



CLEANTECH IN SWEDEN

SECTOR OVERVIEW

Business opportunities in Cleantech





PAVING THE WAY FOR CLEANTECH 2.0

SECTOR OVERVIEW

SWEDEN - AT THE FOREFRONT OF GLOBAL CLEANTECH

During decades, Sweden has been in the forefront of environmental protection. As confirmed in OECD's 2014 environmental performance review, Sweden remains "a front-runner in environmental policy". Incentives to reduce pollution and strong support for innovation have fostered green technologies. Sweden has shown that it is possible to combine economic growth with a decreased carbon foot print.

PAVING THE WAY FOR CLEANTECH 2.0

Cleantech has for long been a priority area by many venture capitalists, but is now more about being adapted as part of everyday life in most industries and sectors. This second wave is to a large extent about implementing cleantech technologies on a broader scale.

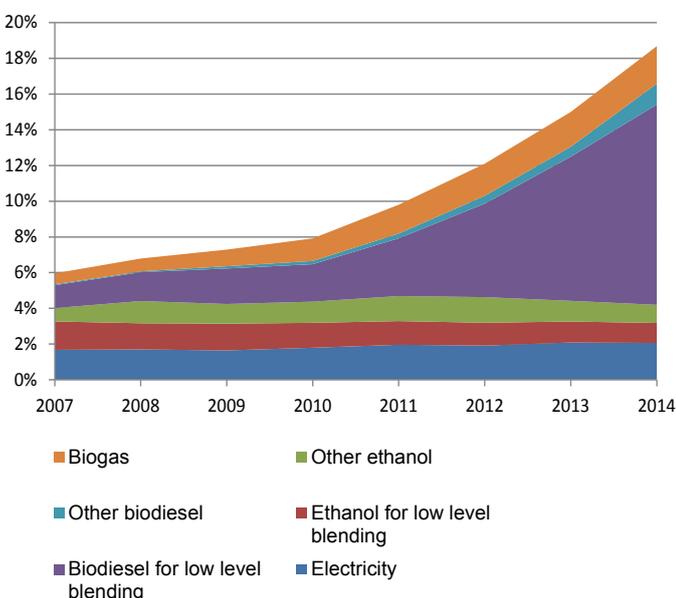
Sweden's cleantech expertise and knowledge has a long tradition which has enabled us to be in the forefront of both the first wave of Cleantech as well as the latest one. Sweden, Switzerland, UK, the Netherlands, and the USA are considered the world's five most innovative nations. Furthermore Sweden was in position 4 in the Global Cleantech Innovation Index 2014.

Every year between 300 and 900 new cleantech companies are incorporated in Sweden and the sector currently comprises several thousand companies with an annual turnover of 220 billion SEK.

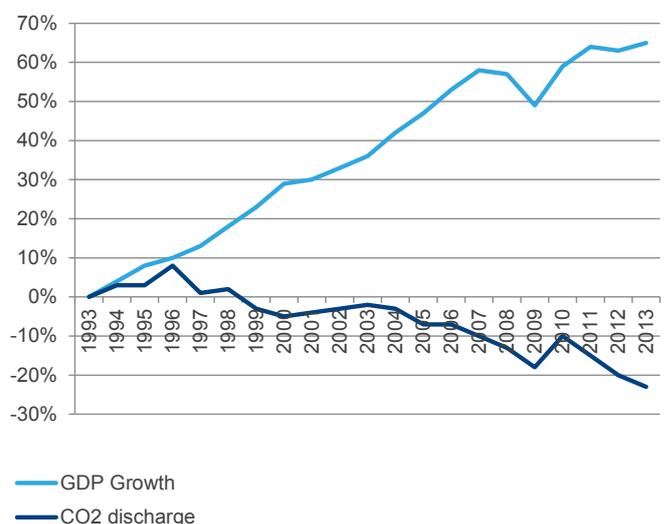
WHY SWEDEN?

