.

Missions

- Improve awareness of cleaner industrial production in all sectors, localities, production establishments and communities at all echelons.
- Perfect the system of mechanisms, policies and laws which boost cleaner industrial production:
  - Review, revise, supplement and promulgate mechanisms, policies and laws on cleaner industrial production or submit them to the competent entities for promulgation;
  - Insert the content of cleaner production into strategies and plans on development of industries; strategies and plans on socio-economic development; programs and plans on environment protection of ministries, sectors and localities.
- Increase capacity of management agencies, consulting organizations and industrial production establishments in applying cleaner production:
  - Raise capacity of management agencies in charge of cleaner industrial production so as to enforce legal regulations on environment protection;
  - Nurture and develop a pool of experts of cleaner production for consulting organizations and technicians of cleaner production for industrial production establishments;
  - Support the experiment and popularization of cleaner industrial production models in industrial production establishments.
- Develop the network of organizations supporting cleaner industrial production.

Solutions

- **Communications solutions to improve awareness:**
  - Promote the propagation and education work in order to improve awareness of cleaner industrial production in all industrial production establishments at all echelons;
  - Build up and popularly introduce the database and websites on cleaner industrial production;
  - Boost the popularization of successful models of cleaner industrial production.

- **Solutions relating to organization, management, mechanism and policy:**
  - Enhance the revision, supplementation and completion of mechanisms, policies and laws on cleaner industrial production;
  - Include the content of cleaner production in strategies and plans on development of industries; strategies and plans on socio-economic development; programs and plans on environment protection of ministries, sectors and localities;
  - Establish a network of agencies in charge of licensing the certificates on cleaner industrial production for industrial production establishments on a voluntary principle;
  - Develop a network of organizations supporting cleaner industrial production within the Ministry of Industry and Trade and in provinces and cities housing many industrial production establishments.
- **Technical support, human resource training, and international cooperation:**
  - Speed up the design and application of technical instructions on cleaner industrial production; assist the application of cleaner production in industrial production establishments;
  - Consolidate linkages between research institutes, universities and industrial production establishments in researching, transferring and applying technologies of cleaner industrial production;
  - Further train, nurture and raise capacity of managers, specialists, and consultants involved in cleaner industrial production;
  - Mobilize resources from foreign organizations and individuals in order to accelerate the application of cleaner industrial production.
- **Investment and financial solutions:**
  - Expenses for realizing the Strategy shall be mobilized from different sources: State budget, aid, donations and investments of domestic and foreign organizations and individuals, and other legal sources;
  - Approve in principle five projects listed in the enclosure Appendix in order to implement targets and missions of the Strategy. Relevant ministries and sectors shall be responsible for designing projects and submitting them to competent agencies for approval. Expenses for realizing these projects shall be allocated from the State budget;
  - The State shall provide state credits to cleaner industrial production projects; encourage domestic and foreign organizations and individuals to invest in research, transfer and application of environmentally-friendly technologies for cleaner industrial production;
  - Investment projects applying cleaner production conducted by production establishments shall receive financial incentives. The Governing Board in charge of the implementation of the Strategy shall be responsible for designing supportive mechanisms and incentives and submitting them to the Prime Minister for approval.

Implementation

- The Ministry of Industry and Trade shall act as the main implementer, in collaboration with the Ministry of Natural Resources and Environment, relevant ministries, sectors and localities, in fruitfully realizing the Strategy on schedule and periodically making reports to the Prime Minister on results.
- The Minister of Industry and Trade shall establish a Governing Board, headed by the Minister, which is in charge of implementing the Strategy. The membership and operation of the Governing Board and its Office shall be decided by the Minister of Industry and Trade.
- The Ministry of Planning and Investment and the Ministry of Finance shall allocate funds from the State budget annually and every five years and guide the use of these funds in order to realize component projects of the Strategy.
- The Ministry of Natural Resources and Environment, Ministry of Finance, other ministries, sectors and provincial-level People's Committees, within their competence, shall be responsible for working with the Ministry of Industry and Trade to fruitfully realize missions listed in the Strategy; make annual reports to the Ministry of Industry and Trade for summary which must be presented to the Prime Minister.

