

# Messages from 2030

Sweden: A picture  
of transformation

NEW EDITION 2024

**SIEMENS**



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## FOREWORD BY THE CEO

# Transforming the everyday to create a better tomorrow

I am glad to share the first revision of this study, which we originally published in 2022. As we had hoped, it has proven to be valuable guidance when puzzling together the pieces of what will become of our future.

At Siemens, we often ask ourselves, “How will we live in the future?” and “How can we, as a company and as individuals, collaboratively contribute to a more sustainable world?” As the world rapidly evolves, anticipating scenarios of our future landscape is crucial to navigating upcoming opportunities and challenges.

As a leading technology company, Siemens partners with other companies, industries, and innovators to combine the real and digital worlds to transform the everyday lives of billions of people worldwide. We are committed to harnessing technology as a catalyst for scaling sustainability impact faster across the backbone of our economies.

This study explores how Sweden could look in 2030, offering insights into our society’s and economy’s evolving dynamics. We hope it provides guidance when exploring pathways for innovation and collaboration as we strive to build a more sustainable world.

The time to act is now, and at Siemens, we are fully committed to driving this change. But we cannot do it alone. We firmly believe that by embracing change and working together, we can pave the way towards a more sustainable future. Through our collective efforts and dedication, we can create meaningful impacts and drive positive change for the benefit of all. This comprehensive, realistic outlook is an invitation to everybody to join us on this journey.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'Mikael Leksell'.

Mikael Leksell  
CEO Sweden & Nordics

## ABOUT THIS PROJECT

# How will Sweden look in 2030?

To create this study, we have gathered and reviewed expert knowledge of global and local developments and (future) trends with the help of internal and external experts and the additional support of research consultancy agencies. We have conducted in-depth research on trends across industries, sectors, and potential transformation areas – and identified global trends as well as specific local trends in Sweden. To gain additional insights and validate existing trends, we have talked to scientists, as well as representatives from various industries, the Swedish start-up scene, and politicians. We have interviewed tech experts and government officials, representatives from health institutes and institutes for future studies, and experts on digital trends and sustainability about their expectations for Sweden in 2030. The results were then evaluated by Siemens and external Swedish specialists in their specific fields. Our Picture of Transformation is based on all of these insights.

## New edition

Given the ever-evolving nature of markets and political landscapes, it is essential for us to ensure that the study remains relevant and up to date. We have, therefore, completed a comprehensive first review and update of the content, originally published in 2022, collaborating closely with internal and external experts. This updated version of the study reflects the latest trends and projections, providing a comprehensive overview of what the future may hold for Sweden in 2030. We are confident these insights will continue to serve as a valuable resource for businesses, policymakers, and stakeholders as we collectively work towards a more sustainable future.



Our 2030 vision for Sweden is digital, electrified, connected and full of new business models and partnerships – this is true for mobility, as well as many other sectors. The potential for decarbonized and more efficient mobility in our society is vast and I'm proud that we at Siemens can shape these transformations together with our customers!

**Kristina Nyquist**  
CEO Siemens Mobility Sweden



Without a global shift to Net Zero by 2050, the other transformations mean little. Technology led us here, and technology is what is going to take us out of it – if we take action now and make Net Zero the True North of Transformation.

**Victoria van Camp**  
Board professional and visiting professor  
at Luleå University of Technology

## ABOUT THIS PROJECT

# Agenda

This project has identified the following eight key areas of transformation:

-  DigiTech
-  Security
-  Infrastructure
-  Mobility
-  Industry
-  Energy
-  Economy
-  Society

# You are about to discover the future of Sweden in 2030



This is not a vision of a distant utopia. It's not a flight of fancy. Rather, we present a scenario that is very probable – as long as we meet the present challenges with determination. The need for a successful transformation has never been greater. If we fail to act now, it might simply be too late. If we succeed, we can transform the everyday to create a better tomorrow.

It's human nature to aspire, to invent, and to evolve our societies. In this paper, we sketch the current vision of the future based on expert knowledge.

Let's make it happen!

# Holistic vision of 2030

This visual illustrates Sweden in 2030. The country has experienced massive digital and sustainable transformations affecting all areas of life, changing the look of our cities, and our everyday lives.



We live in complex times – and more challenging roads lie ahead. An immediate reduction in emissions is required while society reaches further, asking for more flexible, integrated, and healthy ways of living. A strong drive towards technological innovation is the starting point for improving the world of tomorrow. In the following pages, you will find the key drivers of transformation that we have identified through the Picture of Transformation project and that are valid across all sectors.