- ▶ The Swedish industry every year invests substantial amounts in pure environmental protection technologies
- ▶ Sweden has among the highest R&D spendings in the world and several unique research facilities, leading universities, and business institutes.
- ▶ Swedish companies offer a considerable number of cleantech applications based on technologies developed in areas such as Internet of Things, nanotechnology, bio technology and space technology.
- ▶ Open market, welcoming international competition
- ▶ Transparent market, easy to do business

Share of energy from renewable sources in the Swedish transport sector



Swedish GDP growth and CO² reduction since 1990



Source: Statistics Sweden, 2015. Sweden Environment Protection Agency, 2015

MASTERING ADVANCED TECHNOLOGIES

EU identifies six technologies as strategically important for driving growth, competitiveness and contributing to solving big societal challenges. These are nanotechnologies, advanced materials, micro and nanoelectronics, photonics, biotechnology and advanced manufacturing.

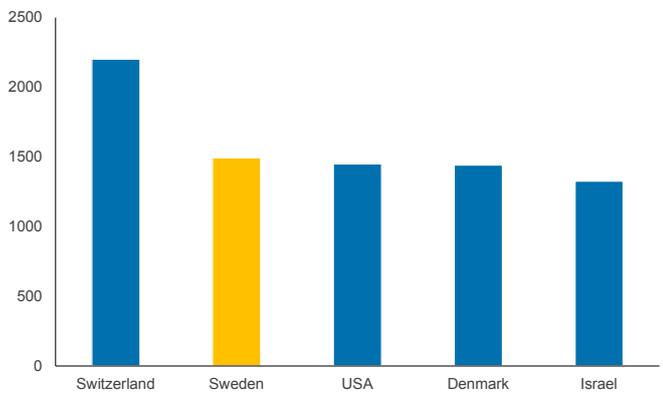
Swedish companies already offer a considerable number of cleantech applications based on the technologies developed in areas such as Internet of Things (sensor development, control and automation development, energy efficient hardware and software, integrated and automated transport systems), nanotechnology (low friction surfaces, light and material-efficient structures), biotechnology (fuels, new materials) and space technology (transport logistics and precision control of traffic flow in cities, monitoring environmental problems).

EXCELLENT RESEARCH

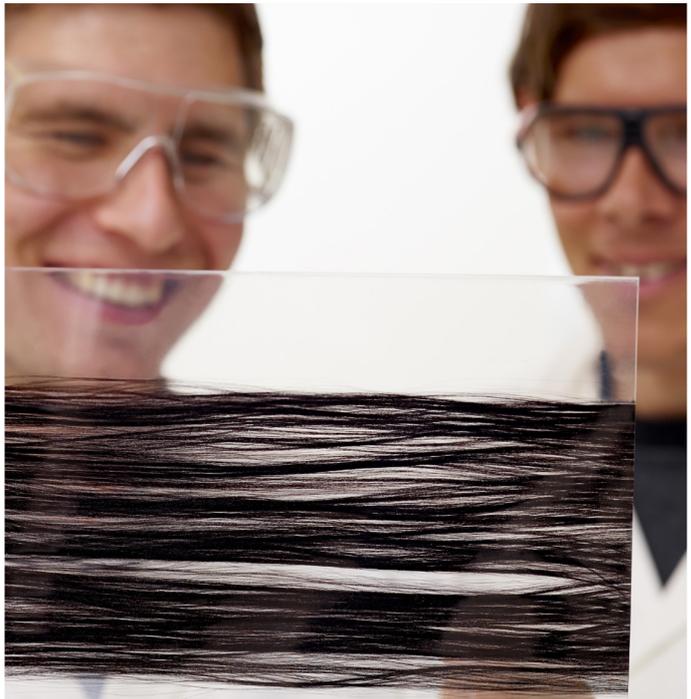
Sweden has among the highest R&D spendings in the world and a number of unique research facilities, leading universities, institutes and companies.

One of the reasons why Sweden is in the forefront in the area of cleantech is prominent research within materials, power systems, and biofuel.

R&D Expenditures per Capita (USD)



Source: Euromonitor, 2015



Materials research

International companies looking for leading materials-related innovations could access these unique R&D facilities by joining forces with regional enterprises, universities and research institutions within the field.

Power systems research

Sweden has a strong position in several of the technical areas that are relevant to the development of the future smart electricity system, including developing prerequisites, technology, and services for smart grids.