Technology Offers

HUNGARY

Anti-diabetes stimulator

Description

Our Romanian partner has developed an anti-diabetes stimulator (ADS) that is an electronic device working on the principle of acupuncture. ADS stimulation method is an adjuvant to standard treatment of diabetes; it helps the pancreas to produce more insulin without additional treatment. During the treatment artificial electromagnetic signals with precise values are transmitted via acupuncture points through conductors and electrodes in direct contact with skin. The client is looking for business partners for licensing or selling the technology and know-how.

Areas of Application

Healthcare, adjuvant to standard treatment of diabetes: The signals are stimulating the pancreas to produce enough insulin to metabolize blood sugar.

Advantages

- ADS uses non-invasive, subliminal low electromagnetic frequencies specific to acupuncture.
- The frequencies of the signals are meant for energy simulation of the acupuncture points entering in the protocol of acupuncture treatment of diabetes recommended in the specialty literature.
- ADS stimulation method is an adjuvant to standard treatment of diabetes; it helps the pancreas to produce more insulin without additional treatment.
- ADS treatment performed correctly makes the pancreas to release more insulin, improves blood sugar and glycosylated hemoglobin, helping to decrease the dose of medication the patient takes during treatment and causes diabetes not to move to advanced forms of the disease.
- Transportable device, it can be used anywhere.

Development Status

Commercial prototype

Legal Protection

Patent

Technical Specifications

Basically diabetic stimulator is a mini-generator of low value and low amplitude electromagnetic signals called subliminal anti-diabetes signals. Artificial electromagnetic signals with precise values.

Transfer Terms

Technology licensing, Selling the technology

Novel polyphase electric generator with switched reluctance

Description

Our Romanian partner has developed an electric generator with switched reluctance for more efficient electricity production. They are interested in a sales agreement, a license agreement or a joint venture opportunity. The invention — "Electric generator with switched reluctance", due to the innovative technology design, it provides more electrical power up to 50% than other electric known generators and also increase the warranty of working life.

Areas of Application

Regenerative energy systems in the "backup" applications; Vertical axis Wind turbines; Water-wheels turbines; Aerospace or defense, naval, automotive, industry with inverter technology generators in stationary or mobile sets; High-performance Welding generators sets for stationary or mobile applications; In explosive atmosphere or submersible applications.

Advantages

The necessary mechanical power is significantly lower than the most efficient electric generators known; Maximum reliability due to the structural features; Low inertia of the rotor due to its simplicity and low weight; Universal application; It is ideal in submersible applications or in explosive atmosphere.

Environmental Aspects

Energy efficiency

Development Status

Commercial prototype

Legal Protection

Patent

Technical Specifications

The technical problem solved by the invention is that it ensures the reduction of the mechanical energy necessary to produce the electric power.

Transfer Terms

Joint venture, Technology licensing, Sales agreement

Energy wall — for converting wind's and water's kinetic energy into electricity

Description

A Hungarian SME has developed an independent electric power generator, with a rigid chassis structure. The invention converts the water's and wind's kinetic energy into electricity without using huge moving parts and generating no noise as a side-effect. The client is interested in finding suitable license partners or distributors.

Areas of Application

Wind Energy Wall (WEW):

- At the top of towers, blocks, department stores and factories, storage buildings, oil rigs or towers etc.
- Highways, farms like fence or separator edge.
- Farmland, forests as protective strips.
- Airport and highway noise-protection wall.
- Industrial energy production at wind farms with high energy demand.

Technology Offers

Energy Spill-over (ESO):

- Energy producing spill-overs or sill dams in rivers.
- Utilizing deep-sea flows with big walls.
- Tidal energy usage.

