



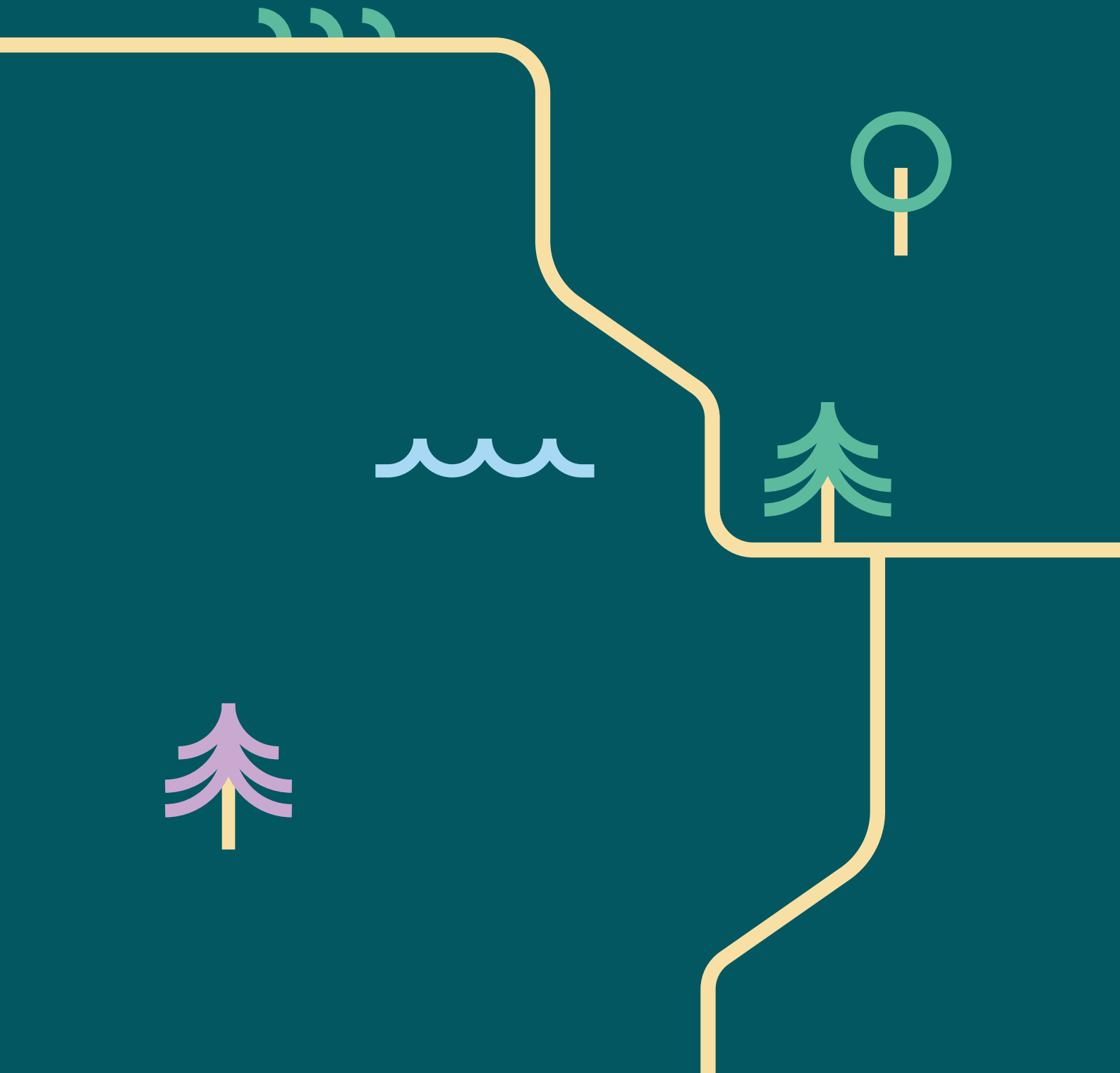
ROADMAP 2.0

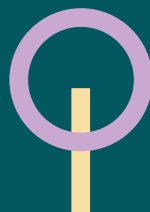


THE GREEN INDUSTRIAL INITIATIVE



Norwegian Ministry of Trade,
Industry and Fisheries





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Why update the Green Industrial Initiative roadmap?

The Government's Green Industrial Initiative will take us through the biggest transition the Norwegian economy has seen in modern times. And time is of the essence. We need to be more ambitious, work faster, implement better and cooperate more systematically than we do today. We must strengthen our cooperation along several axes, pull in the same direction, and see the effects of small and large political decisions in context.

Norway cannot do the job alone. Our approach must entail international cooperation. Simultaneously, we must do what we can to cut emissions, restructure and ensure sustainability here at home, in all areas of society. Our greatest contribution to the global climate challenge will be through the dissemination of knowledge, green technology and the production of green products, and if we are to achieve this, we need to cooperate – not go at it alone.

Norway is dependent on international trade. For many generations, our existence has been based on the exchange of fish for wine, car parts for cars, engineering services for mobile phones and so on. Our harsh northern climate, our abundance of natural resources and a social model based on democracy, trust and predictability, mean 'made in Norway' is synonymous with quality, tailoring and 'just-in-time'.

The Green Industrial Initiative will build on our advantageous starting point – our experience of managing rich natural resources, our industrial expertise, regional advantages and the Norwegian working life model – and exploit the opportunities that exist in the market for green products. However, we cannot meet the challenges we face today using yesterday's tools alone. To achieve our goals, we must cheer on, pave the way for and ease the path of industrial entrepreneurs who are leading the way with innovative projects. If we wait until the

risk is low enough and we have sufficient information, the transition will be too slow. We must strike a good balance between private capital and public funding which promotes good projects and a commercially viable approach, in line with the goals we have set. Our tools must be targeted and meet the challenges and needs that emerge for the actors and society, and we must prioritise better use of our scarce resources.

The economic growth the world has seen in recent decades has lifted millions of people out of poverty, generated great value creation for society and great benefit for consumers. However, this growth has not been sustainable. It deters future value creation opportunities and threatens our very existence on Earth. In the future, we must therefore prioritise better use of renewable resources as far as possible and reuse products and materials in comprehensive circular systems. Our goal must be to ensure good, equitable and sustainable economic development, not the largest possible economic growth. It is only when value chains are consistently based on renewable energy and sustainable activity that we will see the full effect of our green transition policy.

In the course of just a few years, Europe will make the transition from fossil to renewable energy sources, and has ambitions of taking the lead as regards skills for the future. This requires massive development of new renewable energy production such as solar, water and wind power, opportunities for energy storage

and a number of new low-emission solutions, for example in transport. The demand for green products is increasing rapidly. The market for batteries is expected to grow 30 per cent per year until 2030, while the market for solar power is expected to grow even more. All of this requires tailor-made materials and products on a large scale. It is very positive that many countries are announcing dynamic ambitions and facilitating the green transition. This gives grounds for optimism, and does not mean that we in Norway should not do the same. These markets need and have room for many actors. The value chains comprise many links, and different applications require specific product adaptations. In other words, they cover a wide range of products.

The world is changing rapidly. After decades of increasing globalization, views on trade and globalization have changed in recent years. At the same time, the consequences of climate change are more evident. Many express their impatience with the green transition, and companies are queuing up to realise their projects.

Russia's war of aggression against Ukraine has changed Europe, through strengthened solidarity, a change of pace in the transition from fossil to renewable energy and increased attention to the vulnerabilities associated with energy, raw materials, technology and competence. As NATO Secretary General Jens Stoltenberg said at the Confederation of Norwegian Enterprise's (NHO) annual

conference in 2023, value chains work well until they suddenly don't any more. The world has been reminded that business is also politics and that trading with authoritarian states may entail a risk of ending up in a dependent relationship that can potentially be exploited. Many private and public enterprises are experiencing digital security challenges. These are areas that are increasingly being used politically by states looking to exert pressure on

Norway or the West to promote their own interests that do not necessarily overlap with ours.

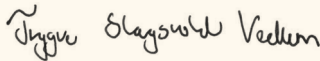
The need to accelerate our work on the Green Industrial Initiative, strengthened cooperation with our closest trading partners and renewed vigour behind measures to solve the climate challenges form the background to why we are now updating and strengthening the roadmap for the Green Industrial Initiative.




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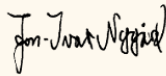
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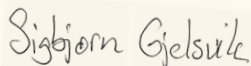
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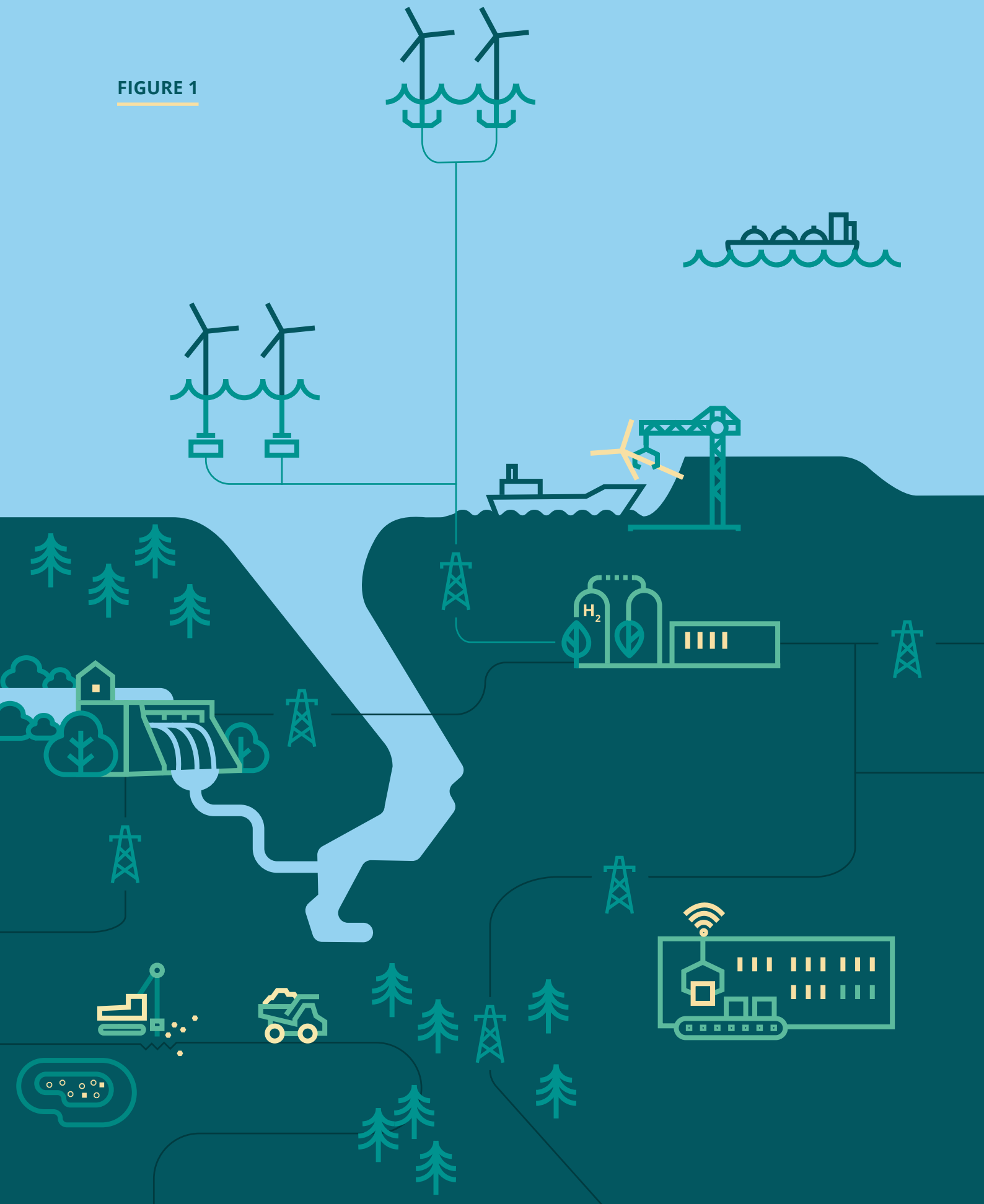


