



UNLOCKING THE GLOBAL GREEN TRANSITION

Executive Global Insight, October 2023

SWEDEN IN POLE POSITION AS GREEN INVESTMENTS RISE

In an era of global sustainability focus, nations and corporations worldwide are committing to ambitious environmental targets. Despite heightened efforts, the world is still far from meeting the Paris Agreement's goal of limiting global warming to 1.5°C. Policy implementation has been slow and companies often struggle to prioritise sustainability over short-term profitability. To meet the set targets for the coming decade, investments in the green transition must triple. A projected USD 5 trillion annually worldwide from 2023 to 2050 is required to catalyse the green transition, underscoring the need for robust collaboration among governments, the private sector, and research institutions.

Sweden stands out as a leader in emission reduction, achieving an annual CO₂ reduction of 2.5 per cent while sustaining a GDP compounded annual growth rate (CAGR) of 1.9 per cent over the past two decades. With an ecosystem of innovative climate tech startups and legacy companies at the forefront of sustainability, Sweden is poised to contribute to global decarbonisation efforts.

This report serves as a guide to the most promising opportunities for which Sweden can leverage its strengths and contribute to global efforts. Major sources of global emissions and the levers that will have the most impact on decarbonisation have been mapped against Swedish strengths and know-how to pinpoint which areas and sectors Sweden can make the largest impact in the short-term. Furthermore, this report highlights how Swedish companies can leverage opportunities in different markets and contribute to a greener future.

Five key opportunities for Sweden in the green transition

- In achieving a fossil-free electricity system, Sweden's leadership in renewable energy sources, energy storage, and grid infrastructure positions Sweden as a pivotal player in global renewable energy expansion in key markets such as APAC and MEA.
- Prioritising energy efficiency and recovery in buildings as well as industry offers the potential to cut significant emissions with key export opportunities for Swedish electrical drives in industrial markets like China and Europe
- On the mobility front, Sweden's strong EV value chain, particularly in the heavy-duty sector, provides opportunities for export to the European and US markets.
- Sweden's expertise in bioeconomy, particularly in second-generation biofuels, is pivotal in transitioning to sustainable fuels and decarbonising hard to abate sectors in advanced economies.
- Sweden's investments in material efficiency, notably in sustainable mining and low-emission production of major emitters like steel and cement, further solidifies its leadership role in the global green transition.



This report emphasizes the need for Swedish businesses to look beyond domestic borders and access international markets to not only grow but also play a vital role in the worldwide shift towards sustainability.

To successfully tap into new markets, meticulous market segmentation is essential. A one-size-fits-all approach does not suffice; instead, companies must adapt their business models and value propositions to align with market demands. Showcasing local viability through pilots and engaging with local ecosystems and stakeholders are essential steps in establishing credibility and trust in new markets. Moreover, strategic partnerships play a pivotal role in realising large-scale decarbonisation projects, allowing stakeholders with green solutions to collaborate with players from traditionally non-green industries.

Sweden possesses the knowledge and expertise to lead the way towards a sustainable future. By leveraging cross-sectoral collaboration, robust R&D investments, policy advocacy, and targeted capacity building, Sweden can amplify its impact on the global stage.

This report serves as a call to action, urging stakeholders across industries, academia, and government to unite in realising Sweden's potential as a beacon of green innovation and leadership.



KEY TAKEAWAYS

- Power generation, industry, transport, and buildings are the main emitting sectors globally
- Implementation of renewable power, energy and material efficiency, alternative fuels, and electrification are identified as key decarbonisation levers across industries by 2030
- Sweden's Greentech companies, legacy industries, and public support are well positioned to contribute to the green transition globally
- Five key decarbonisation levers where Sweden has the greatest potential to contribute to the global green transition are identified: Fossil free electricity system, Energy efficiency & recovery, E-mobility, Bioeconomy, and Circularity
- In the Americas, incentives and grants presents opportunities for Swedish companies within the EV value chain, biofuels, and energy efficiency for the US market while sustainable mining will be highly relevant in Canada and Latin American countries such as Chile
- Within the APAC region, Swedish energy efficiency solutions for industrial purposes can contribute to more sustainable manufacturing in the world's global production hub
- Europe's stringent CO₂ emission standards and race to create a regional battery value chain highlights the need for leading sustainable solutions from Swedish companies within EV and batteries
- The MEA region offers opportunities for Swedish transmission and distribution companies in the development of green energy infrastructure, while the surge in smart city construction creates a demand for energy efficiency solutions
- Swedish companies can contribute to global decarbonisation while achieving economic growth. To succeed in new markets, conducting detailed research, demonstrating local viability through pilots, actively engaging with local ecosystems, and prioritising strategic partnerships are imperative

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LEADING THE WAY TO NET ZERO

In an era where the global green transition has taken centre stage, sustainability permeates all industries globally. Nations, regions, and corporations worldwide are pledging ambitious sustainability targets, vowing to slash emissions, and championing environmental stewardship. Yet, the stark reality remains – the world is still not on track to meet the commitments of the Paris Agreement. We are still far from closing the 23-gigaton CO₂ emissions gap needed to achieve the critical 1.5-degree Celsius target by 2030.

Policy has been slow to realise, and most companies struggle to prioritise sustainability over short term profitability. As we are approaching the 28th UN climate conference of the parties (COP28) no substantial improvements have been achieved since COP26. The world is heading for 2.4°C of warming under current 2030 targets.

The top eight emitting countries and regions, account for 63 per cent of global greenhouse gas emissions. All top emitters in emerging economies recorded increased emissions over the past decade and even in nations with a decreasing emission trend, reductions fall short of the intended CO₂ targets. Governments and countries have a key role in setting measurable targets and implementing policies and frameworks that accelerate the green transition.

Europe has managed to achieve net negative emissions at -0.7 per cent the past 20 years while

simultaneously ensuring a GDP per capita annual growth of 3.1 per cent, proving that sustainability does not have to jeopardise economic growth. Developing, commercialising, and exporting green technologies and know-how will further enable emission reductions while contributing to economic growth.

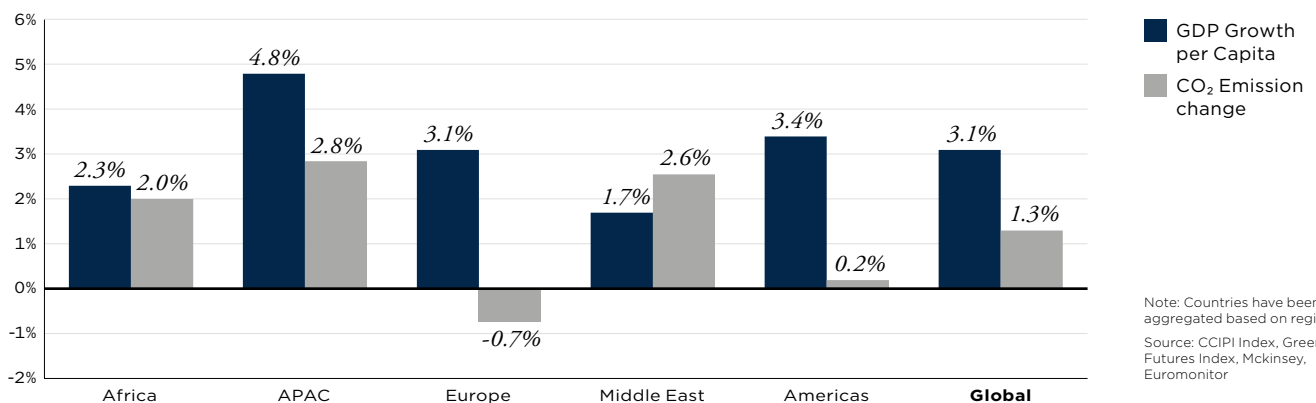
Sweden emerges as a leader in emission reduction and over the past decade, Sweden has achieved an impressive 2.5 per cent compound annual growth rate (CAGR) reduction in emissions while sustaining 1.9 per cent annual GDP growth.

This steadfast commitment to environmental sustainability is underpinned by a series of successes and initiatives, positioning Sweden as a global pioneer in the green transition. With a burgeoning ecosystem of climate tech start-ups and a rich legacy of environmental responsibility, Sweden has the potential to significantly impact the global green transition by exporting climate technologies and expertise.

This report serves as a guide to the promising opportunities for Sweden to leverage its strengths and contribute to global efforts to reduce carbon emissions. Furthermore, it highlights how Swedish companies can leverage opportunities in different markets and contribute to a greener future.

