Publication Year 2013

INVEST IN

cleantech

A MAGAZINE ON SWEDISH ENVIRONMENTAL TECHNOLOGY FROM THE SWEDISH ENERGY AGENCY | 2013

BLUE GROWTH

Threats to our oceans creating new business opportunities

Innovators Three companies on the cutting edge ***In focus*** Indonesia attracting Swedish environmental technology companies ***Climate school*** From CCS to NZEB ***Research*** Alternative routes to capital ***Market*** Biggest deals of the year ***Portrait*** In the mind of an investor

Searching for new markets

SWEDISH COMPANIES are in a good position to capture a larger share of the growing global environmental technology market. If Sweden is to remain a leader during the green transition, however, more money must be allotted to the country's environmental technology companies.

The Swedish Energy Agency publishes Invest in Cleantech in order to highlight the potential of the environmental technology sector. Our aim is to share information on how to create favourable conditions for the growth and development of environmental technology in Sweden.

WE ARE CURRENTLY on the hunt for...
...new financing models. Find out more about the research being conducted with the aim of attracting more capital to Swedish environmental technology companies.
...new investors. Learn how the Swedish Energy Agency, in cooperation with Connect, is creating common ground between environmental technology companies and business angels.
...new markets. In this edition of Invest in Cleantech, we take a closer look at Indonesia, a country undergoing growth, showing an inclination toward reform and facing environmental challenges.
...new investment areas. We turn the spotlight on business opportunities linked to the enormous potential created by our oceans and water.
...new technology. Most important of all, join us as we highlight some of Sweden's cutting-edge companies – companies that will contribute to the green transition and sustainable economic growth.

ALTHOUGH PUBLIC CAPITAL currently accounts for a large portion of the investments being made in environmental technology, I am convinced that private capital will ultimately be attracted to business concepts based on sustainable solutions. The billionaires of the future will include investors in today's innovative environmental technology companies.

ERIK BRANDSMA
Director General,
The Swedish Energy Agency

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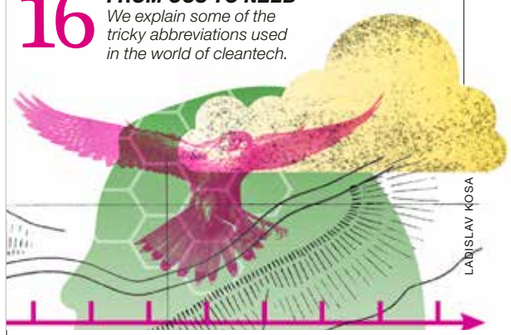

LADISLAV KOSA

INVEST IN cleantech

Invest in cleantech is a supplement to the magazine *Energivärlden* (Energy World) published by the Swedish Energy Agency. The aim of the publication is to highlight Swedish environmental technology and the investment opportunities in the sector.

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Swedish Energy Agency

PETER LARSSON/KTH PRESS

Barack Obama inspects Swedish fuel cells.

OBAMA INTERESTED IN SWEDISH ENVIRONMENTAL TECHNOLOGY

WHEN US PRESIDENT, Barack Obama, visited Stockholm in September 2013, the Royal Swedish Institute of Technology in Stockholm (KTH) was one of the highlights of his stay. The visit focused on the topic of environmental technology, confirming that Swedish research is at the cutting edge of the field.

The President was invited to visit three stations featuring Swedish innovations, two of which were financed by the Swedish Energy Agency. One of the innovations was the Powertrekk fuel cell charger (see page 27).

"Obama was obviously very knowledgeable and asked several questions about the practical uses of this type of technology," says KTH President, Peter Gudmundson.

The other innovations on display were Solvatten, which utilises the sun's ultraviolet rays to treat contaminated water in a simple way (see page 25), and Volvo's new plug-in hybrid engine for buses and other vehicles, which has the capacity to reduce fuel consumption by nearly 80 per cent compared with current levels.

SWEDEN NUMBER TWO IN INNOVATION RANKING

1. SWITZERLAND
2. SWEDEN
3. UK
4. NETHERLANDS
5. USA
6. FINLAND
7. HONG KONG
8. SINGAPORE
9. DENMARK
10. IRELAND

THE GLOBAL INNOVATION Index compiled by the UN's World Intellectual Property Organization (WIPO) compares the quality of universities and access to venture capital in various countries. Sweden also received an impressive third-place ranking on the Global Cleantech Innovation Index for 2012.

2

QUINTILLION €

THE VALUE OF the global market for environmental technology, which is expected to double by 2020. (2 quintillion = 2,000,000,000,000,000,000.)
SOURCE: IEA

LOCATING SWEDISH ENVIRONMENTAL TECHNOLOGY COMPANIES

SOME 950 SWEDISH environmental technology companies are now gathered in one place – and you can find them with the help of simple, easy-to-use search fields connected to Google Maps. **Swedishcleantech.se**, a website run by the Swedish Agency for Economic and Regional Growth, allows users to find most environmental technology players in Sweden. For example, try searching for all waste management companies in Jämtland or all solar energy companies in Norrland.

The site also contains articles about successful environmental technology initiatives, facts and statistics, and links to all government agencies in the field.

Top-seller in Norway.

BREAKTHROUGH FOR ELECTRIC CARS

IN 2013, SALES OF electric cars boomed, thanks in part to the new Tesla Model S, which has a range of about 500 kilometres and accelerates from zero to 100 kilometres per hour in under five seconds. In Norway, for example, the Tesla S was the top-selling car in September 2013.

Tesla has a new business model: a large number of its cars are sold online; customers are able to travel for free using Tesla Superchargers, the company's gradually expanding network of charging stations; and continuous performance enhancements are offered via Internet downloads.

According to a Financial Times article, Tesla may be having an "iPhone moment." But quality doesn't come cheap: the least expensive models start at about SEK 600,000 and the most expensive costs approximately SEK 1 million.

Innovators

Smart technology ideas have the potential to break down boundaries and challenge traditional business logic. Meet three innovators in the field of environmental technology. One has been in the game for 150 years, two were started within the past decade – all three have their sights set on the global market.

TEXT: JOHAN WICKSTRÖM | PHOTO: ANDRÉ DE LOISTED

"Clean water is our business concept"

"CLEAN WATER and pure energy, this is our business concept," says Johan Möllerström, Managing Director of Malmberg Water, looking out over Hanöbukten Bay in southern Sweden.

The company's head office is located five kilometres inland in the town of Yngsjö. Ever since Jöns Mattisson-Malmberg began drilling wells in the 1870s, water has been the focus of this family business.

"We were there when Sweden was developing its infrastructure in the 1940s and 50s," says Johan Möllerström.

One might think that a company with 150 years of experience would be content to settle down, but as autumn 2013 approached, Malmberg Water's order book was fuller than ever – and double the company's budget.

A KEY FACTOR in Malmberg Water's success is its focus on biogas purification, which started nearly ten years ago. At Malmberg Water's plants, carbon dioxide is removed from biogas using a procedure known as water scrubbing, which allows the water to be reused over and over again.

Johan Möllerström shows us around the plant. Outside, in the industrial area, stands a turnkey plant that will soon be shipped to Hainan, China.

"This plant can purify 1,250 cubic metres of biogas per hour," explains Johan Möllerström.

Malmberg Water

Business concept: *Develop and sell water-treatment and biogas-purification solutions.*
Started in: *1866. (Fifth-generation family business.)*
Number of employees: *110.*

The current biogas boom is being driven by an increased demand for vehicle fuel and the important role played by biogas in many countries' electricity production.

Malmberg Water entered the German market in 2007 and is now the market leader in biogas purification, with a market share of 40 per cent.

THE SECOND MAIN area of Malmberg Water's operations focuses on water and waste water treatment plants. The company recently signed a waste water treatment agreement with a company in St. Petersburg.

"The water treatment market is enormous. Some 470 waste water plants will be built in Bulgaria alone this year. Sweden also needs to update its infrastructure when it comes to water."

As a family company, Malmberg Water provides its own financing when new investments are required.

"We can afford to take a long-term approach and we know it takes time. The only money we have is the money we earn," says Johan Möllerström, who is positive about the company's future prospects and expects sales to double over the next five years.

"We have a lot on the go. We're participating in a project related to sustainable urban development in China and have also started targeting the US and UK markets."

JOHAN MÖLLERSTRÖM
Managing Director of Malmberg Water

MAGNUS NORBERG OHLSSON
CEO of Tomologic

TEXT: JOHAN WICKSTRÖM | PHOTO: JENNIFER GLANS

"We are like Spotify for the steel industry"

WHEN MAGNUS Norberg Ohlsson began working part-time as a cutting machine operator for local industrial companies in Kvänum as a teenager, he quickly discovered the improvement potential in the production operations.

"Companies sold time on the machine instead of using the materials efficiently," he explains when we meet at Tomologic's premises on Kungsholmen in Stockholm.

Now, 15 years later, Magnus Norberg Ohlsson is CEO of a company with 18 employees and a distinct business concept: reduce the amount of waste in industrial production (which, in some cases, can amount to between 20 and 50 per cent of raw materials). Tomologic's solutions enable raw material waste to be reduced by up to 50 per cent, resulting in major energy savings – thanks to a declining need for fusion power and reduction in transportation.

TOMOLOGIC'S METHOD is based on advanced calculation algorithms that control the cutting process and was developed in cooperation with other computer scientists at the Royal Swedish Institute of Technology in Stockholm (KTH).

"We sell software. You could say that we are sort of like Spotify for the steel industry. We already have an agreement with one of the world's largest machinery manufacturers," says Magnus Norberg Ohlsson.

The company's technology doesn't require plants. Distribution is carried out online: customers send in details regarding the type of material, thickness and machinery and receive a response in the form of a code – based on advanced algorithms.

Why didn't anyone think of this earlier?

"I think there has been a gap between the research world, machine manufacturers and the industry.

Each one tried to optimise parts of the process, but no one looked at the big picture," explains Magnus Norberg Ohlsson.

Magnus Norberg Ohlsson started Tomologic in 2009 and faced a rocky start in the wake of the financial crisis.