### Decarbonization

The fossil fuel era must end. Science could not be clearer: If global greenhouse gas emissions overshoot the Paris Agreement's thresholds, disastrous climate tipping points will be triggered. Electrifying the various sectors is a prerequisite to decarbonizing our economy. This, however, leads to a shift in energy consumption, with energy-intensive industries establishing in Sweden and requiring a reliable power supply. Forming a net-zero economy in a quarter of a century therefore requires immediate collaborative action on the part of public institutions and private businesses. This results in a massive push for solutions and technologies that can help manage such an unprecedented transformation.

### Circularity

Many natural resources and raw materials seem abundant. But actually all of them are limited. At the same time, given that our ethical standards have been brought into focus by globalization – such as labor rights, occupational safety and health, environmental pollution, and economic and political participation – Swedish society has developed a stronger sense of responsibility. Accordingly, the drive for more sustainable management of resources is multidimensional: Laws require increasing transparency regarding supply chains. Consumers try to reduce their footprints. In their pursuit of the circular economy, companies implement new methods for sourcing materials as well as for production.



## Social impact

Human labor has always been the most important source of value creation. Digitalization and new working models can only partially overcome this inextricable link. The smart and autonomous networks of the future still have to be developed, built, and maintained by highly qualified people. A shortage of IT experts and engineers could be a bottleneck for progress – making education and upskilling key factors for establishing a resilient yet highly flexible labor market. However, the demand for labor stretches across all levels of education, all economic sectors, and age groups. Teachers, craftspeople, and health workers are also much in demand in 2030.

## Purpose-driven technologies

Digital technologies and new business models are key to the transformation: With more information being collected by sensors, new platform approaches and connectivity solutions can re-organize more parts of our daily life. They bring together ground-breaking efficiency and convenience in the design, production, and distribution of goods and services. Artificial intelligence (AI), virtual reality, and automation are strong forces in the creation of a more efficient industrial sector. Due to rising public concern, their implementation has to be accompanied by an equally strong regulatory framework that guarantees cyber security, human rights, and consumer trust.

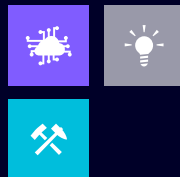


### Disclaimer: **Unforeseeable events**

The global economy will be shaped by multiple headwinds during the next decade. Some will still exist in 2030 – and new ones will emerge. This report focuses on today's knowledge and likely developments. It does not consider the impacts of possible geopolitical uncertainties like new pandemics, wars, and other developments.



### Sweden: Europe's Silicon Valley



The Swedish approach to higher education and the philosophy of supporting tech start-ups have earned the country its status as the European equivalent to Silicon Valley – making Sweden a role model for the rest of the world. These factors have also maintained its leading role in Europe's start-up scene. Many creative tech specialists have used the excellent starting conditions to fertilize new business models in Europe and the world. Some focus on sustainability-related, purpose-driven ICT and life science projects. Others have kept their focus on Krypto, blockchain, and no-code tech. In any case, startups are highly disruptive to corporate value chains as their solutions shift value creation up the value chain.

### Triple helix pushes innovation



State institutions, the nation's universities, and research facilities closely cooperating with each other and with the public sector: This triple helix, which seems like a distant vision to officials in other countries, has become established practice in Sweden. The government has left no one in doubt that they aim to make the country a world leader in digital technology and harness its opportunities. One of the most effective outcomes is the National Approach to AI, which has been carefully carried out and expanded since it was announced in 2018. Sweden is now one of the world leaders in AI development – based on an acceptance of the priorities promoted by the triple helix.

### Battle for skilled workforce



In a digital world, knowledge and technical competence are invaluable: The more complex a system, the more competent, creative, and critical-thinking people are needed to maintain, operate, and further develop it. In 2030, upskilling through digital learning helps address the lack of educated workers. However, the strong need for qualified staff in many fields remains. Companies compete in the battle for skilled workers by offering the biggest benefits for employees. But talent moves frequently between companies, constantly looking for the most exciting business models and projects. (International) talent management becomes a matter of urgency.

## PERSPECTIVES ON DETAILS

### Global trade, local production



Sweden has become a highly attractive location for (manufacturing) companies. Low operating costs due to the abundance of renewable energy, a large pool of raw materials, and a good education system are just some of the advantages. In 2030, companies have partly moved production (back) to Sweden wherever it makes sense – knowing they can rely on politically stable conditions that facilitate resilience to outside influences. This shift to “Glocalization” has been accompanied by high consumer demand for sustainable products – and is decisively supported by the public: It brings production closer to home, and in this way shortens geographical dependencies, and reduces environmental impact.