GDP PER CAPITA AND EMISSION CHANGE

% CAGR over 20-year period from 1992 to 2022



PINPOINTING SWEDISH SOLUTIONS FOR GLOBAL DECARBONISATION

Rather than identifying the sectors or regions with highest emissions, this report focuses on the key decarbonisation levers that can contribute to cutting global carbon emissions. By combining a top down and bottom-up approach, we have identified the most promising opportunities for Swedish solutions to create meaningful impact.

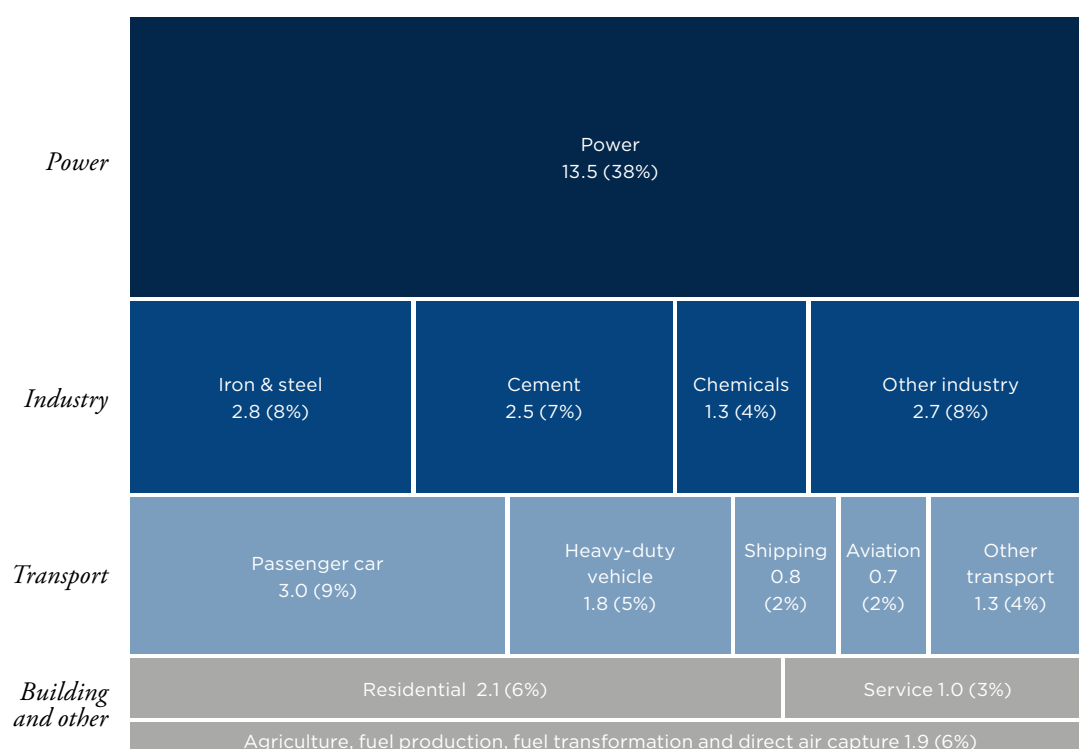
KEY DECARBONISATION LEVERS

Power generation, industry, transport, and buildings are the main emitting sectors globally. Power generation accounts for 38 per cent of global emissions and is the largest contributor of CO₂. Energy is vital for all parts of society and a greener grid will have far-reaching benefits across industries and sub-sectors. Greening the industrial sector and especially production of iron, steel, cement, and chemicals representing almost a fifth of global emissions, will also be vital for slowing global warming.

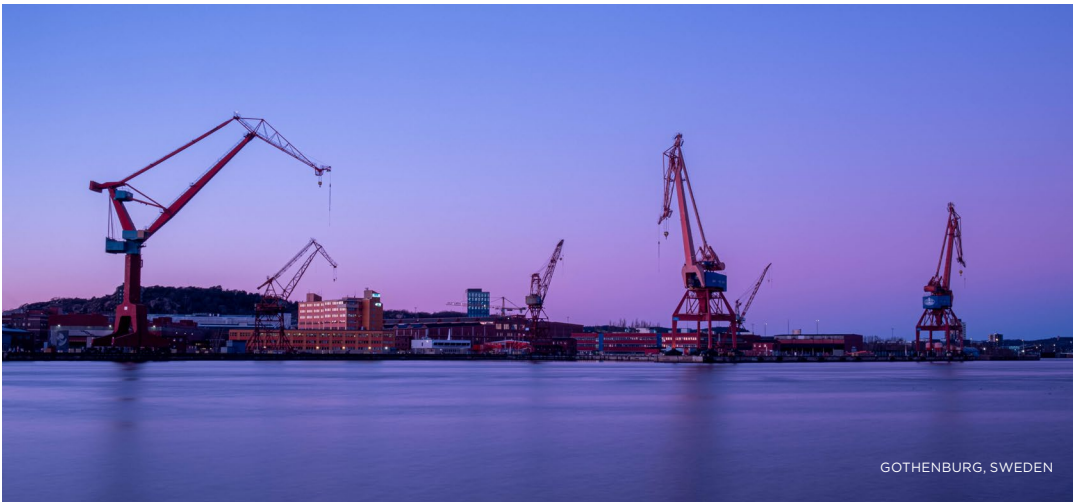
Transportation, accounting for 22 per cent of global emissions is a key focus in the public decarbonisation debate with potential to achieve meaningful emission reductions short term through electrification and alternative fuels.

Technologies and measures that can contribute to decarbonising these three sectors provide an opportunity to have the greatest impact to the green transition globally. Implementation of renewable power, energy and material efficiency, alternative fuels, and electrification are identified as key decarbonisation levers across industries by 2030.

GLOBAL ANNUAL CO₂ EMISSION BY SECTORS AND SUBSECTOR, 2021
per cent of global emissions



Source: Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA)

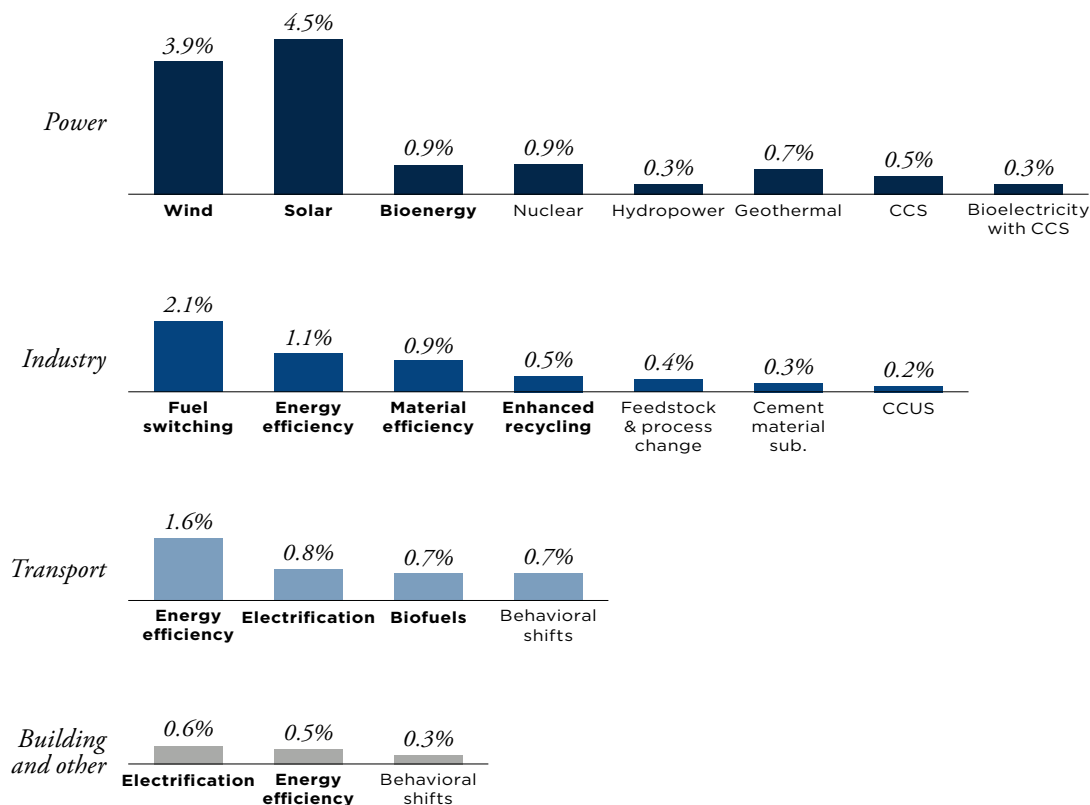


SWEDEN'S STRENGTHS IN THE GREEN TRANSITION

Sweden has already established itself as a global leader in sustainability and green transition, coming up top across multiple global rankings such as the green future index (#5) and SDG goal index (#2). By analysing the Swedish green tech company landscape, legacy industry spill overs, R&D, and government focus areas, several high potential export areas are identified. Battery technology, energy storage, and the EV value

chain have received significant funding and international recognition for companies. Leading legacy industrial firms are investing broadly in green technology, with a focus on circularity, EVs, bioeconomy and H₂ systems. Government funding has largely been directed at low-emission vehicles with investments in biogas, fuel switching, and charging stations.