"We received a grant for SEK 4.8 million from the Swedish Energy Agency. This was crucial to our survival in the beginning."

SINCE THEN, Magnus Norberg Ohlsson has travelled across Europe to meet with customers and financiers, achieving considerable success with both. In 2012, the company also received additional support from the Swedish Energy Agency in the form of a loan for SEK 15.7 million.

"We have received financing from several sources. Things have become easier over the past year. Our financial backers see that we have paying customers and scalable technology that works," he says.

The total steel market is worth thousands of millions of dollars. According to Magnus Norberg Ohlsson, who is aiming for a global market launch in 2014, creating savings of a few per cent in this sector will enable Tomologic to generate significant money.

"But money isn't what drives me. I am driven by the idea of doing something big and changing the world."

Tomologic

Business concept: *Offer an optimisation service for industrial cutting processes that enables a reduction in raw material waste of up to 50 per cent.*
Started in: *2009.*
Number of employees: *18.*

TEXT: JOHAN WICKSTRÖM | PHOTO: ANDRÉ DE LOISTED

"We are reducing losses in the electricity system"

SOMETIMES CERTAIN, products come on the market and turn ingrained and established concepts on their heads. One such product is currently on the shelves of an industrial premises on the outskirts of Eslöv: a lump of iron measuring roughly ten centimetres and resembling a curling-stone.

"Inductors have looked the same since Edison's time: copper threads wrapped around an iron core. We've done the opposite: placed the thread at the centre and cast it in our uniquely developed metal powder solution. This allows us to reduce our copper consumption and energy losses and requires less cooling," explains Sten Camitz, CEO of MagComp.

Inductors can be found in most electronic products and industrial installations, often built into the systems themselves, and are designed to filter out alternating currents from disturbances occurring during the operation of systems and components.

"The growth of the renewable electricity market could open up major markets for our products in the near future. All solar and wind power production requires energy-efficient inductors. Inductors are also vital components in the uninterruptible power supplies used by many major data centres and sports facilities to ensure that their voltage levels remain consistent.

STEN CAMITZ breaks it down using figures: an uninterruptible power supply (UPS) for a data centre has an operating efficiency of 94 to 96 per cent. One-third of the losses can be traced to the system's inductors – and MagComp's inductor can cut this figure by 50 per cent. "An average-sized data centre can save SEK 40,000 per year by using our inductors. The pay-off time can be as short as six months."

However, an inductor is part of a larger system, which means that MagComp will need to attract large, global companies if it is to raise the level of efficiency accepted in the industry. And this isn't always easy for a small company from Eslöv.

The goal is not to replace inductors in existing systems, but rather to enter the next generation of the product cycle.

"We sent a prototype to a US company and they held onto it for quite a while before testing it, but they became very enthusiastic once they realised that the figures were even better than we'd promised. We are now on our way to becoming a supplier for the company's next generation of systems."

MAGCOMP ALSO MANUFACTURES induction heating for industrial companies using essentially the same technology as induction hobs found in home kitchens, but with an output of between 10 kW and 10 MW. All of the company's products have their roots in a research project started at Lund University in the late 1980s, which ultimately identified a number of processes that could be streamlined by using electromagnetic components.

MagComp, whose name is an abbreviation of "Magnetic Components," was started in 2005, with the support of a mechanical industrial company in the area. In 2008, Volvo became one of its major owners and several other financiers have since followed suit. MagComp also received a loan from the Swedish Energy Agency in 2011. Thanks to a new share issue in summer 2013, MagComp has filled its coffers once again.

"We anticipate that we will be in the black by 2016. At that point, we expect to have a turnover of SEK 100 million," says Sten Camitz.

MagComp

Business concept: *Develop and produce energy-efficient electromagnetic products and systems.*
Started in: *2005.*
Number of employees: *16.*

STEN CAMITZ
CEO of MagComp

RAGA JOSE FUSTE/SCANPIX

ECOREGIONS

Left: Heavy traffic in the Indonesian capital of Jakarta. Above: One of the beaches in the future ecoregion of Tanjung Ringgit.

Green businesses

In the shadow of China and India, Indonesia has emerged as the next Asian growth phenomenon. It ticks nearly all the boxes: a high growth rate, an inclination toward reform and environmental challenges. Now, Swedish companies are helping the country build sustainable solutions for the future.

TEXT: **KERSTIN DANASTEN**

WHEN SWEDISH-BASED entrepreneur John Higson first arrived at the Gili Islands off the coast of Lombok, Indonesia, he had no plans of working. He was there on holiday with his then-girlfriend and her young daughter. The trio was captivated by the country's glorious beaches and sheltered coral reef, and ended their stay by writing their names on a rock near the beach before travelling home.

Several years later in Stockholm, John Higson was contacted by a friend who wanted help developing a piece of land he had purchased in Indonesia. "I wasn't at all interested in the beginning, but changed my mind when I realised it was essentially the same spot where we'd written our names on that rock. It was almost like I'd been given a sign," explains John Higson.

This was his first step on a much larger journey. Today, John Higson is in the process of developing a 3,200-hectare ecotourism area known as Tanjung Ringgit, located on the island of Lombok. The Indonesian authorities are investing heavily in the development of Lombok as a holiday destination, including the construction of a new international airport. But the plans for Tanjung Ringgit go beyond tourism: it is to serve as a shop window for new environmental technology.

"Ecotourism has the potential to be a strong driver of sustainable regional development in Indonesia. I specialise in developing sustainable platforms that enable several different players to work together. This is becoming a large ecoregion where we, together with the authorities, are establishing a framework for social, economic, cultural and business cooperation in the area of sustainable development. Among other initiatives, there is talk of tax reliefs for green companies. This framework can then be used to develop many other areas in the country," explains John Higson, whose previous experience includes starting the Drömgården concept in Stockholm.

TANJUNG RINGGIT is just one example of how sustainability projects have begun gaining a foothold in Indonesia. The country's need for sustainable solutions and innovations in the field of environmental technology is acute. Like China and India, Indonesia has grown at a record pace in recent years, reporting a growth rate of between 5 and 6 per cent. As in the case of China and India, however, this development has resulted in rapid urbanisation and a fast-growing middle class, thus placing a greater strain on the environment in the form of pollution and rainforest devastation.

At the same time, these environmental challenges are also creating business opportunities, particularly in light of the more stringent environmental targets introduced in Indonesia in recent years, including a 26-per cent reduction in carbon emissions by 2020.

In May 2013, Indonesian President, Susilo Bambang Yudhoyono, visited Stockholm to sign a new bilateral cooperation agreement focusing primarily on sustainable urban development. Today, megacities such as Jakarta are experiencing major problems pertaining to everything from waste to transportation, areas in which many Swedish companies have already made considerable headway.

"Those of us on the Swedish side have mainly been working on Indonesia's urban transportation system. How can smart, sustainable systems for buses and railways be developed? Scania, Volvo and Bombardier are among the companies investigating the possibility of commercialising their transportation concepts," says Mats Denninger, the Swedish government's special coordinator in the area of environmental technology.

TANJUNG RINGGIT

An ecoregion with future potential

John Higson, investing in ecotourism.

ON LOMBOK, Bali's largest island neighbour, a major initiative is under way to create a new tourist paradise. John Higson – who, among other initiatives, is responsible for starting a highly publicised farmer's association known as Bondens Egen Marknad in Stockholm – is the man behind the plans to transform Tanjung Ringgit into an ecoregion using a new model based on cooperation between the community, the business sector and the local population, which enables faster yet sustainable social development driven by tourism.

Some 75 Swedish companies currently have a presence in Indonesia. Many of these companies, including industrial giants such as ABB, Sandvik, Autoliv and Tetra Pak, do not have a specific environmental technology profile.

"They might not be companies that are normally considered 'cleantech companies' since they don't specifically sell environmental technology. But I think it's important to draw attention to them when they do things that fit in with the cleantech label," says Mats Denninger.

HOWEVER, OTHER small-scale Swedish projects have also begun making inroads into the large Southeast Asian market. One example is the compact, three-wheeled electric vehicle Zbee, designed for short-distance transportation of lightweight goods. The environmental potential of this product is enormous. Jakarta and other major Asian cities are filled with rickshaws, or bajajs as they are known in Indonesia, powered by two-stroke engines running on oil-mixed petrol. According to Göran Folkesson, CEO of Clean Motion, the company that manufactures the Zbee, getting rid of these petrol-driven bajajs would generate a clear environmental gain in the form of better air quality in major cities. He emphasises the importance of seeing cleantech as a broad concept that crosses over into various industries.

"Since our goal is to be the world's greenest vehicle manufacturer, 'clean' is the watchword in everything we do. But as a vehicle manufacturer, we have very little in common with, for example, water treatment plants or other environmental technology solutions. In reality, the collective 'cleantech' label simply indicates that we are contributing to a more sustainable world in different ways," says Göran Folkesson.

IN RECENT MONTHS, the world's investors have maintained a low profile with regard to investments in emerging countries such as Indonesia. However, Göran Folkesson is not concerned about the future of his own company.

"We can still grow. The idea of saving energy – and subsequently money – will attract people regardless of whether we are in a period of recession or aggressive growth," says Göran Folkesson.

Mats Denninger points out that, in light of global economic fluctuations, the presence of large companies plays an important role in protecting the long-term nature of Swedish interests.

"In difficult markets such as Indonesia, you need to be resilient from both a financial and business perspective. Large companies may be better equipped for this than small, newly established companies," explains Mats Denninger.

He believes that this resilience will create even more opportunities. Following the emergence of sustainable urban development, new openings are constantly being created for innovations in such areas as drainage and air quality.

A KEY COMPONENT of the Swedish-Indonesian collaboration involves finding additional methods to help new environmental technology innovations gain a foothold. Ann-Sofi Gaverstedt of the Swedish Energy Agency is currently in the process of launching Insist, an innovation platform in Indonesia, in cooperation with the SP Technical Research Institute of Sweden and various Indonesian players.

In December, the project opened its new premises in Yogyakarta, which will serve as an innovation centre. The primary aim is to identify new ways to increase the portion of renewable energy used in Indonesian society in the form of both innovative developments and policies.