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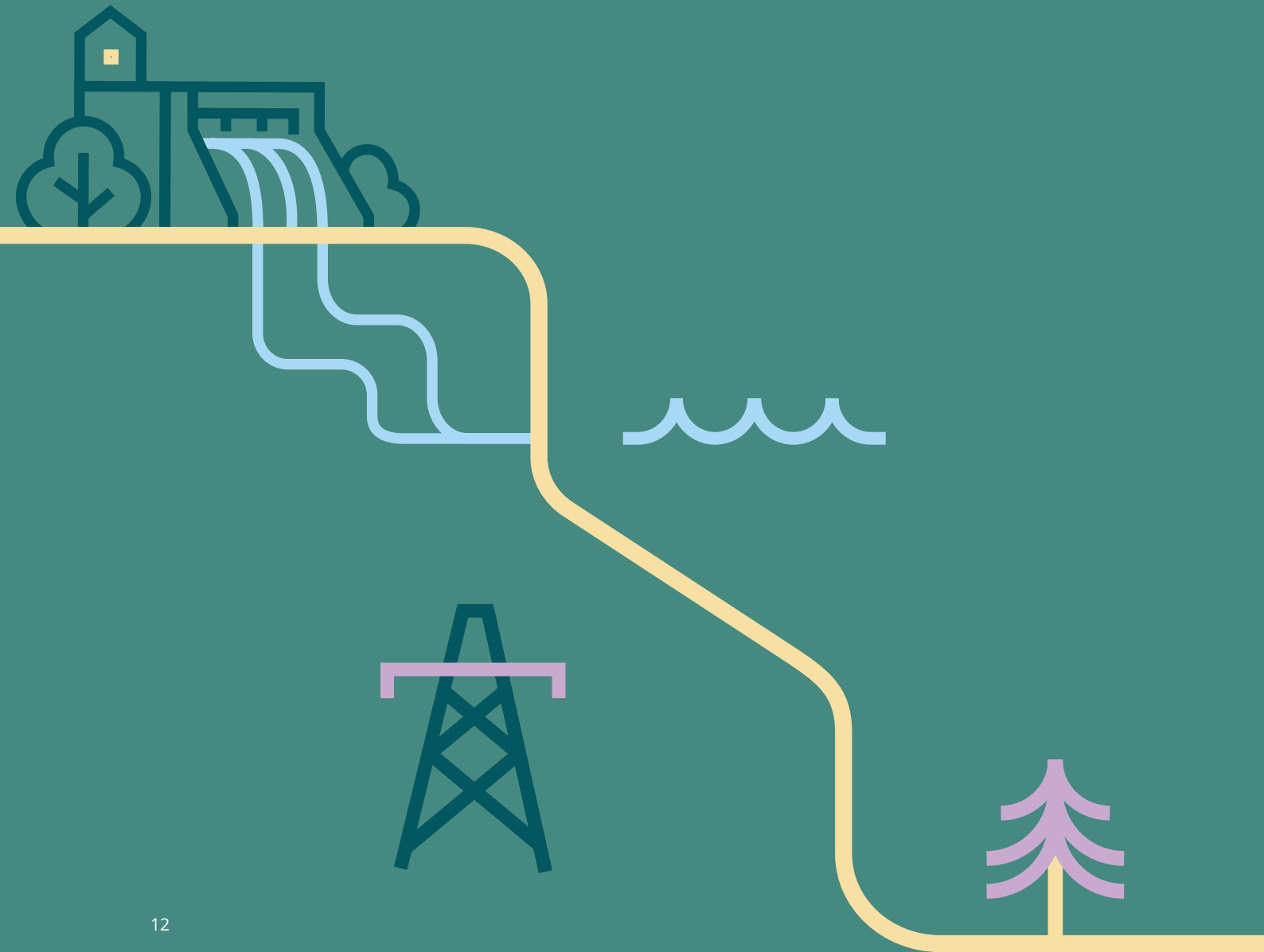
FIGURE 1





01

Updated roadmap for the Green Industrial Initiative



Introduction

The main objective of our industrial policy is to facilitate the greatest possible overall value creation in the Norwegian economy, which means that all commercial activities must be socially, environmentally and economically sustainable, and not affect Earth's tolerance limit. The task of industrial policy is not to manage resources, but to ensure that profitable enterprises and jobs can be created and continue to create value for society. Transitioning to a low-emission society will require a lot from enterprises and society at large, and our industrial policy must contribute to ensuring a highly adaptable economy.

In 2022, the Norwegian Government launched the Green Industrial Initiative.¹ This work will contribute to:

- ✨ Adapting Norwegian business and industry to a low-emission society and helping to achieve the goal of the Norwegian Government's political platform (the Hurdal Platform) to cut emissions by 55 per cent by 2030 (and 90–95 per cent by 2050) compared to 1990.
- ✨ Realising green industrial projects in existing enterprises and in new green value chains.
- ✨ Creating attractive jobs for the future throughout the country.
- ✨ Achieving the Hurdal Platform's goal of increasing non-oil and gas exports by 50 per cent by 2030.
- ✨ Reducing vulnerability in key value chains for the green transition.

In June 2022, as a starting point for the work, the Government presented a roadmap for the Green Industrial Initiative with ambitions and 100 measures for seven demand-driven value chains that are particularly important for Norway; hydrogen, offshore wind, batteries, carbon capture and storage (CCS), the process industry, the maritime industry, the forestry and wood industry and other bioeconomy sectors.² The Government also presented Norway's Battery Strategy, with measures that complement the Roadmap for the Green Industrial Initiative.³

One year after the presentation of the roadmap, a lot has happened, both in Norway and abroad:

- ✨ We have initiated most of the 100 measures presented in last year's roadmap.
- ✨ The Green Industrial Initiative mobilises actors and lays the foundation for cooperation and dialogue with various actors on specifying opportunities, needs, barriers and measures.

1 <https://www.regjeringen.no/no/tema/naringsliv/gront-industri/loft/>

2 <https://www.regjeringen.no/en/dokumenter/roadmap-the-green-industrial-initiative/id2920286/>

3 <https://www.regjeringen.no/en/dokumenter/norways-battery-strategy/id2921424/>

- ☀️ A number of companies have made investments and/or taken important steps towards realising their projects in Norway, and new agreements are being entered into between companies in Norway and across the world.
- ☀️ There is a rapid development in technology, products and markets of importance for green projects in Norway.
- ☀️ We have announced a competition for the first two areas for offshore wind on the Norwegian continental shelf.
- ☀️ We have set a requirement that climate and the environment shall be weighted at least 30 per cent in public procurement.
- ☀️ We contribute to the green transition internationally, in partnership with the EU and individual countries.
- ☀️ The war in Ukraine has resulted in higher prices for energy and several raw materials.
- ☀️ Energy, raw materials and technology have increasingly become geopolitical issues.
- ☀️ The US has launched the Inflation Reduction Act as part of its climate policy.
- ☀️ The EU has reinforced its climate and industrial policy with a Green Deal Industrial Plan and two related legislative proposals called the Critical Raw Materials Act and the Net Zero Industry Act. In addition, the state aid regulations for green industrial projects and zero-emission technology have been eased.
- ☀️ In December 2022, the countries of the world agreed on global targets laid down in the Kunming-Montreal Global Diversity Framework (the 'agreement on nature') to reverse the loss of nature by 2030.

Together, these developments contribute to accelerating the green transition, technology development and expanding the markets for green products.

In the further work, we highlight the solar industry and manufacturing as new priority areas:

Solar industry: the market for solar power is growing rapidly and is part of the solution to the energy transition we are facing in Norway, in Europe and globally. Norway has been a pioneer in the development of the solar industry and is currently uniquely positioned with established expertise and stakeholders in important parts of the European solar value chain.

Manufacturing: Norway has several leading clusters at the forefront of the utilisation of new technology for the production of goods, components and technology. Strengthening our manufacturing companies will be central to exploiting the value creation potential of green value chains and in creating jobs for the future.

1.1 Goals for the work

The Green Industrial Initiative is based on the Government's policy platform, the Hurdal Platform, which highlights the connection between energy, climate and industrial policy. The work will promote attractive jobs, assets and welfare for the future in Norway, promote emission reductions and the green transition, and reduce vulnerabilities in value chains that are key to the green transition. Protecting nature and sustainability are key prerequisites for the implementation of the Green Industrial Initiative.

The work is based on the fact that the markets for green energy and products with a low climate footprint are growing rapidly, and that, in this context, Norway has unique prerequisites for developing profitable green jobs with the help of our natural resources, industrial experience, digitalisation and technology use, expertise and the Norwegian working life model.

To make industry greener, we must use energy and knowledge in new ways. Norway has a long-standing tradition of creating new business activities based on established expertise and natural advantages. The Government's Green Industrial Initiative builds on this tradition.

This Roadmap aims to show companies and investors the benefits of establishing green projects in Norway. Overall, the implementation of the measures we present in the roadmap will provide better framework conditions for green industrial projects and encourage more companies and investors to have the courage to invest in green projects. The roadmap is also a key work tool for the Government and the policy instrument system in the realisation of ambitions in a world that does not stand still, but, on the contrary, is changing rapidly.

FACTS

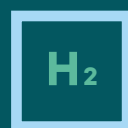
What is manufacturing?

Norwegian industry includes a number of companies that produce various types of physical products that are either sold directly to a consumer market (textiles, chairs, ploughs, paints etc.), or that are included as components for composite products (car parts, boat propellers, circuit boards, navigation systems etc.), or that constitute technology and production equipment that other businesses use in their production (3D printers, packaging machines, robots, machining equipment, control systems etc.). This part of the industry is often jointly referred to as 'manufacturing', which in short is industrial production.