Advantages

- ESO and WEW can be built together without limitation like a big wall, and the installations can be upgraded at any time.
- Doesn't have harmful effects on humans and animals, can be installed to human or animal habitat without limitation.
- Does not emit annoying sounds.
- The preparation doesn't require high-tech methods, the applied materials are reusable, or the device can be made of recycled materials.
- Transporting, installing and maintenance of the devices are trouble free, and cost effective.
- Can be installed directly to the place of use.

Environmental Aspects
Cleaner production, Energy efficiency

Development Status
Commercial prototype

Legal Protection
Patent

Technical Specifications
This device has been created to convert the mechanical energy of the flowing fluids (air, water) into electrical energy. This goal goes along the guidelines set forth by the so-called "sustainable development".

Transfer Terms
Technology licensing, Research partnerships, Commercial agreement

For the above three offers, contact:
Laser Consult Ltd (Hungary)
H-6701, P.O. Box 1191, Szeged, Hungary
Tel: +36-62-562-782;
Fax: +36-62-562-783
E-mail: laserconsult@t-online.hu

INDIA

Freeze dryer

Description
We provide freeze drying solutions to pharmaceutical and bitotech industries like automatic loading and unloading system, ampoule and vial filling machines, HVAC, RABS, LN2 system, process engineering to pharma and bitotech industries. our freeze dryer ranging from 0.5 square meter to 50 square meters.

Areas of Application
Pharmaceutical and biotechnology industries, Oncology API, Antibiotics, Vaccines and Serums.

Advantages
World's largest freeze drying manufacturing facility and R&D lab. We offer affordable, reliable, flexible freeze dryers.

Environmental Aspects
Cleaner production

Development Status
Fully commercialized

Legal Protection
Trademark

Technical Specifications
We follow cGMP and USFDA guidelines, GB-150 pressure vessel compliance certified, European PED, ASME and TUV ISO 9001 certified.

Transfer Terms
Technical services, Technology licensing, Equipment supply, Turnkey

Contact:
Shanghai Tofflon Science and Technology Ltd.,
6th Main, 2 Cross, Tayappa Garden, Bilekahalli - 560076,
Bangalore, India
Tel: +91-9945795502; Fax: +91-80-41227584
E-mail: chidananda.r@tofflon.com

Barium sulfate recovery from chlor alkali plant waste sludge

Description
We offer technology for manufacturing barium sulfate of 98% purity recovered from waste sludge of chlor alkali plant.

Areas of Application
Barium sulfate finds huge application in paints, Paper and pharma industries.

Environmental Aspects
Waste utilization

Development Status
Pilot plant, Fully commercialized

Transfer Terms
Turnkey

Contact:
Auro Associates (India)
B-12 Dhanlaxmi Complex, Nr. Samta, Subhanpura, Vadodara,
Gujarat-390023, India
Tel: +91-9824366779
E-mail: aurochem@yahoo.com

An indigenous design of LPG burner for commercial cooking

Description
Gas burner is a device to generate a flame to heat up the products using a gaseous fuel such as acetylene, natural gas or propane etc. The conventional burners available in market have a mixing

tube for mixing air with the fuel gas to make a complete combustion. This mixing tube is helpful for a stage one mixing of air with fuel gas and further the second stage mixing is done in the perforated burner head where high quality mixing is not possible. Also another problem with the LPG commercial cooking burners is the single venturi type mixing tube. The present technology is designed overcome the drawback of less availability of air during slow cooking hence blue flame combustion is achieved throughout the entire range of cooking. It offers 55% efficiency, thus increasing the efficiency of the gas burner by 22% (saves 22% LPG).

Areas of Application
Commercial cooking, Restaurant and food-services.