"We already have projects under way for small-scale solar, wind and hydro power production and are in the process of adding bioenergy to this list. But in Indonesia, there is still a large focus on fossil fuel – one-third of the GDP goes to subsidising oil. This means that controls and hands-on help will be required to turn the trend around," says Ann-Sofi Gaverstedt, listing a typical example.

"We visited a biogas facility at the fruit market in Yogyakarta, which converts rotten fruit into electricity that can be used by the fruit traders' collective. We were able to determine that while the facility itself produces green electricity, it is still being run using a diesel engine." ■

INDONESIA IS...

... LARGE

Indonesia is the third-largest democracy in the world and the largest country in the ASEAN Free Trade Area. Geographically speaking, the country is spread across 17,500 islands, with most people living on Sumatra, Java and Kalimantan.

... DENSELY POPULATED

The country has 245 million inhabitants, half of whom are under the age of 29. It is the third most densely populated country in the world and has the world's largest Muslim population – 86 per cent of its residents are Muslim.

... RICH IN RESOURCES

The country's key export goods are oil, gas and palm oil. It is home to the world's third-largest area of rain forest.

ZBEE

A climate-smart bajaj

THE ZBEE VEHICLE is reminiscent of a rickshaw, or bajaj as it is known in Indonesia, but is significantly more climate friendly since it runs on electricity instead of oil-mixed petrol. Zbee has been on the market in Indonesia since early 2013. The company's first order for ten vehicles, received from the Deputy Governor of Jakarta, will serve as a small-scale test fleet. The concept includes local assembly of the vehicles.

ROD PORTEOUS/SCANPIX

Red bajajs – a common sight on Indonesia's crowded streets.

PALU

Green electricity with a social dimension

AT A DUMP outside the town of Palu on the island of Sulawesi, a biogas facility purchased from the Swedish company Biogas Systems Nordic will soon produce renewable electricity from old garbage. But this pilot project also has an important social dimension. The dump is currently home to some 80 people who, until recently, have survived by selling reusable waste. The City of Palu is now building homes for these people outside the dump, hiring them to work in recycling facilities and making school arrangements for their children. The project, known as Waste to Value, is a cooperative initiative between the City of Palu and the Borås-based Waste Recovery Partnership, whose members include the City of Borås and the SP Technical Research Institute of Sweden.

JOSE FUSTE RAGA/SCANPIX

JANE SWEENEY/SCANPIX

Street view in Yogyakarta.

Knycer CEO, Monica Hallworth (left), discusses the business opportunities of her company's new drying cupboard during a networking break.

After a couple business pitches, the business angels and other participants in Connect Green Week take a moment to stretch their legs.

FINE-TUNING NEW BUSINESSES

Entrepreneurs with smart ideas and limited capital. Business angels with well-filled coffers. At Connect Green Week, future business constellations are born.

TEXT: **JOHAN WICKSTRÖM** PHOTO: **TINA AXELSSON**

WE HAVE LAID the groundwork for expansion, but at this point we are looking for SEK 5 million in capital. We want more people to join us on our journey," says Monica Hallworth, CEO of Knycer, gathering her papers before scattered applause at Näringslivets hus in Stockholm.

Monica Hallworth has just presented her company's latest technology: a drying cupboard run as a humidifier instead of using heat, thus saving energy and sparing clothes from wear and tear. All care institutions and pre-schools are potential customers and Knycer already sells more than 200 cupboards per year, but the goal is to sell 6,000 cupboards annually by 2017 ("Our goal is to have SEK 50 million in sales at that point").

Before her sits an audience of approximately 100 people, including business angels and investors taking notes with interest. We are at Connect Green Week – a meeting place for new environmental technology companies and investors – which later the same week in early September would embark upon a cross-country road show.

"The global demand for investments in environmental technology is enormous. Our goal is to create the optimal conditions for these companies to succeed in their investments," says Lillemor Svensson, CEO of Connect Öst and creator of Connect Green.

Over the course of the day, five other environmental technology companies will take the stage and present their technology in five minutes or less, focusing on the very best arguments in favour of their companies. The companies received help from Connect to fine-tune their business pitches.

After an hour, the participants take a break to mingle, at which point the business angels have an opportunity to speak directly with the companies, some of which have also set up displays.

ONE OF THE business angels in attendance is Mårten Dahl, an investor in one of the companies on display, Entrans, whose operations include the manufacturing of energy efficiency systems for district heating systems.

"I think this is an excellent way to learn more about the industry. I invested in cleantech to make money, but it also feels good to be able to contribute to the future," says Mårten Dahl.

What considerations are most important when investing in new companies?

"A basic rule is that the technology must be tested. I have to see that it works," he says.

Following the break, there is a panel debate featuring individuals from the Swedish Government Offices, the environmental movement and the risk capital industry.

"Swedish companies are good at environmental technology but not-so-good at commercialisation – despite the numerous opportunities available. We work closely with the Swedish Energy Agency to support these companies," explains Daniel Johansson, State Secretary at the Ministry of Enterprise, Energy and Communications.

> *The business angels in our network have SEK 430 million to invest.*
>
> LILLEMOR SVENSSON, CEO OF CONNECT ÖST

Lillemor Svensson, CEO of Connect Öst and creator or Connect Green.

Stefan Jakélius of Industrifonden also highlights the role of the Swedish Energy Agency.

"Their loans can often be critical in enabling companies to get a foot in the door," he explains.

The lack of capital is difficult in the beginning and business angels have thus become increasingly important to these companies during the early stages of financing.

"Our goal is to create a national network of business angels with a focus on environmental technology. Our most recent survey showed that the business angels in our network have SEK 430 million to invest and many of them are interested in environmental technology," says Lillemor Svensson.

AMONG THE COMPANIES participating in the event is Solvatten (which later had the opportunity to demonstrate its technology for Barack Obama during his visit to Stockholm).

"We are keen to meet with investors now as we prepare to scale up our operations and this is a great meeting place," says Oliver Wadström of Solvatten, while manning the company's display.

Business angel Lars-Erik Nordell stands nearby.

"This is wonderful initiative with interesting speakers and topics. I've spoken with a few companies to get a better understanding of their technology and business value. I want to know what makes them unique and who their target customers are."

What do you expect of the cleantech market in the future?

"Cleantech will be a matter of course for all companies. And small companies will need to find the right niche in which to establish themselves." ■

CONNECT GREEN

CONNECT GREEN is a two-year initiative to create better conditions for Swedish environmental technology companies to succeed in commercialisation. The goal is to establish a national network of business angels with a focus on environmental technology.

Connect Green is run by Connect, a national player that brings together growth companies with expertise and capital. Connect is organised into six regional networks.

The Swedish Energy Agency is the main financial backer of Connect Green, as well as a participant.

For more information, visit www.connectsverige.se

CLIMATE SCHOOL We see them on a daily basis in newspapers and reports. But what do they mean? Join us as we examine seven commonly used abbreviations.

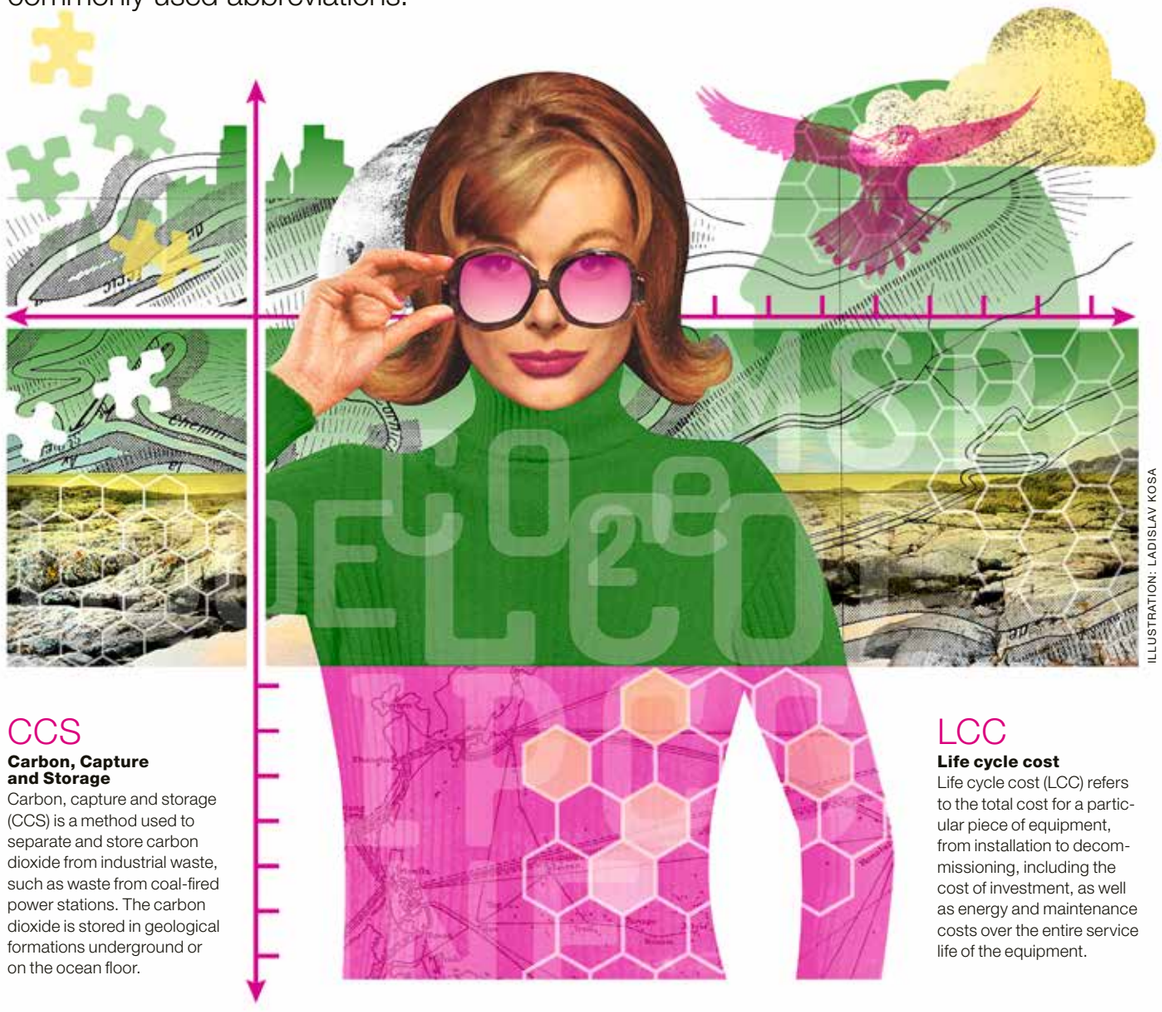


ILLUSTRATION: LADISLAV KOSA

CCS
Carbon, Capture and Storage
Carbon, capture and storage (CCS) is a method used to separate and store carbon dioxide from industrial waste, such as waste from coal-fired power stations. The carbon dioxide is stored in geological formations underground or on the ocean floor.