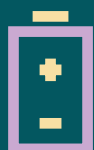
1.2 What we are investing in: the Government's visions for the nine priority areas



Norway will become a leading nation in the field of offshore wind, with an industry that develops and builds superior wind power solutions. The Government's ambition is to allocate areas with potential for 30 GW of offshore wind production on the Norwegian continental shelf by 2040.



Norway will develop a value chain for the production, distribution and use of hydrogen produced with low or zero emissions and contribute to developing the hydrogen market in Europe.



Norway will further develop a coherent and profitable battery value chain, from sustainable mineral extraction to recycling of batteries. Norway strives to be an attractive host country for profitable activity along the entire battery value chain and attract large battery investments and gigafactories.



Norway will continue to work on world-leading industrial solutions for carbon capture, storage and utilisation that create profitable jobs in Norway and that cut global climate emissions in a cost-effective manner.



Norway will have the world's cleanest, most modern and energy-efficient process industry, based on high-tech solutions and great value creation through specialised products.



Norway will develop a profitable solar industry with the potential to grow, which can contribute to the implementation of the green transition and play a key role in the further development of the solar industry in Europe.



Norway will have the world's most sustainable forestry industry. Bioresources from the sea and from land will be used to make climate-friendly and profitable products, including biofuels, and help develop industrial jobs and long value chains in Norway.



Norway must have a profitable, innovative, highly efficient and sustainable manufacturing industry that, based on expertise and the Norwegian working life model, delivers top-quality products with a low climate and environmental footprint to the entire world.



Norway will remain a maritime superpower internationally, leading the way into the green transition by developing, building and deploying zero-emission solutions and autonomous vessels.

1.3 The need for a Green Industrial Initiative – “Everything is connected”

Climate change and loss of nature are some of the greatest global challenges of our time and among the most important reasons for a green industrial initiative. Extreme weather events and global warming are already doing great damage in all parts of the world and represent a real threat to economic growth and welfare. We are facing a pressing need to lead our industry, energy supply, transport sector and society as a whole through a transition from fossil to renewable energy, in a way that safeguards environmental, social and economic sustainability. This applies to Norway and to all other countries. The UN and others emphasise the importance of jump-starting the necessary green transition.⁴ This is our generation’s great and shared responsibility.

Going forward, all activity must be sustainably organised and with low or zero greenhouse gas emissions. In a number of areas, Norway has come a long way, such as the electrification of society, including the transport sector, and the very high proportion of renewable energy production. Many Norwegian industrial enterprises are at the forefront of resource efficiency and low emissions, providing technology, materials and solutions for the green

transition in numerous sectors in Norway and globally. For example, the proportion of renewable energy use in society is more than 70 per cent, we have the highest proportion of electric cars per capita in the world with 650,000 cars on Norwegian roads, and Norwegian industry has reduced its emissions by 40 per cent since 1990.⁵

Demanding tasks lie ahead which require good access to resources, good resource management, faster realisation of green projects and the green transition in general. To make this happen, we need a holistic approach, which takes into account that “everything is connected”. A key point in the Green Industrial Initiative is that a number of large and small puzzle pieces will together promote Norway as a good host country for investments in green value chains.

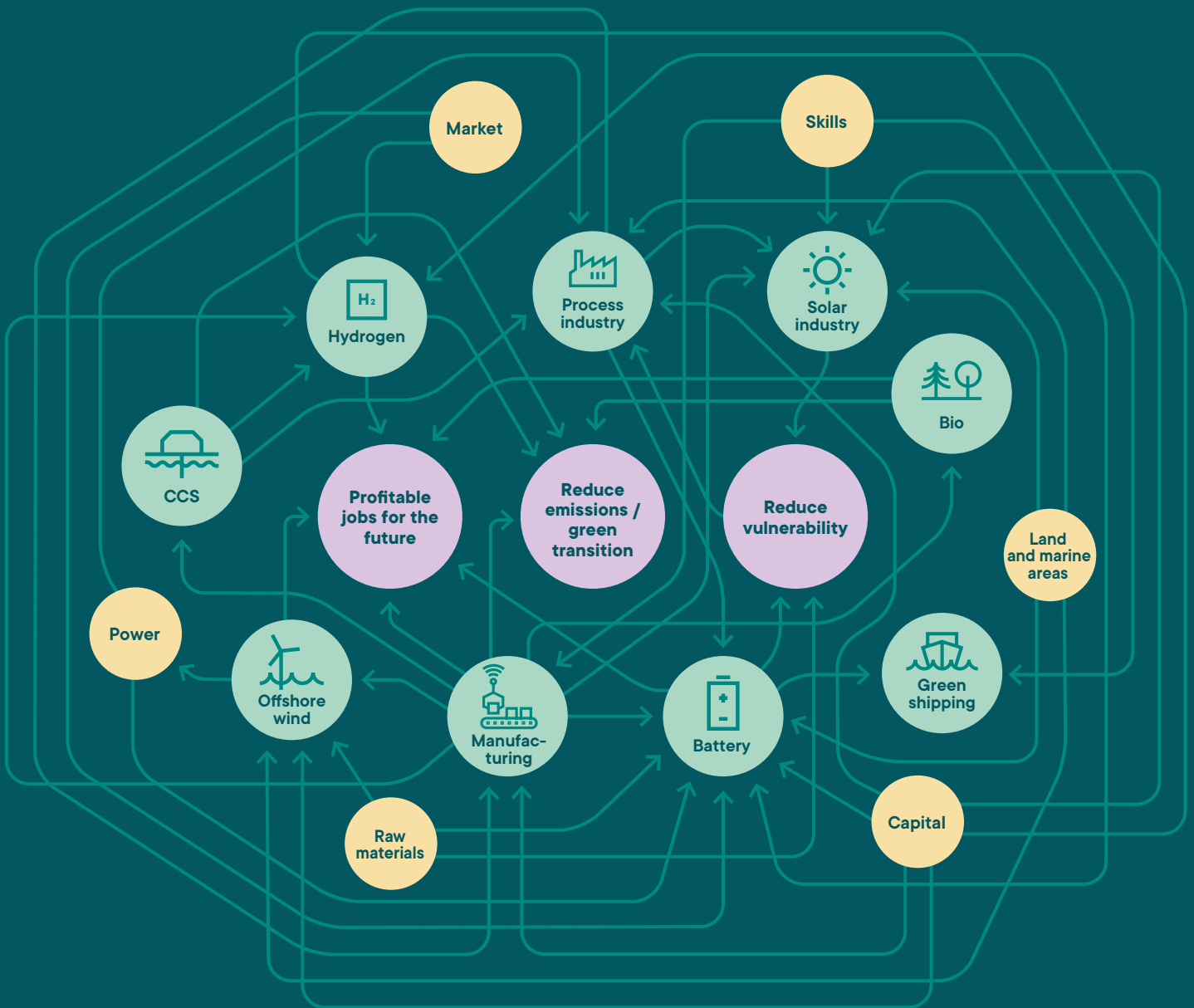
The list of links in the Green Industrial Initiative is long. The green transition requires good access to building blocks in the form of raw materials from the mineral sector, materials from the processing industry and components from manufacturing. How we acquire these input factors has a significant impact on nature and climate.

4 <https://www.fn.no/nyheter/fns-klimarapport-fem-grep-vi-naa-maa-ta>

5 <https://www.eea.europa.eu/ims/share-of-energy-consumption-from>

FIGURE 2

Illustration of links between the nine priority areas and our common prerequisites.



In a growth phase, the amount of material required for the green transition will increase sharply, but increased circularity will be essential to exploit the resources that are already in circulation. Over the past 15–20 years, the increased global demand for materials has mainly been met by increased production capacity in China, supported by significant public subsidies of energy and capital, access to affordable labour and little pricing of greenhouse gas emissions. Overall, European production has decreased, while activity in the Norwegian process industry has been maintained. The Norwegian process industry is seen as technological frontrunner in the production of aluminium, silicon, nickel and manganese, and is the largest European producer of all these raw materials outside Russia and Ukraine, which means the industry has gained strategic importance for Europe.

As new and more efficient low-emission solutions need to be developed, the building blocks will have to be adapted through increased specialisation. Raw materials, other materials and components must be acquired with minimal emissions, based on renewable energy and high recycling rates. This requires the development of new low-emission solutions, which are often more energy-intensive than current solutions, and in some cases include CCS, which also

requires more energy. In other words, the green transition requires increased production of building blocks, which in turn requires increased production of renewable energy. Fortunately, there is an abundance of renewable energy sources such as water, wind and solar power. However, the development of new energy can be demanding and impact nature, other business interests and society in general. The development of renewable energy will in itself require a large amount of tailored building blocks from the process industry and the manufacturing industry.

The transition from fossil to weather-dependent renewable energy supplies is changing the power system in Europe and the rest of the world. As a consequence, the need for energy storage increases, for example when using stationary batteries, so that energy consumption does not have to adapt as much to weather variations. It may become more relevant to increase local energy supplies, such as solar panels installed on buildings. Increased phasing in of variable energy resources is a major reason for the strong growth expected in the battery market towards 2030.⁶ Significant battery storage capacity is therefore being established and planned in connection with large off-shore wind farms. The possibility of storing energy means batteries will also reduce the need for power grids in a renewable power system.

⁶ Norway's battery strategy describes that while the total global demand for batteries amounted to 470 GWh in 2021, various actors and analysis agencies expect it to be somewhere between 3,600 GWh and over 6,000 GWh by 2030, with the European market alone expected to reach 1,000 GWh by 2030. However, Rystad Energy and others predict that approximately one third of the battery market up to 2030 will come from 'new' market areas such as power grid stabilisation, energy supply and energy storage. (Source: Norway's Battery Strategy)



Going forward, all activity must be sustainably organised and with low or zero greenhouse gas emissions.

Another link may be based on green shipping, which, for example, will use batteries, hydrogen and ammonia as energy sources, depending on the type of vessel and distance to be covered. For some vessels, it will be relevant to use batteries in combination with hydrogen, where the fuel cell hydrogen engine runs smoothly while the battery, for example, kicks in when more energy is required. Custom batteries will be needed for different types of maritime vessels. Hydrogen is required in some production processes as a reducing agent in the processing industry, which in turn makes materials for the battery industry. The process industry will account for the production of ammonia for the maritime industry. In other words: the links are many.

The links in the Green Industrial Initiative are also about the integration in value chains between Norway and other countries, and cooperation between authorities. This is because the value chains

consist of many links, and because businesses in different countries position themselves in value chains by exploiting their respective advantages and, not least, because trade increases the markets for all actors, mainly for the common good. It will not be possible to implement the green transition without such cross-border cooperation.