DECARBONISATION POTENTIALS OF MITIGATION MEASURES BY SECTOR, 2030 (F)
Gt CO₂-eq per year

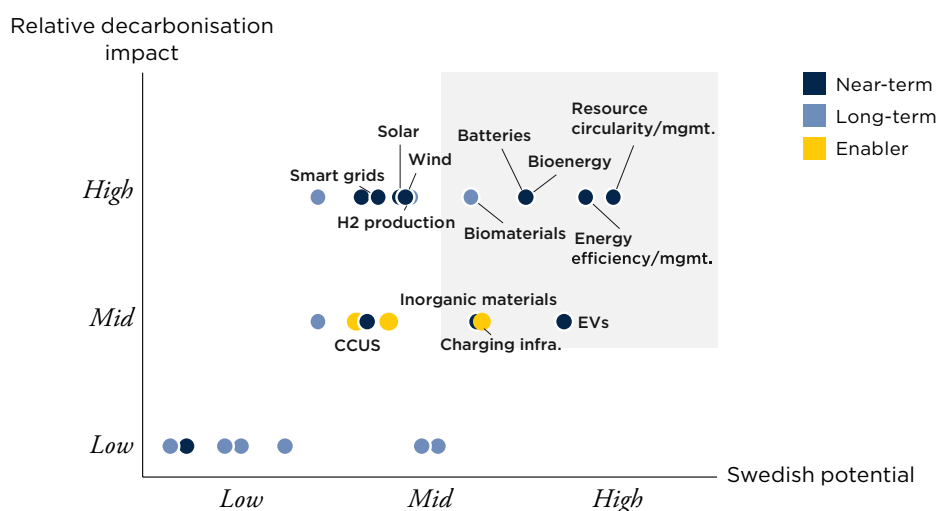


Source: Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA)

FIVE SWEDISH STRENGTHS IN THE RACE TO DECARBONISE

Combining the key mitigation levers with Swedish strengths, we have identified five key decarbonisation levers where Sweden has the greatest potential to contribute to the global green transition: fossil free electricity, energy efficiency & recovery, e-mobility, bioeconomy, and circularity. Sweden's greentech companies, legacy industries and public support are well positioned to contribute to the green transition globally within these sectors and have a near term impact.

OVERVIEW OF DECARBONISATION LEVERS AND SWEDISH STRENGTHS



GREEN TRANSITION AREAS TO BE HIGHLIGHTED IN THIS REPORT



FOSSIL-FREE ELECTRICITY SYSTEM

Including renewables, energy storage and smart grid/grid resilience



ENERGY EFFICIENCY & RECOVERY

Including industry and building energy efficiency



E-MOBILITY

Including EV (battery) and charging infrastructure as well as digital platform enabling the above



BIOECONOMY

Including bioenergy, transport biofuels, biomaterials and biogenic Carbon capture, utilisation, and storage (CCUS)



CIRCULARITY

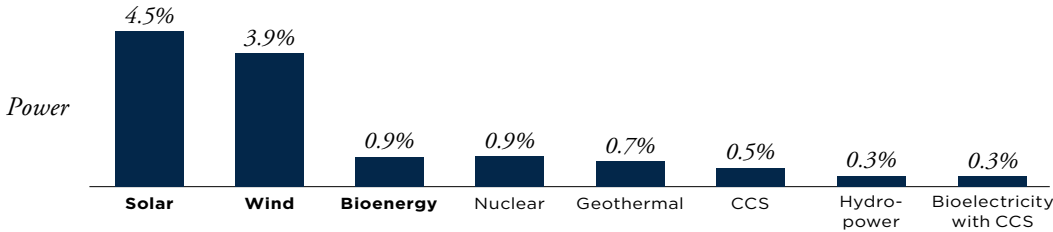
Including resource circularity/mgmt., as well as digital platform, carbon tracking and inorganic materials (including critical mineral from mining) enabling the above



FOSSIL-FREE ELECTRICITY SYSTEM

Power generation is responsible for nearly 40 per cent of global CO₂ emissions each year, establishing it as a pivotal sector for decarbonisation efforts. Greening the power grid is the decarbonisation lever with the most impact, where switching to green energy could mitigate over 30 per cent of global emissions based on 2021 levels.

DECARBONISATION POTENTIALS OF MITIGATION MEASURES BY SECTOR, 2030 (F)
Gt CO₂-eq per year



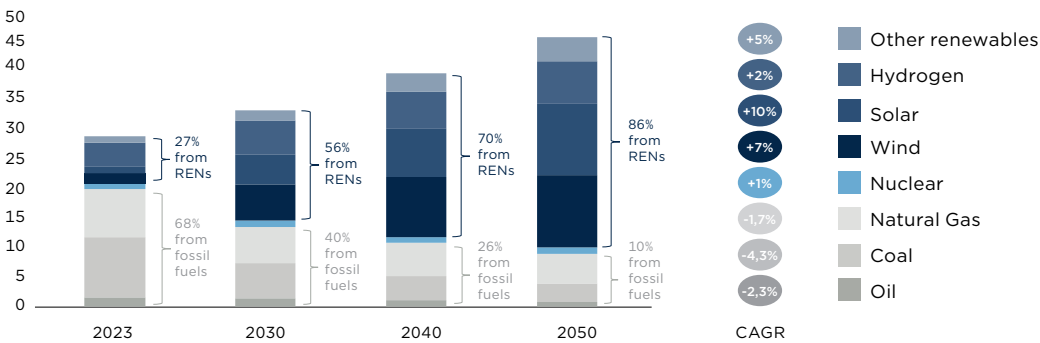
Source: Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA)

EXPORT KNOW-HOW OF RENEWABLE ENERGY SOURCES

Sweden currently derives an impressive 60 per cent of its energy from renewable sources, with a focus on hydropower. Large Swedish companies or international companies with a footprint in Sweden are active in the renewable value chain as component manufacturers. This can contribute to the expansion of renewable energy infrastructure globally and contribute to cost parity. Swedish companies can capture global opportunities by engaging at an early stage when projects are announced to compete with highly risk-tolerant competitors in key markets.

With a strong background in sustainable forestry and access to quality biomass coupled with early investments in bioelectricity, Sweden has become a leader in bioenergy and especially Combined Heat and Power (CHP) for district heating. Ground-breaking initiatives like Stockholm Exergi's Bioenergy with Carbon Capture and Storage (BECCS) project underscores Sweden's commitment to sustainability and opportunity to export technology knowledge and contribute to decarbonisation.

GLOBAL ELECTRICITY GENERATION BY SOURCE
(Thousands TWh/year)



Source: International Renewable Energy Agency, World Economic Forum

ENSURE A MORE RELIABLE GRID FOR DISTRIBUTION OF INTERMITTENT RENEWABLES

The pressure on the existing electrical grid will continue to increase as the share of intermittent renewable energy sources grows. This is in part because green energy tends to be generated in areas far from population centres as well as a growing deployment of distributed energy resources. To lower emissions, countries and utilities will need to upgrade their transmission infrastructure while also making local grids smarter. Swedish SMEs are well positioned in smart grid technologies and have extensive experience, both in pilot projects and full commercialisation both in Sweden and the rest of Europe. Establishing in other markets will be key to support the energy transition.

Incorporating utility scale and other energy storage solutions is instrumental to harnessing the full potential of renewable energy and ensuring grid stability. Sweden's engagement in battery and energy storage ventures span a wide spectrum, encompassing both large industrial companies and nimble green tech start-ups. Several Swedish companies in the transmission & distribution as well as energy storage sectors figure among the top 10 largest players globally, including Hitachi Energy and ABB. These companies – coupled with the presence of Northvolt and Polarium – firmly position Sweden at the forefront of the global energy storage landscape.



ENERGY EFFICIENCY AND RECOVERY

Efficiency is paramount in harnessing the full potential of the energy we generate. Energy efficiency in buildings and industry is one of key levers to decarbonisation, with a potential to mitigate 1.6 Gt of global CO₂ emissions per year.