LCC
Life cycle cost
Life cycle cost (LCC) refers to the total cost for a particular piece of equipment, from installation to decommissioning, including the cost of investment, as well as energy and maintenance costs over the entire service life of the equipment.

NZEB
Nearly zero-energy building
As of 2021, all new buildings in the EU must be nearly zero-energy buildings (NZEB). Since conditions vary considerably from country to country, no fixed standards have been established for the energy value of these buildings. Instead, each country will set its own standards.

MSP
Marine Spatial Planning
Marine spatial planning (MSP) is a tool used to plan the sustainable use of ocean and water areas. Before building an off-shore facility, for example, all relevant factors need to be mapped out and prioritised in relationship to one another.

CO_2e
Carbon dioxide equivalent
Carbon dioxide equivalent (CO2e) is a measure that compares the impact of various greenhouse gases on the climate. For example, the climate impact of the greenhouse gas methane is 25 times greater than that of carbon dioxide, which means that one tonne of methane emissions corresponds to 25 tonnes of carbon dioxide equivalent.

IPCC
Intergovernmental Panel of Climat Change
The Intergovernmental Panel on Climate Change (IPCC) is a UN climate panel with 195 member states. The aim of the panel is to provide scientific reports and assessments regarding climate change and its potential impacts. The panel's most recent report was published in September 2013.

LCOE
Levelised cost of energy
Levelised cost of energy (LCOE) refers the energy price required for an investment in a production facility to break even over the lifetime of the facility. This method is useful, for example, when comparing the profitability of various energy-generating technologies.

Many solar energy companies gained access to capital in 2012.

MANY NEW COMPANIES ON THE CLEANTECH MARKET

A growing number of investments and more public capital. This is an description of the Swedish cleantech market in 2012. At the same time, the market has opened up to a new wave of less capital-intensive environmental technology companies.

TEXT: **SUSANNE ROSÉN** PHOTO: **FREDRIK SANDBERG/SCANPIX**

IN 2012, 96 INVESTMENTS were made in cleantech companies in Sweden. This is the highest number recorded since Cleantech Scandinavia began reporting statistics and analyses on the Nordic environmental technology sector six years ago – and most of these investments were made through public capital. The Swedish Energy Agency has been the most prolific investor in the Nordic region, investing nearly SEK 202 million in 17 companies.

According to Magnus Agerström, Managing Director of Cleantech Scandinavia, this increase in public capital investments in cleantech is a positive sign.

"It's clear to us that many new cleantech companies are emerging from various business incubators and universities. It's gratifying to see government agencies across Scandinavia finding ways to support these companies during the start-up phase," he says.

Sweden is currently home to a number of small companies with considerable potential in the area of solar energy. Sol Voltaics is one example. The company, which develops a nanomaterial that has the potential to improve the efficiency of solar cells by more than 25 per cent, received a soft loan of SEK 41 million from the Swedish Energy Agency in June 2013.

"If they succeed in commercialising this technology, the efficiency and profitability of the solar cell industry could improve dramatically," says Magnus Agerström.

THE INDUSTRIAL SECTOR is also becoming increasingly involved in the development of new companies. Many of the largest private investments in the Nordic cleantech sector are now being made by industrial companies or company-owned risk-capital funds. According to Cleantech Scandinavia, industrial players were the primary investors ▶

We may experience a slight improvement again and we saw more exciting investments made in the first half of 2013.

MAGNUS AGERSTRÖM, MANAGING DIRECTOR OF CLEANTECH SCANDINAVIA

in five of the ten largest investments made in 2012.

A total of EUR 201.1 million of private and public capital was invested in environmental technology companies in 2012 – slightly more than in 2011, but far from the peak of EUR 505.7 million in 2010. However, the trend in Sweden remained negative. Despite a record-breaking number of deals, the amount invested fell from EUR 73.3 million to EUR 46.2 million due to a decline in private investments.

One explanation for the decline in the number and size of private investments in Sweden is that funds do not want to risk becoming involved at such an early stage.

"This creates a vacuum. In the best case scenario, there is enough money in the public sector to bring these companies to the edge of the market and, in many cases, not even that far. This leaves a lot of companies struggling," says Magnus Agerström.

HE ALSO DOWNPLAYS the impact of the financial crisis on the investment climate.

"I think it's more likely some form of realisation and insight into what it takes to bring new environmental technology into the industrial sector. People have underestimated the time it takes. In many cases, it's a matter of changing the attitudes of our entire society," says Magnus Agerström, who nevertheless remains positive about the general investment climate in the Swedish cleantech industry.

"We may experience a slight improvement again and we saw more exciting investments made in the first half of 2013. Perhaps most notable in Sweden was the investment in Flexenclosure (turnkey system solutions for the telecom industry based on renewable energy), which this past spring received SEK 160 million from the International Finance Corporation, Industrifonden and the Second Swedish National Pension Fund."

Cleantech Scandinavia, which organises the annual Nordic Cleantech Open – a competition for Nordic start-up companies – has noticed a new wave of environmental technology companies that are more focused on specific industrial needs, less capital-intensive, more innovative and less dependent on legislation.

The same trend is also evident on a global level, says Richard Youngman of the UK consulting company Cleantech Group.

"Ten years ago, we needed to create new technologies and manufacturers, and a lot of activity focused on solar energy and biofuel. These areas are now more mature and entrepreneurs seeing are greater opportunities in energy efficiency and installation."

ONE RESULT OF this shift has been the emergence of companies focused on the "clean web" field: the use of information technology to enable the sharing, streamlining and collaborative use of resources. The portfolio of companies on the cleantech market is more diversified than it was three or four years ago, which Richard Youngman considers a healthy trend.

He also emphasises that geography plays a significant role in determining the areas in which investments should be made. In China, there is a need for technology that can reduce air pollution, while the prospects in the US market are more focused on energy efficiency, an area where Europe has made greater strides.

"Energy efficiency is an area that will generate business opportunities for many years to come, in many segments and industries," says Richard Youngman.

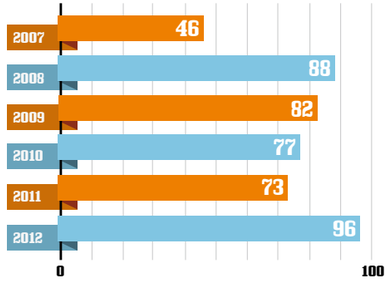
His advice to Swedish environmental technology companies is to consider what part of the world has the best prospects for their business concept and not confine themselves to operating "in or outside Europe."

Many new Swedish companies are too cautious in their ambitions, which Magnus Agerström feels is problematic.

"We are seeing growing interest circulating from international investors and industrial companies. The companies that are bold enough to sell themselves rather than diminish themselves have a better chance of succeeding." ■

NORDIC CLEANTECH MARKET 2012

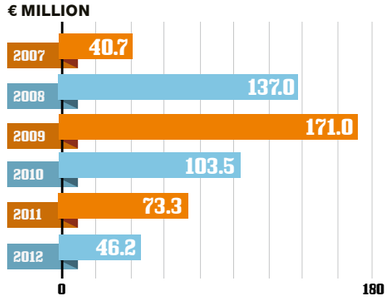
NUMBER OF INVESTMENTS IN SWEDISH COMPANIES



3.6 MILLION €

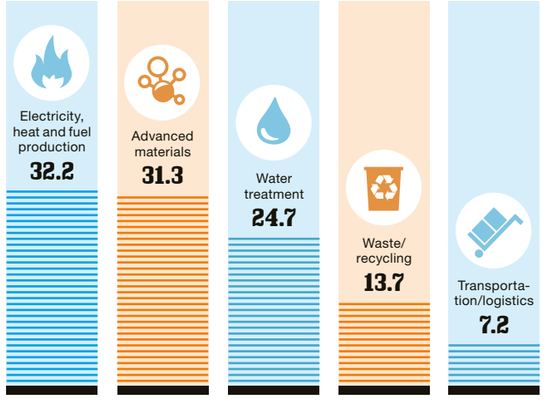
The largest private investment in a Swedish company in 2012, Chromogenics, which develops plastic foils used in windows to reduce the need for cooling.