Norway and many other countries are highly committed to the green transition and to create the jobs of tomorrow. However, there are ongoing public debates about major individual issues, such as increased electricity prices, the location of wind turbines, the opening of new mines or the establishment of new battery factories. The Green Industrial Initiative aims to draw a line between the individual issues as a basis for good priorities and to highlight how the big and small decisions we make now can help us on the road to a low-emission society.

1.4 Paving the way for the Green Industrial Initiative and establishing a framework for the work

The transition to a low-emission society will require significant investments in research, development and skills, in technology and means of production, industry, energy and infrastructure. Access to capital is thus essential for the realisation of projects in green value chains. In addition, private capital flows must be geared towards sustainable investments.

According to BloombergNEF, the world must invest an annual average of USD 4,550 billion in technologies for the green transition for the rest of the 2020s, which is more than triple the level in 2022.⁷ Figure 3 shows the development of industrial investments in Norway over the past fifteen years. These will probably have to increase significantly in the years to come in order for us to achieve our climate, energy and industrial policy goals, which form the basis for the Green Industrial Initiative.

It is largely the industry itself that must take the lead in seizing the opportunities and solving the challenges of the green transition. However, the Government must actively promote private initiatives through good framework conditions and an active business and industrial policy, where the state and the business sector join forces to realise the opportunities of the green transition.

Various forms of market failure can contribute to delaying the green transition, and provide the basis

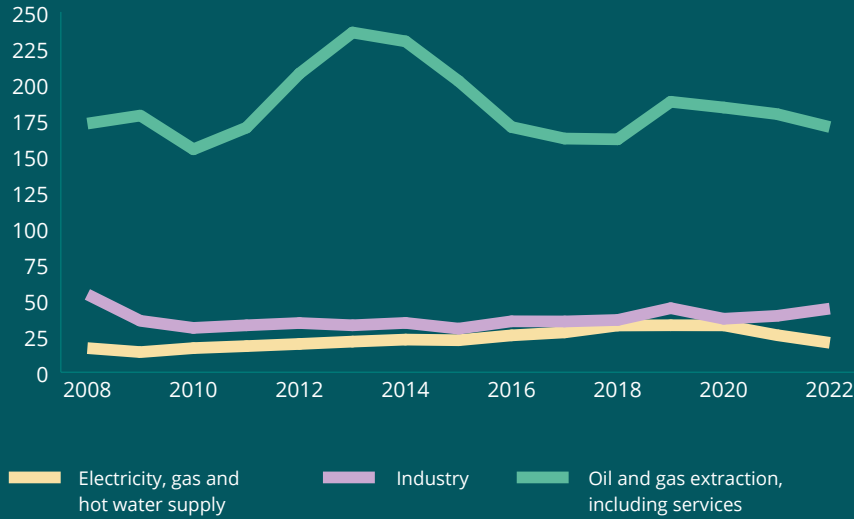
for state intervention. The climate challenge is in itself a significant market failure as many markets have yet to take the damage caused by emissions and the associated sustainability challenges seriously enough in the pricing of goods and services. This can reduce the willingness to invest and channel resources into research and technology development that may bring about the sustainable products and solutions of tomorrow. Furthermore, the market failure may limit private investors' willingness to take risk in the realisation of industrial projects that pilot new sustainable solutions on a large scale. The Government will therefore use government instruments to facilitate green and profitable industrial development, cost-effective emission cuts and sustainable use of Norwegian natural resources throughout the country.

Pricing of emissions in the form of climate taxes and participation in the EU Emissions Trading System are key instruments in Norwegian climate policy. Equal pricing of emissions from different emission sources forms the basis for cost-effective emission reductions and allows for more climate-friendly production and consumption. In addition to the pricing of emissions, direct regulation, standards, agreements, loans, guarantees and grants for emission reduction measures and support for research and technology development are used as instruments in climate policy.

⁷ <https://about.bnef.com/blog/global-low-carbon-energy-technology-investment-surges-past-1-trillion-for-the-first-time/>

FIGURE 3

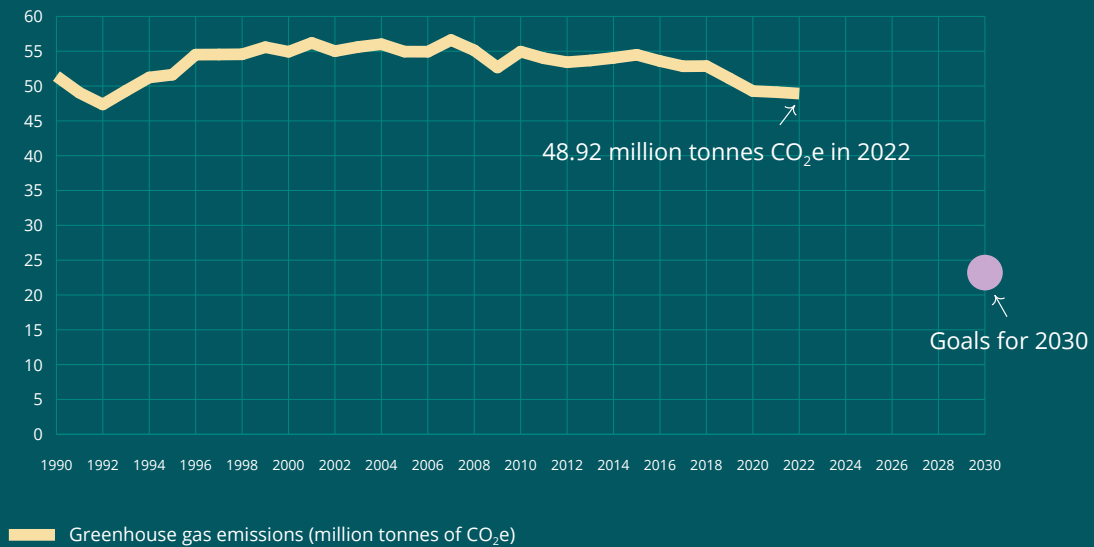
Developments in industrial investments over the past 15 years. Gross investment in fixed capital. Fixed 2015 prices (NOK billion).



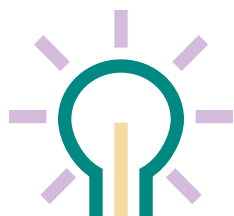
SOURCE: Statistics Norway (2023), statistics table 09181, Ministry of Trade, Industry and Fisheries

FIGURE 4

Norwegian greenhouse gas emissions from 1990 to 2022.



SOURCE: Statistics Norway (2023), statistics table 08940, Ministry of Trade, Industry and Fisheries



The key to the success of the green transition lies largely with the industry, which has the experience and expertise to develop technology and solutions for the future.

The state can also influence the business sector through its role as a buyer. The Government has adopted new rules on climate and environmental requirements in public procurement.⁸ The rules mean that climate and environmental considerations must, as a rule, be weighted a minimum of 30 per cent in public procurement, in line with the Government's Hurdal Platform. Alternatively, climate and environmental requirements can be set in the requirements specification, if it is clear that this will result in better climate and environmental effects. The rules will enter into force on 1 January 2024. In line with the Hurdal Platform, the Government will exercise state ownership more actively to promote society's interests related to climate and sustainability and wages and working conditions where state capital can help trigger even more private investments and ensure national control in strategically important areas in Norway.

In order to ensure a sufficiently rapid transition in all industries, state actors at all levels must be willing to think smart and outside the box about the possibilities for more effective and targeted use of policy instruments. We already have effective instruments to deal with some issues, while others may require adjustments to current policy instruments. A more holistic approach to public investments, costs and

revenues implies that the use of funds in the short term in larger degree is assessed against gains in the long term.

With framework conditions changing rapidly to stimulate the green transition, assessments of what is profitable could change just as quickly. Moreover, the global emission cuts that will be made over the next decade will be decisive for the future climate on Earth. This provides a rationale for the state helping to accelerate global technology development and the implementation of new solutions. Early transition may have higher direct costs due to immature technological solutions, but the more indirect costs of not acting must also be included in the overall assessment.

Opportunities and challenges for the Green Industrial Initiative

Significant opportunities lie ahead at a time when the world is increasingly demanding sustainable solutions. The key to success lies largely with the industry, which has the experience and expertise to develop technology and solutions for the future.

Norway and the Norwegian business sector are well-positioned for succeeding with the green transition. However, the implementation of the Green

⁸ <https://www.regjeringen.no/no/aktuelt/historisk-endring-na-skal-klima-og-miljo-vektes-minst-30-i-offentlige-anskaffelser/>

Industrial Initiative must take several factors into account, such as capacity constraints in the Norwegian economy, the fact that Norway is a small country with a population of just over five million, with an increasing proportion of elderly people, that access to resources is not unlimited, that resources usually have alternative applications, which in turn may involve conflicts of interest, and that we must also safeguard other societal goals. International development trends such as geopolitical tension in light of, among other things, the war in Ukraine, an economic situation characterised by the highest inflation in decades and a lack of key input factors, could also affect the green transition both in Norway and in the countries around us.

In order for Norway to succeed with this transition, society's resources must be used efficiently, which will require strict prioritisation between goals and instruments. A more holistic approach to public investments, costs and revenues will be required, which means that the use of funds in the short term is assessed to a greater extent against gains in the long term. The Green Industrial Initiative aims to promote good decisions, which take into account how everything is connected as regards the overall goals we have set ourselves.

The Green Industrial Initiative poses challenges for companies, green projects and for society at large.

The further electrification of society will significantly increase the need for power in the years ahead. There will be an increase in the prices of components needed for the development of emission-free power, both in Norway and in the countries around us, and it will take time to establish new infrastructure and new production to maintain a surplus in the power balance. This may limit the realisation of new green industrial projects. The green transition of the business sector is a long-term endeavour, and it will be important to ensure stable and predictable framework conditions. Transitioning to a low-emission society with profitable jobs and stable economic growth will require significant and well-timed investments.

Furthermore, secure and predictable access to raw materials and technology, good supplier networks and good market access for end products are key prerequisites for green industrial production. Russia's war of aggression against Ukraine has changed Europe, through strengthened solidarity, a change of pace in the transition from fossil to renewable energy and increased attention to the vulnerabilities associated with energy, raw materials, technology and competence. Moreover, many private and public enterprises are experiencing digital security challenges, which, among other things, limit the possibility of interaction and digital technology utilisation.

Another factor we must take into account, is the potential for an increased shortage of labour and relevant skills. Rapid technology development may increase productivity, which can reduce the challenges.

Sustainable use of Norwegian natural resources is crucial for facilitating future value creation, jobs and settlement across Norway, and is a prerequisite for making industry greener. While we need areas to meet the demand for renewable power and new industrial areas, changes in how we use such areas tend to have a negative impact on nature. Climate and nature must be seen in context, so that important nature and ecosystems are not lost in our efforts to achieve climate goals. Soil protection must also be taken into account.

We will rely on increased productivity and value creation in the Norwegian economy to maintain current living standards and to be able to finance the welfare state in the future.