Advantages
The technology results in better combustion and higher thermal efficiency with reduced harmful emission. The swirling motion increase the residential time of flame in contact with the cooking pot thus increasing and causing better heat transfer to cooking pot. Approximately 22% LPG is saved in this newly designed LPG commercial cooking burner in compare with similar capacity conventional burners at same gas burning rate. Cooking time is reduced by 20% in the new burner in compare with typical commercial cooking burners at same gas burning rate.

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

Spice processing plant

Description
We offer processing technologies for seed spices like cumin, coriander, fenugreek & also cardamom & black pepper on turn key basis.

Areas of Application
Processing of seed spices like cumin, coriander, fenugreek & also cardamom & black pepper on turnkey basis.

Advantages
Fully automatic processing plant with sorting, grading, sterilization, packing.

Environmental Aspects
Cleaner production

Development Status
Fully commercialized

Technical Specifications
Seed spices processing plant capacity 2 ton per hour

Transfer Terms
Consultancy, Subcontracting, Joint venture, Equipment supply, Turnkey

Contact:
Mechair Industries
3/16, B.I.D.C Industrial Estate, Gorwa,
Vadodara-390016, India
Tel: +91-265-2285751;
Fax: +91-265-2291613
E-mail: info@mechair.in

Nanoparticle-polymer complex for sustained release of oral care products

Description
Scientists from the National Chemical Laboratory (NCL), India, have developed a process for constructing nanoparticle-polymer complex for sustained release of active agents for oral care (for applications in toothpastes and oral rinses). Polymer multilayers are built up layer by layer on nanoparticles of 5-50 nm, consisting of a water repelling (hydrophobic) shell around a core of multiply (polyanion and polycation) charged material (the core can be of inorganics as silica, titania and/or clay) and encompassing outer layer with an affinity to the tooth enamel.

Area of Application
Oral hygiene application-sustained release of antimicrobial/flavour compounds.

Advantages
Precisely controlled polymer multilayers can be built on nanoparticles without the requirement of the cumbersome separation step after each coating of the polymer layers.

- Active compounds localised as per the requirement by fine tuning the outer layer of the complexes-retained in the complex despite extensive rinsing with water.
- Enables designing systems that can anchor and retain on the surface enamel of the teeth for extended periods by adjusting the ionic strengths.

Development Status
Laboratory model, Commercial prototype

Legal Protection
Patent

Transfer Terms
Technology licensing

Contact:
National Chemical Laboratory, CSIR

Technology Offers

A208, PAML Building,
Dr. Homi Bhabha Road, Pune-411007, India
Tel: +91-20-25902982,
E-mail: dt.patel@ncl.res.in

Glucosamine from crab shell waste

Description
We offer a novel equipment and method for production of glucosamine — a wonderful molecule approved by FDA for treatment of arthritis and to maintain joint health. This technology is a cheapest method for production of Glucosamine from crab shell waste.

Areas of Application
Nutraceuticals, Pharmaceutical, Health supplement

Advantages
Cheapest and novel method for production of glucosamine. The production cost and market cost are having vast difference.

Environmental Aspects
Waste utilization

Development Status
Design, Laboratory model, Pilot plant, Commercial prototype

Legal Protection
Patent, Technology know-how

Transfer Terms
Consultancy, Technical services, Equipment supply

Contact:
Neo Sciences Research Solutions
C6 Mittal Flats, Near Railway Crossing,
Naranpura, Ahmedabad, India
Tel: +91-9925452665,
E-mail: tech4transfer@gmail.com

Pegylated liposomal doxorubicin

Description
We are a group of technical people and some of us awarded by MIT for research and innovation. We at our facility producing Food and Cosmetic Liposomes with a capacity of producing 6000 Ltrs Liposomes per Month, developed Peg. Liposomal Doxorubicin which is available for technology transfer and commercialisation. The other products which are in pipeline are Liposomal Amphotericin B, Liposomal Docetaxel, Liposomal Daunorubicin, Pegylated Liposomal Topotecan and so on. We are looking for pharmaceutical companies looking for tech transfer or commercialisation of Peg-Liposomal Doxorubicin.

