CHINA

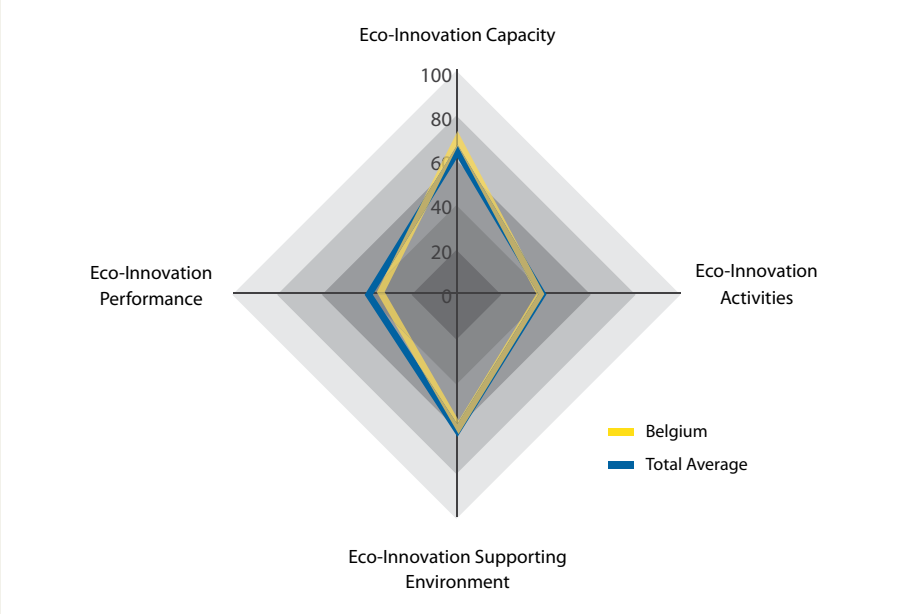

Fig. 8 Result analysis of China

Country Result & Analysis

With an overall score of 47/100, China places below the average in ASEI. China shows average score for all indicators in "the eco-innovation capacity criteria" which consists of "general innovation capacity", "level of economic competitiveness", "level of awareness on sustainability management", "value of investment in green technology SMEs" and "number of jobs in green technology industry". In regards to "eco-innovation activities", China scores average in "number of green patents" and "renewable energy utilization level" but score high in the "level of environmental management". Although, the number of green patents has been increasing rapidly, "level of commercialized green technology SMEs" and "green technology SMEs at Early Stage" is significantly low compared to the average of ASEM member countries. In the recent China Greentech Report 2012, it is stated that tight monetary policy, state focused rapid growth and lack of private funds are acting as barriers to overall green technology development.[33] With regards to "eco-innovation supporting environment", China performs average in implementing systematic environmental laws and getting involved in international environmental agreements. In terms of "eco-innovation performance", China scores below the average in the indicators related to country's "energy sustainability", "CO2 emissions intensity", "water consumption intensity" and the "level of environmental impact on society". However, green industry market size is larger than the average and the market is noticeably increasing. Overall, China ranks just below average in ASEI.

China's Key Eco-Innovation Environment

In March 2011, China launched its twelfth five-year plan for 2011-2016 which includes eight key targets to promote green growth and of the eight key targets, two seem to associate closely to the promotion of eco-innovation; 1) innovation target to increase the expenditure on R&D and patents, and 2) environment & clean energy target related to enhancing water intensity, energy efficiency and air intensity. The twelfth five-year

[33] *China Greentech Initative (2012), The China Greentech report 2012*

plan aims to fulfill the 40-45 percent carbon intensity reduction target by 2020 as well as targets to decline 16 percent in energy intensity and 17 percent in carbon emission relative to 2010 by 2015.[34] Under the twelfth five-year plan, seven new strategic industries have been announced; advanced materials, renewable and alternative energy, information technology, innovative equipment manufacturing, biotechnology, energy conservation and environmental protection and new energy vehicles. These industries provide vast room for the stimulation of eco-innovation in the future.

Rapid Development of Renewable Energy Technologies

China is growing its reputation for rapid development of renewable energy technologies. It is reported that almost one-fifth of total global renewable energy investment comes from China. Growing population and rapid economic growth of China have enforced the government to concern on the amount of energy needed for the growing population. Thus as part of government's long-term development plan, China's current eco-innovation activities are associated to developing and commercializing renewable energy technologies. Going back to the 1990s, the Chinese government initiated various legislative, administrative and economic measures on renewable energy such as the New and Renewable Energy Development Program 1996-2010, Renewable Energy Law, The Eleventh-Five-Year Plan for the Development of Renewable Energy. There has been significant improvement in this area since then, yet recently there have been some setbacks such as oversupply of wind turbines and solar panels. China is intensifying governmental regulations and changing policies to continuously increase the success of commercialization and utilization of renewable energy technologies. China has spent $52 billion on renewable energy in 2011 and expected to contribute around 40 percent of total increase in global renewable energy sources capacity over the next five years.[35] It is expected that China's future eco-innovation activities, regulations and incentives will continue to come from the areas related to renewable energy technologies.