As underlined in Report (White Paper) No 14 to the Storting (2020–2021) Long-term Perspectives on the Norwegian Economy 2021, Norway's population will age and the proportion of the working-age population will drop. In parallel with this demographic challenge, the impulses on the Norwegian economy from oil and gas extraction will gradually decrease,

and the ripple effects of petroleum activity will be reduced. In light of this, we must ensure good, general framework conditions, and facilitate the emergence of new green industrial areas and new green activities in established business. A stable and responsible economic policy and an education system that provides a competent workforce form the basis for the adaptability of the labour market, which we have good experience with from previous restructuring in the Norwegian economy. We must ensure that more people enter the labour market and that the business sector has the skills it needs, and that the proportion of non-employed people and young people who are excluded from work, education and training is reduced. Work for all is the Government's number one focus. Industry can and must be a key driver in Norway's transition to a low-emission society with high overall value creation and sustainable public finances.

Climate and nature as a framework for all policies

Like the countries around us, Norway has set ambitious goals for emission cuts in order to curb climate change and loss of nature. Through the Paris Agreement, Norway has undertaken to reduce greenhouse gas emissions by at least 55 per cent by 2030 compared with 1990. The climate goal is enshrined in the Climate Change Act and is to be achieved in collaboration with the EU. As an interim target on the path



One of the key assumptions for the Government's work is that climate and nature should be a framework for all policies.

towards net-zero emissions and a low-emission society, the Government has set a transition target for the entire economy by 2030. In the Government's platform, this is worded as the goal of cutting Norwegian emissions by 55 per cent compared with 1990. The objective is for all Norwegian business and industry to adapt to a low-emission society. Emphasis should be placed on ensuring that Norwegian business and industry remains competitive in the future, and that Norway continues to have a surplus in its power balance. This transition is contingent on international technology development. The goal must not lead to an ineffective climate policy or disproportionately expensive measures. The transition target is discussed in more detail in Report No 2 to the Storting (2021–2022) on the Revised National Budget for 2022.

One of the key assumptions for the Government's work is that climate and nature should be a framework for all policies. The Green Industrial Initiative must both contribute to the achievement of climate goals and be implemented in a manner that ensures that important nature and ecosystems are not lost. Ecosystems are the basis for the production of food, medicines and a variety of materials. They purify air and water, sequester carbon, protect against floods, landslides, storms and erosion, and provide opportunities for outdoor recreation and experiences. The Intergovernmental Science-Policy Platform on Bio-

diversity and Ecosystem Services' (IPBES) 2019 report on the state of nature shows that the overall global ecological footprint is so big that we are drastically reducing nature's ability to provide basic services such as clean water, clean air and stable access to food.

In the December 2022 Kunming-Montreal Global Biodiversity Framework (the 'agreement on nature'), the countries of the world have agreed on global targets to reverse the loss of nature by 2030. Norway played a central role in the negotiations and contributed to the ambitious agreement. The agreement on nature includes a global target that at least 30 per cent of Earth's lands and oceans shall be protected by 2030 and managed in an efficient manner, and that all nature shall be managed in a sustainable manner. The agreement also includes a goal that 30 per cent of degraded nature will be under effective restoration by 2030 and requires governments to enable companies to analyse and report on biodiversity-related risk and impact in their own operations and supply chains. The Parties to the Convention on Biological Diversity (CBD) are expected to update their national action plans in light of the agreement and to clarify their contribution to the global targets. During 2024, the Government will present a white paper clarifying Norway's follow-up of the global targets. If we are to be able to preserve nature, the business sector must also come up with

more solutions and measures to reduce the impact of its activities on nature.

In the trade-off between climate, nature and industry, decisions on use of land and marine areas are central. Well-functioning nature depends on intact natural areas, while both the energy transition and business development require land. Land degradation and land changes are some of the biggest threats to nature in Norway and internationally, and are characterised by the fact that they occur incrementally through small and large interventions. This leads to loss of biodiversity and a weakening of ecosystems and ecosystem services. Protecting nature therefore requires good processes and adaptations that, in sum, lead to sustainable land management that stands the test of time.

Status of land-based emissions

Changes in land use are also a significant source of greenhouse gas emissions. Annual emissions from land-use change come to approximately 2 million tonnes of CO₂e. That is roughly 4 per cent of Norway's total emissions, as reported to the UN Framework Convention on Climate Change. Emissions of greenhouse gases related to land-use change depend both on which areas are changed and what they are changed to.

Degradation is the land-use change that gives the greatest emissions of greenhouse gases, and deforestation of forests (especially on organic soil) and marshland gives the largest emissions per unit area. The two main drivers behind the degradation are buildings and roads. In the period 1990–2019, various forms of buildings accounted for approximately 43 per cent of total degradation, whereas road construction accounted for around 26 per cent. The

remaining 30 per cent of the total degraded areas in the period were caused by power line construction (10 per cent), gravel pits/quarries (9 per cent), buildings for sports purposes (6 per cent) and other (5 per cent). Forests accounted for 75 per cent of the areas that were degraded.

Ecosystem accounts and menu of measures

The Government has started working on several system improvement measures for nature. Its commitment to nature risk is reflected in the appointment of Norway's Nature Risk Commission. The commission is tasked with assessing how affected parties in Norway analyse and manage natural risk today, identify possible points for improvement and assess and recommend methodology that enable these parties to analyse and manage nature risk in the best possible manner. As for climate risk, nature risk is an important factor that will affect green industry and the business sector in the decades to come.

The Government has also started the work of creating menus of various measures that help maintain a diversity of ecosystems in good ecological condition. Forests are the first ecosystem to be addressed. The Ministry of Climate and Environment has also initiated work on developing ecosystem accounts for Norway, based on the UN standard for environmental economic accounting. The eco-system accounts will show how much nature we have (area), the state of nature and what ecosystem services it provides, as well as how these change over time. The ecosystem accounts will enable us to monitor developments in how nature is affected by human activity and what degradation costs society in terms of loss of nature and ecosystem services.



We are facing a pressing need to lead our industry, energy supply, transport sector and society as a whole through a transition from fossil to renewable energy, in a way that safeguards environmental, social and economic sustainability. This applies to Norway and to all other countries.

1.5 The Green Industrial Initiative is well under way

By presenting a comprehensive policy for the Green Industrial Initiative, we show the world our goals, what Norway has to offer in terms of expertise, natural resources, schemes and policy instruments and a number of other framework conditions, as well as what political steps we will take to realise these ambitions. The purpose is to make investors and stakeholders feel safe about realising their projects in Norway.

We are already well under way with the green industrial transition. We have implemented or initiated the vast majority of the 100 measures we launched in the roadmap last year.

The fact that some measures have yet to be implemented is due to, for example, things having to happen in a certain order. There must be budgetary leeway for the measures to be implemented. There are also capacity barriers in agencies and ministries that prevent everything from happening at the same time. Nor would it be appropriate to implement all the measures simultaneously, as the work on the Green Industrial Initiative will be ongoing for many years and the needs of the actors will vary during different phases.

Our actions must reflect that the designated priority areas differ in terms of maturity, opportunities and needs. This is important for the authorities' organisation of framework conditions and for determining at what stage the various industries will need capital, labour, land etc., and when we can expect to see an effect of the efforts in the form of increased mineral

extraction, increased power production and reduced emissions.

Norway's Battery Strategy highlights ten policy areas ('actions') that are central to realising the adopted vision for the industry. Dialogue with businesses and other stakeholders has enabled us to specify needs, barriers and opportunities. The approach provides us with an action-oriented to-do list of the most important items on the agenda at all times, and on which we should concentrate our work. This is where the Norwegian working life model comes into its own, with its short lines of communication and informal structure in the dialogue between actors, between the social partners, between industry and academia and between actors and authorities.

The to-do list will vary for the respective priority areas and develop dynamically over time, although, at the overarching level, framework conditions may have common designations such as expertise, research, public licences, market access, land use, alignment of the industry-oriented policy instruments etc. To address this, the people involved must work along several axes, and employ a business-oriented approach along with a more general and holistic one.

While it is relatively easy to keep track of the status of measures, the private willingness to invest and the progress of current projects is undoubtedly the most clear indication of how far we have come in realising our ambitions. Although it is early days for measuring the effect of the Green Industrial Initia-



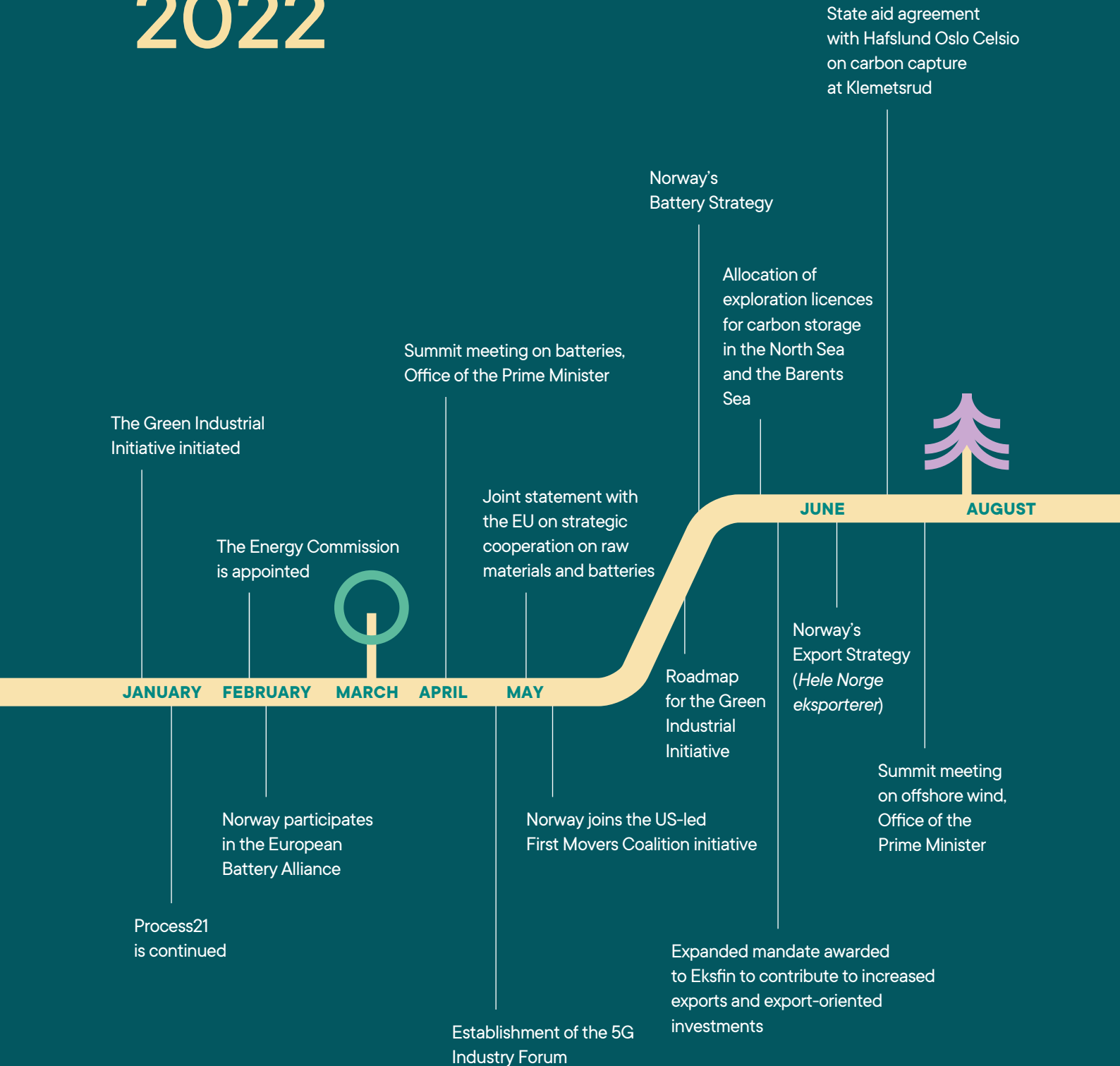
tive just one and a half year after it was launched, we would still like to highlight the following:

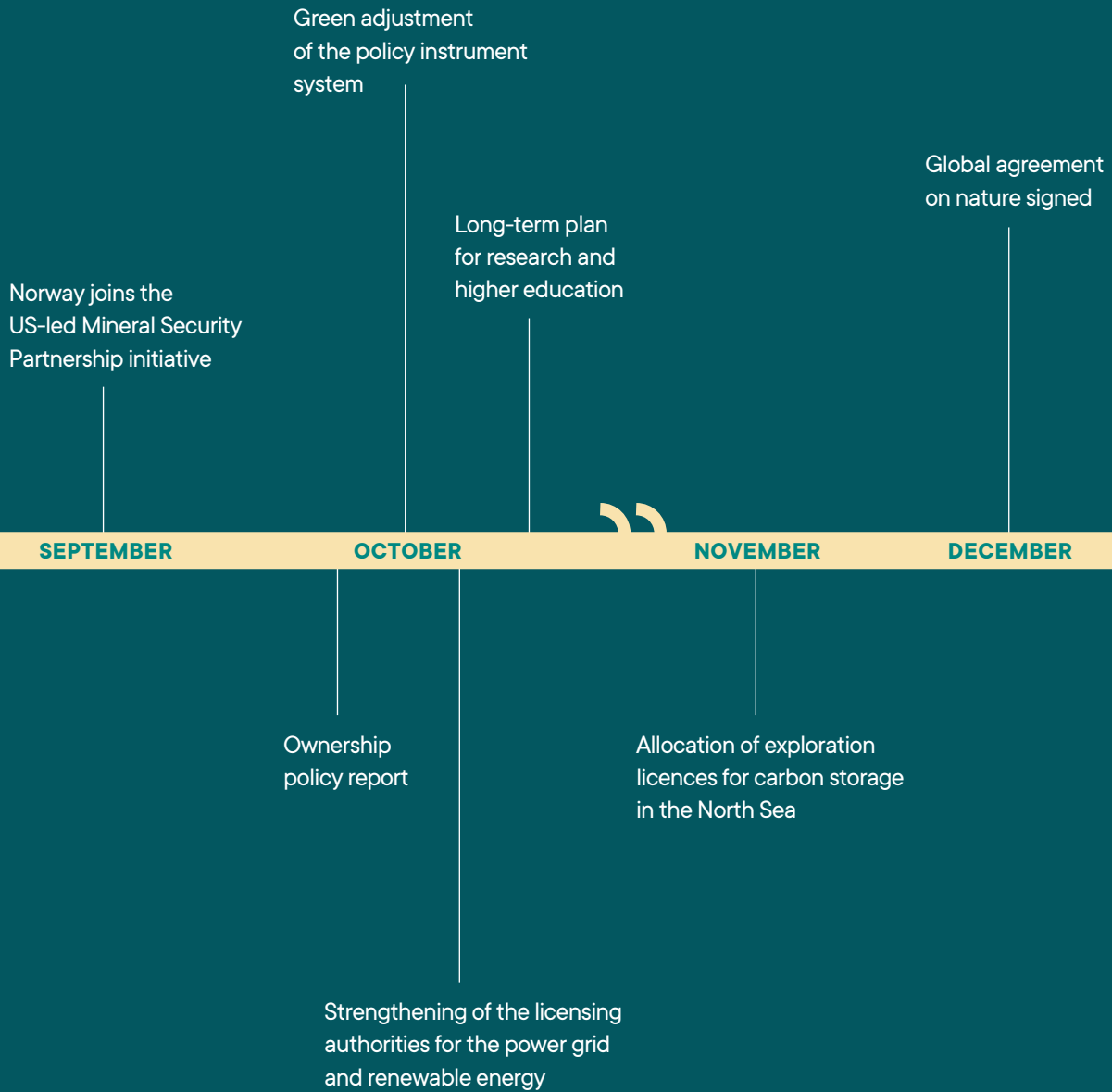
- ✨ We see great interest and willingness to invest in the realisation of projects in green value chains in Norway, and many projects have matured further since we initiated the Green Industrial Initiative. Since 2021, for example, more than NOK 17 billion in private capital has been mobilised for companies in the Norwegian battery industry.⁹ We see that the Green Industrial Initiative brings together and promotes cooperation between actors, both commercially and to solve common issues.
- ✨ The policy instrument system is in a better position than before, and through the Green Industrial Initiative, the actors have gained a national strategy to lean on and follow up. This has triggered contributions to numerous actors from Innovation Norway, Export Finance Norway (Eksfin), Nysnø, Siva, the Research Council of Norway and others.
- ✨ The goal is for companies to meet a more comprehensive and coordinated policy instrument system, and that our system cooperates more seamlessly with regard to both capital policy instruments and permits. The system is also a key 'listening post' in relation to analysing the effects of measures taken and the need for any adjustments to policy instruments.
- ✨ At the international level, our experience is that the Green Industrial Initiative brings an industrial angle to our dialogue with other countries, both on specific political issues and on current projects in, for example, minerals, industry and energy. Both the EU and individual countries have ambitions for the green transition and growth that are similar to our ambitions, and many of the challenges are best solved through cooperation. Our experience is that the Green Industrial Initiative contributes to increased understanding of Norway, how we can contribute and our needs, and we see the effects of the industrial dialogue promoting investments and partnerships between Norwegian stakeholders and suppliers, partners and customers abroad. The dialogue is characterised by a holistic approach, connections and cooperation for mutual benefit and joint implementation, rather than individual cases.
- ✨ At the national level, the Green Industrial Initiative provides a common framework for energy, climate and industrial policy, linking different political processes and decisions together into a whole. This raises awareness and contributes to mobilisation, for example through climate partnerships with the business sector.

⁹ Mapping conducted by the Ministry of Trade, Industry and Fisheries in June 2023 in connection with the presentation of 'New measures for faster transition to green industry' (in Norwegian only): <https://www.regjeringen.no/en/aktuelt/nye-tiltak-for-raskere-omstilling-til-gronn-industri/id2987527/>

