Denmark: A global role model

The Nordic country comes out of the pandemic with a stronger economy and as a leader of the digital and green transitions

Copenhagen aims to be the world's first carbon-neutral capital

The Danish economy overcame COVID-19 at a remarkable pace. It returned to its pre-pandemic level in spring 2021 and expanded by a total of 3.9 percent that year, according to Ministry of Finance forecasts.

Nicolai Wammen
Minister for Finance

It's a scale of growth that the small nation hasn't surpassed in over two decades, says Nicolai Wammen, Minister for Finance. "Our economy is very strong at the moment: we weren't hit as hard as many other countries, but we've also rebounded faster than most. If anyone had said to me a year and a half ago that we would be in this situation, I'd have said let's get back to planet Earth because, at the time, we dared not dream that we could be."

As soon as the pandemic hit, the government started catalyzing this extraordinary recovery by implementing substantial health and economic measures to support businesses and citizens. It was able to take on the financial burden of these due to Denmark's status as a triple-A-rated country with a robust banking system and one of the lowest ratios of debt to gross domestic product in the European Union. Another contributor was its productive industries, which kept running throughout the crisis. "When the world economy was gaining speed again, that meant our companies had their employees at work, ready to take the opportunities that came their way," comments Wammen. "The biggest challenge we face now is if we get too much speed on the economy and it overheats, so we're lifting our foot of the accelerator to deliver long-lasting growth for the economy."

The minister, like most Danes you talk to, is convinced that a key weapon in the country's battle against COVID was its unique socio-economic model rooted in trust, openness and collaboration. As David Briggs, CEO of the roof-window specialist VELUX Group, puts it: "There's a real spirit of partnership between the government, corporate sector, workforce and general public. There's no conflict, rather there's an expectation that we ultimately have similar goals and can only achieve them working together, which enables us to go much further much faster than others in addressing challenges," This spirit was demonstrated by Denmark's extensive pharmaceutical and biotech ecosystem during the pandemic, says Anne-Marie Levy Rasmussen, CEO of the state-owned Innovation Fund Denmark. "An innovative force swept through the country as our researchers, companies and public sector came together. Everyone here always leans in to play their part in developing a shared solution."

This approach to solving challenges collectively and with innovation has helped the country become a worldwide force not just in life sciences, but in a a wide range of sectors, including wind energy and other green technologies, fintech, food ingredients and shipping, believes Brian Mikkelsen, CEO of the chamber of commerce Dansk Erhverv. "The simple answer behind the success of all our growing industries boils down to public-private partnerships."

It has also given the country a huge head start in the two biggest global issues for the post-pandemic era: it's one of the most digitalized countries in the world and it's been ahead of the curve in the green transition for decades. "Denmark has shown it's possible to reduce carbon emissions while still having economic growth and creating jobs. For businesses here, and for the political system, sustainability is a prerequisite for prosperity," Mikkelsen says. Wammen agrees: "My job is to balance the budget and make sure we have growth, it's also to do that in a responsible way when it comes to the climate and green transformation. We're currently working on a green economic model, where we're becoming much better at estimating what green initiatives mean for the economy and vice versa. Denmark has been used as an example of how to do this within the global Coalition of Finance Ministers for Climate Action."

Mikkelsen highlights one challenge for the economy at the domestic level: "Denmark is an extremely good, stable place to do business, but right now there is a shortage of labor in almost all industries." The Danish unemployment rate is currently at its lowest level in 12 years, Wammen explains. "Because the economy is moving so fast and there's a great sense of optimism, companies have all been hiring at the same time. We also see that, on a more structural level, we'll need more hands The good news is that we've taken steps and agreed initiatives that will make it easier for companies to hire the people they need and we're also looking internationally to attract more people to Denmark."

> **"Our economy is very strong at the moment: we weren't hit as hard as many other countries, but we've also rebounded faster than most."**
> Nicolai Wammen, Minister for Finance

As the country puts the pandemic behind it, the minister reveals his new priorities: "In order to put Denmark in an even stronger position 5-10 years from now, I want to make sure we undertake reforms to make Denmark richer, greener and wiser, and that we invest further in the green and digital transitions."

Defensive economy equipped to withstand COVID

A boom in IPOs reflects Denmark's strengths in resilient sectors and a stock exchange operator that has enabled effective trading


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The Royal Danish Playhouse at Copenhagen's inner-city harbor

Denmark's outstanding economic performance over the last two years can be explained by its industrial strengths, says Nikolaj Kosakewitsch, president of Nasdaq Copenhagen, the country's stock exchange. "It's a defensive economy with a lot of exposure to goods and services that will always be demanded, no matter what happens with the pandemic or global supply chains."

The economy's composition is replicated in the companies listed with Nasdaq Copenhagen, he adds. "The majority are defensive by nature, meaning pharma, medtech, biotech, food ingredients and utilities. As a result, when COVID hit, we didn't have a big drop in market capitalization. In fact, we've seen a 50 percent increase since the start of 2020." One of four exchanges that global capital-market services provider Nasdaq operates in the Nordic region, Nasdaq Copenhagen has also seen an expansion in investor numbers, including many individuals who had never traded in stocks before the pandemic. This is benefiting both established businesses on the exchange's main market and those on Nasdaq's First North Growth Market for emerging Nordic firms, reveals Kosakewitsch. "It's hugely advantageous for newly listed companies or ones on the verge of an initial public offering (IPO) and its part of the reason we've had such a big IPO boom in Denmark and across the region."

> **"We have a strong opinion about the green transition and how Nasdaq can help."**
> Nikolaj Kosakewitsch, President, Nasdaq Copenhagen

Major contributors to its investor-base growth are the high level of digitalization and financial literacy in Denmark, with most of the population doing its banking, personal financing, taxes and shopping online. Equity culture is also flourishing in a country driven by innovation and entrepreneurship, he states. "The pipeline of companies on our growth market looks very strong. These aren't startups that want to sell for a quick dollar—they are founder-led, passionate about their businesses and want to drive them for the long run. However, its important to note that many are in their infancy and you shouldn't expect all newly listed companies to be the next Facebook, which is why we spend a lot of time explaining that it's a riskier segment to invest in."

Best known as an exchange operator, Nasdaq's support of the worldwide financial sector extends much further to include listings, trading, market data, investment intelligence and technology that powers over 90 marketplaces. "Our technology business is growing a lot. We supply global capital markets with infrastructure technology and are focused on investing in anti-financial-crime technology as well. Last year, we acquired Canada-based Verafin, which is world class in this area. This is where customers are looking to us for support and that is where we are going to give it," asserts Kosakewitsch. Nasdaq is also targeting technology toward environmental, social and governance (ESG) issues. Recently launched services include an ESG Data Portal that offers standardized ESG and financial metrics for companies listed with its Nordic exchanges; the Nasdaq ESG Footprint platform, which allows investors to rate the sustainability of their portfolios; and the Europe-wide Nasdaq Sustainable Bond Network that gives insights into thousands of global bonds.

Nikolaj Kosakewitsch
President
Nasdaq Copenhagen

"We have a strong opinion about the green transition and how Nasdaq can help make the world a greener and better place," he explains. "In line with this, we invested in Helsinki-based Puro.earth last year. It's a platform that helps businesses that want to become carbon neutral or negative to buy carbon-removal certificates. It matches them with certificate issuers and aligns well with Nasdaq's marketplace strategy: we were born as a marketplace operator and Puro is doing the same thing, just within carbon-removal certificates." In addition, Nasdaq provides Green Equity Designation accreditation for firms that derive over half of their turnover from environment-friendly activities and it runs a substantial sustainable bond market, which is seeing an explosion of activity. "Businesses that want to go through a green transition need debt or equity financing, which we are helping to solve. The markets we operate in are at the center of the transition to a more sustainable society, and almost all of the companies that we are IPO-ing are thinking about sustainability. We will certainly continue to rollout ESG offerings in Copenhagen."

Nasdaq: Optimizing marketplaces

- Nasdaq Copenhagen: **50%** growth in market cap since Jan 2020
- Nasdaq Europe: **174** IPOs in 2021
- Nasdaq Global: **~3,900** listings
- Nasdaq Global: **~$13tr** market value

The Danish model: Transparency, trust and balance

Anne Hougaard, Director, Invest in Denmark, reveals why the country attracts innovative, life science and green technology investments


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Copenhagen is regularly ranked as the world's most-livable city

As the country's investment promotion agency, Invest in Denmark advises international investors and facilitates their investments. What are some of the country's unique advantages that make it a successful destination for foreign direct investment (FDI)?

The broad answer has to do with overall concepts such as transparency, trust and balance. To borrow a phrase from a former French ambassador, "Denmark is the country of balance." It's a country built on a high level of social trust and this pours over into our labor market: we have one of the world's most flexible labor market regulations that is based on a transparent and trusting paradigm between employers and unions. In short, you can hire and fire more easily than you can in comparable European Union (EU) countries.

The World Bank ranks Denmark first for ease of doing business, and we have a digitalized and transparent system for establishing and running a business. We have a long tradition in public-private partnerships as well, and you see many examples of companies, local and national authorities working closely in tailor-made partnerships. We also do well in education, skills and had the fifth-largest spend on research and development (R&D) in the EU in 2020. Additionally, we have a world-renowned work-life balance: there are a lot of educated people here that want more than just a career. They also want a full life in livable cities, which Denmark offers—in Transparency International's rankings, we compete every year to be the happiest population in the world.

> **"Denmark is among the most digitalized countries in the world and ranks first in the EU's Digital Economy and Society Index."**
> Anne Hougaard, Director, Invest in Denmark

The Danish economy is estimated to have grown by 3.9 percent in 2021. What factors and sectors lie behind its resilient performance?

The most significant element driving our growth is that Denmark is among the most digitalized countries in the world and ranks first in the EU's Digital Economy and Society Index. Because we are highly digitalized, we are well positioned to withstand shocks. In a health crisis, Denmark also has an advantage because we have very robust healthcare and life science industries. For example, we are home to state-of-the-art pharmaceutical companies and have one of the strongest R&D environments for medtech, pharmaceuticals, biotech and healthtech. In addition, Denmark is ahead of the curve in many aspects of the green transition.

What are the most attractive investment opportunities in Denmark today?

Anne Hougaard
Director
Invest in Denmark

The obvious opportunity would be in green solutions and technology. Our government has the ambitious goal of reducing our carbon-dioxide emissions by 70 percent by 2030. As a result, Denmark has the regulatory framework to test, develop and scale green solutions. We also have big offshore wind investments and a stable grid that is interconnected to the rest of Europe. We've been successful in attracting investments in power-to-X, for example, because we have cheap green power and connections to Germany, which has adopted a strategy to use green hydrogen. This makes Denmark an interesting place to invest in areas like hydrogen, as well as carbon capture and utilization. In a historic moment, Germany's RWE recently won a concession to build Denmark's largest wind farm to date. For the first time, the state will be paid for the authorization to build an offshore wind farm, which demonstrates the competitive prices and capacity to create gigawatts of renewable energy that are present here.

Regarding life sciences, clinical trials is one area where Denmark has something unique to offer and the government has also created framework conditions enabling companies to produce cannabis for medicinal purposes, which has attracted a lot of investments. A third example is the result of Denmark being very digitalized, as we have comprehensive patient data that makes it attractive for testing medtech and digital health solutions.