### Making conscious choices



In 2030, consumers are highly aware of the impact their consumption has. They demand full transparency when it comes to sustainability, greenhouse gas emissions, and inventory availability across all channels. National and international legislation has led to higher standards and accelerated the transformation towards environmentally sound business models. All products and processes along the value chain are directly associated with certain information on their sustainability in economic, social, and governance terms. Nowadays, providing full transparency on production and value chains is valued as a sign of a company's credibility and competitiveness.

## HIGHLIGHTS

**Visible mindset shift**  
across society to make the needed transformation happen.

**Future of work**  
is flexible – but still about the well-being of people in an increasingly digitalized world.

**Upskilling & reskilling:**  
Life-long learning via digital platforms is a new way of life.

# Infrastructure

Be it (prosumer) buildings, roads, or any other thing in the city: Everything is smart and connected in Swedish cities in 2030, elevating infrastructure to a new level of smartness and resilience – in both the real and digital worlds.





# Infrastructure: Smart, decentralized and interconnected

In 2030, major Swedish cities such as Stockholm are more human-centered, where Smart management reduces traffic, allowing the first green streets to be created. E-commerce is the general standard, and shops and service centers that once lined inner-city streets are now where people meet and socialize. The human-centered city integrates and shares roads with delivery vehicles and trucks that also need city access. AI and sensor technology help organize most everyday life needs effectively and conveniently: Smart streets prevent accidents, buildings produce their own energy, and people work in cities with many co-working spaces. Large cities are also divided into smaller hubs, with everything within a 5-minute reach.

## People contribute to producing energy

In 2030, many people contribute to energy production in one way or another. Electrical and heating power production for houses is mainly decentralized. "Prosumer" (production + consumer) houses equipped with solar panels are more common and produce more energy than they consume. Smart building technology takes over important parts of grid management – and transfers it into new ecosystems consisting of small energy-producing units that seamlessly work together. Inductive charging possibilities for electric vehicles increase. Throughout the day, e-cars serve as potential energy storage. In the evenings, they can provide the energy needed, for example, in family homes.

## A mixture of satellites and 6G

There is a gradual shift towards smart, resilient infrastructure. Eventually, an integrated mesh of 6G stations and satellite technology is established, with new kids on the block providing their own satellite communications net. While existing digital service providers face competition from these newcomers, the launch of this new breed of startups creates new types of employment opportunities and enables increasing exports of digital services.

## Climate-proofing the city

Cities are more resilient to climate change, for example, by integrating green spaces. These spaces play a crucial role in urban environments by managing increased precipitation during winter and helping to lower temperatures in summer. Additionally, with increased precipitation, there is a growing trend of people reassessing the placement of electrical substations in their homes. Basements are no longer viable options, especially for those near watercourses prone to flooding.

## DEEP DIVE: INFRASTRUCTURE

### Updating water systems

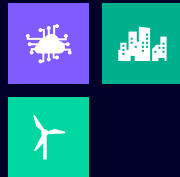
Stricter regulations regarding urban drinking water are implemented, resulting in better monitoring of its content. The presence of PFAS is minimized, and the assessment of pharmaceutical levels in wastewater is increasing. These developments result in necessary investments in the water system. Additionally, thanks to AI, municipal authorities better understand how much drinking water is lost due to leaks.

### Greener and healthier city spaces

Thanks to a new mindset, people and communities are rebuilding their environment as part of a collaborative process. Metaverse, AI, and VR solutions allow them to analyze their infrastructure to its core, using digital twins and digital information modeling. Constructing digital twins is a natural choice to minimize the impact of climate change and management costs. Regarding Stockholm's urban development, brownfield areas vanish in favor of greener and healthier spaces planned with economic and social benefits in mind.

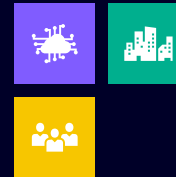


### Buildings power the grid



Offices, factories, and homes are more than places to work, live, and get together. In 2030, they play an active part in generating and storing energy as well as leveling the grid. Almost every new building is equipped with solar panels and thermal or battery-based energy storage, and it uses heat pump systems or district heating power from carbon-free sources. This makes them largely self-sustaining. Smart sensor technology increases building efficiency and transparency while at the same time lowering costs: Most homeowners can analyze the eco-balance of their houses via their smartphones, and AI supports real-time improvements to limit energy waste.