Timeline of deliveries and actions

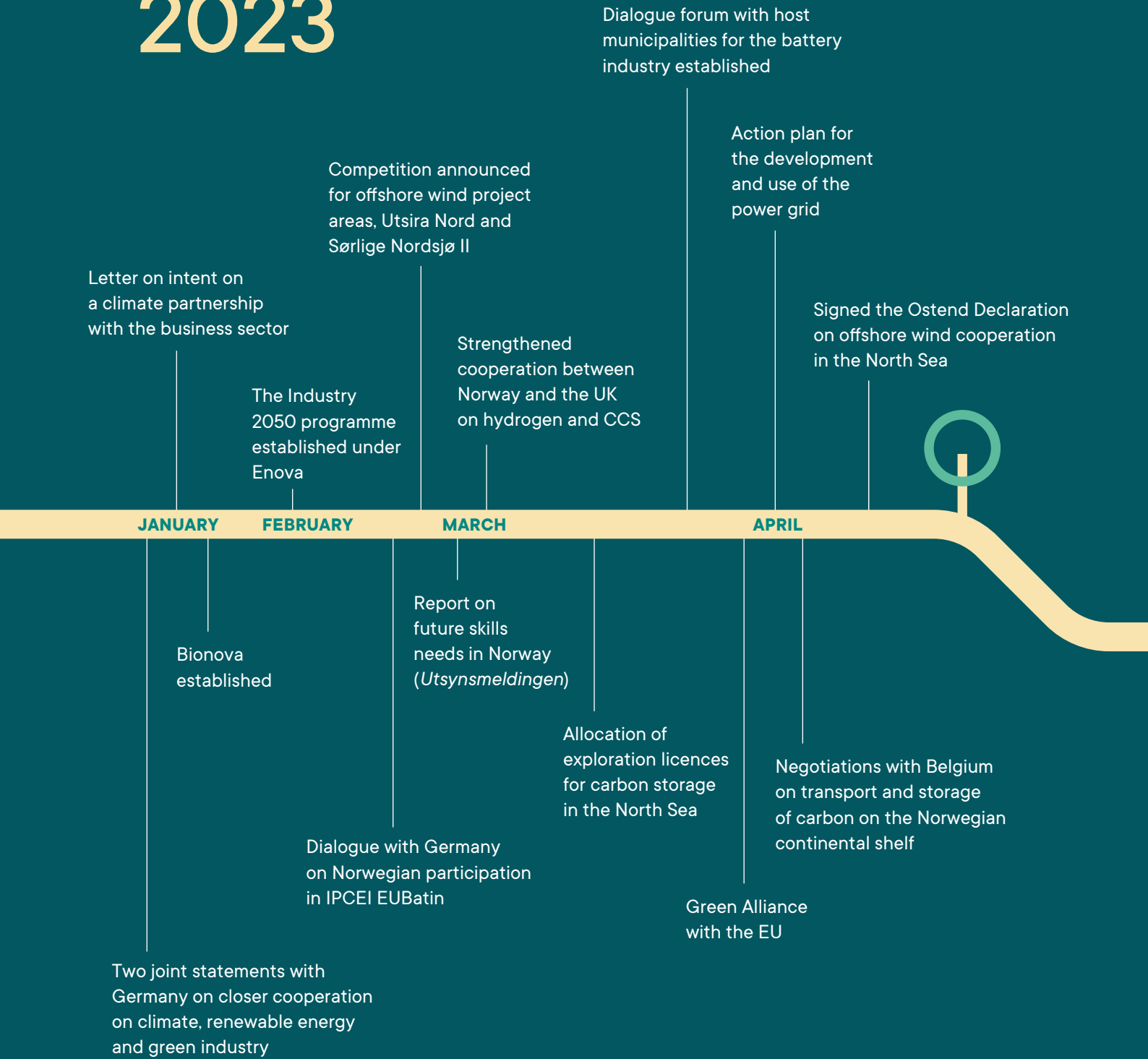
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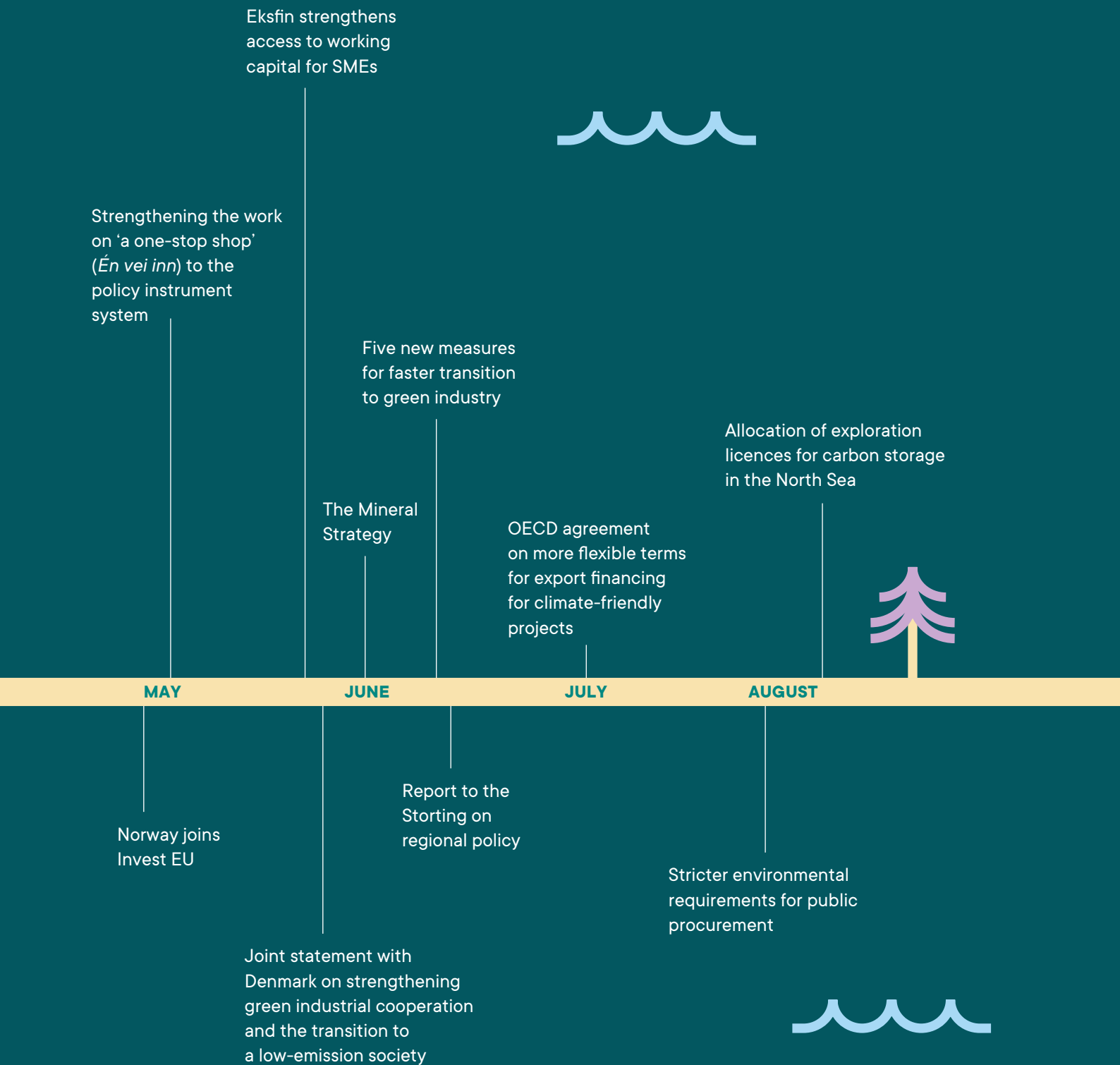




Timeline of deliveries and actions

2023





1.6 A fast-changing world

To implement the green transition, we rely on international trade and cross-border cooperation.

The trade policies of our most important trading partners and allies has a large impact on Norway. As a small, open economy, Norway is dependent on international trade and we are a strong defender of the rule-based multilateral trading system. We must, however, adapt to international developments.

In recent years, Russia's invasion of Ukraine, the Covid-19 pandemic and the deterioration of US-China relations, have led security and climate policy considerations playing a much greater role in the formulation of economic policies of our most important trading partners and allies in the EU and in the USA. Strategic considerations, preparedness, security and climate are given greater importance than in the past.

This development started a few years ago. In 2015, China launched its strategy 'Made in China 2025' to, among other things, strengthen China's position in

global high-tech production. The EU launched its new trade policy strategy 'Open, Strategic Autonomy' in 2021, with the aim of making the EU less dependent on other countries while remaining open to international trade.¹⁰

In October 2022, the US launched a new security policy strategy in which they express that the US should become independent of China in three strategically important value chains: semiconductors, biotechnology and the green transition. The US has also adopted major legislative packages to implement this policy, such as the *Inflation Reduction Act* (IRA) and the *CHIPS and Science Act*. As part of its reaction to this development, the European Commission presented its Green Deal Industrial Plan for a Net Zero Age in February 2023.

A key part of this plan is a new legislative proposal called the *Net Zero Industry Act* (NZIA) presented in March 2023. Here, the European Commission proposes that the EU set a target of producing 40 per cent of the industrial products included in key

¹⁰ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en



The EU is Norway's most important market, and as an integral part of the Single Market, we can play an important role in the EU's work on autonomy within strategically important value chains.

zero-emission technologies needed to implement the green transition and achieve the climate goals by 2030. *The Critical Raw Materials Act (CRMA)* was presented simultaneously with the NZIA and the Regulation aims to strengthen sustainable mineral production and build robust supply chains for mineral raw materials. The proposals are now under review in the European Parliament and the EU Council and are set to be adopted by winter 2024 at the latest. Norway has submitted its input to the European Commission and other relevant stakeholders in the EU in connection with these proposals. In addition, in March, the EU adopted adjusted temporary guidelines (the Temporary Crisis and Transition Framework) to make it easier for EEA countries, including Norway, to provide state aid to industries and value chains that contribute to achieving the climate goals.

The EU is Norway's most important market, and as an integral part of the EU's Single Market, Norway can play an important role in the EU's work on autonomy within strategically important value chains.

With a well-developed and efficient process industry, access to important minerals and products with high performance and a low climate footprint, we are well-positioned for being a stable and safe partner for the EU.

The development we see signal that the multilateral trading system is being challenged. As a result of geopolitical tension, we are witnessing a greater emphasis on strategic partnerships to reduce dependencies and ensure resilient value chains. With the global trading system under pressure, it is even more important that we defend it and work to adapt the system to our times. For Norway, closer cooperation with our closest partners and ensuring competitive conditions for Norwegian business and industry will also be very important.

1.7 Why Norway will succeed

Our experience of different types of offshore operations, production of advanced materials in the process industry, renewable power production and a high-tech, tailored supplier industry and manufacturing industry, constitutes, both individually and overall, expertise that has significant transfer potential to new green value chains, such as batteries, offshore wind, CCS and hydrogen. Combined with stable framework conditions, a responsible economic policy and an education system that develops a competent workforce, this makes Norway an attractive country in which to establish new green industry.

The Norwegian labour market is flexible, and Norwegian industry has demonstrated a strong ability to restructure and transfer expertise in the past. A clear thread runs from the industrial utilisation of hydropower more than 100 years ago, via the petroleum, maritime and aquaculture industries, to the green industries being established today. There is a long-standing tradition in Norway of new activities emerging from existing ones, through market adaptation or spin-offs, driven by interaction between experience and new knowledge. Norwegian industrial entrepreneurs are often at the forefront of developments, in combination with Norwegian and foreign expertise and capital.

The Norwegian social model has facilitated this industrial restructuring. The model is characterised by the individual employee enjoying a high degree of freedom, trust and responsibility, a generally high level of education in the population, a social safety net for everyone and a regional profile that entails close links between educational institutions and businesses, welfare and infrastructure in the whole country. As a consequence, high-tech, export-oriented businesses can be located close to natural resources and be connected digitally and have short lines of communication with suppliers, customers and partners at home and abroad. The authorities provide predictable framework conditions which in particular promote development, restructuring and market access. There are short lines of communication between the authorities and the business sector, between businesses in different industry clusters and between businesses and academia. The Norwegian working life model is unique and gives us overall strong industrial capability. The strength of the Norwegian working life model at company level is described in a study conducted by SINTEF (2020), cf. section 2.5.¹¹

Many Norwegian businesses have been able to generate considerable added value by improving existing processes. This applies to many companies

¹¹ <https://www.norskindustri.no/kampanjesider/industrifuturum/artikler/ny-studie-hvordan-skafter-de-beste-bedriftene-seg-konkurransekraft-igjennom-digitalisering/>

in the manufacturing and process industries, which, despite their mature technologies, are constantly improving in terms of cost reductions and increased efficiency.¹² This constitutes valuable experience for actors starting up in the battery value chain in Norway, where a low level of production scrap, through a complex series of steps in the production of tomorrow's battery cells, based on better and more sustainable materials, is expected to have a major impact on profitability.

Continuous improvement lies in the backbone of many Norwegian companies and is an important element of the Norwegian working life model. This is a fundamental competitive advantage for Norwegian industry, and, for those building new Norwegian industries, it is perhaps the most important advantage in the global competition. Many Norwegian businesses are at the technological and operational forefront of efficient use of resources, automated solutions and other digital technologies. The companies have employees with high theoretical and practical expertise in all parts of production, and the employees tend to operate with a high degree of independence. In sum, the Norwegian working life model means that many businesses can carry out more work with fewer employees, which results in high productivity in Norwegian industry.

FACTS

Scrap from the production of batteries

If batteries have to be scrapped during production or after delivery, the battery manufacturer will normally lose the income from the sale and must bear the full cost of manufacturing the battery. In addition, the battery manufacturer must pay for recycling, handling, trouble shooting, increased insurance costs etc, and it will weaken its position vis-à-vis the customer and in the market. Should defects in batteries delivered to the customer result in the recall of vehicles, the potential costs are considerable.

The materials used in battery production are complex and very expensive, and the stakes are high in such a complex production chain. Manufacturers who manage to produce batteries with a low scrap ratio, high performance and few faults will be able to charge a higher price to customers.

At present, the best battery manufacturers have a utilisation ratio of 90–94 per cent, i.e. 6–10 per cent of production must be 'scrapped'. The average for the industry is around 85 per cent.