What is Invest in Denmark's strategy for attracting investments?

We have an extensive presence in Europe, Asia and North America, where we operate in New York, Silicon Valley and Toronto. The U.S. currently accounts for 25 percent of our inward investment flows. Life sciences and greentech are important sectors for those investments as the U.S. has a lot of innovative companies providing digital solutions that are looking to Denmark because of the framework conditions we offer. FDI stock in Denmark has been relatively robust in recent years: before 2019, stock increased by around 10 percent a year on average, although from 2020 to 2021 we saw only a 4 percent increase due to the pandemic. In 2020 we launched a new strategy that focuses on attracting investments that foster productivity and innovation, connect Danish companies to the rest of the world and make them competitive in a global market. Secondly, we want investments that support our green transition and our third priority is to attract investments all across Denmark. My main ambition is to grow the number of FDIs while not compromising the quality of investments.

The Danish recipe for scientific innovation

Investment in research and public-private partnerships has nurtured a community that acts quickly to address societal challenges

University of Southern Denmark undertakes large-scale research

"Denmark has been at the center of a wide range of major scientific and technological breakthroughs. The root cause of this is that we have excellent researchers and universities, plus skilled experts in industry who translate their research into commercially viable global solutions," states Anne-Marie Levy Rasmussen, CEO of Innovation Fund Denmark (IFD).

Anne-Marie Levy Rasmussen
CEO, Innovation Fund Denmark

Since 2014, public agency IFD has been a major cornerstone of the nation's research and development success, she explains. "We invest in entrepreneurs, researchers and businesses, providing them with risk-willing, soft funding to develop workable solutions to pressing challenges, primarily the green transition, health, and the adaptation and use of new technologies." According to its CEO, a key strength of IFD is the breadth of its initiatives. "It's a one-stop shop for innovation. For example, we have programs that target high-risk entrepreneurs, small and medium-sized firms and large partnerships. We have the full toolbox: if you want to join a European Union (EU) research program, partner with international companies or universities, or get investment to spin-out your business, it can all be done with IFD."

The agency facilitates collaborations within the Danish innovation and research ecosystem to unlock its full potential, she adds. "We want to use our programs and knowledge to ensure that the most competitive innovation partnerships are funded and that we also fully realize the capabilities of our thriving startup scene. To date, we have financed almost 2,000 startups, which we can help on every step of their journeys."

Innovation Fund Denmark 2021

$1.1bn in active research and innovation investments

$250m in new investments

2,400 active projects

3,700 applications a year

As one of the world's most digital societies, Denmark's advanced use of technology, data, analytics and digitalization helps radically with its creation of innovative solutions. Rasmussen highlights an impressive energy sector that includes renewable specialists Ørsted and Vestas to illustrate this: "With IDF as an investor, Vestas in collaboration with our universities has achieved wind-power breakthroughs and commercialized them at scale. Another area to spotlight is agriculture and sustainable food, where we boast companies like Chr. Hansen, the food-ingredient developer." A further innovative stronghold is a vibrant life-science ecosystem that includes companies from pharma giants to high-tech startups, and Denmark's long-term investment in health research paid off during the pandemic, she says. "We felt a responsibility to support society to get through it. We put out a call that resulted in the biggest number of applications we've ever received—the whole community mobilized around the challenge." Among other solutions, this initiative led directly to a COVID-19 vaccine, which emerged from a IFD-funded University of Copenhagen research group and is now being developed by biotech firm Bavarian Nordic.

> **"What's critical is that we address the global climate challenge with the same mindset as we tackled COVID-19."**
> Anne-Marie Levy Rasmussen, CEO, Innovation Fund Denmark

"It shows that when you invest in education and research, and foster collaborations between companies and universities, you're nurturing a culture and environment that can act quickly," Rasmussen enthuses, adding that IFD is now mustering resources toward the worldwide green transition. "What's critical is that we address the global climate challenge with the same mindset as we tackled COVID-19. We need to act now, with companies and researchers moving together at pace with shared purpose." To encourage this, IFD has launched Innomissions, a program with four research and innovation missions: carbon capture, green fuels, environment-friendly agriculture and food, and the circular economy, particularly in relation to plastics and textiles.

Rasmussen is keen to point out that no single country can solve global challenges alone. Therefore, IFD taps into worldwide innovation networks to build knowledge and partnerships, as well as to support talent. "We need international partners and are connected to a lot of different platforms, such as the EU Horizon programs, and we also have an agreement with the U.S. Department of Energy. Like the pandemic, climate change affects everyone: we need global solutions and integral collaboration, and that's why IFD is making every effort to engage internationally."

Digitally literate and connected

Businesses and the government have worked as a team to make Denmark a frontrunner in digitalization, where every aspect of life is digital by default

Denmark labor: highly skilled and business oriented

"Digital tools ranging from apps and meeting platforms to robots are one of the most important reasons why Denmark managed the pandemic better than most," believes Lars Sandahl Sørensen, CEO of the Confederation of Danish Industry, the country's largest trade body.

The nation adapted to these tools seamlessly, as expected from such a highly digitalized country—last November, it was crowned champion in the European Union's Digital Economy and Society Index (DESI), which has four benchmarks: human capital, connectivity, integration of technology and public services. "When it comes to public digitalization, we're probably the best in the world. All information goes through digital communication," says Brian Mikkelsen, CEO of the chamber of commerce Dansk Erhverv.

Denmark continues to push digital boundaries forward, he states. "We're focused on how to leverage the possibilities of technology in all industries and speed up the digitalization of society. For instance, government ministries, the heads of our largest companies and other business leaders including myself, formed the Digitalisation Partnership last year to design new policies and guidelines in this area." In October, the partnership presented a 46-point digital roadmap of legislative tools and other measures that aim to take the country to the next level in digitalization in order to, among other things, foster sustainable economic growth and the green transition.

Denmark is able to advance digitally because it has the best connectivity in the European Union, according to the latest DESI report. A key contributor to that is TDC NET, the country's largest telecoms infrastructure provider, which invests $600-$750 million every year in its high-speed networks. Denmark was the first mover into 5G within Scandinavia, CEO Henrik Clausen reveals. "In 2020, we swapped our mobile network to 5G. It's been an extremely fast transition and the new network has proved very reliable. After COVID struck, we saw an increase in data traffic of around 50 percent—we were able to handle that across all our networks because of the quality of our infrastructure." Clausen is convinced there is a significant link between investments in infrastructure and Denmark's ability to sustainably grow its economy. "Broadband access translates into growth, while advanced infrastructure including high-speed access enables a 15 percent improvement in overall progress on the sustainability agenda in some industries. The benefits of digitalization are quite clear and it's a priority on a national level."

Brian Mikkelsen
CEO
Dansk Erhverv

Why invest in Denmark?

- Europe's easiest place for doing business
- Cost-efficient and flexible labor market
- Productive and motivated workforce
- Well-connected infrastructure
- World-class R&D and innovation environment

An ideal test bed for financial technology

Thomas Krogh Jensen, CEO, Copenhagen Fintech, introduces a thriving hub for innovators in finance

Thomas Krogh Jensen, CEO, Copenhagen Fintech

Copenhagen Fintech is a not-for-profit organization that has been central to the development of an entrepreneurial Danish fintech sector that now includes over 300 companies. Why is this cluster growing so rapidly?

Despite its small size, Denmark has a powerful fintech ecosystem. One reason is that it is highly digitized in terms of infrastructure and the financial services sector is driving a lot of that. For example, the national ID system is managed in a collaboration between the state and the financial industry. In global standings, the Nordics in general, particularly Denmark, are ranked among the countries with the most open public data and they are leading in one of the prerequisites for financial innovation: the European Union's (EU's) Payment Services Directive 2, which gives third parties access to payment data in open-banking scenarios. You'll find us high on the list of innovative nations as well and always among the top five in sustainability. We're building on Denmark's tenacious focus on sustainability and combining it intelligently with fintech, which has fueled a great deal of innovation in sustainable finance.

Another element that has driven our fintech industry is our interest in small and medium-sized enterprises (SMEs)—99 percent of Danish businesses are SMEs—and many Danish solutions are targeting this segment, which has been neglected by established financial players. The final factor is a focus on human-centered design that solves real problems that dates back to mid-century Danish furniture. In addition, we have an ideal test bed for new solutions that has been thoroughly validated by major global players: fresh solutions can easily be brought to market after having been piloted in a society that adopts new digital solutions rapidly. Denmark is a low-risk country for companies looking to scale in Europe and beyond.

Copenhagen Fintech offers a co-working lab for 50 businesses as part of its wide range of services to support and advise local and international startups. It has also built extensive networks of private-sector partnerships to develop growth in the sector. How does it stand out as a hub for fintech?

We will never be the biggest hub in the world because this is such a small country, but we could be one of the most connected. The fintech sector doesn't happen in one country and so we made the decision to build a globally connected ecosystem. We spent a lot of time connecting to other hubs, such as New York, London, Berlin and Singapore, to create an internationally connected hub that could efficiently help to scale companies. Copenhagen Fintech's model is also quite unique: the original initiative takers were established banks, pension funds, insurance companies and the country's Financial Services Union. Later, the Confederation of Danish Industry, the trade body Insurance & Pension Denmark and the state-owned Danish Growth Fund joined, so our ecosystem covers all the main stakeholders. It's a public-private partnership that aims to create jobs and growth, attract investments and enable businesses to scale. We do everything for our startups from incubation to helping them expand globally, we assist them to attract investments, validate ideas with financial institutions or tech companies, and we partner with universities and global investors. We're also a community-fueled organization, where the different stakeholders form a networking and matchmaking platform for Nordic startups. At its core, what drives growth in Copenhagen Fintech's ecosystem is it's attractiveness for talent and smart capital.

> **"At its core, what drives growth in Copenhagen Fintech's ecosystem is it's attractiveness for talent and smart capital."**
>
> Thomas Krogh Jensen, CEO, Copenhagen Fintech

How is Danish fintech contributing to the global drive for sustainability?

People tend to only discuss the E in environmental, social and governance (ESG). Of course that is very important, but from a Danish tradition, the S and G are just as crucial and our fintechs are looking to be very specific about the positive impact their solutions have for their customers and the world. Overall, the single biggest decision you can make to create a more sustainable world is to change your investments. Statistics show it's 27 times more effective to shift your investments toward more sustainable industries than to take any other action, such as flying or driving less or eating less meat.

Our companies have a number of solutions that help people to invest more in sustainability. A lot of them concern the foundations for doing that, such as data for screening companies and their whole supply chains in order to make informed decisions about which to fund and invest in. Another focus is cybersecurity, as the financial sector is one of the most data-rich industries and this data is highly sensitive.

What are some of the current stars in Denmark's fintech sector?

One I could mention is Lunar, a unicorn challenger bank created in Denmark, which targets private customers and SMEs. Another is Public.com, one of the biggest competitors to investment app Robinhood in the U.S., which has a Danish co-founder. Public offers a social network where you can own fractional shares of stocks and exchange traded funds, follow others and share ideas inside a community of investors. It's building much of its tech out of Denmark—there's a high degree of trust in Danish-built tech solutions. Interestingly, many of the unicorns and larger fintech companies coming out of Denmark are business-to-business focused and a good illustration is Pleo, which is helping SMEs to manage their spending. A noteworthy example in the blockchain space is Chainalysis, one of the first residents of the Copenhagen Fintech Lab, that is helping to create transparency in the crypto economy.

