

SWEDEN

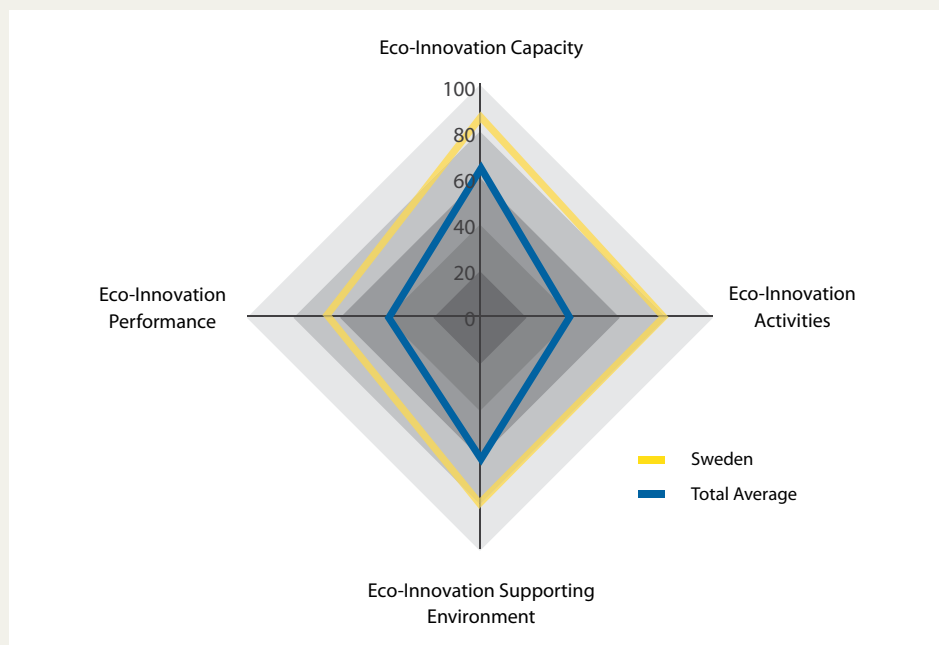


Fig. 18 Result analysis of Sweden

Country Result & Analysis

Based on 20 indicators, which are aggregated into four criteria, Sweden positions high (77/100) in ASEI. Sweden's high score in "eco-innovation capacity" is backed with high "general innovation capacity level", strong country's "economic competitiveness", high "awareness level on sustainability management", a relatively "large amount of investment capital flow in green technology" and "employees in green technology industry". In regards to "eco-innovation activities", the country scores average in "number of green patents" and "turnover of environmentally friendly companies". However, the "number of green technology SMEs at early stage" is much higher than the average. In Sweden, a large number of companies have been successful in commercializing green technology solutions. In the area of "eco-innovation supporting environment", the country scores high in the "level of systematic environmental laws" and "government's R&D expenditure in green industry". Furthermore, amongst the leaders of sustainability, the country is ratified to many international environmental treaties. As an early starter of eco-innovation, there is significant evidence of high performance in "eco-innovation performance" described by the country's high score in "energy sustainability level", "CO2 emission intensity", "water consumption intensity", "environmental impact on society" and "green market size". In regards to "energy sustainability" and "CO2 emission intensity", the country performs well above the average. Overall, Sweden ranks high on the ASEI index.

Sweden's Key Eco-Innovation Environment

Sweden is known for a strong eco-innovation reputation. Based Harmonization of liberal economic policies and strict environmental regulations provide a wider and flexible ground to implement eco-innovation in Sweden. The Swedish Ministry of the Environment set the national Environmental Quality Objectives in 1999;

most of them are to be achieved by 2020. In basis with the 16 set national objectives,⁷⁸ active environmental policies and programs have been introduced to address environmental challenges, and eco-innovation has been largely integrated in these policies and programs. The Swedish government built various bodies and institutions to achieve environmental improvement such as the Environmental Protection Agency, The Environmental Objectives Council, Swedish Environmental Technology Council, Foundation for Strategic Environmental Research, The National Environmental Management Authority and Swedish Energy Agency. Eco-innovation in Sweden has long been supported by the government's pro-active push for environmental protection, and it is clear that the government has a holistic view on eco-innovation. Sweden is seen as one of the national best practices in the field of eco-innovation.