TOTAL INVESTMENTS IN SWEDISH COMPANIES



PRIVATE INVESTMENTS IN NORDIC COMPANIES BY AREA

€ MILLION



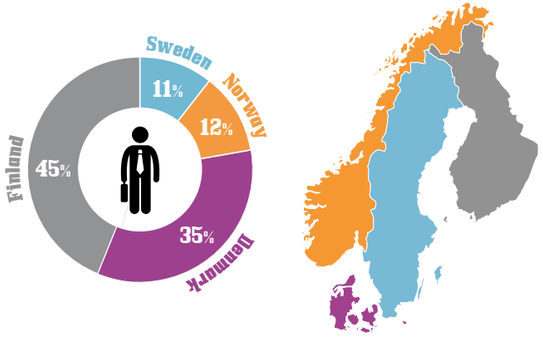
TOTAL INVESTMENTS IN NORDIC COMPANIES

202.1 MILLION €

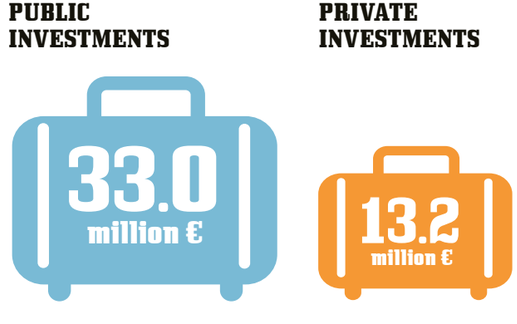
NON-NORDIC INVESTMENTS IN NORDIC COMPANIES

83.7 MILLION €

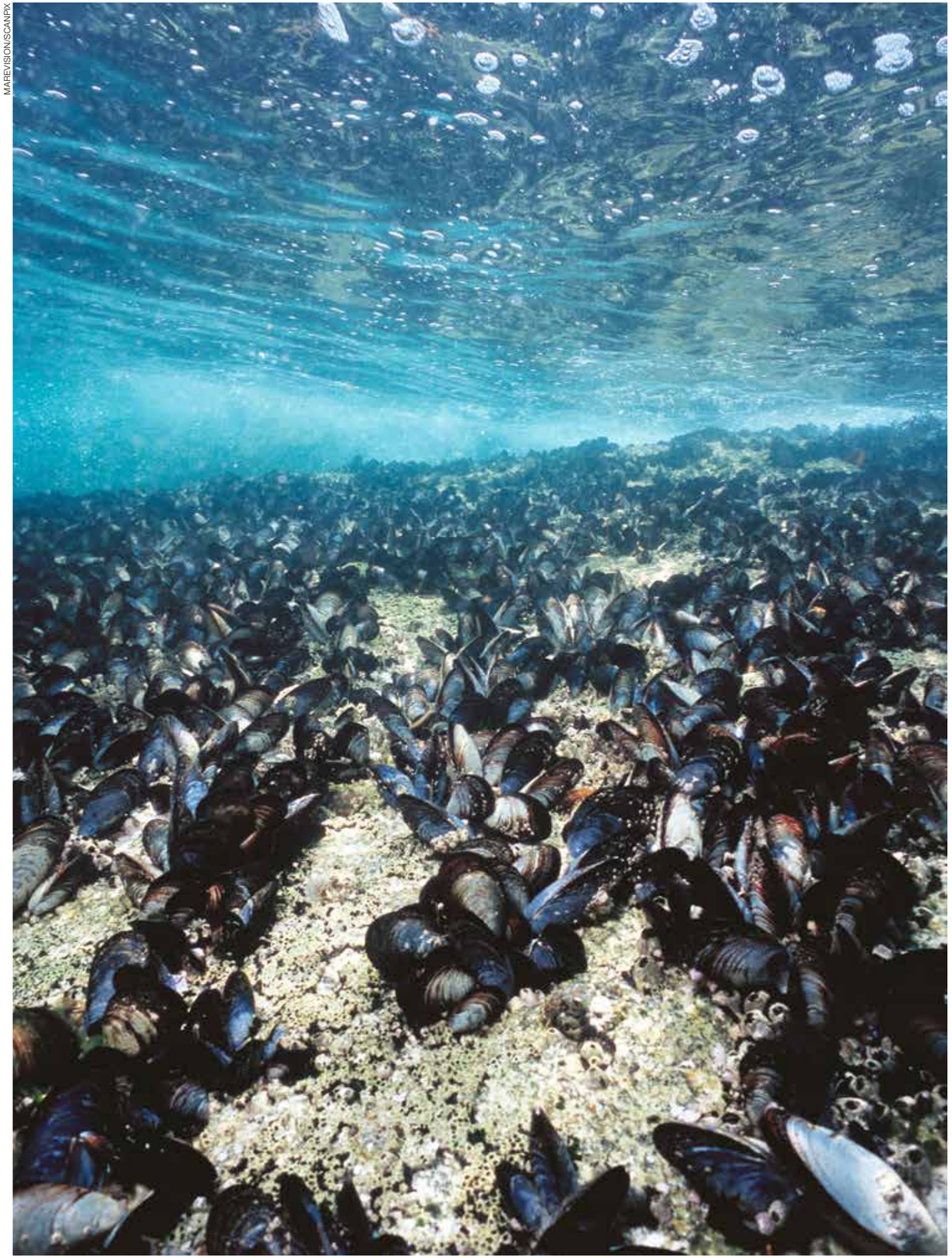
TOTAL PRIVATE CAPITAL BY COUNTRY



PUBLIC CAPITAL DOMINATES IN SWEDEN



SOURCE: CLEANTECH SCANDINAVIA (ALL FIGURES PERTAIN TO 2012)



MAREVISION/SCANPIX

Sea mussels: a common sight on the ocean floor.

A SEA OF BUSINESS OPPORTUNITIES

Overfishing, eutrophication and dumping. As the threats to the world's oceans increase, significant business opportunities are being created. Will "blue business" be the next major cleantech area?

TEXT: **KERSTIN DANASTEN**

RUBBISH THAT BLOWS out to sea and forms floating dumps. Fish and shellfish that wind up on the dinner table despite coming from endangered areas. Boaters who let their waste run directly into the lake – leftover medication and all.

These are some of the common environmental offenses affecting our oceans and water – sadly, the list goes on. More people around the world have entered the middle class, and this is placing greater pressure on the world's oceans and fresh water reserves. Eutrophication, pollution and overfishing have already created a situation in which dead sea beds and disrupted marine ecosystems are common realities. The need for new technological solutions to save our oceans and guarantee access to fresh water is acute.

Senior Analyst Catarina Hedar of the Swedish Agency for Marine and Water Management.

These developments have more people talking about "blue growth" and "blue business," just as green business is already a well-established concept onshore. In many ways, companies with a business concept based on environmental technology that contributes to sustainable marine development and creates employment opportunities hold an important key to future business opportunities.

THE DEVELOPMENT OF blue business is in line with Sweden's innovation strategy, as well as the EU's goals for blue growth. And according to Catarina Hedar, Senior Analyst in Marine Planning and Maritime Affairs at the Swedish Agency for Marine and Water Management, these innovations are sorely needed.

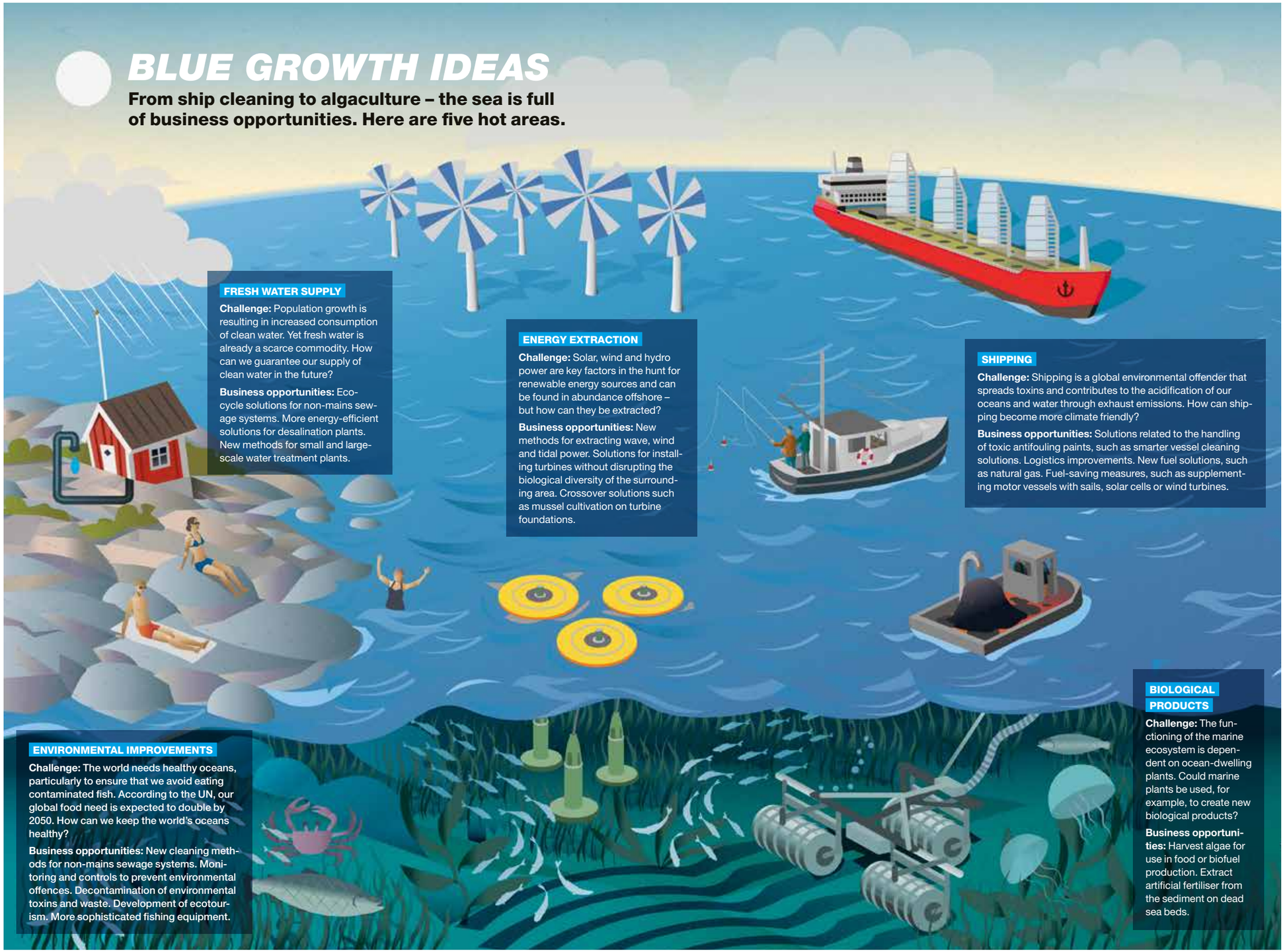
"We are facing some massive challenges. We need more innovations if we are to create new businesses in a sustainable manner. More players need to understand just how closely business and the environment are related. We can't simply measure an operation's value in terms of money; we also need to consider the value of having healthy oceans and clean water – we need to have the courage to stand up for our ecosytem."