### Connected data across cities



Be it sensors for traffic prediction, smart lighting solutions, or smart locks: In 2030, we see various smart use scenarios implemented on a large scale across cities – supporting a safer, more economical, sustainable, and convenient way of living. As the increased capacity of digital platforms is made openly accessible through standardized programming interfaces (APIs), cities use them to manage real-time data collection. New data access on a broad scale helps develop new smart services and facilitates the planning of more human-centered cities. This results in growth and innovation opportunities for small and medium-sized companies in this field. With this increased connectivity, cybersecurity is paramount. Additionally, AI is an integral part of cybersecurity, contributing to making connections more secure.

### Billions

of connected IoT devices  
implemented in commercial smart  
buildings worldwide by 2030.

### Swedish buildings:

more connected,  
greener, self-sufficient,  
and sustainable.

### Smart city

Use scenarios enable a safer, more  
economical, sustainable, and  
convenient way of living.



# DigiTech & Security

Digitalization is the driver and enabler of massive transformation in all sectors. (Autonomous) artificial intelligence supports, shapes, and simplifies all areas of our lives and our digital twins—in the real world and in the Metaverse.



2030



# Digitalization: Potential and basis for mastering challenges

In 2030, digitalization is still the key driver to develop all parts of Swedish society – from mobility and infrastructure, industry and economy to how we organize our private lives. AI provides great fundamental support for people. And the combination of data collection and AI creates limitless possibilities.

## AI adoption is fluid

In recent years, we have experienced a perfect storm: Technological developments, business models, and the need for economic and social resilience progress in a mutually beneficial way, resulting in the widespread adoption and integration of AI.

## Interacting with digital twins

The fusion of real and virtual worlds in the Metaverse is a daily opportunity for people to adapt to the next stage of digitalization. Exchanging data in the Metaverse is the foundation and main influence on how we communicate and interact with each other and with things. Automated work activities, business meetings in the Metaverse, and interactions with digital twins require people to learn new soft skills to communicate with physical and virtual beings. The industrial Metaverse leads the way because of its significant competitive advantages. These include bridging different value chains such as Product Lifecycle Management (PLM) and Supply chain Management (SCM), monitoring real-time data, and predicting future incidents to optimize value. Collaborating with AI enables us to address real world challenges in real time. The fully digitalized workplace is now the natural choice thanks to vast improvements in user interfaces – that are more convenient than ever before.

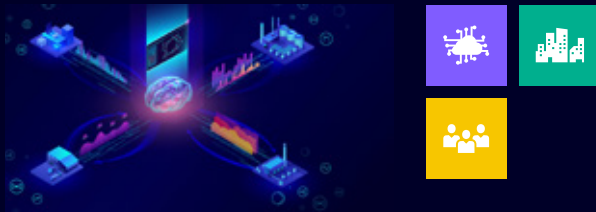
## Living in an interconnected world

In this interconnected world, everyone and everything can be connected. Sensors deliver data of all sorts, using 5G and 6G connectivity supported by new satellite networks. Data drives society. Advanced AI enables autonomous systems, devices, and processes: (Autonomous) cars, lorries, and trains permanently scan their surroundings and increase passenger safety. Bank accounts analyze cash flows and suggest measures to optimize savings. Apartments and houses regulate energy consumption for better efficiency, comfort, and convenience. In healthcare, digital gadgets detect early symptoms, prevent injuries, and monitor therapy progress.

## Legal regulations needed to build trust

Appropriate legal adjustments are needed to regulate technological advancements. Step-by-step, new standards are enforced to manage private data. Regulations and standards guide how the digital ecosystem owners are responsible for collecting, processing, storing, and protecting data. Regulations define rules for the mutual power supply within a decentralized power grid and can protect consumers from being held responsible for actions taken by their automated appliances. They can build trust. Accordingly, they are vital in laying the foundations of a resilient society.

## AI: smart decision-maker



As a decision-maker, AI is central to our world in 2030. Thanks to the omnipresence of data sourced from everything and everybody, advanced AI enables new prognoses and decision-making levels almost without human interaction. Buildings, infrastructure installations, cars, industrial plants, warehouses, and people using wearables and data goggles are all data providers. AI is the key to extracting intelligent and high-quality usable data from large amounts of source data (Big Data). Self-learning AI uses this material as a basis for building and operating increasingly autonomous systems, devices, and processes. Over the years, AI is naturally integrated into people's lives. Specialized AI is now the key that unlocks the next step of efficiency and increasing productivity. This redefines duties and focus for many occupational groups, enabling less administration and more value creation.