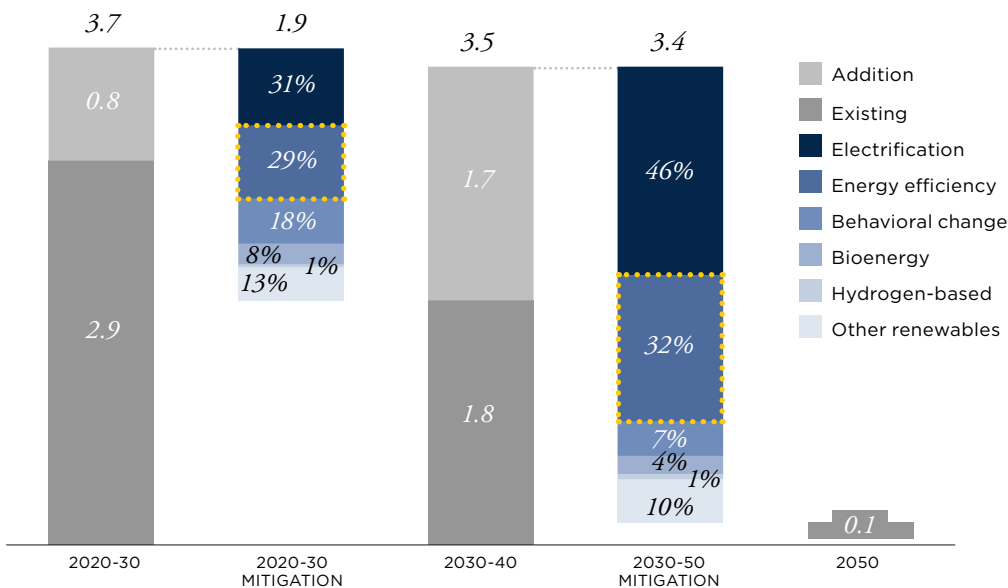
CREATING MORE SUSTAINABLE BUILDINGS THROUGH SMART MONITORING

Buildings' operations accounted for 30 per cent of global final energy consumption and as much carbon emissions as passenger cars (3 Gt in 2021). Rapid application of the energy efficiency value chain in buildings is necessary to align with the Net Zero Scenario (NZE). Digitalising energy management in buildings is gaining popularity for effective monitoring and action-taking in residential as well as commercial buildings.

The Swedish ecosystem boasts a vibrant array of energy management technology companies, ranging from agile start-ups to multinational corporations. Swedish companies offer both software and hardware solutions for Home Energy Managements Systems (HEMS). With most of these companies small or medium-sized, partnerships with local actors in markets like North America and APAC will be key to export solutions.

Within Commercial Building Energy Management Systems (BEMS) there are numerous large Swedish companies, as well as innovative start-ups, dedicated to managing energy usage in commercial buildings. While large Swedish companies already have a presence in global markets, emerging start-ups with unique selling points will benefit from collaborating with complementary solutions in the global market.

ANNUAL CO₂ EMISSION CHANGE IN BUILDING SECTOR, 2020-2050 (f)
Gt CO₂



Source: International Energy Agency

ENSURING MORE ENERGY EFFICIENT INDUSTRIAL MANUFACTURING

Machine drives and motors have a significant influence on industrial electricity consumption, accounting for 52 per cent of the energy consumption in manufacturing processes. A large portion of electricity consumption in manufacturing is consumed by machine drives and motors which play a crucial role in sectors like plastics, rubber, and machinery.

Key sectors in Sweden include applications involving electrical motors, such as heat pumps, compressors, and robotics, with a focus on automation and sustainability to enhance manufacturing competitiveness on a global scale.

The end customers are mainly located in APAC and the Americas region, with China, the US, and Japan as the world's top three manufacturing nations, collectively responsible for 54 per cent of global manufacturing. Swedish electrical drives and motors play a crucial role in enhancing energy efficiency, especially in manufacturing industries. There are significant export opportunities in global markets, and while large companies like ABB have a strong global presence, smaller companies can benefit from partnerships to improve their export capabilities.



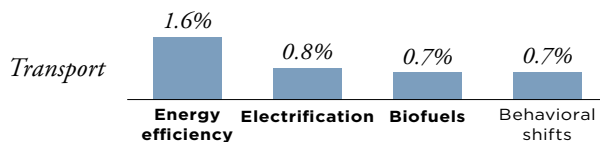
E-MOBILITY

Beyond power generation and industry, transport is one of the most emission intensive sectors, accounting for a fifth of global carbon emissions. Electrification of the transport sector is expected to stand for 44 per cent of the mitigation of emissions in the Net Zero Scenario (NZE) and provides key near-term impact.

EV SECTOR EXPECTED TO GROW RAPIDLY

A faster adoption pace in commercial vehicles has mainly been driven by the rise of fuel prices and lower total cost of ownership (TCO) of electric vehicles. 60 per cent of light-duty and 30 per cent of heavy-duty vehicles are expected to be EVs by 2030. Regional policies are being adopted to drive the shift to EV coupled with a strong push from OEMs. The global new energy vehicle sector has entered a period of rapid development and is expected to continue its high-speed growth in the next 5-10 years as major auto manufacturers compete to take market shares early.

DECARBONISATION POTENTIALS OF MITIGATION MEASURES BY SECTOR, 2030 (F)
Gt CO₂-eq per year



Source: Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA)

PIONEERING SUSTAINABLE BATTERY PRODUCTION

Battery demand is set to increase as nations continue to set electrification targets, with production capacity expected to double worldwide by 2030. China has a clear dominance across the full global battery value chain. There is continued investments in establishing a complete domestic battery value chain in Europe and the US, and as a result the supply chain will need to become more regionally resilient. Northvolt produces some of the world's most environmentally friendly batteries and is setting a global standard. Together with the larger Swedish battery ecosystem, Sweden is now positioned as a leader in battery production.

BUILD ON AUTOMOTIVE LEGACY TO DRIVE ADOPTION OF EVS

In Sweden, legacy automotive giants like Volvo and Scania along with innovative disruptors such as Einride, and Polestar accelerate the adoption of electric mobility. Coupled with companies ranging from LKAB to Autoliv, Sweden has built up a strong EV value chain spanning from mineral extraction to charging infrastructure. The automotive industry in Sweden has an export value of SEK 219 billion, which corresponds to nearly 14 per cent of the total Swedish exports in 2022. Heavy truck producers as well as car producers have ambitious plans to increase electric vehicle sales by 2030. With a range of globally recognised OEMs, Sweden has an opportunity to export EVs from the European market to emerging markets with growing support for decarbonisation.



BIOECONOMY

Transitioning to sustainable fuels will be pivotal to reducing emissions in the transportation and energy sector. Globally, the biofuel share in transport fuel consumption will continue to grow and is expected to climb from 4.3 per cent to 5.4 per cent by 2027.

MOMENTUM TO SCALE UP SECOND GENERATION BIOFUELS

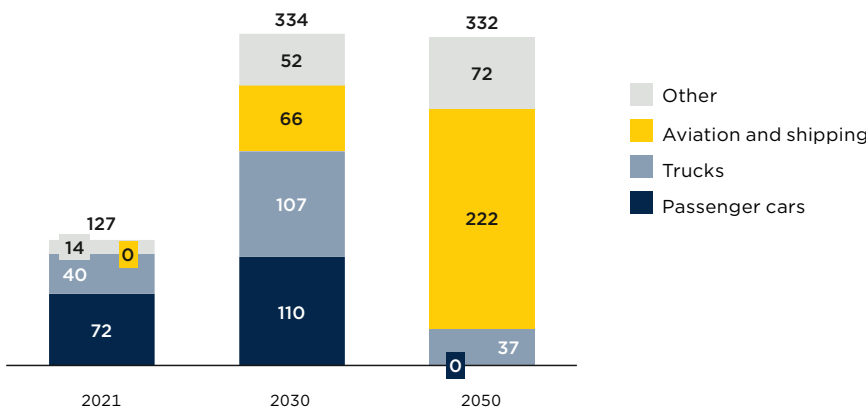
Current biofuel production is dominated by first generation feedstock for conventional ethanol and biodiesel. Concerns about sustainability is driving a shift toward second generation feedstock which does not compete with food supply and utilises waste streams instead. Renewable diesel will see the biggest growth of 21 per cent until 2027 as well as Sustainable Aviation Fuel (SAF) that is poised to scale up significantly in coming years. Under the NZE scenario, around 90 per cent of liquid biofuels produced in 2050 would be advanced biofuels, whereof 75 per cent would be consumed in aviation and shipping.