The innovative data platform that Chainalysis has developed is able to analyze billions of transactions in thousands of blockchains quickly in order to identify transaction patterns and illicit behavior, a process that was extremely hard or even impossible before the company launched in 2014. This means that its clients are now able to fully understand exactly how people are using cryptocurrencies. As a result, Chainalysis has grown to become a leading software provider for financial institutions, government agencies and businesses around the world that want to detect or prevent cryptocurrency crime and money laundering, and its platform has already been used to help solve a number of very high-profile criminal cases. The company now employs close to 500 staff, was valued at $4.2 billion last summer and has the backing of global investors like Accel and Benchmark.

Pleo, on the other hand, has devised an out-of-the-box digital business solution that combines smart payment cards for staff of SMEs with automated expense management and reporting, saving firms both time and money. Headquartered in Copenhagen where it was founded in 2015, today Pleo's system has been adopted by over 20,000 companies in six European countries, a number that is rising by 1,000 a month. In December 2021, Pleo successfully completed a $350-million Series C funding round and saw its valuation shoot up from $1.7 billion to $4.7 billion, making it one of Europe's most valuable fintech startups and the fastest-growing company in terms of value in Denmark. The firm intends to use the new funding to help implement its ambitious plans for growth, which include expanding into another 14 European markets within the next 18 months and having a million users by 2025.

Powerful pharmaceutical and biotech cluster

European leader in drug development, Denmark also ranks in the top three for productivity in biotech. The country has developed an impressive life science ecosystem

Tackling obesity is a key focus for Novo Nordisk's researchers

Denmark's life sciences sector is among the most advanced in the world. The country is a major player in areas such as diabetes, inflammatory and infectious diseases, plus cancer and central nervous system research. It's also home to one of Europe's biggest pharmaceutical and biotechnology clusters that includes pharma multinationals, around 300 biotech firms, 138 medtech companies and many other businesses.

"The sector accounts for 22 percent of Denmark's exports, worth around $21 billion. If we continue to foster this ecosystem, that could exceed $55 billion by 2030," says Kasper Bødker Mejlvang, general manager of Novo Nordisk, the healthcare giant that was founded in Denmark in 1923, which specializes in the treatment of chronic problems like diabetes, obesity, rare blood and endocrine diseases. "The company is linked to the discovery of insulin in Canada, after which the Danish Nobel Prize winner August Krogh and his wife obtained the right to manufacture and commercialize insulin in Scandinavia. We've been one of the leading companies in the fight against diabetes for almost 100 years," he explains. Still headquartered in Denmark, where about 39 percent of its 45,000-strong workforce is located, Novo Nordisk's products are used by over 32 million people in 169 countries and it has about a 30-percent share of the global diabetes market.

> **"We've been one of the leading companies in the fight against diabetes for almost 100 years."**
> Kasper Bødker Mejlvang, General Manager, Novo Nordisk

Denmark is one of the world's most research-intensive countries and Novo Nordisk is a prime illustration of this tradition. "We've made many innovations, including new types of insulins and glucagon-like peptide-1 (GLP-1) agonists that better enable people to stay in control of their diabetes. A recent innovation was our production of a GLP-1 as a tablet. Historically, they have only come in liquids for injection and no other company has found a way to put these large molecules into tablets. There's still a lot to do in molecular innovations for diabetes: for instance, we're researching once-weekly treatments and glucose-sensitive insulins," he reveals. Novo Nordisk also transformed insulin delivery systems, Bødker Mejlvang adds. "We were the first to find easier ways to inject oneself using pens and we now produce more than 700 million pens a year. Currently, we're launching a new generation of pens that can connect to smart phones and continuous glucose-monitoring devices. Digital health will play an increasingly important role for people living with chronic diseases."

A growing focus for the company is helping people living with obesity, he states. "We've brought forward innovations that can really make a change in treatment options. Our efforts to tackle obesity are important, not just because it can create physical and mental issues, but it can also contribute to problems like diabetes and cardiovascular disease," Novo Nordisk has research and development (R&D) centers on three continents but also collaborates with a range of organizations on innovation. According to Bødker Mejlvang, the impact of partnerships was clear in the COVID-19 crisis. "We partnered with the Danish government and established testing facilitators for rapid testing within weeks, which made it possible for Denmark to get out of the first lockdown much faster. We hope to build on those learnings to create public-private partnerships (PPPs) to solve more health challenges."

Kasper Bødker Mejlvang
General Manager
Novo Nordisk

Challenges the company is aiming to address in this way include earlier identification and more effective treatment of diseases. Another challenge is prevention, he comments. "In the future, global healthcare systems will be under immense pressure from chronic diseases rising, which won't be solvable without innovative partnership solutions. For example, we're working with, and looking for more, public and private-sector partners in major cities around the globe, to see what we can do to help make populations healthier in order to prevent obesity and diabetes." Bødker Mejlvang believes Denmark could become a model of inspiration in helping to solve these challenges innovatively. "Among other things, PPPs are robust here, the different stakeholders know each other, there's a general culture of trust and the food chain from university research to biotech startups and big pharma works."

Carsten Hellmann, president and CEO of ALK-Abelló, another flagship Danish firm, confirms that Denmark's intrinsic strength in life sciences makes it attractive for innovators. "It's not just about how many big pharma companies are in the ecosystem, there are many other businesses with a global perspective and cutting-edge technology." His firm is a good example of the ecosystem's innovative prowess: ALK is the frontrunner in respiratory allergy immunotherapy treatments, with 40 percent of the worldwide market, and it's a substantial investor in R&D that has globally influential results. ALK recorded revenues in 2020 of $523 million, a figure expected to grow significantly over the next decade, and Hellmann is equally optimistic about the country's future: "Everyone interested in the life science industry should come to Denmark. The ecosystem is huge, expanding fast and its prospects are immense."

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Roche's Danish workforce has grown 23 percent in recent years

Innovation led by data-driven, personalized healthcare

A crucial factor behind the sector's growth is a government that is prioritizing its development, says Darine Ghanem, general manager of Roche Pharmaceuticals. "It's recently invested over $40 million to create better framework conditions, foster collaboration between universities, startups and enterprises, attract foreign investments and talents, and support exports." Ranked as the largest pharmaceutical company in the world in 2020 in terms of sales, Roche celebrated its 50th anniversary in the country last year. "In 2019, Roche Denmark contributed $240 million to the Danish economy and supported 2,800 jobs. For every dollar that is spent through our guided contribution, we generated an additional 3.4 dollars in the economy," notes Ghanem.

What's unique about Roche Denmark within the global giant's organization is that it covers the entire value chain through three divisions: Roche Pharmaceuticals, Roche Diagnostics and Roche Innovation Center Copenhagen. Together, they are tasked with developing new solutions to address unmet medical needs and bringing that innovation to the Danish healthcare sector and society, she states. "Roche Pharmaceuticals, for instance, is looking at treatments for our patients who have severe and life-threatening diseases such as rheumatoid arthritis, multiple sclerosis and cancer. Between 2017 and 2021, we introduced more than 15 new innovative treatments."

> **"I see Denmark being a lighthouse for innovation for Europe and for other countries."**
> Darine Ghanem, General Manager, Roche Pharmaceuticals

Roche Diagnostics' role is to accelerate diagnostics to improve diagnoses, prevention, support and care for patients. During the pandemic, the division supported the country by offering automated PCR solutions to hospitals and by introducing rapid antigen tests. In Ghanem's opinion, "The biggest challenge society is facing is we are treating diseases very late, which generates costs for society. Roche's investment in diagnostics is to enable earlier and more advanced diagnostics in infectious diseases, such as with COVID-19 and flu, but also in oncology and neuroscience."

The life sciences industry is responsible for about 35 percent of private sector R&D investment in Denmark and Roche is among the global players that considers it to be a core country for its research. The Danish capital is home to one of the company's seven hubs for innovation: Roche Innovation Center Copenhagen (RICC), which was founded after the acquisition of Santaris Pharma in 2014, she explains. "We're extremely proud of RICC, which has its roots in a Danish biotech. It focuses on ribonucleic acid (RNA) novel medicines and technologies and has become an essential part of our R&D across the world. Denmark is also one of the most important countries for our trials. It provides the possibility of running our phase one, two and three clinical trials across oncology and all the new therapeutic areas where we are advancing medicine and accelerating learning," she declares.

© MEW

Darine Ghanem
General Manager
Roche
Pharmaceuticals

Ghanem is confident that Denmark offers the ideal environment to advance an area close to her heart: personalized healthcare. "We can no longer take isolated approaches to diagnostics and treatments. We need a more personalized approach, understanding the type of data that is essential for us to understand diseases, to better diagnose patients, to give them the right treatment at the right time. We're seeing this shift in Roche's strategy toward patient-journey and disease-lens approaches." Ghanem is convinced that an essential part of this strategy is PPPs and that the government, industry and healthcare sector in Denmark are creating the optimum conditions for those partnerships. "We have a unique opportunity here to drive more personalized and sustainable healthcare. Denmark is so advanced and rich in healthcare data and digitalization, it's important to discover how to release the power of that data to better inform health decisions and accelerate innovation. This is something we're excited and passionate about in Roche, and we're working closely on it with the different life science stakeholders."

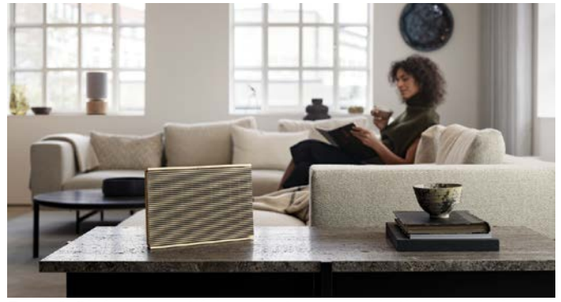
Kim Domela Kjøller, CEO of UNION therapeutics, a Danish biotech firm working in immunology and infectious diseases, expands on the wealth of data available. "We have registries with data including all medicines that each individual has picked up at a pharmacy since the mid-1990s, records of all hospitalizations back to 1977 and a cancer registry going back to 1943, to mention just a few. *Science* once ran an article about Denmark with the headline 'When an entire country is a cohort'!" UNION offers a case study into how Denmark nurtures emerging innovators. For over 10 years, it has been developing various molecules including niclosamide, a potential candidate for preventing and treating COVID-19, he says. "UNION has benefited from the Danish life science ecosystem in its development process for this. Innovation Foundation Denmark supported early development of niclosamide, the phase one study was done at local hospitals and shortly after we started late-stage studies. That fast progression was only possible because of our ecosystem."

The capital of aural-health technology

Interestingly, Denmark is one of the top global hubs for sound-related innovation and many world-beating sound industry companies are based there, including Bang & Olufsen, Brüel & Kjær, Libratone, DPA Microphones and Dynaudio. As well as being a center of excellence for sound technologies in entertainment and communication, Denmark has huge industrial and research expertise in health aspects of sound, such as hearing. A preeminent example of this is GN Group, which was founded in 1869 and is probably best known as the global leader in hearing-aid innovation. Over decades, GN has pioneered many firsts, such as including 2.4 GHz technology in hearing aids for direct connectivity and a made-for-Apple hearing aid with stereo sound. Driving the group's innovations, according to GN Hearing CEO and president, Gitte Aabo, is the fact that "We believe that everyone deserves great hearing. Treating hearing loss can radically transform lives, helping people to thrive."