Areas of Application
PEG-liposomal doxorubicin is effective in ovarian cancer and in the patients with metastatic breast cancer.

Advantages
As a first line product of Oncology Peg., Liposomal Doxoubicin is always in demand.

Environmental Aspects
Cleaner production, Energy efficiency

Development Status
Fully commercialized

Technical specifications
Will be offered once the NON DISCLOSURE AGREEMENT is signed.

Transfer Terms
Consultancy, Subcontracting, Joint venture, Technical services, Technology licensing, Equipment supply, Turnkey

Contact:
Swanand Malode
101, Krishna Apartments, 82 - 83, Greater Tirupati Colony,
Indore – 452 001, Madhya Pradesh, India
Tel: +91-9300917373,
E-mail: swanandmalode@gmail.com

PHILIPPINES

Upgraded natural dyeing technology for selected plant dye sources

Description
The PTRI-developed natural dyeing technology is an environment-friendly process which includes the extraction of dyes from indigenous plant sources and their application to natural fiber-based fabrics and fossilized flowers. To date, PTRI has identified and established appropriate dyeing technology for 65 dye-yielding plants like sibukao, bakawan lalake, loco roots, mahogany to name a few. These sources yield a wide range of colors that suits the color specification of various commodities. Adoption of said technology could generate an added income thru the application of natural dye to the fiber-based materials and products and the fossilized leaves of the producers.

Areas of Application
Dyeing of natural fibers, yarns, fabrics and natural fiber based GTH

Development Status
Fully commercialized

Transfer Terms
Consultancy

Contact:
Philippine Textile Research Institute
General Santos Avenue, Bicutan,
Taguig City, Metro Manila, Philippines - 1631
Tel: +63-02-837-1325

Technology Requests

ETHIOPIA

Extraction of linen fibres from flax

Description
We would like to request for technology for extraction of flax fibres using enzymes.

Area of Application
Chemical industry

Studies Available
Feasibility report

Project Type
New idea

Contact:
iOTEX-BDU, Bahir Dar, Ethiopia - 50000
Tel: +0938854357; E-mail: drskathirvelu@gmail.com

INDIA

Chemical activation of carbon

Description
Chemical activation of wood/wood charcoal required.

Areas of Application
Food, Pharma

Project Type
Expansion/Modernisation

Contact:
Activated Carbon Universal Carbons,
Tanda Road, Hoshiarpur-146001, India
Tel: +91-950-100-5395
E-mail: kartik.gupta@ucicarbons.com

Sugar from sugar beet

Description
We need technology and details of machiners for 500 to 2500 TBD Sugar Beet Plant.

Area of Application
For India & African countries

Keywords
Sugar beet

Project Type
Start-up

Assistance Sought from Potential Partner
Plant and machinery with technology

Additional Information
Cost effective

Contact:
Mr. Batra, 5, Sangam Vihar, Jalandhar, India
Tel: +91-9779408885; E-mail: batra210@gmail.com

UK

Ceramic slurry coating/impregnation technology requirement

Description
We have an urgent requirement for a ceramic slurry coating/impregnation technology, used to produce ceramic filtration media from a reticulated polymer foam substrate. Currently reticulated polymer foam filters, with ppi (pores per linear inch) ranging from 20 – 6 ppi, are coated with a ceramic slurry by first impregnating via submerged rollers, then spraying a more diluted version of the same slurry composition. When considering a coarse foam a strand thickness of 1–3mm is deposited during the impregnation process, and less than 1mm is added during the spray process. The spray process is a continuous one and the drying is done in batches. The process of spray, air knife and dry, is performed twice on each side of the filter (4-spray process). 30–50% of the total filter weight is added by spraying. The spray slurry viscosity is around 2.7–3.1 PaS and the solids content is approx. 60–70% (depending on the end product) The filters are then dried and fired prior to use.