Public Support in R&D

China's centralized government has long supported to increase its eco-innovation capacity by facilitating R&D programs and investing large amount of public budget in R&D. Since the launch of the Medium and Long-term National Plan for Science and Technology Development (2006-2020) policy, China has specified areas of prioritized research within the next 15 years. The prioritized field of research includes energy, water and mineral resources, environment, agriculture, manufacturing technologies, transportation, IT, population and health, urbanization and public security, all of which eco-innovation is closely related to. Under this central policy, China has developed fiscal policies and programs to promote R&D activities through nine ministries, agencies and local governments. The national high-tech research and development program called "863 program" can be seen as the main driver program to foster eco-innovation related R&D activities in China[36]. The "863 program" focuses on the application of advanced technologies in the priority research areas[37] of Medium and Long-term National Plan for Science and Technology Development (2006-2020) policy. The "973 program" established by the Chinese Ministry of Science and Technology is also an R&D program which has also created a foundation for energy and environment related research. In addition, the National Key Technologies R&D program and National New Products Program include research on development of green technologies and sustainable utilization of resources. Rather centralized governmental support towards R&D

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[34] *http://www.forbes.com/sites/jackperkowski/2012/07/27/china-leads-the-world-in-renewable-energy-investment/n*

[35] *http://www.forbes.com/sites/jackperkowski/2012/07/27/china-leads-the-world-in-renewable-energy-investment/*

[36] *Eco-Innovera (2002), Eco-innovation activities in key countries beyond Europe*

[37] *Prioritized Research Areas for Medium and Long-term National Plan for Science and Technology Development (2006-2020) policy: energy, water and mineral resources, environment, agriculture, manufacturing technologies, transportation, IT, population and health, urbanization and public security*

activities in China is building a firm foundation to increase the potential for rather active eco-innovation activities in the future. Local governments are recently working on the development of green technology business clusters in China.

Fostering Companies to Innovate

Previously, governmental funds in China were mostly gone to research institutions and universities. Only little amount of governmental funds was gone to private companies. However, over the past years, public programs such as the Thousand Enterprises Program established in 2006 are providing benefits to companies. The Thousand Enterprise Program allows the government to select 1000 top companies to improve their energy efficiency by cooperating with local officials. Although, the benefiting companies are mostly large companies rather than SMEs, it is important that available fund and programs are slowly flowing towards private companies. In recent years, China has been undertaking a reform to improve company's competitiveness by encouraging companies to pursue excellence in environmental management and carry out R&D activities that contribute to green technology development. As an expected result, radical eco-innovation at the business level may become more visible in the future.

Eco-Innovation Case Studies

CASE STUDY 1

Sunrain Solar Energy

Sunrain Solar Energy (Sunrain), an innovative renewable energy company, is the biggest listed company in China in the solar water heater sector. During 2009 and 2011, the Sunrain Group's revenue doubled from solar water heating technology. Much portion of this broad dissemination of solar water heater in China is attributed to support policy of the Eleventh Five-Year Plan as well as its market competitiveness. The Twelfth Five-year Plan is also keeping the same track on expanding the application of solar thermal energy industry with more focus on the engineering, agricultural and international markets. China ranks first in the solar hot water market due to growing domestic demand and more than 10 percent of Chinese households rely on this solution. Sunrain's renewable energy facility attracted both the rural and urban consumers in China. Sunrain Solar Energy was founded in 1999 specializing in research and application of solar energy manufacturing. Now the company is the frontrunner in exporting, reaching global customers in more than 100 countries.

Source: http://en.sunrain.com

CASE STUDY 2

Xinjiang Goldwind Science & Technology Company

Through the 863 and 973 Programs launched in 2005 and 2008 respectively, the central government provided a large amount of research funding to domestic turbine manufacturers to develop and design wind energy technology. China's current top wind turbine manufacturers are the companies that have received such funding and support from the government. One of them is **Xinjiang Goldwind Company (Goldwind)** established in 1998. The company was selected as one of the target companies of National High-tech R&D program (863 program). In 1999, the company developed 600KW generating set for the first time in China. Under the implementation of the Tenth Five-Year Plan, Goldwind obtained three National Science and Technology Projects, which enabled Goldwind to develop 1.2MW, 1.5MW turbine manufacturing technology subsequently. Goldwind is now designing 5MW generator. Goldwind has received full support from the Xinjiang Autonomous Regional government. The local government provided a high-tech development zone for Goldwind and made an infrastructure investment. In addition, the government gave Goldwind up to 15 percent income tax deduction between 2001 and 2010.

Source: http://www.goldwindglobal.com

CASE STUDY 3

Haier Group

Founded in Qingdao, Shandong province, in 1984, **Haier Group (Haier)** is the world's fourth largest home appliance manufacturer. Since Haier established a company-wide green strategy, the company has combined the green strategy with every part of its value chains, from the product development to the logistical chain. Through this green R&D base, Haier rolled out a variety of eco-friendly and energy-efficient products with its own technologies; refrigerators using carbon dioxide as a coolant, air conditioners using water as a natural cooler instead of HFC, washing machines using electrolyzed water instead of detergents to wash and dish washers with green wash option on it to save energy and water use, etc. In addition to this, Haier made Green Procurement Partnerships with more than 50 key suppliers. As an effort to make the overall industry greener, Haier initiated the Low Carbon Inverter CFC-free Air Conditioner Alliance with 8 leading companies, including Mitsubishi and Panasonic. According to Haier, the annual quantity of energy saved by Haier's energy-saving household appliances could support Hainan Province with population of 8.26 million for a whole year. Haier also contributed to making the Olympic Games green by providing over 60,000 environmentally-friendly and energy-efficient products to all the Olympic venues in Beijing.

Source: WEF (2012), The Corporate Global Citizenship Challenge, https://www.haier.net