Marriage of design, technologies and craftsmanship

Denmark's unique expertise in sound technologies and in designing timeless products that are built to last combine to create iconic results



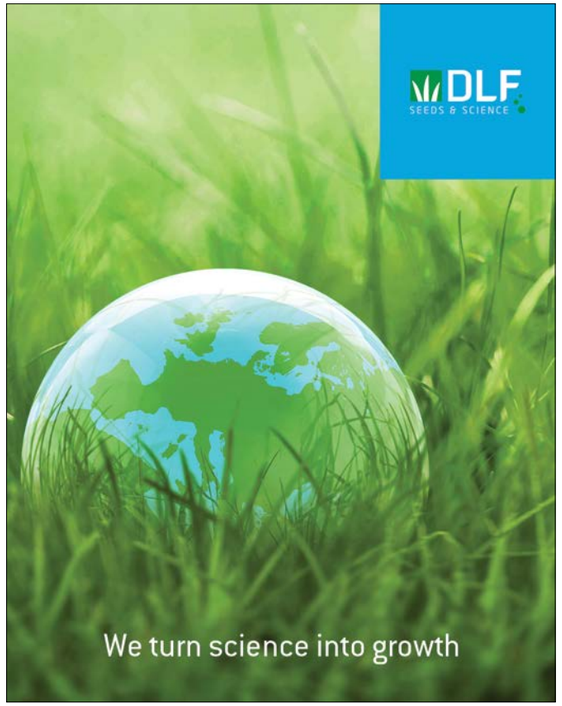
Bang & Olufsen: beautiful products encased in timeless designs

"There's a culture and tradition in Denmark of making beautiful things with superior craftsmanship. It also has companies and universities with cutting-edge expertise in audio technologies. This core of design, audio expertise and craftsmanship can't be found anywhere else and we benefit hugely from it," says Kristian Teär, CEO of Bang & Olufsen.

The iconic brand was launched almost a century ago by two engineers, Peter Bang and Svend Olufsen, in the coastal town of Struer where it's still based. "The fact we've survived so long comes down to great people, great products and a passion for what we do. We've always tried to do things differently, rethinking how people use audio-visual products and experiences. We've been designing the future since 1925," Teär claims. The firm's creations, including audio products and systems, headsets, speakers and televisions, are developed by designers and engineers in collaboration, he states.

Kristian Teär
CEO
Bang & Olufsen

"The design competence in Denmark inspires us, but we also have the pleasure of being able to work with many external designers that share our design thinking. You can tell a product is a Bang & Olufsen because it looks different: even from afar, you'll notice the aluminum, the wood, the color scheme." Appearance counts for nothing, however, if functionality isn't perfect, which is why the company also boasts one of the world's most powerful sound laboratories. One constant is that its products are crafted to last, notes Teär. "At the heart of our strategy is product longevity. We have a higher price point, but many of our products have lasted for 50 years; people keep them because they evoke emotions."



Focused on minimizing its products' environmental footprint, last year it became the first consumer electronics company to gain certification from the Cradle to Cradle Products Innovation Institute, the most ambitious standard for designing and making sustainable products that contribute to a circular economy. It's also started restoring heritage products for owners, he enthuses. "You can send us your beloved turntable or speaker from the 1970s, we'll upgrade it with new technology and send it back to you ready to deliver new memories. We've also introduced a software feature that connects our past products with present or future ones without compromising quality. We want to keep your products alive—that's who we are."

Far from being solely preoccupied with its heritage markets, much of Bang & Olufsen's innovation is dedicated to building long-lasting products that fit the lifestyles of new generations of customers, according to Teär. "Gaming and hybrid work, for instance, are growing interests for us. Most recently, we teamed up with Cisco to create a solution for the post-pandemic trend of working from anywhere. You want a high-quality headset to use at work, to listen to music while commuting or to use at home when watching TV. Why should you have to buy three different ones? We offer one product with all the enterprise business features you need for work that is also a fantastic audio product and it looks amazing when you wear it."

Beyond current lifestyles, he reveals that Bang & Olufsen is focusing on how the world will change in the future and how it can push the boundaries of design and technology to help us with that future. "Immersive music and sound experiences will always be in demand and we see new opportunities for us as technology develops. We're confident we're on the right path and will continue to make the best products and deliver outstanding experiences based on excellent designs with the very best craftsmanship and sound."

Tourism: Exploring Denmark's authentic riches

Experience endless coastlines, cozy cities and the world's best food in a kingdom that prioritizes the simple pleasures of life all year round

Greenland is home to giant 'Titanic-sinking-sized' icebergs

Over the six years leading up to the pandemic, the number of visitors attracted to Denmark grew by 25 percent, with tourism contributing 4.2 percent of the country's economy in 2019. Now travel is back on the agenda, advanced bookings suggest it's the vacation destination of choice for many of us in 2022.

Boasting over 400 islands, one huge draw is Denmark's stunningly varied natural environment, says Jan Olsen, CEO of tourism promotion agency VisitDenmark. "Our coastline is 7,300 kilometers long and dotted with small villages, cottages and holiday homes. There's a lot of space to relax in your own family bubble, but even if you opt to stay in a city, you're never more than 52 kilometers from a beach."

Jan Olsen
CEO
VisitDenmark

Then there are the cultural attractions of colorful cities like Aarhus, Odense, Aalborg and Copenhagen, which embody the deep-rooted Danish concept of "hygge" that roughly translates as cozy comfort and togetherness. "People also come because of our design, architecture, icons in furniture like Arne Jacobsen, Finn Juhl and Poul Kjærholm—and our simplicity. Small is beautiful here," adds Olsen. Copenhagen illustrates how the country successfully blends its history with innovative flourishes, he states. "For example, the old industrial harbor has been transformed into a vibrant contemporary neighborhood and you can now enjoy a swim in its waters or unwind in a floating sauna."

Another major incentive to visit is that Denmark is the current capital of gastronomy. It's home to the top two restaurants on the planet—Noma and Geranium—according to the World's 50 Best Restaurants, as well as a host of other chefs holding Michelin stars that are turning seasonal and hyperlocal ingredients into culinary masterpieces. "Denmark's strong focus on the environment is also playing a growing role in attracting tourists. It's an important criteria for many," says Olsen. A great way to explore small, green and safe Denmark is by bike, he suggests. "We're one of the biggest bicycle-centric nations in the world—there are bike lanes all over the country."

From awe-inspiring mountains to polar bears: A walk on the wild side

Over three times bigger than Texas, Greenland is home to just 56,000 people, who mainly live in the towns and small settlements that are scattered around its Arctic and Atlantic coasts. Much of the rugged island's interior is covered by one of the world's two permanent ice sheets. "It's a truly unique, remote destination—nowhere compares," asserts Hjörtur Smárason, CEO of Visit Greenland, the agency responsible for tourism in the Danish territory. Given the small population size, it's no surprise that tourism infrastructure is limited, although there are over 100 farms, hostels and hotels—including the fabulous 4-star Hotel Arctic—that offer extremely warm welcomes to guests. Transportation is a fascinating challenge, says Smárason. "There are no roads between towns. You travel by boat, helicopter or dogsled. The lack of infrastructure is an asset: you really experience unspoiled environments, where you feel like you're the first person ever to step on the ground you're walking on."

In 2019, a privileged 57,000 visitors who arrived by plane and 48,000 by cruise ship enjoyed both that experience and a singular 4,500-year-old culture, he reveals. "The Inuit people have a special relationship to nature. The kayak originated here and dogsledding is part of everyday life. As an example, 240 registered fishing vessels are dogsleds: when the sea is frozen, you use a sled, drill a hole in the ice and fish through that." As well as its vast ice sheet, Greenland's landscapes include giant icebergs, awe-inspiring mountains and dramatic fjords. "It's a popular off-the-grid adventure tourism destination. Then there's the unbeatable views of the Northern Lights and our wildlife—whales, polar bears, walrus, reindeer, eagles and so on—it's really something," Smárason enthuses.

> **"Denmark's strong focus on the environment is also playing a growing role in attracting tourists. It's an important criteria for many."**
> Jan Olsen, CEO, VisitDenmark

For those looking to travel to untouched locations that are in tune with nature, where they can experience and learn more about the world we live in, Greenland is clearly a great answer. But how accessible is it? "There are now two hubs to fly into Greenland from: Copenhagen and Keflavík in Iceland. We also have two international airports under construction in the towns of Nuuk and Ilulissat that will be ready by the end of 2024. At that point, Nuuk will be only four hours from New York, for instance. Our goal is to open up new routes, with the aim of becoming one of the leading global sustainability destinations by the end of the decade," he replies.

The country is committed to ensuring future tourism has no negative impact on the pristine environment, Smárason stresses. "The current government was voted in to stop radioactive mining, it has also stopped oil and gas exploration. Sustainability is the only way forward for our tourism in terms of the environment, economy and society. There are many small, fragile communities here and it's very important that any development is on their terms and to their benefit. We don't want to create an exploitative tourism economy as has happened in some countries."

A taste for organic food and carbon-neutral farming

Denmark's largest competence cluster is its vast knowledge-based and highly efficient agriculture and food sector

30 percent of Denmark's dairy production is organic

With an ideal temperate climate, fertile soils and flat landscape—61 percent of which is farmed—Denmark produces enough food to feed three times more people than its own population.

Agriculture generates about €20 billion in international sales annually, around a quarter of the nation's total exports, mainly from its premium-quality meat and dairy products. "Our food sector occupies a strong position and has done for over 100 years. Germany is our biggest market, followed by China, Sweden, the U.K. and Poland, while the U.S. is seventh or eighth," states Flemming Nør-Pedersen, executive director of the trade body Danish Agriculture and Food Council (DAFC). Denmark stands out for its focus on organic and environment-friendly farming, with about 12 percent of its farmland being cultivated organically. But the country wants to go further, he says. "Our ambition is to double organic production over the next 10 years and to increase organic exports. We're collaborating with the government on programs to support this." The sector also aims to become climate neutral by 2050 without impacting production volumes, he adds. "We see innovative technology as a hugely important answer for this and have research centers working together to find new technical and digital solutions."

Flemming Nør-Pedersen
Executive Director
DAFC

Truels Damsgaard
CEO
DLF Seeds

The sector's commitment to quality, safety, animal welfare, the environment, research and other forms of added value has helped some of its food businesses, many of which are cooperatives, to become major global players. The pork industry is a key example of this. At one end of the value chain is DanBred, co-owned by DAFC, that has developed world-leading genetic testing systems for breeding pigs. At the other end is Tican, which produces fresh, frozen and vacuum-packed meat from high-quality local pigs. CEO Niels Jørgen Villesen expands on one reason for the Danish pork sector's international success: "It has a low carbon footprint and we're always looking at developing solutions to reduce it further, by implementing programs around energy and water use, and ensuring feeding products are deforestation-free, for example."