Area of Application
Ceramic filters made from a reticulated polymer foam substrate

Project Type
New idea

Assistance Sought from Potential Partner
Step-change in application methodology of ceramic

Water saving devices

Description
The management of water consumption is becoming increasingly necessary as the global population grows and consumers in the developed world become compelled to reduce their environmental footprint. Our client is keen to find innovative technical devices to reduce water consumption, and have focused on applications where consumers use and therefore potentially waste the most amount of water. They are therefore searching for IP-supported, ideally DISRUPTIVE technology for the following markets:

- Domestic housing/consumer use
- Public toilets
- Hotel toilets/showers/baths
- Schools/offices/social housing water consumption

The company is focused on gaining access to products that reduce water consumption, or assist users in monitoring their water consumption. These should be inexpensive devices to modify the following products:

- Taps/faucets
- Showers/Baths
- Toilets Additionally

Area of Application
Water saving devices for domestic and commercial use

Keywords
Sustainable, water-saving, products

Project Type
New idea

For the above two requests, contact:
Strategic Allies Ltd.,
The Red & White House 113, High Street Berkhamsted, U.K HP4 2 DJ, Berkhamsted, United Kingdom,
Tel: +44-1442860634; E-mail: ashima@strategicallies.co.uk

PUBLICATIONS from APCTT

PERIODICALS

(Free access at www.techmonitor.net)

- ❑ Asia Pacific Tech Monitor (4 issues/year) (e-version)
- ❑ VATIS Update (4 issues/year)
  - Biotechnology (e-version)
  - Non-conventional Energy (e-version)
  - Food Processing (e-version)
  - Ozone Layer Protection # (e-version)
  - Waste Management (e-version)

BOOKS

	Indian Rupees* (India, Bhutan and Nepal)	US Dollars*
❑ Managing Innovation for the New Economy: Training Manual, 2002 Volume 1: How to Guide & Quick reference materials Volume 2: Articles & Lectures	1,000.00	50.00
❑ Regional Capacity-building for the Adoption of ISO-14000 and Transfer of Environmentally Sound Technology: Training Manual, 2000	600.00	30.00
❑ Small Rural Industries in the Asia Pacific Region: Enhancement of Competitiveness of Small Rural Industries in a Liberalized Economic Environment and the Impact of Poverty Alleviation, 2000	600.00	30.00
❑ Technology Transfer and Technological Capacity-building in Asia and the Pacific		
❍ Volume 1: Big Countries and Developed Economies, 1999	600.00	30.00
❍ Volume 2: ASEAN, NIEs, SAARC and the Islamic Republic of Iran, 1999	600.00	30.00
❍ Volume 3: Least Developed and Pacific Island Countries and Economies in Transition, 1999	600.00	30.00
❍ Volume 4: Emerging Issues in Regional Technological Capability-building and Technology Transfer, 1999	600.00	30.00
❑ Rural Industrialization as a Means of Poverty Alleviation: Report of the Regional Seminar on the Enhancement of Partnerships among Governmental, Non-governmental and Private Sector Entities for the Promotion of Rural Industrialization for Poverty Alleviation, 1999	600.00	30.00
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❑ Development and Utilization of S&T Indicators: Emerging Issues in Developing Countries of the ESCAP Region, 1998	300.00	15.00
❑ ODS Phase-out: A Guide for Industry, 1998	500.00	25.00
❑ Proceedings of the Consultative Meeting on Technology Management Education and Training for Developing Countries, 1997	800.00	40.00

Notes: *Amount less than Rs 500 should be sent through a demand draft only. Otherwise, payment should be made by cheque/demand draft/ UNESCO coupon in favour of the Asian & Pacific Centre for Transfer of Technology, payable at New Delhi.*

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** Amount to be sent to APCTT with the order for covering costs and handling charges.*