Eutrophication, sustainable shipping,

ILLUSTRATION: NILS-PETTER EKWALL

BLUE GROWTH IDEAS

From ship cleaning to algaculture – the sea is full of business opportunities. Here are five hot areas.



FRESH WATER SUPPLY

Challenge: Population growth is resulting in increased consumption of clean water. Yet fresh water is already a scarce commodity. How can we guarantee our supply of clean water in the future?

Business opportunities: Eco-cycle solutions for non-mains sewage systems. More energy-efficient solutions for desalination plants. New methods for small and large-scale water treatment plants.

ENERGY EXTRACTION

Challenge: Solar, wind and hydro power are key factors in the hunt for renewable energy sources and can be found in abundance offshore – but how can they be extracted?

Business opportunities: New methods for extracting wave, wind and tidal power. Solutions for installing turbines without disrupting the biological diversity of the surrounding area. Crossover solutions such as mussel cultivation on turbine foundations.

SHIPPING

Challenge: Shipping is a global environmental offender that spreads toxins and contributes to the acidification of our oceans and water through exhaust emissions. How can shipping become more climate friendly?

Business opportunities: Solutions related to the handling of toxic antifouling paints, such as smarter vessel cleaning solutions. Logistics improvements. New fuel solutions, such as natural gas. Fuel-saving measures, such as supplementing motor vessels with sails, solar cells or wind turbines.

ENVIRONMENTAL IMPROVEMENTS

Challenge: The world needs healthy oceans, particularly to ensure that we avoid eating contaminated fish. According to the UN, our global food need is expected to double by 2050. How can we keep the world's oceans healthy?

Business opportunities: New cleaning methods for non-mains sewage systems. Monitoring and controls to prevent environmental offences. Decontamination of environmental toxins and waste. Development of ecotourism. More sophisticated fishing equipment.

BIOLOGICAL PRODUCTS

Challenge: The functioning of the marine ecosystem is dependent on ocean-dwelling plants. Could marine plants be used, for example, to create new biological products?

Business opportunities: Harvest algae for use in food or biofuel production. Extract artificial fertiliser from the sediment on dead sea beds.

> *Marine planning is really catching on at the moment. Onshore, everyone knows what forests and fields are, but things aren't as clear offshore.*
>
> CATARINA HEDAR, SWEDISH AGENCY FOR MARINE AND WATER MANAGEMENT

hazardous waste and biological diversity are the four areas Catarina Hedar considers most important and most open to innovation right now. She believes that coastal tourism is a key development area and sees new solutions for sustainable fishing as another top priority. It is critical, for example, that the problem of overfishing be rectified, since this has such a serious impact on the balance of the ecosystem. Catarina Hedar explains that it is basically a matter of adapting business operations to the ocean's actual ability to cope.

"Marine planning is really catching on at the moment. Onshore, everyone knows what forests and fields are, but things aren't as clear offshore. The companies that got there first essentially decided to do whatever they wanted instead of making sure their plans were compatible with the marine environment as a whole."

"Now we've started including information in our permits specifying how offshore operations are to be set up to take the entire biological chain into consideration. After all, everything is connected. And there are lots of very interesting combination solutions out there. For example, wind turbine foundations can be used for mussel cultivation," explains Catarina Hedar.

SHIPPING IS ANOTHER key area for development. The world's shipping fleet is still largely run on fossil fuel and is a major contributor to the acidification of the world's oceans. However, Catarina Hedar also believes there are positive aspects to the shipping industry.

"This industry is undergoing a major transformation at the moment, with large investments and a growing desire to make a difference. One modern example is Viking Lines' new ship Viking Grace. It runs exclusively on liquefied

In the shipping industry, public environmental regulations can create multi-billion markets essentially overnight.

SVERRE PRYTZ, GREEN MARINE CAPITAL

natural gas and is almost like a floating city. Everything is taken care of: waste water isn't released into the ocean, but rather taken ashore again. The list goes on."

In Singapore, we meet venture capitalists Mikael Krogh and Sverre Prytz from the Norwegian-based company Green Marine Capital, which specialises in investments in environmental technology for the marine industry. The basic idea behind the company is that sustainable development and profitable business can and should go hand in hand. At the moment, they see considerable market potential for new innovations and business concepts that build on the development of existing systems. Among other contributing factors, society's growing demands and stricter regulations are continuously creating new openings.

"In the shipping industry, public environmental regulations can create multi-billion markets essentially overnight. Take, for example, the new regulations regarding ballast water treatment, which, if they go through, could result in a large portion of the world's fleet suddenly needing to install ballast water treatment systems to meet the new requirements," explains Sverre Prytz.

PROFITABILITY TARGETS are another strong driving force in the industry. Fuel costs have shot up in recent years and can now account for 60 to 70 per cent of a ship's operating costs. This is creating greater interest in energy efficiency technology.

At the same time, it can be difficult for new innovations to break through. Mikael Krogh explains that the shipping industry is quite conservative.

"There is a resistance to using new technology before it has been tested. Considering how much a ship costs, this is actually understandable – you don't want to put an entire ship at risk by using untested technology. But we also see opportunities here: if we can work together with more innovators in the industry and jointly test and assess new technologies, this in turn could give our business partners a competitive edge by allowing them to be the first companies to use new technology."

MORE SALT WATER THAN FRESH WATER

97%

of the world's water reserves are made up of saltwater oceans. This water is not drinkable and cannot be used for irrigation purposes without first being desalinated.

2%

of the world's water reserves are made up of fresh water that is difficult for people to access. This includes deep groundwater, polar snow and ice, and atmospheric water molecules in the form of clouds and precipitation.

1%

of the world's water reserves is made up of fresh water accessible to people in the form of shallow groundwater, freshwater lakes, inland watercourses and accumulated precipitation.

FREDERIC SOLTAN/SCANPIX

New regulations regarding ballast water treatment could impact the world's ship fleet.

WHEN GREEN MARINE Capital looks for investment opportunities, it doesn't only consider companies with a distinct marine profile. Often, environmental technology that is not specifically developed for marine applications can also be used in the shipping industry.

Green Marine Capital is not the only company with this mindset. Large companies are also discovering the potential of products that were perhaps not originally intended to have a cleantech profile. One such example is C-leanship, a spin-off of Saab's underwater vehicle operations. C-leanship is a small, unmanned submarine used to clean the hulls of large transport vessels while in harbour instead of having divers clean the hulls while the vessels are at anchor in the roadstead. The trick is that, while cleaning the vessels, the vehicles also collect flakes of antifouling paint that fall into the water as the vessels are scrubbed, flakes would otherwise sink to the ocean floor and impact the surrounding environment. C-leanship also provides a cost-effective way for shipping companies to clean their vessels while they are already in harbour to be loaded and unloaded.

ANOTHER AREA with significant development potential is environmental control technology. This technology – which is used, for example, to track vessels that knowingly dump prohibited substances into the ocean – need not be limited to traditional air and satellite monitoring. One example of an innovative project is Ocean Search, a Swedish network that links sensor technology, social media and storytelling. The idea is to create a

CASE: SOLVATTEN

From dirty to drinkable in a few short hours

INNOVATION: Solvatten. A portable container that harnesses solar energy to make 11 litres of dirty water drinkable in a few short hours.

POTENTIAL: Could help people, particularly in poor, dry areas, avoid waterborne diseases by allowing them to purify their own water.

After a few short hours in the sun, the water in the container is clean – thanks to solar energy.

IF DIRTY WATER could easily be transformed into clean water, the everyday lives of people in hot, poor areas would suddenly be completely different. If, in addition, they could purify their own water using the energy of the sun, they would also have an endless energy resource. This was Petra Wadström's thought process when developing an innovation known as Solvatten, a smart little container that purifies dirty water using only solar energy. Petra Wadström, who has an educational background in biotechnology, came up with the idea after living in Australia in the 1990s.

"While I was there, I started thinking about how we could use the overabundance of sunlight. When I later travelled to Indonesia, I saw how many areas were suffering from a shortage of clean water and the impact this had on their everyday lives, especially the women. That's when I came up with the idea for the first prototype," she explains.

THE TECHNOLOGY IS based on the knowledge that UV rays can kill micro-organisms. After filling the container and placing it in the sun for a few hours, the water undergoes three effective purification methods: filtration, heat pasteurisation and, finally, disinfection using UV rays. Users are also able to save fuel since no wood is used to boil the water. The container accommodates 11 litres of water and, in sunny conditions, can be used up to four times a day. According to UN calculations, a single person needs between 25 and 40 litres of clean water per day to have sufficient water to drink, cook food and clean themselves.

"Clean water is about more than just drinking water. We know what a difference it makes, for example, to children's health to be able to wash their faces with warm, clean water and avoid skin diseases and infections," Petra Wadström points out.

Solvatten has attracted considerable attention and currently works together with a number of organisations and companies, including the Church of Sweden, Axfood and OK Q8, which donate Solvatten units to various areas primarily in Uganda and Kenya. But financing is an ongoing issue.

"We need resources to reach even more people. A larger goal would perhaps be to find an extremely patient venture capitalist who believes that better public health ultimately benefits us all," says Petra Wadström.

social network of sailors who – by equipping their boats with sensors and working together – can monitor the oceans and share stories that strengthen people's desire to make a positive change.

Of course, the subject of clean oceans cannot be raised without also discussing water scarcity. Although 70 per cent of the earth's surface is covered by water, it is not an infinite resource. According to a study conducted by the McKinsey consulting company, the global demand for water is expected to increase 60 per cent by 2030. Not only will we see a growing middle class adopting a new way of life and consuming more fresh water – the industries that employ and serve this growing middle class will also need water to function.

However, fresh water is already a scarce commodity in many parts of the world. Only 1 per cent of the world's water supply is directly accessible as fresh water in the form of lakes, inland watercourses and shallow groundwater – and this 1 per cent is well on its way to becoming contaminated.