## Connectivity is everywhere



In 2030, connectivity shapes all areas of life in Sweden – thanks to 5G, 6G, satellites, cloud services, and advanced, real-time data processing options. The emergence of ubiquitous, borderless connectivity applies to all parts of society, to industry, infrastructure, and trillions of devices. Connectivity and automation are prerequisites for the shift to renewable energy and multiple decentralized energy sources. Thanks to the connectivity of mobility services, every citizen can move around seamlessly. End-to-end connectivity enables better oversight, transparency, and control of logistics and value chains.

## Sustainability drives technology

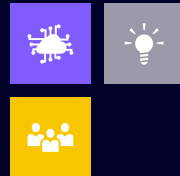


In 2030, sustainability is no longer a choice but a business necessity. Businesses adopting sustainable practices throughout their value chains are equipped to meet regulatory requirements and position themselves for long-term success. AI plays a significant role in accelerating R&D, optimizing processes, increasing resource utilization, and minimizing waste. Regulatory requirements speed up the traceability of products and services, fostering innovation awareness as sustainability data is now readily available. Greater data transparency across the value chain enables new business models.



## PERSPECTIVES ON DETAILS

### Merging the real and digital worlds



Real or digital world? Imagining or doing? This line is blurred. The virtual world brings people together in shared, virtual spaces to interact and create in private and business settings. User experience (UX) systems use augmented and virtual reality (AR and VR) for nearly seamless human-machine interfaces. AI is used as a UX driver, providing tailored solutions for each user and assisting as co-pilot prompt engineering, where needs are explained and AI assists. The real world is mirrored in the virtual as its digital twin, whether they are energy grids, the complete industry, supply chains, people, and places. In this mixed reality, we simulate, analyze, and test products, services, and technologies; we test functionalities and improve processes and maintenance in all aspects of life before we apply them in reality – and all of this without physical boundaries.

### Zero Trust becomes fundamental



As everyone and everything is connected, digital security acquires a whole new level of seriousness. Secure and reliable data enables new applications and business models. Confidence and trust are the key elements. As more and more data are collected and exchanged, zero trust concepts are increasingly mandatory. The Zero Trust strategy mandates preliminary security checks for everyone and everything and is increasingly common within companies and private use scenarios. This requires strict identity verification for any person or device. User identification ensures that zero trust policies are manageable and scalable.

## HIGHLIGHTS

The Industrial Metaverse

### mirrors

real machines, buildings and transportation systems to solve real-world problems.

### Trust:

A precondition for every business transaction.

Police implement more digital technologies for

### prevention measures.

Communication net in 2030:  
Multi network without human interactions, sustainable, trustful, and with self-reliant data provider –

### partly through new kids on the block.

### Individual cybersecurity –

New systems for user identification will be used, privately and in work.

# Mobility

Mobility in Sweden has seen significant transformations by 2030. Because everything is connected and there are seamless (ticketing) systems, people and goods can travel more conveniently in a climate-neutral way.



# Mobility: Flexible, seamless, convenient, and electrified

The way people and goods move around is one of the most fundamental social and economic processes, entailing all kinds of questions: How and where do we live? Where and how can we grow food or build factories? When do we work, where do we meet our friends, how much time do we spend on roads or trains? Who can afford to move quickly and comfortably?

## Seamless, connected travel solutions

In Sweden, mobility in 2030 has evolved in many ways: E-vehicles, car-sharing, and smart mobility apps were only the early signs of a large-scale transformation. People now move more efficiently, sustainably, and comfortably. They have access to seamlessly connected travel solutions like bikes, scooters, cars, buses, and trains using new ecosystems. Goods can be delivered on short notice and through more flexible options – consumers and companies have partial access to drones, new air-mobility services, and in specific cases even self-driving vehicles. These transformations have not been achieved solely by existing mobility providers, but rather by new market players, collaborations, and unexpected partnerships with new, innovative business models.

## Mobility as a service is the new norm

“Mobility as a Service” solutions are the common way to move around for many people. Smart apps, new data pools, and new business models allow providers to integrate formerly separated fields – and provide the most efficient combination

of transport possibilities. These new connected mobility services offer end-to-end solutions for customers: on demand, in real time, and with precise information for customers, drivers, operators, and more. All of this is enabled through 6G, sensors, and integrated data interfaces. With more data, public transport solutions are more flexible, more user-friendly, and more sustainable. Peaks in demand are being reliably predicted, waiting times are reduced, routing is optimized, and emissions are cut. To achieve this, government and companies have mastered a massive infrastructure roll-out in recent years.

## Cities: Less pollution, less noise

Sweden has been able to use its excellent starting conditions. Thanks to more connected, seamless, and digital mobility, cities like Stockholm or Gothenburg especially have moved in a greener, cleaner, and healthier direction: There is less air pollution and less noise but more space for recreation and for rich social interaction. The country now serves as a role model for others. Many challenges that seemed overwhelming at the beginning of the century have become manageable.