Biofuel research

International companies looking for how to develop the second generation of biofuels will find a multitude of opportunities in Sweden for both gaseous as well as liquid biofuels.



GREEN ENERGY INVESTMENT OPPORTUNITIES

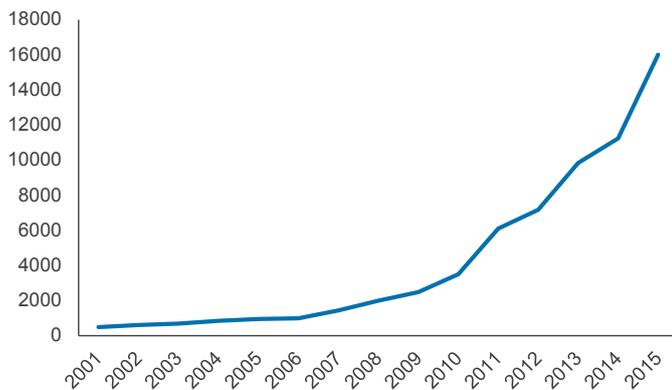
SECTOR OVERVIEW

Sweden is in the forefront when it comes to developing new technologies for wind power, bioenergy, ocean energy, solar power, smart grids, green building, waste and recycling, green vehicle technologies and for taking care of water resources.

WIND

Supported by Sweden's green certificate system there has been a massive expansion in wind power. In 2014, Sweden was in position number 8 when it came to new installed wind capacity. Wind power production has increased from 0,7 TWh in 2005 to 11,2 TWh in 2014 and continues to grow.

Electricity supply from Wind Power 2001-2014 (GWh)



Source: Swedish Statistics, 2016

Sweden is the base for a large number of successful suppliers to the global wind power sector. They include market leading companies like ABB and SKF but also a vast number of smaller and specialised enterprises ranging from tower manufacturing, heavy machine part manufacturing to monitoring software and advanced consulting services. Sweden also offers some unique advantages that makes it an ideal spot to conduct R&D activities, e.g. within wind energy generation in cold climates.

Financial and corporate investors committed to investments in renewable energy have a multitude of wind power opportunities in Sweden. A large corporate purchaser of renewable energy that see the potential is Google through their investment in Swedish wind power for powering their data centre in Finland.

BIOENERGY

Sweden is a world leader in the utilisation of bioenergy, in heat and power production, in biofuels like ethanol, biodiesel and biogas and in applications for aviation, maritime and the land transport sector. Out of Sweden's total domestic energy use in 2014, the largest portion is



bioenergy. By introducing various incentives like a CO2 tax, green electricity certificates, tax exemption of biofuels for transport and direct investment support, there has been a major increase in the use of biofuels. EU's target of 10 percent renewable fuel in the transport sector in 2020, is a level Sweden already has surpassed.

In addition to Sweden's solid fuel combustion plants, there are 277 biogas plants where about 50 percent is upgraded to be equivalent to natural gas and in several cases even injected into the natural gas grid. The process of biogas becoming an efficient fuel has led to a buzzing business sector that offers knowhow and expertise throughout the value chain.

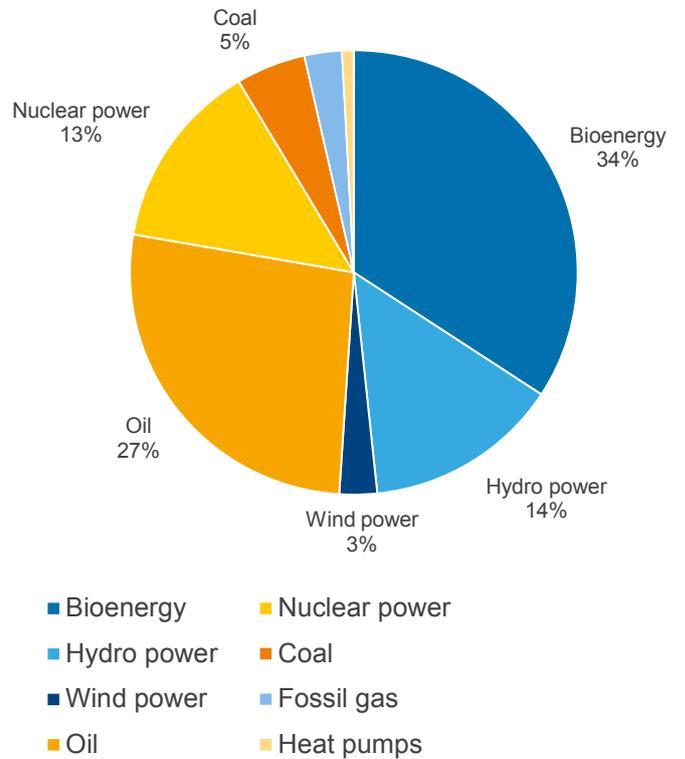
Massive investments in bioenergy heat and power plants have resulted in a number of large orders for international boiler and turbine suppliers and it is predicted that bioenergy production will continue to increase in importance. Collaboration with Swedish companies in areas like construction, pollution abatement equipment, fuel handling as well as with engineering consultants could add great value - not only when doing business in Sweden but also when exploiting the expanding global market.