THIS IS WHY Catarina Hedar of the Swedish Agency for Marine and Water Management believes that there are excellent opportunities for environmental technology innovations in the area of water purification – for both fresh and salt water. Today, sea water can be desalinated for use in crop irrigation, but the process is energy-intensive and costly. And setting up test facilities is rarely cheap.

"This is not only true in the case of water purification. This is a major challenge we face in general when it comes to innovations – seed money is difficult to find," says Catarina Hedar.

In ten years, Catarina Hedar hopes that blue business will have gained a solid foothold.

"Realistically speaking, I think we are a long way off. But I certainly hope that acidification will have become a non-issue, that marine planning will be an established practice and that our biological diversity will no longer be threatened. I also hope that all of the companies with ideas that contact me today are on the right track and that our work generates tangible results in the form of new job opportunities. After all, the labour market and growth are closely linked to environmental issues." ■

CASE: TECHMARKET

From dead sea beds to green fields

INNOVATION: Low-flow dredging. A small underwater device reminiscent of a vacuum cleaner that carefully transforms sea bed sediment into artificial fertiliser.

POTENTIAL: Could be a new Swedish weapon in the fight against the eutrophication of our oceans.

JOHNÉR

Sediment from sea beds makes an ideal artificial fertiliser.

THE IDEA IS actually as simple as it is brilliant: the substances causing eutrophication in our oceans and lakes and killing bottom sediment make an ideal artificial fertiliser on dry land. Based on this eco-cycle approach, a new Swedish project has started to take shape.

TechMarket, a spin-off from the Royal Swedish Institute of Technology, has developed a gentle, computer-controlled dredging device that can be used to restore eutrophicated water – while at the same time producing artificial fertiliser.

"We simply take sediment from the sea floor and bring it back onshore to farmlands. You could say that we remove sediment from areas that are being damaged and put it somewhere useful instead. We only remove organic matter, not the stones, sand or blue clay that would otherwise follow," explains Bengt Simonsson, Head of Research at TechMarket.

THIS LITTLE DEVICE, which has not yet been given a name, is carefully guided across the sea floor using wires and sucks up the top layer of sediment through a hose attached to containers on land. The result is that the sea floor is oxygenated and given a chance to recover, while the collected sludge can then be tested and spread on crops as fertiliser.

The idea for the device came about when the Royal Swedish Institute of Technology mapped out the environmental technology needs of more than 500 Nordic municipalities. Two recurring problems were the issues of non-mains sewage systems and agricultural runoff, which are contributing significantly to the eutrophication of our lakes and oceans. This sparked the idea for a method known as low-flow dredging. With support from the Swedish Agency for Marine and Water Management and Vinnova, TechMarket developed a prototype of the small underwater device, which underwent stringent testing over the summer. TechMarket is now preparing a spin-off operation to take the next step in the commercialisation process. The plan is to create a product so simple that non-profit organisations in the Baltic region can use it to purify their watercourses. But the company is also garnering growing international attention.

"In the autumn, for example, we were visited by a company from China, a country that is experiencing major problems with contaminated lakes and watercourses," explains Bengt Simonsson.

CHEAP SOFTWARE FOR CLEANTECH COMPANIES

DO YOU HAVE a brilliant idea, but no money to develop it? If this idea is related to cleantech, Autodesk could be your solution.

The US-based Autodesk specialises in software development for 3D design and entertainment. The company also runs a special programme, known as the Autodesk Clean Tech Partner Program, which gives small cleantech companies access to Autodesk's CAD software and other systems at a significantly reduced price.

With the help of Autodesk's solutions, companies are able to test their ideas and prototypes, produce drawings and visualise their thoughts in various ways without incurring hefty development costs.

"We are doing this to promote the development of technology and innovations designed to create more sustainable products. Many entrepreneurs in the cleantech field have good ideas, but don't have enough resources to acquire the software needed to develop them," says Tanja Pikula, Clean Tech Program Manager EMEA at Autodesk.

THE COMPANIES in the programme are given access to software worth up to EUR 120,000 for as little as EUR 50, enabling them to develop their ideas more quickly into finished products and focus their own resources on actual development work instead of incurring high costs for software and physical prototypes.

"A prerequisite for participation in the programme is that the candidates must be developing technology that could help improve the environment in various ways," says Tanja Pikula.

JOHAN HÅRD

Developing new technology using Autodesk software.

CHARGING PHONES WITH WATER

ADD WATER, insert a fuel puck, close the lid and – presto! – you can now charge your mobile phone via a USB port.

The Swedish company myFC has developed what is known as a Powertrekk charger, which functions as an all-in-one power source and battery. The technology is based on fuel cell research conducted at the Royal Swedish Institute of Technology in Stockholm.

The device is targeted at people travelling in remote areas of the world, but could also eventually be used in developing countries. The technology has already been sold to users in China, Japan, the US and many areas in Europe.

"Our invention has excellent potential to accelerate the pace of social development in the Third World. These countries have large areas with no power grids, yet mobile phones are being used for an increasing number of functions that are vital to the population," says Anders Lundblad, researcher and founder of myFC.

A splash of water and you can start charging.

14
USD BILLION
Global investments in smart power grids in 2012, four times the figure reported in 2008.

42 %
The global increase in installed solar energy in 2012, corresponding to 29–30 GW. In comparison, Sweden's Forsmark Nuclear Power Plant has an output of nearly 3 GW. SOURCE: IEA

Cleanergy's path to China

A 200-YEAR-OLD invention could help solve problems with China's electricity supply – with some help from Swedish cleantech.

The company in question is Cleanergy, which builds solar farms and gas power plants based on Stirling engine technology – engines operated using heat. Cleanergy is currently in negotiations with one of China's largest energy companies regarding the construction of a solar farm.

"Perhaps the most important success factor is being able to secure financing. Many companies have good ideas, but aren't able to finance them," says Anders Koritz, CEO of Cleanergy.

But Cleanergy has succeeded in securing strong financial backing, including funding from financiers Kent Janér and Jim O'Neill, the Nobel Foundation and the Wallenberg family. The Swedish Energy Agency has also provided support in the form of a soft loan for SEK 5 million.

"We also have an outstanding team at our company, including the Board and executive functions."

HE REITERATES several times the importance of contacts and networks.

"This creates a ripple effect. And you need to network in several different arenas, particularly within the public sphere. We have excellent contacts at the government level and these people have supported us, for example, during our negotiations in China."

Do you any additional advice for other companies in the same situation as Cleanergy?

"Always be well dressed," says Anders Koritz. "This is more important than you think. It helps establish credibility and gives the impression that you mean business."

JOHAN HÅRD

A research group dedicated to finding new capital models: David Sonnek in the foreground, flanked by Malin Olovsson and Martin Vendel.

STAGES OF COMPANY DEVELOPMENT

1. Research and development

During the research stage, future companies have relatively significant amounts of capital with which to establish and develop new innovations and refine their business models. Several state-owned agencies help to finance this research, including the Swedish Energy Agency.

2. Seed money

It is more difficult to access capital during this stage since the risks are higher. It is common for business angels – individuals with private capital – to invest during this stage. The Swedish Energy Agency may offer business development loans.

3. Growth

As a company begins to gear up and develops the capacity to deliver larger volumes, more capital is required. Yet gaining access to capital can still be difficult during this stage. The Swedish Energy Agency offers growth loans for companies planning on industrialising their innovations.

4. Expansion

During the expansion phase, the company has begun production and sales. It now requires capital to further expand its operations. There are often fewer business risks at this stage, which in many cases makes it easier to find venture capital.

Searching for alternative routes

TO CAPITAL

Swedish environmental technology companies need more venture capital to commercialise their solutions. A group of researchers from the Royal Swedish Institute of Technology are trying to find new financing models to simplify the process for these companies.

TEXT: **JOHAN WICKSTRÖM** PHOTO: **JENNIFER GLANS**

OVER THE PAST 15 years, the technology-oriented SEB Venture Capital has invested approximately SEK 3 billion in some 100 companies. Only a handful of these are cleantech companies.

"The cleantech market is tough. The rules of the game are unclear, the time horizon is long and the companies are often capital-intensive," says David Sonnek, Global Head of SEB Venture Capital, as we sit down at the company's grand and venerable offices in central Stockholm.

SEB Venture Capital's investment priorities are themselves a telling example of the challenges cleantech companies face in securing capital, particularly during the early stages of development. Venture capital firms often want to sell the companies they invest in after five or six years at a very high profit, while cleantech companies might need ten to 15 years to achieve profitability – at which point their leverage effect could be even larger.

DAVID SONNEK – who is also an adjunct professor at the Royal Swedish Institute of Technology in Stockholm – is working together with researchers Malin Olovsson and Martin Vendel to find new financing models for the cleantech industry.

"Not a lot of research has been done into how the venture capital market chooses companies and the research that has been performed has been rather narrow in its focus. We want to find out how these funds think and why they act the way they do. With a better understanding of the business models used by venture capitalists, we can also help cleantech companies become better at securing capital," says Malin Olovsson.

The aim is for the results of the research project, which is being funded by the Swedish Energy Agency, to be applied in new ways to attract more capital to Swedish environmental technology companies. Today, only about 7 per cent of the venture capital invested in Swedish companies goes to the cleantech sector.

According to David Sonnek, Sweden is in a somewhat unique position.

"We have a great deal of knowledge and technology, yet a very small home market. These companies need to become international quickly. The capital market is also thin, with few companies and even fewer investors. This is why it's important to create meeting places that bring together companies, capital and customers – because there actually is a lot of money here in Sweden."

> *We will look at how these challenges have been handled in other countries and see if we can find any interesting examples to emulate.*
>
> MARTIN VENDEL, ROYAL SWEDISH INSTITUTE OF TECHNOLOGY

THE RESEARCH PROJECT is divided into stages. First, the existing business models will be examined: what do the existing models look like and what are the barriers preventing capital from being secured? The researches will then address the issue from an international perspective.

"We will look at how these challenges have been handled in other countries and see if we can find any interesting examples to emulate. Some of the countries we are investigating more closely are Israel, Singapore and Canada," says Martin Vendel.