Demand is mainly driven by the Americas and EU, where strong policy support is driving adoption. In the coming years, demand for advanced biofuels will be driven by advanced economies while emerging economies aiming to reduce dependency on oil imports are set to drive ethanol and biodiesel demand.

Sweden emerges as a prominent player within biodiesel with both strong demand and innovative technology providers at the forefront of production. Around one fourth of fuel consumption in Sweden is biobased, one of the highest shares in the EU. In 2021, Sweden produced over 1 billion litres of liquid biofuels with Preem being the main producer, mainly focused on Hydrotreated Vegetable Oil (HVO) and biofuel, backed by suppliers like Sunpine producing tall oil from forestry residues. With abundant forestry resources and strong industry experience in extracting value from wood residues there is potential to scale up production.

A shift from first generation biofuels in major consumer markets to biofuel with an increasing focus on using rest products like lignin and tall oil, positions Sweden as a global frontrunner.

BIOFUEL DEMAND BY SECTOR
Billion liters per year, 2010-2030 NZE



Source: IEA, Biodiesel Magazine, Biofbr, Norwegian university of science

CONTRIBUTE TO DECARBONISATION OF HARD TO ABATE SECTORS

Carbon capture, utilisation, and storage (CCUS) will be instrumental in achieving net-zero emissions and unlocking value from waste streams. CCUS deployment has fallen short of expectations in the past but is set to grow rapidly with a five-fold increase by 2030. However, there is still a substantial gap to the 1.6 Gt of CO₂ that the IEA estimates must be captured by 2030 to reach NZE scenario and many are highlighting the need for investments to create cost competitiveness of CCUS technology.

Sweden has limited opportunity for domestic permanent geologic storage but an emerging CCU industry, mainly focused on advanced e-fuels, BECCS, and H₂, has emerged. With several projects aimed at CCU for transport e-fuels, Swedish companies like Vattenfall, Perstorp, and Liquid Wind pioneers within e-fuels for hard to abate sectors.

The US will continue to have a leading role in developing CCUS, strengthened by generous incentives under the Inflation reduction Act (IRA) and Infrastructure and Jobs Act (IIJA). Announced policies and incentives in the US and Canada also present an opportunity for Swedish companies within the CCU field to export technology.



CIRCULARITY

Increasing focus on material circularity and efficiency will also play a pivotal role in the green transition, especially in decarbonising emission intensive industries.

POSITION SWEDEN AS A LEADER WITHIN SUSTAINABLE MINING FOR CRITICAL MINERALS

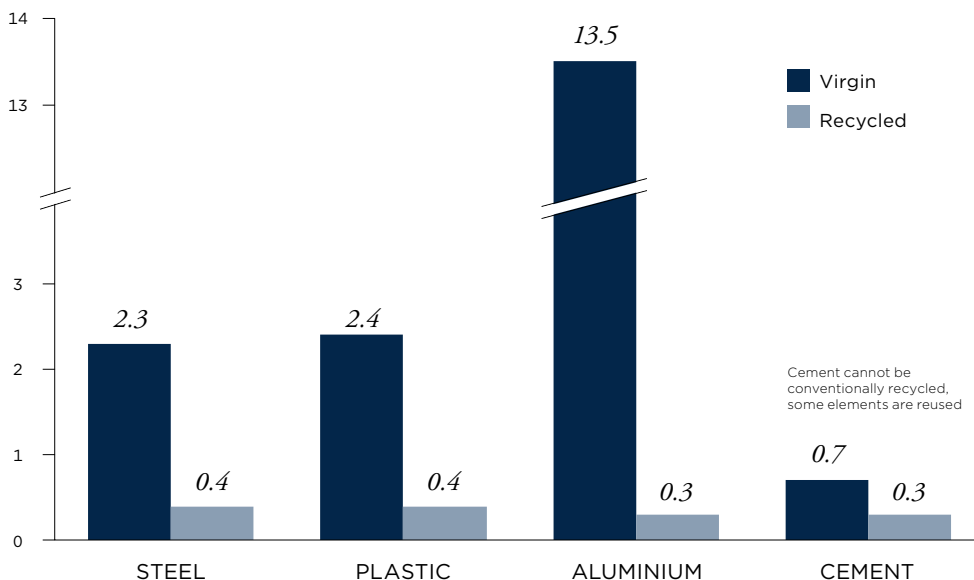
The demand for renewable energy and EVs has put a spotlight on material extraction as the demand for critical minerals intensifies. Decarbonisation of mining is one of the main priorities for the IEA, which currently is investigating new technologies to improve energy efficiency in ore extraction.

The battery race has led to markets looking at investigating alternatives to Li-ion batteries such as sodium and graphene-based batteries, which can help reduce the extraction of rare earth minerals. As countries and companies look to meet Sustainable Development Goals (SDGs), there is a first mover advantage for companies that can decarbonise ore extraction. SSAB and LKAB in Sweden are positioning themselves as leaders for sustainable mining. Companies like Epiroc and ABB continue to drive the sustainable mining agenda through more efficient practices, electrification of mining equipment, and smart technology. The use of AI and the cloud for smart mining solutions are also being developed to ensure efficiency within the supply chains to reduce environmental impact.

DECARBONISE PRODUCTION OF MAJOR EMITTERS STEEL AND CEMENT

Steel, aluminium, and cement are key input materials for the green transition. With over 2.3 billion metric tons of steel produced every year, decarbonising steel production proves one of the most impactful levers within the industrial sector. Hybrit, Ovako, and H₂ Green Steel has garnered international recognition as leaders within fossil-free steel production by utilising green hydrogen. Across materials, enhanced recycling provides opportunity to reduce emission by up to 56 per cent. Sweden is considered a leader in recycling key raw materials, with projects to increase recycling of iron, aluminium, and alike.

EMISSIONS GHG OF VIRGIN VS. RECYCLED MATERIALS EXTRACTION, 2021
in tCO₂ per ton of material



Source: OECD, Goldman Sachs, MDPI

POSITIONING SWEDEN AS A KEY PARTNER IN GLOBAL MARKETS

Sweden's position as a sustainability pioneer provides opportunities to share experiences and export technologies with other markets that are beginning to realise, and prioritise, the importance of decarbonisation.

Overlapping the five decarbonisation levers with opportunities in four geographic regions highlights where there is potential to make an impact and help countries reach emission reduction targets to ensure a more sustainable future.



AMERICAS

NEW CLIMATE BILLS ARE INCENTIVISING GREEN TECHNOLOGY

While the US and the rest of the Americas has previously been less sustainability focused, recent policies have underscored the focus on decarbonisation. The current US administration has set ambitious targets to cut CO₂ emissions by half by 2030 compared to 2005 levels. The bipartisan \$1.2 trillion infrastructure bill and \$369 billion climate provisions from the IRA act as a catalyst, accelerating the US green agenda.

The IRA provides an opportunity for Swedish companies within the EV and energy storage value chain that can adapt to domestic manufacturing requirements. The IRA extends consumer and commercial EV credits that are expected to drive adoption of passenger EVs. At the same time, more stringent domestic requirements could benefit local OEMs that can receive extensive production tax credits. Electrification of bus fleets in LATAM countries like Brazil, Colombia, and Chile presents an opportunity for leading Swedish OEMs like Scania and Volvo, although competition is high. Electrification of mines is another industry where Sweden holds a strong position, with as high as 50 per cent of market shares for heavy machinery in underground mining, that present an opportunity in major mining markets Chile and Canada.

The Americas region is a major producer of ethanol with the US and Brazil responsible for over 60 per cent of total global biofuel capacity. Policies mandating a certain per centage of renewable fuels and incentives to scale production of low carbon fuels continue to drive demand in the region.

With an increasing emphasis on second generation biofuels and transition to renewable, biodiesel as well as SAF, leading Swedish technology providers can benefit from incentives and funding across the region. Production credits and grants under the Infrastructure and Jobs Act (IIJA) and Inflation Reduction Act (IRA) for advanced biofuels as well as E-fuels in both Canada and the US create opportunities to license and export technology and scale up production.

Energy efficiency and recovery is also emerging as a key green area. The IRA provides generous tax credits for consumers to invest in heat pumps and production tax credits are spurring investments in US manufacturing. As a result of generous incentives and logistical challenges during COVID, reshoring to the US and Mexico is becoming a key priority for American manufacturers. Over 300 thousand jobs were added to the region in 2022 with major investments in automotive, battery, and semiconductor manufacturing. Buildout of new plants will open opportunities for energy efficient industrial solutions, where leading Swedish companies can play an important role in ensuring sustainable production.