Food production powered by genomics

Denmark is also at the forefront of creating agriculture's starting block: seed, led by DLF Seeds, which specializes in grass and clover for livestock foraging and turf, as well as sugar and fodder beet, and vegetables. Owned by a cooperative of grass-seed farmers, DLF is the seventh-largest seed company in the world, says CEO Truels Damsgaard. "We're the fastest growing firm in the sector: 20 years ago, we were a small local company and today we're the leader in forage and turf seed in Europe, Oceania, North and South America, with 30 percent of the worldwide market." DLF is renowned in the industry for its dedication to innovation and cutting-edge technologies that allow it to continually develop improved varieties for nutrition, resilience, performance and maintenance. About 11 percent of its over-2,000-strong workforce operating in more than 20 countries are involved in research. "New seed technologies can support farmers to become more efficient, deliver higher yields and improved quality, while at the same time becoming more climate- and environment-friendly," explains Damsgaard.

Traditional plant breeding for seed selection took many years and was often an expensive lottery in terms of results. The use of biotechnology tools such genomic selection—which analyzes a plant's genetic makeup and other measurable traits—brings rich rewards, he comments. "It's a powerful technology that gives us plant-breeding gains that are larger, faster and more precise. Through the use of huge computer power and tailor-made algorithms acting on the millions of data points we have from our historic breeding results, coupled with our new knowledge on genetic profiles, we can now pick out the best plants with much higher precision. We also combine the use of big-data tools with camera images taken by drones of our testing fields, enabling us to quickly and efficiently oversee plants' appearance and performance." According to Damsgaard, a key characteristic of Danish agriculture is strong cooperation between universities, authorities, industry and farmers. "The whole chain works together in solving challenges, which is why we're at the front in developing solutions. For example, with other Danish plant breeding companies and universities, we've established a state-of-the-art root screening facility so we can study what's happening below the ground—the size of roots plays an important role in drought tolerance and carbon sequestration."

Because DLF mainly produces seed for temperate-climate perennial crops that are optimized for local environmental conditions and which provide farmers with higher carbon sequestration and less need for fertilizers than annual crops, the company's portfolio is an inherent contributor to sustainability. Where it can have the biggest future impact on climate change is by developing sustainable proteins from crops such as grasses and legumes for local production, he suggests. "We believe we can produce financially competitive protein in Denmark to replace some of the massive amounts of soy protein that it imports. DLF stands not just for innovation but also for entrepreneurship: Denmark and ourselves are first movers on this because we're always ready to test something new." That approach has proved successful to date, with the company's turnover increasing by an average of over 10 percent a year through both worldwide acquisitions and organic growth to reach $1.15 billion in the last financial year. Damsgaard is confident there is a lot of potential for further expansion. "We still have many opportunities for growth in North America, for instance, and there are clearly opportunities for us to enter the tropical forage-seed business in South America and Asia."

Bringing Greenland's wonders to your plate

The country of Denmark harvests surprisingly little food from its seas. Instead, the marine champion of the Danish kingdom is the world's largest island: Greenland. For centuries, the remote, ice-covered country's economy has relied on wild-caught seafood from the rich fishing grounds of the Arctic and North Atlantic Oceans that surround it. "Currently, 95 percent of Greenland's exports are seafood and Royal Greenland is involved in about half of those exports. We're owned by Greenland's government, but operate as a commercial company, and we're the world leader in cold-water shrimp and lumpfish row, with a significant position in the global snow crab and Greenland halibut markets as well," says CEO Mikael Thinghuus. He explains that Royal Greenland's strengths lie in the island's deep, unique fishing traditions, plus the quality and traceability of its products. "We're vertically integrated: we catch the fish, process it, distribute it and sell it to customers around the globe." The company runs its own fleet of modern, energy-efficient trawlers, he states. "We also buy seafood from over 2,500 independent fishermen in Greenland and Eastern Canada, most of whom operate vessels that are less than 6-meters long."

Almost all its products are sold frozen, a procedure which needs to happen rapidly after catch and processing to retain their quality. That's an extremely complicated proposition on an island where no roads link the artisanal fishing communities that are dispersed around the country's vast coastline, especially when many are iced in during the coldest months. Royal Greenland's solution is to process the seafood in close proximity to where it is caught, Thinghuus reveals. "We have 38 factories in Greenland, plus a few in Canada and Germany. Most of our facilities, especially in the north of the country, consist of a small factory with a large freezing house. In the winter, fishermen fish through holes in the ice, we process and freeze it immediately and, when spring comes,

> **"Wild-caught fish is a superb way of getting sustainable healthy protein."**
> Mikael Thinghuus, CEO, Royal Greenland

we take the products out for distribution." The company's fishing methods may be traditional, but its processing facilities use the latest technology to guarantee the strictest quality, hygiene and safety standards. "We're a successful exporter because we have an exceptionally good reputation for food safety and production quality; if we say we'll produce within certain specifications, we will," he affirms.

Historically, nearly all of its exports were enjoyed in Europe but, today, over 30 percent are shipped to Asia, especially China and Japan, around 15 percent goes to North America and its recent investment in a Chilean fishing business is now boosting South American sales. Royal Greenland's customers can be assured that it only works with sustainable fish stocks, Thinghuus stresses. "Some people think all fishing is unsustainable—that's inaccurate. Wild-caught fish is a superb way of getting sustainable healthy protein if you have well-managed fisheries, take care of the ocean and act on what biologists tell you about where, when and how much to fish. We're very strict in following these criteria." Indeed, the company aims to get the most value that it can from its catch, he adds. "Fillets make up only 35 percent of a fish's weight. The challenge is what to do with the remaining 65 percent and we're developing technologies for the many side streams that come out of our fishing. For example, we've taken our utilization of shrimp to almost 100 percent by using the peelings to make powdered meal." The company takes an equally responsible approach to its economic role in Greenland. In recent years, it has returned solid profits on average annual sales of around $762 million and it recorded its best ever results in 2021. Royal Greenland has also doubled its employee numbers in the last decade, says Thinghuus. "We now employ around 2,500 staff and twice as many in the fishing season. It's of paramount importance to us that we train and motivate our staff, and we maintain very high levels of employee satisfaction. Social sustainability counts a lot for Royal Greenland."

Mikael Thinghuus, CEO, Royal Greenland

Mobilizing farmers to decarbonize agriculture

Denmark is cultivating innovative agtech solutions that are speeding up the adoption of regenerative practices in farming

Regenerative practices allow soils to capture more carbon

Agriculture is responsible for around one-fifth of Denmark's total carbon-dioxide (CO_2) emissions and its decarbonization is a priority for a country seeking to become carbon neutral by 2050.

In October, the Danish parliament ratified plans to reduce the sector's greenhouse-gas (GHG) emissions by 55 percent within 10 years, pledging funding of nearly $600 million for green farming technologies to help achieve this. One new solution that is rapidly being adopted by farmers in Denmark and Europe comes from the startup Agreena. "To achieve carbon neutrality, carbon removal is essential and nature-based solutions are the most cost-effective strategy for this," says CEO and co-founder Simon Haldrup. "A lot of the answers can be found in agriculture and that latent potential needs to be unlocked, but it requires economic incentives at the micro level—and that's Agreena's focus." In summary, Agreena mints, verifies and sells carbon credits generated and owned by crop farmers that are transitioning to regenerative practices, such as increasing use of cover crops and organic fertilizers, or reducing soil disturbance and fossil-fuel usage: methods that help reduce GHG emissions, keep carbon stored in soil and boost biodiversity.

Simon Haldrup
CEO and Co-founder
Agreena

"We're a farmer-centric company and want to enable them to take on a new role in the climate battle. Our mission is to mobilize a scalable approach for farmers to adopt sustainable practices by plugging in a secondary income from carbon certificates. We launched a year ago in Denmark, have already scaled to eight countries and we expect that our farmers' will be removing over 2 megatons of CO_2 a year from the atmosphere by the end of 2022," Haldrup reveals.

A significant advantage of Agreena's proprietary agtech platform is that it's vertically integrated: farmers enter data about each of their fields, relating to what's happening now and their plans for transition, and the platform calculates the impact of those changes using Agreena's vast data resources, he states. "We capture a lot of data on farms and quantify it in terms of how much carbon each activity reduces." Farmers can then track their shift to regenerative practices and, once a year, their carbon reductions are translated into CO_2 e-certificates that they can sell through Agreena's platform or elsewhere on the voluntary market to, among others, organizations looking to offset their own emissions. Before issuing certificates, Agreena validates all data through farm visits, algorithmic analysis and satellite technology. It also goes through two layers of independent verification and its ISO-standard program is certified by the international accredited registrar and classification society DNV.

This month, Agreena raised €20 million in its Series A round led by Kinnevik, Giant Ventures and the state-owned Danish Green Investment Fund. Haldrup explains how those funds will be invested: "We want as many farmers as possible to participate in the carbon market and are looking to expand across the pan-European region over the next 24 months. Our second focus is to enhance our program, improving the technology, algorithms, specificity of the verification and increasing the number of farming practices. Our vision is to enable farmers to become climate heroes by giving them the tools to help build a green European economy. There's a need for a fundamental shift in how food is produced, we need to build that tidal wave in collaboration with farmers and I really believe our efforts are beginning to crack that nut."

What we can learn from Denmark's energy transition?

The Nordic country's pioneering creation of an energy system that's green, stable, secure and affordable sets an example for the world

Dan Jørgensen, Minister for Climate, Energy and Utilities

"Denmark has shown that it's possible to reduce emissions significantly while at the same time becoming more competitive, creating jobs, having better health and a higher living standard," states Dan Jørgensen, Minister for Climate, Energy and Utilities.

"As a small country, we're probably only responsible for around 0.1 percent of the world's greenhouse gas (GHG) emissions, so you might question if it matters what we do. We think it does, because we believe we have a chance to inspire other countries." Between 1990 and 2019, Denmark's total carbon emissions plummeted by over 44 percent, driven by a huge increase in its production of green energies: by 2020, 68 percent of Danish electricity came from renewables, with the majority being generated by wind. Already one of the least carbon-intensive countries in the OECD, in 2019 the government introduced a Climate Act with ambitious new goals that included cutting GHG emissions to 70 percent of their 1990 volumes by 2030 and achieving carbon neutrality by 2050 at the latest. "With regard to our 2030 emissions target, the gap between how much we needed to reduce when we set it and where we are now has been cut in half so far, which is great progress. We were also the first country with a sizable oil production to say we would cancel all new licensing rounds and put an end date on oil and gas exploration of 2050," says Jørgensen.

The pressure is now on to rapidly install and connect a lot of additional renewable generation capacity, he adds. "We have to innovate, develop new solutions and technologies, which other nations will also be able to use. It's not the first time we've done that: Denmark built the first offshore wind farm back in 1991. At that time, it was considered expensive, which it was, but we're happy we did it because that was the first step in a shift that has had global impact. Today, offshore wind competes on price with coal and even nuclear."

The last two decades have seen many more wind farms being built off Denmark's coasts and the ideal conditions of its seas give it the opportunity to host another 40 gigawatts of capacity, far in excess of the 15 gigawatts the country needs to meet its carbon-neutrality goal. Rather than waste that potential, Denmark is creating energy islands, which will act as hubs that harvest energy from nearby wind farms and channel part of it to the Danish electricity grid and the surplus to neighboring countries. Two are currently being developed, one of which is entirely artificial, Jørgensen reveals. "This is a new era in offshore wind; it will be the size of 64 soccer pitches and have a 10-gigawatt capacity. As well as being able to export the surplus, power-to-X technologies can transform it into hydrogen, which can be utilized or transformed further into green fuel."