Although the project itself is still in the starting gate, David Sonnek offers historical examples where capital contributions made a significant difference in earlier industrial cycles facing similar challenges.

"The state has often played a key role - for example, when it comes to building demonstration facilities. You could compare the current scenario to the construction of railroads in the 1800s or the expansion of hydro power in the 1900s. We need to make it easy for the first customers to invest in new, capital-intensive technology," says David Sonnek.

PENSIONS FUNDS could also play a larger role, he explains.

"Why should they be limited to short-term investments? They could invest more money in environmental technology – and adopt a much longer term approach."

To find proof that a long-term approach pays off, we need look no further than the Swedish heat pump market. Following the oil crisis in the 1970s, the Swedish government has invested approximately SEK 200 million in research, development and technology procurement related to heat pumps. Today, Sweden is a global leader in heat pumps. The Swedish market alone has a turnover of SEK 8 billion – the international market is expected to grow over the long term.

The researchers will present their conclusions in late 2014.

"We are facing enormous environmental challenges, so we need to be able commercialise new environmental technology quickly. We hope that our results will make it easier to finance environmental technology that demonstrates good potential," says Martin Vendel. ■

JENNIFER GLANS

Heléne Axelsson and Andreas Stubelius of the Swedish Energy Agency are creating new meeting places for the environmental technology sector.

Coordinating Swedish cleantech

Swedish environmental technology is among the best in the world. However, this is not always enough. According to Heléne Axelsson and Andreas Stubelius of the Swedish Energy Agency, we also need to create more networks and a better understanding of how the market functions.

CONGRATULATIONS. What a fantastic story," said Barack Obama when he met Solvatten's CEO, Petra Wadström, during his visit to Stockholm in September 2013.

It was not a coincidence that Obama chose to meet with three environmental technology companies at the Royal Swedish Institute of Technology (KTH). Sweden's reputation as an environmental technology nation has grown successively in recent years.

This is confirmed by the fact that most of the world's global cleantech players will be coming to Stockholm on 19-21 May for the tenth annual European Cleantech Forum, which will be hosted by the Swedish Energy Agency.

"We have worked on this for a long time and started sowing the seeds as far back as 2007 through our international contacts. It's great that it is all coming together now," says Andreas Stubelius of the Swedish Energy Agency.

Together with his colleague Heléne Axelsson, he is working intensively at various levels to create more meeting places within the environmental technology sector.

"It's a chain made up of many types of players: companies, banks, venture capital firms, government agencies and business angels. The goal is to connect them in various ways," says Heléne Axelsson.

The Swedish Energy Agency's efforts are key to the government's environmental technology strategy, which was launched in 2011 and set aside SEK 400 million during the period from 2011 to 2014 to increase the number of environmental technology companies and promote their export opportunities.

Part of the Swedish Energy Agency's work involves supporting research into the cleantech market. One example is the research group at KTH (see pages 28-29), which is trying to find new financing models for the cleantech industry.

"We also provided funding for a business studies project at Mid Sweden University, which will examine the collaboration between small environmental technology companies and major industrial companies. The project will also look at how well they succeeded and the conclusions that can be drawn from this," says Heléne Axelsson.

THE SWEDISH Energy Agency's network also includes its own portfolio of companies: some 50 environmental technology companies that received loans and support from the agency.

And when the cleantech world convenes in Stockholm in May 2014, some of these portfolio companies will be there, along with other Swedish environmental technology companies.

"It is wonderful that we are able to introduce companies in this manner. If Swedish investors see that there is international interest in Swedish companies, this could generate a ripple effect," says Andreas Stubelius.

JOHAN WICKSTRÖM

SWEDISH ENERGY AGENCY'S PORTFOLIO

A unique technology, a strong team and a distinct market. These are the requirements for securing a soft loan from the Swedish Energy Agency. Each year, the agency finance about SEK 90 million to support companies in the stages of commercialisation. One prerequisite for being granted a loan is that the company must arrange private counter-financing in a corresponding amount. In autumn 2013, there were 56 companies in the Swedish Energy Agency's portfolio.

Read more on www.energimyndigheten.se/en

NEW GREEN INVESTMENT FUND

THE GOVERNMENT WANTS to initiate a new green investment fund to improve access to venture capital for environmental technology companies. Up to 2020, the government will invest approximately SEK 700 million, if the proposal will be approved.

"More venture capital is needed for promising Swedish environmental technology companies. With the new green investment fund, more small and medium-sized environmental technology companies will have the opportunity to grow and develop," says Swedish Minister for Information Technology and Energy, Anna-Karin Hatt.

Together with its corporate partner, ALMI, the Swedish Energy Agency will provide suggestions regarding the framework of the fund. The fund will be supplied with about SEK 175 million from each agency, as well as funds from the EU Regional Development Fund, bringing the green investment fund to a total of approximately SEK 700 million.

FIVE LARGEST PRIVATE INVESTMENTS IN SWEDEN (2012)

1. Chromogenics	Advanced materials	€ 3,6 million
2. Rindi Energy	Energy supply	€ 2,4 million
3. CrossBorder	Transport	€ 1,5 million
4. Soltech	Energy supply	€ 1,3 million
5. Glo	Energy efficiency	€ 1,1 million

PHOTO: WIKIMEDIA, HOLGER ELLGAARD

This brewery is to become a meeting place for investors.

INVESTORS TO CONVENE IN STOCKHOLM IN 2014

ON 19–21 MAY 2014, many of Europe's cleantech players will convene at Münchenbryggeriet in Stockholm for the tenth annual European Cleantech Forum, arranged by the Cleantech Group. The event will be hosted by the Swedish Energy Agency, together with a number of other public players, and is expected to attract investors, innovators, government agencies and contractors from around the world.

A number of exciting Swedish environmental technology companies will have the opportunity to demonstrate their solutions for an international target group.

"The European Cleantech Forum is a unique opportunity to meet with key investors in the cleantech field," says Julien Mialaret, Investment Manager at the French company Idinvest Partners.

Read more about events.cleantech.com/europe

ENVIRONMENTAL COMPANIES BENEFIT FROM COOPERATION

SMALL environmental companies looking to export benefit from cooperation. According to Johan Strandberg of the IVL Swedish Environmental Research Institute, who has been involved in the Environmental Technology for Export project, the product range of these companies is often too small for an international market.

The three-year Mälardal Project has improved the export potential of the 134 small and medium-sized companies in the network, as well as enabling them to grow at a faster pace. In addition to cooperation, the success of these companies is also attributable to research and development, as well as meetings with international stakeholders.

SOURCE: SWEDISH AGENCY FOR ECONOMIC AND REGIONAL GROWTH

1.2 MILLION

The number of electric and hybrid vehicles sold in 2012. The US and Japan account for 90 per cent of the market.

HELLO Erik Brandsma

Last summer, Erik Brandsma, Director General of the Swedish Energy Agency, was named Sweden's most powerful energy player by NyTeknik, Sweden's leading technology and IT newspaper, which stated that he "plays a key role in determining Sweden's energy future."

How does it feel?
"I am obviously happy and proud, but also humbled. This demonstrates the agency's significance and the importance of our role in the Swedish energy arena."

What are the major challenges in the energy sector?
"Challenges exist on several levels, but if I have to highlight three of the most important ones, they would be: 1) viewing energy from a broader perspective, 2) daring to have pragmatic discussions about all types of energy, and 3) involving all stakeholders, from consumers to the business community and politicians."

What issues are on the agenda now?
"For the agency, it's mostly about implementing the EU's energy efficiency directive and focusing on the integration of important energy issues within urban development, transportation and smart networks."

Where is Sweden in terms of international environmental technology?
"We are far ahead, which we view as an additional confirmation of Sweden's third-place ranking in the Global Cleantech Innovation Index for 2012. The global market for environmental technology is enormous and this is providing Swedish environmental technology companies with excellent opportunities to contribute to sustainable development and create new jobs in Sweden."

JOACHIM COHEN

Name: Ewa Grzechnik.
Age: 28.
Job: Investment manager, 3M.
Education: Master's Degree in Environmental Science (Uppsala), Bachelor of Science in Finance/ Social Science (Bremen).
Driving force: Seeing investments grow and develop.

EWA GRZECHNIK 3M NEW VENTURES

"CLEANTECH IS PART OF OUR STRATEGY"

POST-IT NOTES, tape and kitchen sponges. These are some of 3M's nearly 85,000 different products. Innovation and development have been guiding forces for 3M since its inception in 1902.

"In recent years, we have focused more on finding interesting projects in the field of cleantech, such as batteries, water purification and products based on renewable raw materials," says Ewa Grzechnik, Investment Manager at 3M New Ventures, the company's internal venture capital company.

A major company that also acts as a venture capitalist – does that work?

"Yes, absolutely. For us, it's part of the business strategy – and necessary for us to be able to continue to produce high-quality, sustainable products."

For 3M to consider an investment, the company must either have a connection to 3M's current operation or be considered to offer exciting potential in a new field.

"It's also good if the operation is at the cutting edge of technology and has the potential for scalable growth."

When a "standard" venture capital company makes an investment, the time horizon is usually quite short – about five years. Since lead times are longer in the cleantech sector, it may be difficult to attract capital to these companies.

However, 3M takes a slightly different approach to lead times.

"Since we are a major player, we are able to enter a project at an early stage, although this may mean higher risk. However, we are more resilient since our primary focus is not on generating a quick return, but on how the investments could complement our own strategic plan."

As always with investments in new areas, assessing whether or not a company has what it takes to succeed can be tricky.

"The idea itself or the technology is naturally a crucial factor. But it is equally important that the team behind the company is good."

One example of a typical cleantech investment made by 3M is Ecovative, a US-based company that developed a new technology for manufacturing packaging material based using mushrooms and agricultural waste. The material can be used in the same way as plastic, but is biodegradable.

"We invested in Ecovative in 2011 and the company now has a multi-million dollar annual turnover. This is a company we believe in, particularly because of its extremely strong team."

JOHAN HÅRD