## HIGHLIGHTS

### Mobility as a service

is a norm & new mobility ecosystems have emerged.

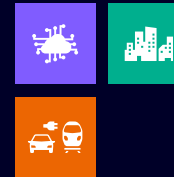
Massive build-out in public & at homes of  
**stationary e-charging infrastructure.**

Digitized passenger interface, monitoring control system & “signaling in the cloud”  
**increase rail efficiency.**

## PERSPECTIVES ON DETAILS

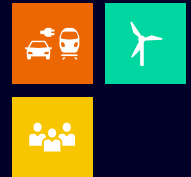
# 2030

### Digitally connected rail solutions



Be it transporting goods or through people traveling from one place to another: Rail systems have increased in significance. Their transformation is still ongoing, providing a convenient and eco-friendly way to commute and travel. Digitally connected rail transport solutions, which continue to emerge, enable significant capacity increases. Digitized passenger interfaces, monitoring control systems, longer and heavier trains, and automated processes for operation and maintenance are being used to increase efficiency. A system of night trains and seamless ticketing connects cities all over the continent, challenging aviation as the most important means of international travel.

### A world full of wall boxes



In the early years of electric mobility charging along the route was one of the key obstacles for users. In 2030, those inconvenient times are long over. Thanks to a massive roll-out of stationary e-charging infrastructure within cities and across the country, orchestrated by the public and private sectors, public places and private homes are equipped with high-power charging. The massively built-out grid benefits from the option of vehicles partly serving as energy storage when production peaks on windy or sunny days – and vice versa providing energy when turbines stand still and at night. Inductive charging is slowly becoming more prominent.

### Smart transport management



Instead of being overcrowded during peak traffic times, cities and transport routes are calmer and safer even on busy main streets. The 2020s saw a series of victories by “Mobility as a Service” providers developing smart solutions for urbanized areas. In cities, fewer people than ten years ago own cars as seamless transport solutions have become cheaper and more convenient. Real-time data delivery, smartphone apps, and connected interfaces between providers have established ecosystems that guarantee efficient routing for people’s mobility and the transport of goods. This has helped bring intermodal delivery solutions to a new level – for urban goods distribution and end-to-end freight.

### Major progress in air mobility



The way we move through our cities and how we transport goods has visibly changed. People are starting to see the first vertical take-offs and landings here and there – but new air mobility solutions such as electric city air taxis, regional e-jets and electric helicopters are ready for their first commercial use. Delivery drones are used for express deliveries in situations like health emergencies or for essential production goods. Advanced Air Mobility (AAM), though still in its infancy, promises to make life much more convenient and to further reduce the load on urban streets and rail. And in addition, it supports the transition towards a decarbonized transport sector.

# 95%

of new cars produced are powered by electricity.

# ~50%

of all cars and light trucks on the streets in Sweden are electrified.

### Advanced air mobility e-solutions

(eVTOL air taxis, e-jets, electric planes, drones) are in first commercial use for private individuals.

# Energy & Industry

A perfect interplay of renewable energies – including solar, wind, and green hydrogen – puts Sweden on the path to being climate-neutral, enabling a decarbonized industry, driven by AI and supported by new business models.



2030





# Energy & Industry: Circular, automated, and decarbonized

The drive for decarbonization has been a key driver of massive developments. By 2030, our energy acquisition, production, storage, and usage methods are far more sustainable. Compared to ten or twenty years ago, we have massively increased sustainable power production to fulfill the requirements of a primarily electrified industrial sector, new establishments of energy-intensive industries, and the rising energy demand. Thanks to a concerted effort, Sweden has changed enormously and is on its way to being climate neutral. To change at this enormous pace and become climate-neutral, Sweden made an action plan with a long-term commitment from the politicians. This was crucial to make sure Sweden did not fall behind in important areas such as 5G and 6G, green steel, and battery production. Sweden now keeps its leading position in this industry transformation and continues to attract new investments.

## Sweden is a pacesetter for renewables

Sweden has a strong position regarding renewables: Most buildings are equipped with some form of decentralized energy production, and solar panels are visible on rooftops across Sweden. Improved permit processes enable skyscraper-tall wind turbines on- and off-shore and political interest in nuclear power contributes to fostering a technology-neutral approach alongside renewables. Sweden and the Nordics are now the leaders in Europe for green hydrogen production due to a combination of ambitious climate targets and large amounts of cheap fossil-free energy – enabling new uses of green hydrogen in the industrial sector.