One of the 50 largest pension funds in Europe, PensionDanmark, is a partner in the man-made island's development. The non-profit labor-market fund's CEO, Torben Möger Pedersen, is enthusiastic about the project: "It's a world first, but I predict that the next decade will see 10-15 of these islands in the North Sea alone." To date, PensionDanmark has invested over $6 billion into renewable energy infrastructure and companies, plus sustainable real estate, he says. "The large amount of accumulated savings in Danish pension funds can be used to finance societal objectives and we're allocating capital into the green transformation as a long-term investor. To give you another example, we've said we would support the shipping company A.P. Moller-Maersk with its move to green fuels."

> **"Everyone should ask their pension funds to step up their investments in the green transition."**
> Torben Möger Pedersen, CEO, PensionDanmark

Hydrogen and green fuels are a hot topic in Denmark. Among various other schemes in the pipeline, Ørsted is leading the development of what will be one of the world's biggest hydrogen and green-fuel facilities, while Everfuel's HySynergy project is the largest production and storage facility for green hydrogen currently under construction in Europe. "It's a 1-gigawatt three-phase project and phase one, a 20-megawatt hydrogen electrolyzer, will be operational by the end of this year," says Jacob Krogsgaard, CEO of Everfuel, a company the operates across the hydrogen value chain, from using renewable energy to power its electrolysis from water to distribution and refueling stations for hydrogen-powered vehicles. He explains why the gas is seen as so important for Denmark's future energy mix. "As the frontrunner in wind power, it's reached the point where we have surplus energy at times. There's a place for battery storage, but it has its limitations, and the easiest, most-efficient gaseous solution is hydrogen. Everybody wants to be green as long as it is affordable and that means costs that are roughly the same as those of fossil fuels. We can do that with hydrogen. It has to be a part of the green transition and Everfuel is all about making the hydrogen business case work."

A green energy and utility sector

- **58%** cut in CO_2 emissions 1990-2019
- Potential for **40GW** extra offshore wind
- **>95%** cut in CO_2 emissions possible 1990-2030
- Green energy demand could grow **64%** to 125TWh by 2030

Reaching the energy trilemma

Denmark's fast build out of renewable capacity and the changes to its energy mix present challenges to its transmission system operator for electricity and gas, Energinet, states president and CEO Thomas Egebo. "What we're trying to build is a future energy system based on renewables, with a high level of secured supply that is affordable: what we call the energy trilemma. In short, we're talking about an energy system that is electrical, integrated and digital." One challenge is adapting the electricity grid for renewable energies, he comments. "We've come far in integrating fluctuating energy sources. Some 50 percent of our electricity consumption is matched on average by fluctuating production from wind and solar, a penetration rate that's the highest in the world. People would have said it was impossible 10 years ago, but we've been able to do it by developing solutions as we go along, such as sophisticated forecasting systems. Denmark is also among Europe's top performers for security of supply and our wholesale electricity market prices are quite competitive in general as well."

> **"Denmark has shown that it's possible to reduce emissions significantly while at the same time becoming more competitive."**
> Dan Jørgensen, Minister for Climate, Energy and Utilities

Egebo notes that a distinctive characteristic of the Danish electricity system is that it's well integrated with those of nearby countries. "We're directly linked to Norway, Sweden, Germany and the Netherlands, and are currently building a new interconnector to the U.K. You can only have an energy system that's more or less 100-percent green and based on fluctuating renewables by integrating across countries and we have a great deal of experience doing that."

Thomas Egebo
President and CEO
Energinet

Denmark's experience in green-energy collaborations extends a long way beyond its neighbors, according to Kristoffer Böttzauw, director general of the Danish Energy Agency, the government body responsible for developing and implementing policy for the sector. "If Danes really want to do something regarding international climate issues, we need to go abroad to show the rest of the world that it's doable and that's what we're doing. The best platforms for us are the European Union and the United Nations climate conferences. We also have 19 partner countries around the world, including giants like China, India and the U.S., as well as developing countries like Kenya. Our role is to inspire them and share our knowledge, so that they can leapfrog from the Danish experience and thereby speed up the global renewable transition." Böttzauw is confident that Denmark will have reached its objectives for greening its energy sector by 2030 and he is now focusing on the second half of the green transition. "That means areas like transport, industry and agriculture. We're going into the second half and that is about forming the future. Many Danish companies are currently doing a lot of planning in terms of how to form that future, and I see my agency's role as giving them the best opportunities of doing that.

‘We’ve proved that it’s possible technologically’

Having pioneered the first offshore wind farm in 1991, Ørsted is at the front in the climate crisis, says Mads Nipper, Group President and CEO

Ørsted builds gigawatts of renewable energy capacity each year

Mads Nipper
Group President and CEO, Ørsted

Ørsted develops, constructs and operates renewable energy production facilities worldwide. Most notably, it is the global leader in offshore wind. What is the group’s role in the green transformation of energy?

I like to compare Ørsted’s role to Tesla’s in the automotive sector. Electric vehicles would have happened anyway, but nowhere near as fast if Tesla hadn’t proved it was possible to make them technologically safe, high quality and affordable. This is what Ørsted has done for offshore wind. Before 2008, nobody really believed it could be a scalable technology. Ørsted started to build one wind farm after another, each bigger than the last: we’ve built the largest wind farm in existence repeatedly, we have the biggest one currently and next year will open an even larger one, Hornsea Two in the U.K. We’ve proved that it’s possible technologically, that it’s a scalable part of the transformation of the world’s energy systems, and that it’s something from which the value chain can make money. We’ve been an agent for change that has accelerated investment. This creates competition: as a CEO, I hate competition, but as leader of a company with a vision of a world that runs entirely on green energy, I love that everybody is copying us now.

Ørsted’s goal is to become the world’s top green energy producer. Beyond offshore wind, what other sectors are you focused on?

Ørsted is helping decarbonize the world through green power—we build several thousand megawatts of renewable capacity every year. Today, we are a clear leader in global offshore wind but we’re also adding significant onshore-wind scale and we’re building solar-wind farms, many of which include battery storage. Another key area is green hydrogen. Some industries need renewable fuels and hydrogen for decarbonization, and we want to prove this is technologically possible at scale and at a competitive price. Overall, we would be happy to remain a leader in offshore wind, to build a sizeable and complementary onshore business in solar and wind, and to be a catalyst for scaling up green hydrogen and renewable fuels.

Ørsted recorded revenues of €7.1 billion in 2020. How were its operations affected by the energy and pandemic disruptions of 2021 and what is the group working on this year?

In 2021, we continued constructing our next two major offshore wind farms, we also made an onshore-wind acquisition in Europe and entered new markets: we entered Scottish seabed auctions; announced investment in Norway; started developing in Sweden, Estonia and the Baltic states; got our first 2.5 gigawatts of capacity in Poland; opened an office and are developing sites in Vietnam; announced partnerships in green hydrogen with, for example, South Korea’s POSCO; and we won another U.S. auction with a big offshore wind solicitation. I don’t think the company has ever had as busy a year.

Looking forward, we’re completing our first large-scale offshore wind farm in Asia, which will go live in Taiwan this year and we’re hoping to enter Japan. We’re also continuing development in South Korea, there are exciting upcoming auctions in the U.K. and we’ll continue with bids in the U.S. as well. In January, we expanded our presence in green fuels with an investment in a large-scale Swedish e-methanol project and I believe 2022 will be the breakthrough year for green hydrogen. Ørsted has over 10 hydrogen projects and is in the process of constructing one of them.

Why is Ørsted placed seventh on Corporate Knights’ 2022 ranking of the world’s 100 most sustainable corporations and how is it helping other corporations to reduce their carbon footprint?

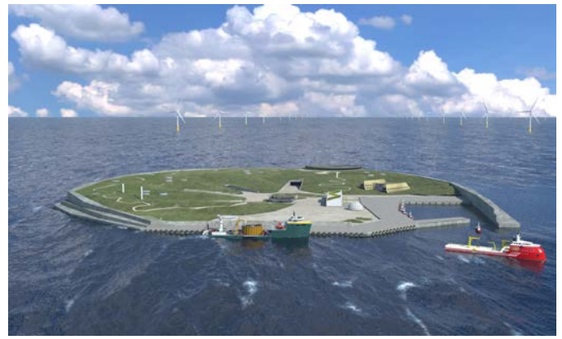
We’re proud that we’ve been ranked as the most sustainable energy company in the world three years in a row. We run many sustainability programs, and among the most impactful is what we do to be a role model in decarbonizing our own value chain. By 2025, our energy production will be carbon neutral and, by 2040, our entire value chain will be net zero. Moreover, we are one of only seven companies in the world to have that verified by the global Science Based Targets initiative. One way we help other companies is by selling corporate power purchase agreements. For example, in Germany, we are building a large wind farm and selling its power to corporations like Amazon, Covestro, Google, BP and the REWE Group. We’re also engaging in strategic partnerships with some of the industries most challenged by decarbonization by building a market for and an impact from green hydrogen and fuels.

> **“We’ve built the largest wind farm in existence repeatedly, we have the biggest one currently and next year will open an even larger one.”**
> Mads Nipper, Group President and CEO, Ørsted

One of our sustainability program areas I’m very excited about relates to biodiversity. Building out green power requires seabed, a lot of land and many cables, and we are concerned as to how to ensure that this massive build has a positive impact on nature. That’s why Ørsted has committed to be, not biodiversity neutral, but biodiversity positive.

Energy island to power 10 million households

The transformative North Sea development project illustrates how COWI and other Danish companies are helping nations around the world to transition to green



Denmark’s energy island, as visualized by COWI (Arkitema)

Lars-Peter Søbye
President and CEO
COWI

Construction of the world’s first energy island is planned to start in 2025. 100 kilometers off the Danish coast in the turbulent waters of the North Sea, the vast artificial island will connect over 10 gigawatts of energy generated by 670 offshore wind turbines to the grids of Denmark and neighboring countries, and will also host facilities for technologies like large-scale energy storage and power-to-X green-fuel generation.

Leading the project that will provide renewable power to over 10 million households is the Danish Energy Agency, which has enlisted the expert knowledge of domestic firms to help realize the pioneering concept. One of those is COWI, the global full-service consulting company with world-class competencies in engineering, economics and the environment that has been a strategic partner for Denmark on transformative development projects since it was founded in Copenhagen in 1930. For the past two years, COWI has provided consulting services on every aspect of engineering and constructing the island and all of its facilities, and in November it was appointed as owner’s engineer for a project it’s ideally suited to, says Lars-Peter Søbye, COWI’s president and CEO. “The company’s primordial intention was to support the sustainable development of society and we’re always searching for the best possible ways to apply our know-how to projects around the world to have an impact on society, particularly in terms of the green transition. That’s been part of our DNA from the very beginning throughout the sectors we’re involved in.”

Those sectors include the delivery of solutions not just for sustainable energy, but also for other infrastructure, industry, water, architecture, buildings, environmental projects and planning. In all cases, the company—which ranks 26th in the highly respected Engineering News-Record’s 2021 list of top international design firms—works closely with other stakeholders in order to create groundbreaking results. “The challenges society is facing are getting more and more complex. In such a world, COWI can’t and shouldn’t deliver complete solutions on our own. Instead, we believe that co-creating solutions together with our customers and partners is the best way forward, for society, for our customers and partners, and for us,” explains Søbye.