Pro-active Government Support towards SMEs

Previously, Swedish government focused on supporting R&D activities to promote eco-innovation. However, realizing that SMEs had the greatest potential to be the drivers and creators of eco-innovation, the government started supporting SMEs in this area. The Swedish Agency for Economic and Regional Growth (NUTEK) implemented the Environment-Driven Business Development program since 2003. This program was set up with an aim to strengthen the competitiveness of Swedish SMEs in the "Environment-driven Markets". The Environment-Driven Business Development program supports projects that are based on cooperation between companies and projects that enhance knowledge about environmentally driven growth. As of 2007, it is reported that the program has provided 40 million SEK in funding for projects.⁷⁹ As a pioneer for stimulating SMEs for eco-innovation, Sweden enabled SMEs to develop their business accordingly and strengthen their competitive advantage as eco-innovative companies in the global market.

Green Technology Readiness

The Swedish eco-innovation approach seems to be technology focused. The country's innovative business climate, rapid technology adoption skill, highly conducive environment for R&D and innovation, promising green technology companies and close collaborating setting between universities, industry and governmental bodies allow Sweden to be a global laboratory and test bed for green technologies. The recent figures regarding the green technology sector show that the sector's turnover increased by 11 percent between 2005 and 2006, to almost SEK 97 billion and exports increased by almost 20 per cent, to just over 25 billion SEK.⁸⁰

Due to advanced green technology, currently 45 percent of Sweden's energy supply comes from renewable energy, and the country aims to increase this share to 50 percent by 2020. These advanced figures are supported by the government's initiative and funding to develop Swedish green technology since the mid 2000s. The Swedish Environmental Technology Council (SWENTEC) established in 2008 provides an effective environment to support Swedish green technology companies, while the Swedish Trade Council works to accelerate the globalization of the green technology companies increasing their exports by means of global project collaboration. In addition, VINNOVA, the Swedish Agency for Innovation Systems, funds and supports eco-innovation projects through the "Innovations for a Sustainable Future" program. The agency aims to promote sustainable growth by financing research and development of technology and effective innovation solutions. The Government's environmental technology strategy was further introduced in 2011 to facilitate the development and trade of Swedish green technology solutions. Swedish government has a good

⁷⁸ The 16 Environmental Quality Objectives set by the government are: Reduced Climate Impact, Clean Air, Natural Acidification Only, A Non-Toxic Environment, A Protective Ozone Layer, A Safe Radiation Environment, Zero Eutrophication, Flourishing Lakes and Streams, Good-Quality Groundwater, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos, Thriving Wetlands, Sustainable Forests, A Varied Agricultural Landscape, A Magnificent Mountain Landscape, A Good Built Environment, A Rich Diversity of Plant and Animal Life

⁷⁹ Sweden's report to the European Commission (2007), Implementation of the EU Sustainable Development Strategy

⁸⁰ Invest Sweden, Cleantech report: a country that fully embraces green technologies, <http://www.investsweden.se/>

understanding of the role of companies to eco-innovate to act as an engine for green growth. As a leader of technology readiness, the Swedish government recognizes the importance of not only developing new green technology but also diffusing and spreading existing green technology solutions into local, regional and global markets. Furthermore, the country takes forefront approach in searching for the right pricing mechanism in the green market. The Swedish government announced that it aims to invest 400 million SEK in green technology between 2011 and 2014 based on its Strategy for Environmental Technology.⁸¹