## Shifting landscape in energy production

During the mid twenty twenties, we saw a political shift that fostered a renewed interest in nuclear power, promoting a more technology-neutral approach that balanced increased nuclear with a continued focus on renewables. Other contributing factors were improved financing mechanisms, risk-sharing, and incentivized new nuclear reactor projects. However, securing long-term political support and addressing public concerns remain crucial in 2030. The deployment of Small Modular Reactors (SMRs) is closer and prioritizes regional energy needs rather than national-level baseload power. Despite permitting complexities, SMRs are set to replace diesel generators, fulfilling the commitment to phase out fossil fuels with clean, reliable reserve power. Existing nuclear plants are also being upgraded to increase output and extend their lifetimes.

There is a significant expansion in solar and wind power, both offshore and onshore. This balanced approach ensures Sweden remains a leader in renewable energy.

The growing demand for electricity and the increasing use of intermittent renewable sources like wind and solar power highlight the need for pumped hydro energy storage. This shift in energy production increases grid volatility, creating opportunities for traditional hydropower and pumped storage plants to offer ancillary services and stabilize the grid. New pumped hydro plants are being developed alongside existing ones to provide these services and long-term energy storage.



## DEEP DIVE: ENERGY & INDUSTRY

Hydropower is the most crucial regulatory resource in the power system. While other large-scale energy storage solutions may emerge, there is uncertainty about which technologies will be widely adopted.

### New business models and digital solutions ensure grid flexibility

The grid is evolving to incorporate millions of diverse and variable energy production sources. We have moved from an energy system where generators output is based on consumption demand. Now, storage and the consumption adjust output levels according to the grid's generation and capacity availability. Various flexibility solutions are implemented to optimize the grid. Digital solutions, such as sensors placed throughout cities, generate large amounts of data. AI evaluates this data in real-time to equalize power peaks and ensure efficient energy storage and distribution. Additionally, new business models, such as performance-based contracting, revenue sharing, and similar, are vital in securing a stabilized and efficient grid.

To ensure grid flexibility, the market potential for various energy storage solutions and battery storage installations is growing dramatically across different sectors, addressing the need for ancillary services. Combining battery storage with traditional power plants to create hybrid power plants is increasingly popular. Additionally, electrical vehicle (EV) owners are incentivized to participate in Vehicle-to-Grid services and peak shaving, leading to a higher penetration of EVs in low-voltage networks. Cybersecurity is exceptionally important for industries and the energy system, especially after joining NATO.

## DEEP DIVE: ENERGY & INDUSTRY

### Companies are motivated to push further

Industries are key drivers and enablers in moving Sweden towards climate neutrality. With this success in mind, companies are more motivated than ever to push further. The demand for renewable and fossil-free energy enables industries to achieve CO<sub>2</sub> neutrality. The steel industry, for example, is a frontrunner for sustainability by using green hydrogen in its production. Recognizing the importance of circular value chains, companies work hard to rethink how they use materials, design products, and keep after-life materials in the production cycle – with the support of digital solutions and AI. Additionally, government funding and support further bolster the shift towards circular value chains. Wood-based products are certified as carbon storage, and bioeconomics is implemented.

The increased demand for fundamental raw materials is due to a globally growing population and ongoing energy transition. This positions Sweden as a crucial player in the European Union's efforts to become more self-sufficient in minerals and critical raw materials.

## HIGHLIGHTS

### Sweden:

Leader in green steel, battery production, and setting up bioeconomics.

### Doubled electricity demand:

by 2045 due to electrification of industry and establishment of energy-intensive industries.

### Huge demand for renewable energy

since industries need to be CO<sub>2</sub> neutral.



## HIGHLIGHTS

Industries are steered  
by self-reliant &  
**self-learning cobots.**

Every product, process, and  
operation share sustainability  
information (ESG)  
**along the  
value chain.**

**All energy grids**  
have a digital twin.

## PERSPECTIVES ON DETAILS

# 2030

### Developed and digitized energy grid



As more intermittent renewable energy sources are fed into the grid and transmission needs evolve, the grid must be used increasingly intelligently. Therefore, the Nordic Power System is transformed into a sophisticated digitalized smart grid. The digitalization of electricity networks enables optimized network capacity usage and speeds up authorization processes for connecting renewable electricity producers and prosumers. Digital twins for energy networks are crucial for capacity planning and control, enabling an increasingly proactive data generation from field devices managed by the

digital twin. This increases transparency and analytics, resulting in more efficient and stable grid operations, ensuring enough power is transmitted where needed.