The rapid buildout of renewable energy also provides an opportunity for Swedish companies to engage in projects in the US and Brazil. The main opportunities lie within grid infrastructure projects to export components from companies like Hitachi Energy, ABB and emerging tech companies part of Sweden's strong Transmission and Distribution ecosystem.



E-MOBILITY

- Supply Medium-Heavy duty electrification of vehicles backed by robust auto industry
- EV adoption expected to follow EU and speed up across states with generous incentives for consumers
- Incentives for battery production in both US and Canada
- Electrification of bus fleets in LATAM



BIOECONOMY

- Position as technology leader and key sub supplier in the scaling of 2nd biofuels and e-fuels to benefit from incentives in US and CA
- Swedish forestry industry potential to export R&D and know how within biofuels and packaging



ENERGY EFFICIENCY & RECOVERY

- Swedish electrical drives and motors can play a role in enhancing energy efficiency and facilitating a greener manufacturing industry
- Electrification is on the rise with increasing focus on more sustainable buildings in the US as well as LATAM



FOSSIL-FREE ELECTRICITY SYSTEM

- Rapid buildout of renewable energy and grid updates in US and Brazil
- Strong local competition limiting potential for large scale renewable project dev
- Energy storage applications, T&D components, grid optimising, and renewable components demand expected boost



MATERIAL CIRCULARITY

- Position Sweden as a pioneer in sustainable mining to ensure green practices for critical minerals in Canada and LATAM countries like Chile
- Knowledge sharing and collaboration for green steel production and recycling

Most important



Least important

APAC

SCALING UP ENERGY EFFICIENT PRODUCTION AND RENEWABLE ENERGY INFRASTRUCTURE

The APAC region is a vast region with a range of opportunities and challenges for Swedish green tech companies. China has been instrumental to the rapid scale up of climate technologies in recent years, with the world's largest market for EVs and a strong manufacturing industry for both batteries and solar panels.

China and the APAC region is home to a significant share of the world's manufacturing and as production sites undergo modernisation, there will be an increasing demand for energy efficient solutions. There is a discernible push to integrate green energy solutions into manufacturing and construction projects. Noteworthy is China's Catalogue of Encouraged Industries for Foreign Investment, which underscored the importance of sustainable construction practices and added areas such as green hydrogen technology and industrial water-saving as key investment areas. There is also an increasing number of projects for district energy and cooling in the Chinese market, where Swedish solutions are well positioned to contribute to efficient and environmentally friendly cooling systems amid public concerns about rising temperatures.

The region offers opportunities for Swedish companies within the renewable energy value chain as several countries ramp up efforts to decarbonise the grid. India, notably, demonstrates substantial growth in renewable electricity capacity, driven by the country's commitment to diversifying energy sources. Solar PV technology is poised to lead this transition, supported by India's target of achieving 500 GW of renewable energy by 2030, alongside the gradual reduction of subsidies for non-renewable sources. In China, although the 14th Five-Year plan (2021-2025) placed emphasis on energy security through coal, the target of 39 per cent non-fossil energy sources in power generation combined with the target of 30 per cent electrification of end-use energy still spur rapid growths of renewables like wind and solar. Strong local solar PV value chain and cost competitiveness complicates export opportunities for renewable energy projects. With several countries investing in a greener energy mix and countries like Singapore set to import renewable energy, expansion of an Association of Southeast Asian Nations (ASEAN) power grid similar to the Europe is in plans which would open opportunities for several Swedish companies within the T&D sphere.

Swedish companies specialising in the mining value chain can play a pivotal role in the decarbonisation of mining practices in the region. By sharing sustainable mining practices and circularity technologies, Sweden can contribute to reducing the environmental impact from the mining industry in large markets like Australia, China, and India, especially within electrification of mines.

The region is undergoing a significant transformation towards e-mobility. India's National Electric Mobility Mission Plan and China's New Energy Vehicle initiative are just two of the many regional policies promoting the adoption of EVs. However, given strong local competition in the EV value chain, the opportunity in this area for Swedish players are comparably less significant but pockets of opportunities exist within e.g., the heavy-duty sector where Scania is well positioned.



ENERGY EFFICIENCY & RECOVERY

- Position Swedish energy efficiency solutions as key to modernise and green manufacturing industry in key markets such as Japan and China



FOSSIL-FREE ELECTRICITY SYSTEM

- Opportunity to contribute to rapid buildout of renewable energy capacity, with major projects in China and India, although strong domestic value chain within solar PV limits opportunity in some markets



MATERIAL CIRCULARITY

- Pivotal role in the decarbonisation of mining practices in the APAC region
- Collaborate with local manufacturers to develop sustainable materials through recycling and material efficiency, opportunity for Swedish retailers in e.g. Vietnam and Bangladesh



E-MOBILITY

- Increasing demand with regional policies in India and China although local competition limits potential for Swedish export
- Pockets of opportunity within heavy duty segment



BIOECONOMY

- Limited opportunities to export Swedish technology for biofuels
- Explore opportunities to collaborate on more sustainable packaging in South Korea and India

Most important



Least important

EUROPE

NEW OPPORTUNITIES FOR SWEDISH SOLUTIONS IN THE BATTERY VALUE CHAIN AND ENERGY OPTIMISATION

Europe is the most important market for Swedish green technology exports, accounting for 40 per cent of the export value for green technologies. Swedish companies have a leading position within sectors like the EV value chain, bioeconomy as well as energy efficiency.

In the realm of e-mobility, stringent CO₂ emission standards exemplified by initiatives like “Fit for 55” in Europe, are spurring the widespread adoption of electric vehicles. The demand for EV batteries and materials has surged and is projected to maintain an annual growth rate of over 10 per cent in Europe. With a strategic focus on establishing a local battery value chain and reducing reliance on foreign markets, notably China, Europe is actively seeking to bolster its battery industry. The Nordic region stands poised to contribute to Europe’s sustainable, resilient, and innovative battery industry. Swedish industry is driving cell production with mineral resources, green energy availability, and strong automotive sector creating a favourable battery value-chain and EV export.

The EU region has witnessed a notable surge in manufacturing projects, particularly in automotive manufacturing and battery plants. EU policies and regulations, such as the RePowerEU Plan, are actively promoting the transition towards more energy-efficient operations. Energy efficiency presents extensive opportunities across Europe, particularly in highly industrialised nations like Germany, Italy, France, Spain, Poland, the Netherlands, and the Nordic countries. Industries with the highest potential for energy optimisation include plastics and rubber, machinery, transport equipment, and food and beverages.

In the buildings sector, both residential and commercial segments exhibit considerable potential, especially in countries characterised by high levels of industrialisation and colder climates. The European Energy Efficiency Fund (EEEF) offers significant opportunities for large-scale investments in this critical area. Sweden has seen a widespread adoption of heating pumps which is being recognised as a key mitigation effort to decarbonise European buildings. The heat pump market is set to grow 19% annually from 2022 to 2032 and leading manufacturers have announced plans to invest more than 4 billion euro to expand heat pump production capacity.

In decarbonising hard to abate sectors of transportation, like aviation and shipping, as well as reducing reliance on fossil sources for energy generation, bioenergy will also play a key role in the European market short term. Bioenergy has been key when Sweden has reduced emissions of greenhouse gases. The successes with biofuels and district heating from biomass resources could be exported to European countries with similar raw materials. Production of heating and cooling is the largest energy sector within the EU and 75 per cent of the fuels are still fossil. The EU wants to increase the share of biofuels and energy recycling by expanding cogeneration and district heating. Swedish CHP cogeneration plants have achieved a high degree of efficiency while utilising resources that would otherwise go to waste such as forestry, paper, and pulp residues. Key markets where CHP penetration has largely been supported by incentives such as Feed-in-tariff and Feed-in Premium schemes include Germany, Hungary, and Italy.

Opportunities for Swedish export are also present within the fossil-free electricity system as the demand for renewable energy surges. The EU has unveiled a new wind power package that emphasises the need for expansion of renewable energy capacity. There is also decisive need for modernization and expansion of the electricity grid. Cross border capacity on the grid needs to triple in the next ten years with emphasis on adding more low voltage lines onshore as half off all low-voltage lines could be over 40 years old already by 2030.