OCEAN ENERGY

Sweden's industrial and engineering base combined with strict environmental and safety policies have created a solid foundation of wave and marine current test sites and research nodes. Sweden has the largest concentration of wave power research in the world. There are companies ranging from experienced knowledge providers including SSPA with their towing tank and Maritime Dynamics Laboratory, to enterprises that are taking their technologies to full scale.

Swedish companies in the ocean energy supplier base include consultants, suppliers of advanced electro/mechanical systems, and simulation/super computer centres to manufacturers of construction materials. Working with these suppliers, international companies will get the opportunity to enhance their proprietary solutions. The laboratories and test environments also provide unique opportunities to test solutions in demanding marine environments.

Swedish energy use in 2014



SOLAR ENERGY

There is a large potential for solar generated power in Sweden. It is estimated that 40 TWh annual power can be produced which makes it a potentially important contributor to the future sustainable power system. Despite a large increase in installed capacity, the share of total power production is still low. There are however several subsidy schemes that could lead to an increased production.

Swedish knowledge in solar cell technologies relies on research in new types of solar cells and photovoltaic materials where several of the research groups are at the global forefront. Some examples are the Ångström Thin



Film Solar Center working with CIGS and CZTS development and NanoLund that successfully developed a novel nanowire-based photovoltaic film cell.

Sweden can offer an environment that support foreign companies in their venture for the next generation of solar power technology through developing future cutting-edge products, managing technology leaps and paradigm shifts in the area of solar power.

SMART GRID

Existing grids are under pressure; a global rise in demand for electricity requires a reliable and efficient electric power network. Mitigating climate change also requires large-scale incorporation of renewable sources into the energy mix. Investments in smart grids are in line with Sweden's ambitions of a 100 percent renewable based energy system.

The Swedish electricity market has been deregulated since 1996 and with an early and nationwide roll-out of more than five million smart meters, Sweden can offer extensive experience in the field. In a highly collaborative manner, the business sector has generated advanced technical solutions. This could be illustrated by the world's most advanced, full-scale smart-grid project on the island of Gotland.

International companies with hardware or software offerings, should look into the Swedish market and its opportunities. The Swedish business community includes many smaller but technologically advanced companies. International companies in the smart grid sector could benefit greatly from cooperating with Swedish companies and adapt a technology for the global market.

GREEN BUILDING

A large portion of the running costs for a building origins from heating and the oil crisis in the -70ies put energy use in focus even more. Adding the driving forces set up by policymakers to lower energy consumption in general and the use of fossil fuels in particular, have led to the standard we see today.

In the forefront of the many green building projects in Sweden is the Stockholm Royal Seaport - one of 18 projects within the global Climate Positive Development Program, launched in May 2009 by the Clinton Climate Initiative and the US Green Building Council. Building on experiences from the world famous Hammarby Sjöstad, it will transform a former industrial zone into an area with 10,000 new homes and 30,000 additional work spaces, with zero fossil fuel emissions by 2030.

International companies can benefit from seeing how Sweden actually has implemented green building in numerous green building projects, identifying solutions that could be transferred to their own geography and connecting to a specific tech provider.