With 6,700 employees working from its offices all over the world, COWI is involved in more than 10,000 projects at any one time. Noteworthy current schemes include the construction of the world’s longest road and rail tunnel to connect Denmark and Germany that started last year; a proposed Scottish hydroelectric project that would be the first large-scale pumped storage facility to be developed in the U.K. for over 30 years; and Vineyard Wind in Massachusetts, the first major U.S. offshore wind energy farm, which covers 650 square kilometers.

“Each of our projects is unique, with only 50-60 percent being ones that we have previous experience with, the rest we develop from scratch. As a result, we’re innovating every single day,” he states. At a corporate level, COWI also invests heavily in research and development related to sustainability, such as new materials with low carbon footprints, the CEO adds. “We’re invested in developing the future of our society and showing customers the difference that using innovative methods instead of traditional ones can make for the climate. The technology used in, for example, the creation of Denmark’s artificial energy island is cutting edge and can drive sustainability to the next level. The worldwide need for energy is not dropping anytime soon, so creating new innovative solutions and alternatives to fossil fuels is a goal for us.”

> **“We’re always searching for the best possible ways to apply our know-how to projects around the world to have an impact on society.”**
> Lars-Peter Søbye, President and CEO, COWI

In 2020, COWI recorded an impressive net turnover of $973 million and $48 million in earnings before interest and taxes, and Søbye notes that global investors are increasingly targeting green development projects as significant prospects with good returns. “Within COWI, we’re taking a long-term perspective to our green investments and we want to make a real difference. In the meantime, we need to accumulate capital and be sustainable as a company through acceptable returns of investments. We’re expecting a growing turnover in the coming year and see many new possibilities for projects, especially in the U.S., the U.K. and Scandinavia—society’s infrastructure for the green transition is far from complete.”

COWI, which became carbon neutral in 2020, will continue to focus on shaping that infrastructure, he asserts. “Our aim is that 100 percent of our revenue must come from projects supporting the green transition. It’s crucial that the world stops talking about what we want to do about this and starts doing it. The good news is that we already know many of the solutions that can move the world in a sustainable direction. What we need is speed, commitment and to work together in partnerships across sectors and industries to achieve it.”

Danish companies step up against climate change

Denmark's private sector is taking the lead in supporting both the country and the world to meet their targets for sustainability and reducing greenhouse gas emissions

Energy-efficient solutions apply to cities, homes and construction

At the Glasgow Climate Change Conference, COP 26, Denmark presented its model for accelerating the global green transition: partnerships that combine the ability of governments to set optimal framework conditions with that of businesses to innovate and invest in new solutions, as well as to reduce emissions throughout their value chains.

In 2019, the Danish government initiated 14 industry-specific Climate Partnerships in which the heads of those industries and relevant ministries were tasked with devising roadmaps for how their sector could contribute to Denmark's climate goals. Last year, the Climate Partnerships produced a combined report with over 400 recommendations, many of which are now being integrated into national policy. "We did what we've always done when faced with profound challenges: Denmark has a long tradition of pulling off bold objectives through strong public-private partnerships. I myself am chairing the Climate Partnership for Manufacturing," states Kim Fausing, president and CEO of Danfoss, a Danish business at the front of the green transition. "We're a company with a global footprint that's engineering future solutions and offering the technology needed to decarbonize. Despite over 88 years of operation, we've never been as relevant with our technology as we are today."

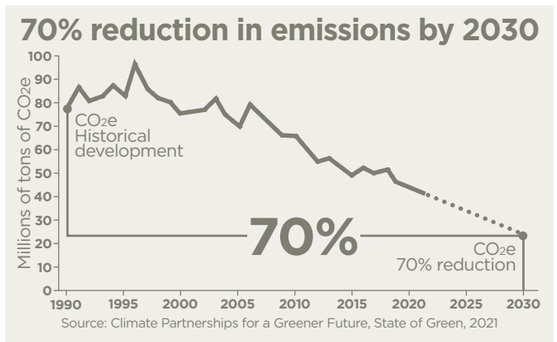
Its technology covers three areas: power solutions, particularly mobile and industrial hydraulics; climate solutions for cooling and heating buildings and infrastructure, for example; plus drives and electrification. One thing connects them all, Fausing explains. "We're extremely focused on how to decarbonize the planet with energy-efficient technology. According to the International Energy Agency, more than 40 percent of the carbon emission reductions the world needs to make have to come from energy efficiency. There are two pillars to that: using energy that is already there and replacing combustion technology with electrification through renewables and electrical systems. Danfoss is the leading provider globally for energy efficiency in buildings, infrastructure, supermarkets, data centers and many more structures. At the same time, we're enabling electrification worldwide with a diverse range of technological solutions to electrify cars, ships and off-road machinery. That's the core of our business."

Kim Fausing
President and CEO
Danfoss

Improving efficiency can be as simple as making small adjustments to air conditioners so they consume 30-50 percent less energy or electrifying short-distance ferries. They can also be more complex, he notes. "For example, we're in many of the data centers that are being built, harvesting excess energy and putting it back into the energy system. Recently, we worked on a Facebook center in the Danish city of Odense, which is now heating over 10,000 houses nearby." Danfoss has expanded rapidly in recent years through organic growth and its purchase of U.S.-based Eaton Hydraulics for $3.3 billion in 2021. "The acquisition was strategic, it has basically doubled our hydraulics business and given us a leading position in the U.S., where many of our largest customers are based," he says. Even though the firm is going through a transformational time, he confirms it is still committed to becoming carbon neutral in all its activities by 2030.

It will also continue to invest in research into new energy-efficient technologies and to push for the adoption of existing solutions, Fausing promises. "In our view, energy efficiency hasn't had the focus it should have had. It's actually very good business, with a short payback period compared to capital-intensive new renewable energy projects. Maybe more importantly, it has a quick impact and we already have the technology to reach the Paris Agreement targets on energy efficiency, we just need to implement it. It's okay to talk about the green transition, but it's more important to act and, if we work together, we can make a lot of significant things happen in a very short period of time."

Mads Leth, CEO at one of the country's largest water and wastewater utilities, VCS Denmark, agrees that the climate-change challenge requires partnerships. "That's why VCS is heavily involved in research and development collaborations with other utilities, suppliers and universities. Already, a lot of our water utilities are energy neutral or even positive, we produce more energy than we consume," he says. That energy comes from biogas generated at wastewater treatment plants, which creates heat for district heating systems and electricity for the grid. But VCS and others are trying to get even more out of their wastewater, Leth reveals. "Biosolid sludge is a global problem: there are a lot of nutrients in it such as nitrogen and phosphorous, but there are also not so nice things like heavy metals, pesticide residues, medicines, oil residues and microplastics. Right now, we are looking at pyrolysis, a thermal process that will eliminate most of the pollution." VCS also collaborates internationally by providing consultancy and training services to utilities around the world, he reveals. "Our specialty is everyday operations for the stable supply of clean drinking water and handling of wastewater. It's a great way for our employees to contribute to a better environment and safer water in, for example, Africa."



Source: Climate Partnerships for a Greener Future, State of Green, 2021

Waiting to act is not an option anymore

Denmark's 34,250 retail and wholesale companies are directly responsible for only 0.15 million tons of carbon-dioxide emissions a year. But that's not the full story, says Jan Bøgh, president and CEO of JYSK, the home and garden furnishings retailer which counts over 3,000 stores in 51 countries. "We've set the goal of halving our scope 1 and 2 emissions by 2030, but about 95 percent of our footprint comes from our supply chain. Raw materials are important and an area where a big company like JYSK can make a difference. For example, one of our goals is that the cotton used in our textiles is more responsible before the end of 2024. It's a problematic crop, as it requires a lot of water and pesticides, and we're working with non-governmental organizations on this."

Another Danish driver of sustainability in retailing is Flying Tiger Copenhagen. The chain has successfully established presence across 26 countries on the back of an ever-changing portfolio of original products ranging from kitchen tools to gifts, toys and party decorations—all in-house designed with the aim of generating smiles and good feelings from customers. "Flying Tiger is built on the Danish heritage, which is design-led, simplistic and very sustainable. As Denmark is a frontrunner in sustainability, it was natural for us to say we also wanted to be a leader in the green movement," CEO Martin Jermiin discloses. For the retailer, that meant fully understanding and precisely calculating how every element in its value chain impacts the environment, he asserts. "We've sought out the very best data and authorities on every dimension we could find within sustainability. On emissions, we've signed up to the 1.5 degree Paris Agreement goal, we've had our targets validated by the Science Based Targets initiative and we're on fire in terms of meeting them."

> **"We have a race to win: it's not against peers, it's to save the planet. Sustainability is something we implement and consider in every single business decision."**
> Martin Jermiin, CEO, Flying Tiger Copenhagen

Flying Tiger designs all its products to have as low an impact on the environment as possible, according to Jermiin. "For instance, we use wood and paper certified by the Forest Stewardship Council in our products, we've been reducing our plastic usage by half, eliminating half of all single-use items and we'll be reducing our overall emissions by over 30 percent by 2026. We're very proud of where we are, but there's a long journey ahead to a zero-emission world. We promise to get there faster than most because we have a race to win: it's not against peers, it's to save the planet. Sustainability is something we implement and consider in every single business decision because waiting for others to act is not an option anymore."

A window onto a better and healthier world

Their strong innovation aptitude and sustainability mindset make Danish firms good role models, according to David Briggs, CEO, VELUX Group

VELUX windows help to decarbonize the built environment

As the worldwide frontrunner in roof windows and skylights, VELUX is among an elite league of global brands whose name has become the generic term for the sector they operate in. Can you provide an insight into the group's history?

David Briggs
CEO
VELUX Group

We're an eighty-year-old business founded on a spirit of innovation—our founder, Villum Kann Rasmussen, invented the roof window as we know it today and his brainchild has freed up millions and millions of square meters across the world to be used as living areas. As a group, we've remained resolutely focused on roof windows and have resisted the temptation to stray too far from being a daylight and fresh-air vendor. This niche has enabled us to build up quite an enviable position: we're now a multi-million-euro business operating in 37 countries around the world. We're market leader by quite some distance, with a share in most markets of above 70 percent. We're still owned by the founding family and a philanthropic foundation as well, which means we're afforded a long-term vision and we can aspire to not only be successful as a business, but also to contribute something to society.

How are VELUX's extensive research and innovation programs contributing to the development of healthier and more sustainable buildings?

Our windows have evolved continuously in terms of energy performance and we're looking very heavily at the decarbonization of buildings. We continue to innovate with smart solutions, for example, that ventilate a house at the appropriate time. Today, some VELUX windows can be controlled from your cell phone and, through affordable sensors installed throughout your house, you can regulate its internal climate from air quality to temperature, reducing the need for air conditioning. We're also working on material technology: the biggest carbon contribution to a VELUX window comes from aluminum and glass, so we're looking for substitutes that are less carbon heavy. Additionally, we're working on glass technologies such as vacuum-insulated glazing and making glass thinner so that it takes less energy to produce.

Currently, 80 percent of our innovation is connected to sustainability, but sustainability isn't linked to decarbonization alone. The essential purpose of a building is to keep you safe, comfortable, healthy and warm, with plenty of daylight and fresh air. Of course, we need to focus on decarbonizing by renovating all our buildings: it's crucial for the planet because 40 percent of the carbon going into the atmosphere comes from the building sector. However, in renovating and constructing buildings, we need to make sure that we're producing environments that are conducive to the health and wellbeing of everybody in them. VELUX is about making the most of what is naturally available in a way that decreases the amount of carbon released into the atmosphere.