E-MOBILITY

- Widespread adoption spurred by stringent CO₂ emission standards
- Sweden positioned to export with strong EV value chain including emerging battery cell pack ecosystem and automotive legacy with strong export



ENERGY EFFICIENCY & RECOVERY

- Industrial opportunities for energy optimisation in nations like Germany, Poland and Italy with a policy landscape supporting shift
- Residential and commercial energy efficiency presents opportunities for EMS and heat pumps



BIOECONOMY

- Collaboration across EU vital to increase production capacity of advanced biofuels and reduce dependency on Asia
- Bioenergy and cogeneration opportunity to decrease fossil fuel dependency and collaborate on projects for BECCS



FOSSIL-FREE ELECTRICITY SYSTEM

- Large scale off shore wind projects in United Kingdom and Netherland provide opportunities for Swedish suppliers and component manufacturers
- A growing energy storage demand creates opportunities for Swedish companies in the sector



MATERIAL CIRCULARITY

- Increasing demand for sustainable construction materials
- The Carbon Border Adjustment scheme infers tariffs on carbon-intensive aluminium and steel - innovation to decarbonise with initiatives similar to green steel and recycling

Most important

Least important

MEA

SOLAR AND WIND ENERGY EXPECTED TO DOUBLE THE REGION'S RENEWABLE POWER GENERATION

In the Middle East and Africa (MEA) region, ongoing reforms and substantial investments are driving progress towards environmental sustainability. Several countries in the Middle East are now realising the importance of the green transition, motivated by two key trends: the need for economic diversification away from oil and gas, and a heightened focus on building resilience to address the impacts of climate change. Capital-strong O&G actors from the middle east are emerging as key investors in green technologies. As financial interests shift from solely O&G, these actors will play a key role in the green transition regionally as well as globally. The region is seeing a push to build out clean energy infrastructure and construction of smart cities is spurring demand for energy efficiency solutions as well as waste management and recycling technology.

MEA is poised for a notable increase in renewable energy. Solar power and wind energy are anticipated to double the region's renewable power generation by 2030. Examples include Morocco, which is actively enabling industries to generate their own renewable energy. The UAE is aiming to build the world's largest single-site solar park projected to annually save a substantial 6.5 tons of carbon emissions once operational. Egypt is aiming to become the energy nexus towards Europe from the middle East and African continent with major investments in renewables and grid. In the African region, challenges like low generation capacity, high costs, unstable energy supplies, and limited access rates have led to transformative initiatives such as the African Continental Power Systems Master Plan (CMP). Combined efforts to develop renewable energy generation and update grids establishes the MEA region as a key market for Swedish component manufacturers such as Hitachi Energy.

With several major projects and construction of smart cities, Swedish companies with broad experience in waste management and recycling can contribute to a greener development. Africa is expected to see the most urbanisation of all regions the coming 20 years, creating a demand for smart cities and climate conscious buildings. Sweden's experience within this sector positions technology and solution providers as key partners in ensuring sustainable growth. Moreover, there exists an opportunity for Swedish companies to collaborate with emerging economies in Africa and Middle east, promoting recycling and material circularity. This partnership not only presents a chance to scale decarbonisation efforts but also contributes to the broader goals of sustainable development and environmental stewardship in the MEA region.

For a deep dive on regional focus on sustainability in MEA, find Business Sweden's report "Green Growth in the Middle East" [here](#).



FOSSIL-FREE ELECTRICITY SYSTEM

- Investments in clean energy generation encouraging foreign investments
- Efforts to increase energy stability and transmission provides opportunities for Swedish companies within T&D



ENERGY EFFICIENCY & RECOVERY

- Construction of smart cities with sustainability focus creates opportunities for energy efficiency technology providers



MATERIAL CIRCULARITY

- Urbanisation and population growth increasing demand for waste management strategies including recycling as well as sustainable construction materials



E-MOBILITY

- Beginning to implement policies for increased adoption of EV but not a priority



BIOECONOMY

- Strong focus on decarbonising oil and gas production through climate tech like CCUS

Most important



Least important

HOW CAN SWEDISH COMPANIES TAP INTO GLOBAL OPPORTUNITIES?

Innovative Swedish solutions have a key role to play in the global decarbonisation agenda. Having a global mindset from the beginning is vital to scaling green technology solutions as the Swedish domestic market represents only a fraction of total opportunities in most sectors. It is imperative that Swedish companies look to other markets for new opportunities, both from a growth perspective but also to make the biggest impact and support the global green transition.

Market opportunities are rapidly evolving as new decarbonisation pathways are being developed and technologies evaluated. Companies need to do their homework and the development of a growth strategy needs to take this into consideration. Understanding the competitive landscape and the implications of country-specific policy agendas are also key strategic considerations.

Based on insight and experience gained from providing advice on market entry and growth strategies to hundreds of Swedish multinational companies and SMEs, including those with innovative green solutions, the following are some of the key factors to consider when targeting green opportunities.





SEGMENT THE MARKET TO UNDERSTAND POCKETS OF OPPORTUNITY

To successfully tap into new markets, it is important to first analyse and segment the market to pinpoint key characteristics, opportunities, and potential barriers to success. With granular data, it is possible to make better and more informed decisions for which market has the best fit – and biggest market does not always mean best.

It comes down to understanding what is driving the market forward – it could be a political agenda, private investments, customer demand, or a combination of the above. In larger markets like the EU, opportunities can be country-specific, but for markets like the US opportunities can vary on the state level and in China by province. Therefore a “one size-fits all” approach tends to not be successful. Companies must understand the market conditions for their solution and adapt their business model and value proposition to meet market demands – as this will impact how successful the expansion will be.

REAL-WORLD EXAMPLE

A legacy Swedish company was rolling out a new product category of sustainable solutions and needed to identify relevant customer groups and distribution channels in the US. A thorough market analysis identified unexpected pockets of opportunities in segments not typically known for their sustainability focus. Industry interviews concluded that 80 per cent of the market for their solutions was concentrated in a single state, which pinpointed clear use cases that could be scaled up short term.



SHOWCASE THAT THE SOLUTION IS LOCALLY VIABLE THROUGH PILOTS

For companies with innovative technologies, it is important to establish a local pilot to showcase the viability of the solution. This is regardless of how successful a company has been with commercialising its product in Sweden.

When it comes to new solutions it is difficult being a first adopter – and this is especially true in fast paced sub-sectors such as those which enable the decarbonisation agenda, where the level of uncertainty, risk, and cost of full deployment is high. Showcasing that a product or technology works in the local market, under local regulations, addressing market specific concerns (e.g., “will this product work in my climate?”), is a good first step to becoming a trusted new entrant. This can enable potential customers to make that first order and speed up the process to capture additional market share.

REAL-WORLD EXAMPLE

Despite having pilots and strong partners in Sweden, one Swedish autonomous vehicle company secured a local pilot with a global brand early on in their internationalisation efforts. The pilot aimed to showcase how the autonomous vehicle could support the logistical operations in a controlled environment and visualise how it could help decrease vehicle-related emissions.

The pilot was an important strategic milestone and set a strong foundation from which to scale local business development efforts more efficiently. In part due to having secured a strong brand as a development partner, the pilot received recognition in industry related publications which increased visibility to a larger group of local stakeholders. A natural next step was to pilot the autonomous vehicle on public roads and close orders with new customers.



EDUCATE THE MARKET AND ENGAGE WITH LOCAL ECOSYSTEMS

Whether a company is supplying a component or a final product there will be local stakeholders, in addition to end customers, which need to be identified and engaged with to facilitate a growth journey. This is much more important on export markets where Swedish companies tend to be less-known players in the local market.

Local ecosystem stakeholders can range from governmental agencies to multibillion dollar companies to smaller system integrators and/or distributors. Positioning oneself as a “thought leader” and a key partner to green transition stakeholders is important as it can help differentiate the company from its competitors, or at least put it on the same level as local players.

Navigating the local stakeholder ecosystem allows for the opportunity to learn about key market developments while also helping to educate the market on new ways of doing things. Engaging with local stakeholders needs to be done continuously and in parallel with traditional sales efforts and should not be ignored.

REAL-WORLD EXAMPLE

Business Sweden, together with Swedish academia, government agencies and industry, have supported countries around the world with evaluating various pathways for decarbonisation, on topics such as the bio-economy and renewable energy deployment. Through close collaboration with local stakeholders, key opportunities within specific mega projects have been identified e.g. airports, grid interconnections and public transportation.

Swedish companies have had the opportunity to take position as thought leaders by showcasing their technological offering, participating in technical roundtables with key stakeholders, and transforming theory into practice on the local level by leveraging and sharing experiences from other markets. As a result, the Swedish companies have been recognised as key green transition partners and others have won large deals. In the long term, this positioning effort has led to increased visibility and sales.