WASTE AND RECYCLING

Waste and waste management is a global challenge of huge proportions. The total amount of waste generated worldwide annually exceeds 4 billion tons. It is estimated



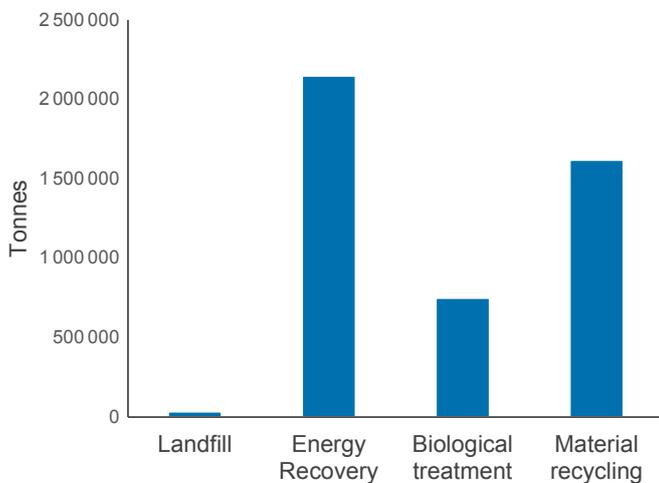
that more than half of the earth's population does not have access to the most elementary waste management services.

By involving everyone from producers, businesses, municipalities and households, combined with ambitious national targets and environmental requirements, Sweden has created a high performing waste management system recovering material, energy and nutrients from waste.

Sweden offers a number of innovative technologies that will bring waste and recycling to the next level. The technologies consist of automated vacuum systems and underground containers for waste collection, large vehicle fleets and infrastructure for bio gas and world class waste incineration. Research activities in Sweden include among all the recovery of rare earth metals from LCD screens and solar PV panels, and urban/landfill mining.

Learning from the Swedish experience of going from a widespread use of disposal by basic landfill to the current standards with emphasis on the upper steps in the "pyramid", international companies can benefit from aligning with the Swedish waste management sector.

Yearly Waste and Recycling in Sweden 2014



Source: the Swedish Waste Management Association, 2015

WATER

By applying strict treatment standards, using more than 1 750 public waterworks, Sweden has a waste water and water piping system that exceeds the equivalent distance of four times the diameter of the equator. Waste water treatment, drinking water supply, rain water treatment, sanitation and energy production are all interconnected elements in a system, resulting in a highly resource efficient solution.

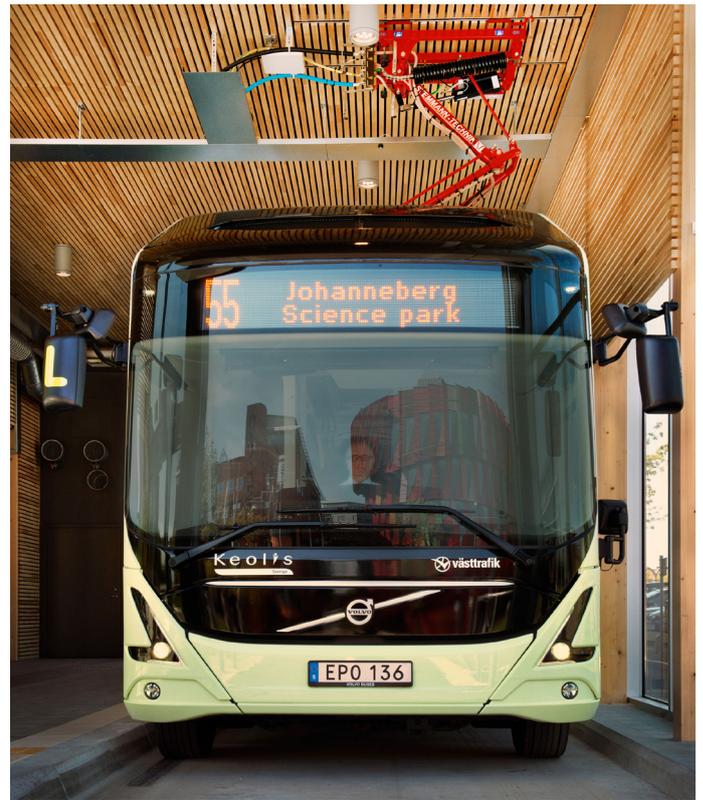
Sweden's widespread implementation of anaerobic digestion at waste water treatment plants has been a strong driver for creating a market, now including more than 50 000 biogas propelled vehicles and 200 refilling stations in Sweden.