Global Reach through Delivering Eco-innovation Solutions

The Swedish Government considers environmental problems as transboundary challenges that need global solutions that can be applied in various regions and countries. Sweden realizes that environmental problems go hand in hand with poverty, security and health problems that need solving based on holistic thinking. The Swedish International Development Cooperation Agency (Sida)'s Innovation Against Poverty program invites private companies to develop projects, services and business models that contributes to both fighting poverty and climate change. Each year, Sida's IAP program encourages companies to create innovative sustainable business solutions that can be delivered to the international community. In 2011, Sida launched the Green Solutions and Sustainable Development Conference in Kenya to encourage local authorities of Kenya to identify green solutions suitable in the context of Kenya. In the same year, Sida financed the establishment of an environmental technology center at the Swedish Embassy in Beijing called the Center of Environmental Technology (CENTEC). CENTEC promotes the introduction and doing business of Swedish eco-innovative companies in China. More recently, VINNOVA, the Swedish Agency for Innovation Systems, launched a new program called the International Cooperation for Eco-innovations in July 2012. This program aims at strengthening international research and development cooperation for eco-innovation in the field of sustainable urban development, information and communication technology and environmental engineering. Through such programs and initiatives introduced above, Sweden is working on delivering and exporting eco-innovation ideas, solutions and products to emerging countries to support in tackling local challenges while it benefits Swedish companies too.

⁸¹ Government Offices of Sweden (2011), *Environmental Technology – 13 Swedish Solutions*

Eco-Innovation Case Studies

CASE STUDY 1

Solvatten AB

Solvatten AB (Solvatten) is a company that has developed a solar energy water purifier that uses ultraviolet light in sunshine to kill microorganisms in water. The name of the product is Solvatten meaning sun water. This product's design includes two 5 liter compartments with two transparent faces which heat up water to 130 Celsius degrees. This temperature is high enough to kill off disease-causing pathogens. When the water is safe to drink, an indicator light turns from green to red. With this purifier, 11 liters of water is purified in 2 to 6 hours and can be used two to three times a day. The Solvatten water purifiers are distributed to 130,000 people in Kenya. According to Global Autmaning's report, this will enable Nairobi families to save around \$150 to \$250 per year. This purifier has made some people to do small business by selling purified water to others at an affordable price. Solvatten is now involved in larger scale climate change, clean water and deforestation reduction projects in twenty countries.



Source: <http://www.solvatten.se/>

CASE STUDY 2

ClimateWell

ClimateWell is most known for its technology that uses solar power for cooling, heating and domestic hot water. The company is one of the most successful green technology start-ups that received a funding support and show rapid growth. This technology is only available technology on the market to provide powered cooling and hot water with embedded solar and waste energy storage. This company's vision slogan is "One billion tons less CO₂". The company aims to make a "global sustainable energy supply" through its heating and cooling technology. ClimateWell had been selected as one of the GE's Eco-imagination Challenge awarded firms in 2010. Since then, the company is working on the application of this technology in GE appliances as well as commercial buildings. Due to its rapid growth, this company has been selected as one of the 100 cleantech companies selected by the Cleantech Group. Now the company's green technology is reaching out to other European countries and the Middle East with heat pumps and air conditioning that need zero electricity. ClimateWell promotes that an average family can reduce their CO₂ emissions with up to 15 tons per year. Now, ClimateWell is receiving Swedish government support for developing green truck cooling system which reduces fuel consumption. ClimateWell's technology is contributing towards energy efficient society disseminating its technology into various appliances and buildings to reduce power consumption and carbon emission.

Source: <http://www.climatewell.com/>

CASE STUDY 3

Biorecro

Biorecro is a recognized company that offers Carbon Cleanup service using Bio Energy with Carbon Capture and Storage (BECCS) technology. Carbon Cleanup is a service that captures carbon dioxide from the atmosphere and compress and stores it permanently below the ground to reduce ocean acidification and global warming. BECCS can capture carbon dioxide from biomass which encompasses any type of vegetation and thus can store negative emission. Negative emission is known as a process of removing greenhouse gas from the Earth's atmosphere and is considered the opposite of carbon dioxide emission. It is estimated that 3.5 billion tons of CO₂ can be removed from the atmosphere annually by 2050 for a cost of less than 50 Euros per tones. Biorecro is involved in three major projects in the US; Illinois, North Dakota and Kansas. Biorecro has been selected as one of the Climate Solver by WWF in 2010. Biorecro's innovative service and technology have a large potential in mitigating climate change and is attracting new investors and influencing policy makers.

Source: <http://www.biorecro.com>