PRIORITISE STRATEGIC PARTNERSHIPS TO CAPTURE ADDITIONAL OPPORTUNITIES

The decarbonisation agenda requires the deployment of new technologies on a scale not seen before. To realise these projects, it's important to adopt a mentality which encourages the building of strategic partnerships and larger ecosystems.

Strategic partnerships are forming between stakeholders with green solutions and players from industries that are historically non-green, and this can be seen in everything from the development of offshore wind projects to CCUS facilities. Partnerships are also occurring among players that are upstream and downstream from each other in the value chain.

By establishing these strategic partnerships, it is possible to decrease time to market while also capturing larger opportunities. This is especially true in new markets, and or when expanding into new verticals, since companies can leverage joint knowledge and experiences, secure raw materials, gain access to key technologies, or tap into an extended network of stakeholders and customers. It is also important to gain access to new capital to secure key initiatives.

REAL-WORLD EXAMPLE

There are several examples of larger Swedish companies with green solutions combining efforts and collaborating with other players, both Swedish and foreign, from various parts of the value chain to co-fund and develop major projects such as CCUS, sustainable fuel production and batteries. These projects have been used to not only show proof of concept, but to increase scalability and generate revenue in non-Swedish markets.

Smaller Swedish players have also seen success with establishing partnerships with project developers and become preferred technology suppliers. Project developers have become important partners as they usually have a finger on the pulse, understand how to navigate the developing decarbonisation landscape, and can identify new projects, secure funding and specify technologies. These partnerships are especially important for companies whose products may not be visible to the end user.



BECOMING A LOCAL PLAYER TO ACHIEVE A BIGGER IMPACT

While it is possible to gain a footing in a new market by selling directly from Sweden or working with local sales partners, establishing a strong local presence is something that should not be ignored. A local presence will be especially important in many key markets where networking and face-to-face interactions are key or in markets where language may be a

hurdle to growth.

Localisation is not only about local sales team, but also the local adaptations needed for the products and solutions and in some cases, local manufacturing to avoid tariffs or even benefit from potential incentives and positioning.

REAL-WORLD EXAMPLE

Several large Swedish industrial companies supplying energy efficient solutions and materials for the manufacturing sector quickly realised that to capture a larger market share in China, “the factory of the world”, they had to launch products in the value segment. In many Asian markets, the value segment is the largest market segment by size and is often dominated by regional competitors. By re-thinking and adjusting the product offering, and localising manufacturing, several Swedish companies could offer highly competitive products to a lower price point – being able to capture a large market share while supporting to reduce emissions at larger scale.

HARNESSING THE POTENTIAL OF SWEDEN'S GREEN POSITION IS VITAL

The combination of Sweden's track record as a decarbonisation pioneer, its emerging green tech sector, its legacy industries, and innovative technical know-how, can all be leveraged to capture opportunities abroad.

As previously stated in this report, Sweden is a global leader in many key green areas. Sweden rank as number 5 in the green future index and as number 2 in the SDG goal index. 60 per cent of Swedish energy comes from renewable sources, mainly hydropower. During the last decade, CO₂ emissions decreased by a CAGR of 2.5 per cent. During the same period, GDP increased by 1.9 per cent annually, proving once and for all that decarbonisation and a healthy economic growth are more than possible to combine.

The Swedish green tech industry is projected to flourish in the coming years. The combination of a nation in the green global forefront with a tech sector that is both historically successful fast paced, innovative, forward-looking, and agile, makes Sweden a green force to be reckoned with.

But rankings, know-how, eagerness, and legacy, are not by any means a guarantee for success. To succeed, companies need to make the correct decisions at the exact right time. These decisions may vary, depending on where in the world you want to establish your business or sell your products.

There is no such thing as a "one-size-fits-all"-solution in any business, but perhaps even less so in the highly competitive and rapidly moving green tech sector. Painstakingly granular research is key, as is a full segmentation analysis of the market in question. Also, the value of localisation cannot – and should not – be overlooked. Decarbonisation is often accompanied by a wide array of local stakeholders, from small local businesses to global multibillion companies, regional, national, and local policy makers. To succeed, an understanding of who and what these are, what drives them, and what their impact on the market is a must.

TO SUMMARISE

The impact that Sweden and Swedish companies' can have on the green shift within energy and transport is substantial, and it is necessary to take a leading position so that the world can meet its carbon reduction targets. By addressing these global challenges head on, and if done correctly, it could become one of the biggest growth opportunities in a generation.



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BUSINESS SWEDEN CAN SUPPORT YOU

Business Sweden's green tech specialists have helped many Swedish companies, of different sizes and in diverse sectors, to maximise the impact of their strategies in the global green shift.

We can help you improve your risk management, sales and operations planning (S&OP), procurement, sustainability performance, logistics and distribution – and provide hands-on support for localisation, M&A and 'Make or buy' (MoB) decisions.

With a unique mandate from the Swedish government and the business sector, our global team offers strategic advice and practical support in more than 40 markets worldwide.



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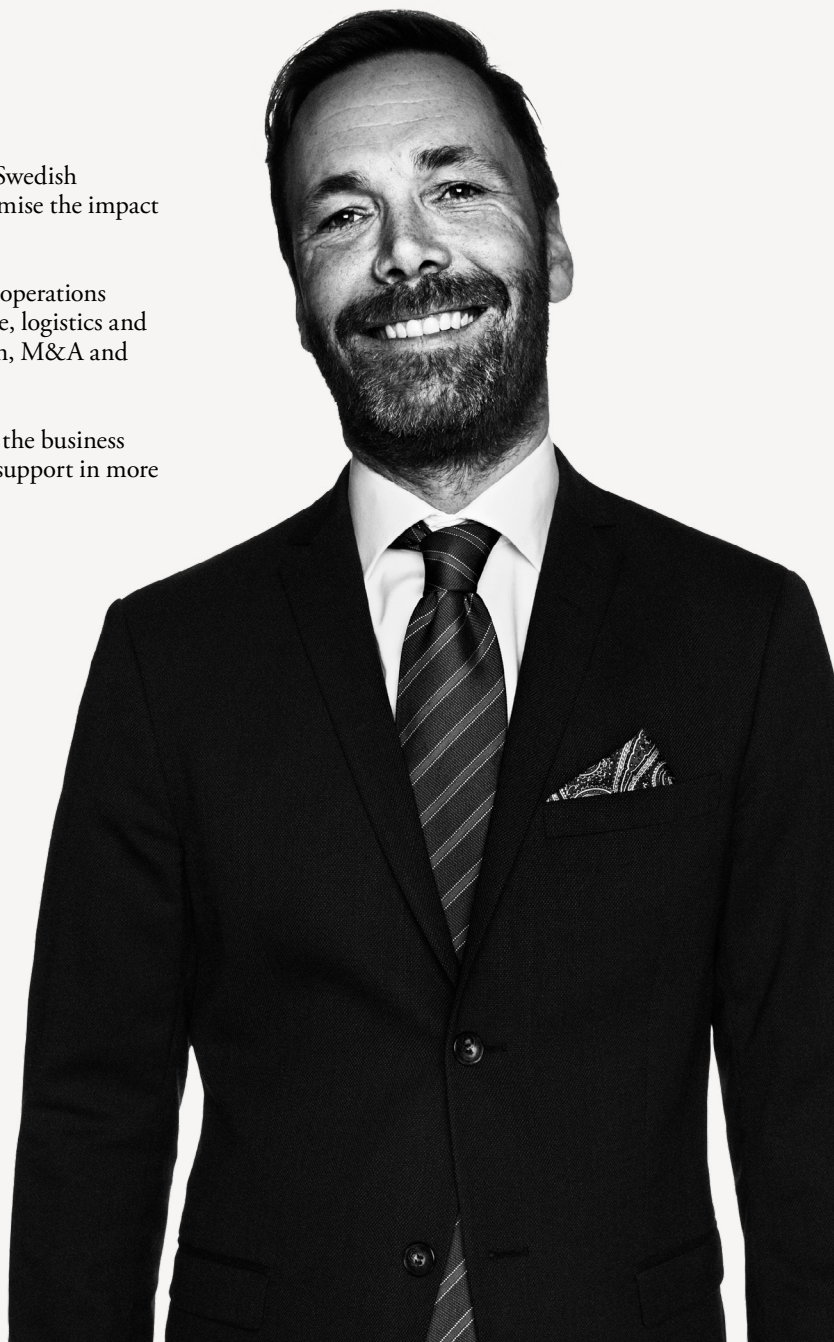
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