In order to be able to meet the challenges of a changed climate, large investments in securing water supply on a global scale will be needed. An environment of close collaboration between public and private stakeholders in the Swedish water sector, systems of collecting and storing data, research clusters, test beds and demonstration facilities create favourable conditions for innovation in Sweden.

GREEN VEHICLE TECHNOLOGIES

Sweden is the base for three major vehicle manufacturers; Volvo, Volvo Cars and Scania. The vehicle sector is an important part of the Swedish economy, representing 11 percent of Sweden's overall exports and 12 percent of industrial investments. Furthermore, the sector includes almost 1 000 businesses employing more than 135 000.

In 2009, the Swedish government presented a target for Sweden to have a vehicle fleet independent of fossil fuels in 2030. It is foreseen that several measures including renewable fuels, more energy efficient vehicle techniques, hybrid vehicles and electric vehicles are parts of the solution. Sweden has dedicated large resources to support this effort resulting in a significant increase in renewable energy use in the transport sector.



Several research, innovation and development programmes are running in areas like energy efficient drivelines, renewable fuels and efficient vehicles. Other cutting-edge projects include automated cars and transport systems, electric cars and heavy vehicles, batteries, charging infrastructure and fuel cells.

Sweden has unique skills and offerings adding high value to a future sustainable transportation system. There are plenty of projects, initiatives and businesses offering learning experiences and collaborating opportunities. At the same time, the vehicle industry is part of a global value chain. Expertise found in many countries and in international companies could thus prove very valuable for the outcome of projects and for industrial partners in Sweden.

DID YOU KNOW THAT...

- ▶ Sweden's goal is a 100 percent renewable based energy system
- ▶ Sweden ends up in position 4 in the Global Clean-tech Innovation Index 2014
- ▶ Sweden has the largest concentration of wave power research in the world
- ▶ In 2014, Sweden reached position number 8 worldwide in new installed wind capacity.
- ▶ Sweden is a global leader in the utilisation of bio energy, heat and power production, biofuels like ethanol, biodiesel and biogas, and in applications in aviation, maritime and in the land transport sector.



WE HELP YOU EXPAND YOUR BUSINESS IN SWEDEN

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Business Sweden is the official Swedish trade and invest council. We facilitate foreign investment in Sweden and make it easier for Swedish companies to grow internationally.

Business Sweden supports international companies to connect with investment opportunities in Sweden – whether the interest is to gain access to the market or world-class R&D competence and innovation. We provide you with the information, guidance, solutions and network required to invest in Sweden.

EXPERIENCED STAFF

Business Sweden's industry specialists facilitate for international companies in the process of establishing in Sweden and finding partners for collaboration or investment. Our strength lies in an experienced team of international trade and investment professionals in sectors where Sweden enjoys competitive advantages such as environmental technologies, ICT, life sciences, material technologies and transportation systems. A network of regional partners across Sweden ensures local support.

STEPS TO SUCCESS

Business Sweden has a simple process for supporting your future business with Sweden and our offer is based on your company's specific needs. Our working process consists of a number of steps, including the following services:

- ▶ **Information sharing.** Based on your investment needs, we share insights on Swedish business sectors, the Swedish market, the investment climate, R&D, specific competence clusters and investment costs.
- ▶ **Location management.** Based on your requirements, we support you in identifying sites for your operations in Sweden.
- ▶ **Investment opportunity search.** Based on your priorities we scan, identify and present business opportunities in Sweden. We give you advice on key industry stakeholders and help you identify your next investment step.
- ▶ **Matchmaking support.** We introduce you to various opportunities of strategic partnerships, investments and other types of cooperation.
- ▶ **Establishment information.** We provide you with information on how to set up and run a business in Sweden including rules and regulations, legal entities, employment, taxes and more.
- ▶ **Network access.** We introduce you to all necessary public and private service providers, authorities and organisations.



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