AI is increasingly used to make grids more autonomous, self-healing, and self-organizing. AI is important in grid planning and operation to ensure fast connection processes and a secure electricity grid. There are visible cases where AI helps lower consumer energy costs through flexible and efficient energy use. Additionally, there is a rise in demand-side flexibility, contributing to a more efficient operation of the electricity grid and electricity market.

### New business model: XaaS



Anything-as-a-Service (XaaS) is key for B2B and related data-driven platforms. Software-, Ransomware-, and Platform-as-a-Service are the major business contracts. Due to information and operative technology (IT/OT) blurring, platform economy, and digital marketplaces like XaaS, business models grow in almost every industry and for all kinds of products, tools, and technologies. B2B is increasingly done as pay per use, pay per services, pay per CO<sub>2</sub>, or pay per steel. XaaS models also support recycling, reuse, and remanufacturing –mainly thanks to data from the entire lifecycle, products are optimized.

### Resilience based on forecasts



With more manufacturing and energy production decentralized and more players in the market, economic development is harder to predict. Load balancing, market forecasts regarding pricing levels and volumes or supply chain management, trading companies, aggregators, balance-sheet managers, energy providers, and many more all need reliable data. Advanced forecasting algorithms ensure quality and precision. Industrial and infrastructure companies significantly benefit from prediction methods that can flexibly adapt to sudden disruptions and changing customer requirements. This ensures stable business patterns despite volatile markets.

### Smart autonomous factories



Self-learning AI is a (key) decision-maker for most business, manufacturing, and logistics processes – increasing efficiency and precision almost without human interaction. In many areas, humans and cobots seamlessly cooperate and are connected through collaborative tools in the Industrial Metaverse. Devices integrate and evaluate information, using AI to ensure feasibility in industrial applications and working in ecosystems of self-learning algorithms. These semi-autonomous systems, devices, and processes support, for example, “lights-out factories.” Plants in the Machine Economy are autonomous market participants powered by the Internet of Things (IoT), blockchain, and AI/machine learning.

# Advancing Sweden's society and economy

At Siemens, we work with all sorts of relevant partners to create a better tomorrow. Our activities in countries like Sweden revolve around the goal of a net-zero economy by 2030. Challenges include the rebuilding and updating of factories to ensure clean industry, digitalizing existing infrastructure, establishing reliable ecosystems that help companies improve their production efficiency, as well as contributing technology for more sustainable ways of working.

## Help customers achieve their goals

Our customers in Sweden embrace this transformation. They are pioneers who need technology to solve real problems, create value, and obtain competitive advantage. That is why Siemens' ambition is to create technology with purpose: to help them transform their businesses. To translate the drivers of change into sustainable progress, businesses need simulation technology to support the analysis of processes. They need resilient systems that can grow as fast as their companies, enabling sustainable value growth. They need a partner like Siemens that thinks outside the box.

## Creating technology with purpose

With our deep domain know-how, a strong partner ecosystem, and our leading technologies, Siemens is positioned to drive Sweden's sustainable transformation. Our ambition is to drive sustainability in all areas and strategically

invest in our portfolio. We have always had a strong commitment to our role in society, our communities, and as an employer. By investing in our people, we create an environment where they can thrive, with a commitment to lifelong learning, equity, and well-being. Through our Environmental, Social and Governance framework (ESG), DEGREE, we are committed to creating a better tomorrow by doing more with less.

## Multiply impact: Transformation needs cooperation

Now is the time to act to master humanity's biggest threats and improve people's lives. We believe that the upcoming transformation will work best if different stakeholders come together. Within an ecosystem of partners, businesses and communities, people need to jointly develop solutions for a more flexible, cleaner, and healthier Swedish economy, using planetary resources more efficiently. We want to enable our Swedish partners to achieve their goals, multiplying our collective impact across whole industries and the backbone of our economy.

Looking back through history we know one thing for sure: Real progress always needs collaboration. By working with each other, we are stronger and can multiply our impact. We stand ready to work together with anyone who wants to make an impact for a more sustainable future.





## OUR CONTRIBUTION

With our portfolio, and together with our partners, we develop sustainable innovations for a more livable world.

The key opportunity areas we identified throughout this project include:

- Digital Decarbonization
- Electrification and new Business Models
- Circularity
- Ecosystems & Partnerships
- Emerging sectors focusing on new green technologies
- Shaping new industry standards
- Digital Twins & Simulation
- Connectivity and Data Management
- Autonomous Decision Making & Prediction





## Messages from 2030

Sweden: A picture  
of transformation

**NEW EDITION 2024**

Published by Siemens AG  
Werner-von-Siemens-Straße 1  
80333 Munich  
Germany

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