As well as using innovation to create sustainable products, VELUX is taking pioneering climate and nature actions as part of its strategy for sustainability as a business. Can you describe some of these?

We were the second company in the world, just after Microsoft, to announce that we would repay in full our own historical carbon debt. By 2041, when we will be 100 years old, we will have pulled out of the atmosphere the total amount of carbon that we have put into it over those years; that's about 5.6 million tons of carbon dioxide. We're doing this in partnership with the Worldwide Fund for Nature (WWF), because we want to tackle not only carbon, but also biodiversity challenges. We've focused on reforestation and are working on big projects across the world, with our first running in Uganda now. Our partnership is a long-term commitment that WWF and the local communities can depend on, and that's critical to making this initiative a success. We've also signed up to the global Science Based Targets initiative,

> **"We were the second company in the world, just after Microsoft, to announce that we would repay in full our own historical carbon debt."**
> David Briggs, CEO, VELUX Group

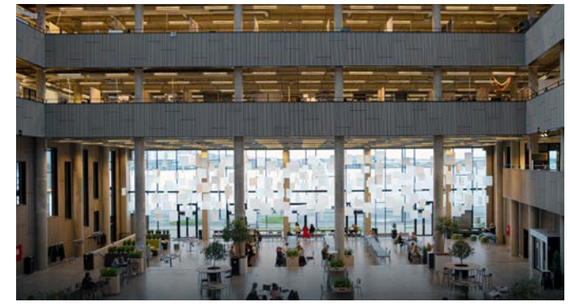
which means eliminating our scope 1 and 2 carbon emissions by 2030 and halving our scope 3 emissions, those of our supply chain, by 2030 as well. Our motives are not just because it is good for the planet, rather, we want to also demonstrate to other companies how to build sustainably going forward.

Essentially a residential business, VELUX is now increasing its presence in the commercial space? What can it offer in this area?

There hasn't been much attention given to the energy performance of products put into the roofs of stadiums, factories, hospitals or offices, for instance. Our products can contribute significantly to reducing the carbon footprint of those buildings. In addition, until recently, if you built a store or a warehouse, the solution has been to have no windows, which is extremely unsustainable. Roof windows have such potential to transform a building and the people's lives within it, and VELUX is the firm that can best harness that potential.

Mission-based universities

Denmark is home to eight public universities, which provide world-class, industry-focused education and are also the country's main centers of research excellence



University of Aalborg in Northern Denmark was founded in 1974

"Our universities are very international, highly ranked and one of their great advantages is they're free. If you have the ability and yearning to get a university education, you can, no matter what social background you come from," says Per Michael Johansen, rector of the University of Aalborg (AAU).

Based in vibrant Aalborg city in the industry-rich north of the country, AAU is one of the most prestigious of those institutions. Across three modern campuses, it generates research with global impact, while around 20,000 students a year undertake its degree programs that are based on a unique problem-based learning platform, he states. "Our vision is for education in close collaboration with the surrounding world and, from day one, students work on real problems with industry or the public sector. We see ourselves as a mission-based, collaborative university that is equipped to take on global challenges," he explains.

AAU takes an interdisciplinary approach across its faculties that cover engineering and science, IT and design, medicine, social sciences and humanities, plus a new business school that encourages innovation, particularly in small and medium-sized firms. Within those areas, the university concentrates on fields where it has proved to be among the very best, notes Johansen. "For example, we're thriving in natural sciences, we've been ranked as one of Europe's leading universities for IT and we focus a lot on digital health research. In engineering, we're among the world's top universities for power electronics, we're extremely strong in digital signal processing and we have over 200 researchers in the field of energy and sustainability. Based on the quality of its research and education in that field, AAU is the sixth-largest university contributor toward achieving the United Nations Sustainable Development Goals, according to Times Higher Education. Innovative projects it is currently working on include a carbon-capture initiative for a cement company that is one of Denmark's biggest carbon-dioxide emitters and a power-to-X program for sustainable biofuels.

Johansen believes a crucial reason for AAU's high standing is its internationalization. "You can't develop a university unless you are international in your scientific collaboration and we have substantial worldwide partnerships with many top universities. We also tap into European Union (EU) research programs, such as Horizon 2020, where we collaborate with other European universities and businesses—in fact, about half of all EU energy grants are attracted by AAU and the Technical University of Denmark. We may be small, but we're agile, focused and we're making a difference by creating knowledge for the world."

Per Michael Johansen
Rector, University of Aalborg

Denmark's place in global education

5th for expenditure on tertiary education

2nd for scientific journal articles

15th combined ranking of universities

10th for relevance of education to the economy

Source: The Global Talent Competitiveness Index 2021, Insead

Transition in transportation accelerates

Denmark is rapidly electrifying its existing transport systems, while also investing in expansive new road-and-rail infrastructure

Fehmarnbelt will be the world's longest immersed tunnel

Last year, the Danish government announced a plan to spend $17 billion on transport infrastructure projects by 2035 to support the country's ambitious goals for decarbonization, as well as to improve its road and rail systems.

Benny Engelbrecht
Minister for Transport

Mikkel Hemmingsen
CEO
Sund & Bælt Holding

"The core of that investment is electrification. All public transport needs to be electrified and we need to get a hold on road transport, the largest contributor to carbon-dioxide (CO_2) emissions," reveals Minister for Transport Benny Engelbrecht. To cut road-related emissions by over 2 million tons a year by 2030, his ministry wants to increase the number of electric cars on the road from just over 100,000 to a million, he says. "We're doing well, electric car sales are booming and we've accelerated investments in charging infrastructure."

A harder part of the equation is reducing emissions from heavy-duty vehicles before the automotive industry has developed a firm alternative to fossil-fuel-powered trucks, he states. "Developments might overtake us if we decide on a technology to invest in too soon. Therefore, from 2025, we've decided to tax the CO_2 emitted by heavy-duty vehicles. Trucks will pay a per kilometer fee to drive on Danish roadways plus a surcharge equivalent to the approximate cost per ton of CO_2 that they emit. This is actually the first true CO_2 tax we've had in Denmark. The details need to be ironed out, but the basic principle is that you get a 75 percent discount if you don't emit CO_2."

The answer to greener rail, on the other hand, is clearly electrification. "All trains in Denmark will be carbon neutral, which means electrifying our major core rail network and equipping it with a digital signaling system that is up to European Rail Traffic Management System standard," asserts Engelbrecht. Most of the ferries that link Denmark's many islands also have the potential for direct electrification, which the government is encouraging through a financial incentive that brings the price of an electric ferry down to that of a diesel one, he adds. "This is also something that can support Danish industry as we are frontrunners when it comes to electrifying ferries. Once demand increases prices will fall, making it much easier to export our technologies."

One way the government plans to boost the use of more sustainable forms of transportation is to increase the capacity and accessibility of public transport networks by investing in mass urban transit systems. "At present, everyone traveling by rail in and out of Copenhagen, for instance, must pass through its central station, which creates a massive bottleneck. Our idea is to have a number of central hubs, allowing you to shift between train lines," he notes.

Europe's new shortcut

Denmark's largest infrastructure project, however, is a critical segment of the Scandinavian-Mediterranean Trans-European Transport Network core corridor. "The Fehmarnbelt link will be the world's longest immersed tunnel with a length of 18 kilometers and will create a link between Copenhagen and Hamburg in Germany. The tunnel will include a four-lane motorway that will cut around 160 kilometers off the drive between those cities and two electrified high-speed rail tracks will link Sweden, Norway and Copenhagen to Hamburg and wider Europe," explains Mikkel Hemmingsen, CEO of Sund & Bælt Holding, the public company responsible for designing, constructing, operating and maintaining Denmark's biggest transport infrastructure investments, including Fehmarnbelt.

Sund & Bælt started constructing the Danish section of the vast tunnel in 2021 and aims to complete it by 2029. The company's track record in developing world-class infrastructure strongly suggests that Fehmarnbelt will be its next socio-economic success story. Its largest project to date is the 18-kilometer Storebælt road-and-rail link between east and west Denmark. Among the world's longest bridge and tunnel constructions, Storebælt has become one of the country's most important traffic arteries since it opened in 1998 and is estimated to directly benefit Danish society by $1.5 billion a year. Another similarly impactful achievement is the 16-kilometer road-and-rail Øresund Bridge linking Sweden and Denmark via a bridge, an artificial island and a tunnel, which was inaugurated in 2000.

> **"Investments in artificial intelligence, drones and sensors have resulted in us being able to double the lifespan of our infrastructure to 200 years."**
> Mikkel Hemmingsen, CEO, Sund & Bælt Holding

Sund & Bælt's responsibilities extend to establishing financing for its projects, for which it has devised an innovative, user-financed model, states Hemmingsen. "Bridges and tunnels are very expensive for the state's budget; so we invented this model of a state-owned company borrowing the financing at a very low interest rate with a state guarantee. These loans are paid back by taking fees from the road and, to a lesser extent, rail users." The solidity of its

Innovative drone technology monitors the health of infrastructure

model having been proved by the Storebælt and Øresund Bridge developments, both of which are on track to beat their loan-repayment dates, Sund & Bælt's financing of the $7.9-billion Fehmarnbelt is following the same system. However, he cautions, "If the model were to be exported, it's important that governments create entities with a super-efficient monopoly to run the projects. Sund & Bælt is an example of this: we operate as a private company, we have to meet all benchmarks, we have to be efficient. That gives you a very powerful instrument to transform a country."

With over 20 years experience in constructing and maintaining complex infrastructure, the company has developed digital technologies that have enormous potential in the wider industry, believes Hemmingsen. "Substantial investments in artificial intelligence (AI), drones and sensors have resulted in us being able to double the lifespan of our infrastructure to 200 years. For example, we've equipped drones with cameras and developed an algorithm so that AI can analyze concrete for cracks. We can tell where future problem spots will be, carry out repairs at the right time and have a continuously accurate view of the condition of our infrastructure. Being able to determine the state of concrete or steel to double life expectancy is going to change the way infrastructure is maintained worldwide. In partnership with IBM, we're rolling out this innovative technology globally." Sund & Bælt has also developed advanced data-driven technology for its toll systems, which incorporate camera-based automatic number-plate recognition for digital user payments and control of, for example, congestion and environmental zones.

Sund & Bælt sees itself as a green company tasked with providing infrastructure as sustainably as possible. The construction of its link projects has had no lasting negative impact on the environment, while building artificial reefs and islands as part of them has a hugely positive effect on biodiversity. In one upcoming innovative project, Sund & Bælt will take another step toward sustainability by reusing the factory with which it is building Fehmarnbelt to create a 10-kilometer tunnel around Copenhagen. "We're trying to work with infrastructure like a shipyard operates: you build one ship, then you use the same mold for the next. We want to turn infrastructure from projects into more industrialized fabrication, which would reduce risk and cost. It's a new way of thinking in the infrastructure business," Hemmingsen says. According to the CEO, the company's project pipeline consists of more innovative infrastructure schemes and technologies for Denmark, but it would welcome further international partnerships with players like IBM. "Exporting our innovations is a way of contributing to other countries. We are open about sharing everything, because we would like others to be as successful as we are."

Nordic Fintech Week 2022

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