¹² Hydro's press release on the company's results for Q4 2022 shows that the company expects to save NOK 10 billion in costs by 2025 through such improvement efforts, although its activities must be characterized as 'extremely mature'. <https://www.hydro.com/en-NO/media/news/2023/hydros-fourth-quarter-2022-results/>

1.8 Reinforced efforts

The ability to use and create value from new technology is becoming increasingly important for restructuring, competitiveness and increased productivity. Enabling the breadth of small and medium-sized enterprises, in particular, to make greater use of the opportunities afforded by technology is therefore central to the Green Industrial Initiative.

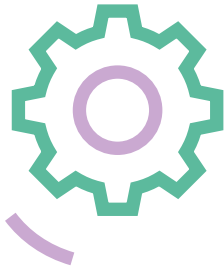
Our tools will support our advantages, market opportunities and needs, thereby contributing to the goals of creating sustainable and profitable jobs for the future, reducing emissions and implementing the green transition, and reducing vulnerability in key value chains. In the efforts to mobilise private capital for the Green Industrial Initiative, it is the sum of the relevant framework conditions and qualities that count. Our target cannot be the lowest possible costs or international competitions for special framework conditions, but to exploit the strength of the Norwegian model and the experience we have gained to create profitable, sustainable business activities for the future. Our tools must support the 'spearheads', i.e. companies who have demonstrated an ability to develop and realise groundbreaking products, technology and solutions.

The intentions behind the Inflation Reduction Act (IRA) and other relevant support packages for green industry and energy production in the US are largely similar to those of our Green Industrial Initiative; to attract projects and trigger private capital. This

will accelerate the green transition and technology development, but may also, in the short term, draw raw materials, projects, actors and capital away from Norway and Europe and to the US. In the long term, however, the IRA and other similar measures can result in lower prices for green technology, which can contribute positively to the green transition, also in Norway.

The US economic and climate policy package, the IRA, entered into force on 1 January 2023, six months after we presented our Roadmap for the Green Industrial Initiative. The IRA package includes subsidies and other support for a number of green investments. As a result of the IRA, many actors and investors are reviewing projects and initiatives, and some projects and investment decisions are being postponed or adjusted as a result of uncertainty about what framework conditions different countries in Europe will be able to offer. In particular, decisions about large-scale realisations in solar power, batteries and hydrogen are affected. Several Norwegian stakeholders have asked the Government for a response to the American subsidy package.

A subsidy race will not benefit Norway. Increased use of subsidies and other state aid in other countries should not be met with similar measures in Norway. We will implement the Green Industrial Initiative the Norwegian way, by drawing on our natural advantages, our well-developed social and working life



We will implement the Green Industrial Initiative the Norwegian way, by drawing on our natural advantages, our well-developed social and working life model and an efficient and adaptable industry.

model and an efficient and adaptable industry. We will further develop and strengthen our well-functioning policy instrument system so that private capital can find its way to good green projects.

It is not clear how the IRA will affect planned projects, or the development of new projects, in the battery value chain and other industries in Norway. Many initiated projects are of Norwegian origin and are organised in a manner that makes it natural to

realise the project on a large scale in Norway. Industrial actors with a long-term perspective, with experience from and/or good knowledge of Norway, will probably emphasize that Norwegian companies are 'well equipped' to achieve high efficiency in the utilisation of input factors and production equipment (Overall Equipment Efficiency) over time and not least in relation to the production solutions of tomorrow.

FACTS

Efficient production

Norwegian producers are dependent on their production equipment being highly efficient to maintain their competitiveness in global markets. Efficient production means, among other things, that the production equipment has high availability and performance in relation to the quality criteria set. Optimised production processes have high performance and minimal production scrap. The optimisation and interaction of the machine equipment often requires human input. When employees in production processes are actively involved in this optimisation work, they achieve a better understanding of the practical challenges and the associated optimisation proposals. This contributes to building a broad culture, common ambitions and goals through the company's organisation. There are many tools that can be used to continuously achieve better efficiency, for example preventive maintenance, standardised operating instructions, competence building and various methods for continuous improvement.

In order to promote the objectives of the Green Industrial Initiative, the Government presented five new measures on 30 June this year to accelerate the green transition in the business sector.¹³ The measures are intended to promote an active transition policy based on Norwegian advantages. The measures target competence, technology, innovation, quality and productivity:

NOK 1 billion for innovation grants for major battery projects

In the upcoming national budget, the Government proposes an innovation grant scheme for large projects developing tomorrow's battery solution. The scheme will be linked to IPCEI EUBatIn. Strict requirements apply in terms of innovation height, industrial scalability, ripple effects, implementation capacity, binding European cooperation and environmental impact. The innovation grant has a budget of around NOK 1 billion over five years, and it will be managed by Innovation Norway.

Norway will participate in the EU Hydrogen Bank

The Government aims to enable Norwegian projects to participate in the EU Innovation Fund's upcoming hydrogen auction. Through a new auction instrument, the scheme will provide funding for the production of renewable hydrogen for up to ten years. A pilot auction is scheduled for the end of 2023 with a budget of EUR 800 million.

Strengthening capital instruments in the Green Industrial Initiative

The Government will strengthen the capital instruments in the Green Industrial Initiative, among other things by adopting a greener approach in the policy instrument system. One way to do this can be to invest in companies, industrial buildings or process equipment. The Government will return to this in connection with the national budget for 2024.

Government loans for more green projects

The Government will ensure that the state can provide market loans to finance more projects along green value chains, including in the early stages. The Government will return to this in connection with the national budget for 2024.

Mapping of risk and vulnerabilities in global supply lines

The Government will map the risks and vulnerabilities associated with the global supply lines for important input factors, raw materials and products imported into Norway.

Further strengthening of Siva and Nysnø

The Government is following up on its promises of 30 June to strengthen the capital instruments under the Green Industrial Initiative to increase investment in green industrial projects, and it will propose significantly increasing capital infusions to Nysnø and Siva. The Government will return to this in connection with the changes to the national budget for 2023 at the end of November.

¹³ <https://www.regjeringen.no/no/aktuelt/nye-tiltak-for-raskere-omstilling-til-gronn-industri/> <https://www.regjeringen.no/no/aktuelt/nye-tiltak-for-raskere-omstilling-til-gronn-industri/>



Our tools must support the ‘spearheads’, i.e. companies who have demonstrated an ability to develop and realise groundbreaking products, solutions and technology.

02

Common prerequisites for the Green Industrial Initiative



Introduction

‘Norwegian companies must have good, predictable and stable framework conditions that facilitate private investment and further growth. The state must take responsibility for establishing the necessary infrastructure, enter into partnerships that combine emission cuts and business development, contribute capital and other risk mitigation.’

The Hurdal Platform

The general framework conditions for industry are vital to the success of the Green Industrial Initiative. How efficiently Norwegian industry will be able to adapt to a low-emission society largely depends on its access to basic input factors such as renewable energy, other raw materials, capital and labour. It is also important to have access to suitable commercial areas, infrastructure, knowledge, technology, good supplier networks and markets.

In the following, the Government has outlined challenges and opportunities for Norwegian industrial enterprises in each of these areas, and presents key policy initiatives and processes.

2.1 Power



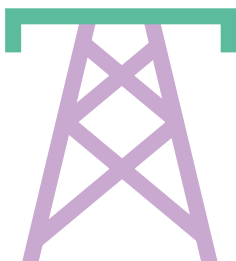
Norwegian industry must have access to clean and affordable renewable energy. Therefore, we need to increase renewable power production, further develop the power grid, reduce lead times and make energy use more efficient.



Licences for new power and grid development can be granted in cases where it benefits society and where due consideration has been given to safeguarding important natural assets and other environmental and societal interests.

We now know more about greenhouse gas emissions and loss of nature from land use change. The energy authorities will assess whether the practice needs to be amended for greenhouse gas emissions from land use changes in connection with the licensing of energy facilities. The energy authorities will continuously assess how new knowledge about loss of nature is used in the licensing of new energy facilities.

Access to power at competitive prices will be of great importance to investment decisions in the industry going forward, especially for power-intensive businesses. The Government will therefore pursue an energy policy based on access to renewable energy being a competitive advantage for Norwegian industry.



The Government will pursue an energy policy based on access to renewable energy being a competitive advantage for Norwegian industry.

The electrification of society and the establishment of a new green industry will significantly increase the need for power in the years to come, both in Norway and in many other countries. European and global energy markets are developing rapidly, including significant development of renewable and variable power production, both in large plants and local small-scale production facilities, and with a number of new solutions for energy storage in batteries being developed and used.

Energy efficiency can contribute to curbing consumption growth and promote the competitiveness of industrial enterprises that implement such measures. For many companies, various forms of local power generation and energy storage solutions may also be appropriate measures to reduce energy costs.¹⁴

Energy efficiency, more efficient use of existing power grids and local power production in combination with energy storage solutions can reduce the need for investment in the grid over time and also the need for other measures to ensure the energy balance for parts of the year. Energy efficiency

measures can often be implemented faster than the development of new power production and a new power grid. The Government will present a comprehensive action plan for energy efficiency in all parts of the Norwegian economy.

Opportunities and challenges

The balance between power production and consumption, the 'power balance', has an impact on the level of energy prices in Norway. However, the situation over the past two years has shown that an energy surplus is not in itself a guarantee of low power prices. The review of the power situation 2021–2022 also demonstrated that Norway is increasingly affected by the power systems around us. This is not unique to Norway. Many other countries have great ambitions for the development of green value chains, which will entail increased electrification and more demand for renewable power. However, Norway is in a better position than most other countries as a result of ample access to natural resources, long experience of renewable power production and a high degree of electrification in industry and society in general. The climate

¹⁴ https://www.finansavisen.no/industri/2023/07/05/8020333/brunvoll-bygger-landets-storste-solcelleanlegg?internal_source=sistenytt



The climate footprint of Norwegian power production is attractive to investors and companies looking for adequate locations for realising green industrial projects as Norway can offer the actors emission-free renewable power for their projects.

footprint of Norwegian power production is attractive to, investors and companies looking for adequate locations for realising green industrial projects as Norway can offer the actors emission-free renewable power for their projects. In the course of a few years, this advantage could be reduced as a result of increased renewable power development in many other countries. However, our regulated hydropower system is unique. The flexibility of hydropower production will become increasingly important with an increased share of renewable, unregulated power production in the countries around us.

Norway still has an energy surplus in years with normal weather conditions, but there is great uncertainty about future consumption trends. Several forecasts indicate that demand for power will increase as a result of plans for green transformation of existing activities in the petroleum sector, industry, transport sector, agriculture and other activities, plan for new establishments in the industry sector (e.g. battery materials, cells an recycling), energy sector (e.g. hydrogen) and services (e.g. data centres) Such a transition places higher demands on the Norwegian power system and requires sufficient transmission capacity in the grid, increased power production, solutions for local energy storage and consumption adjustments, and a power system that has the capacity to meet needs during periods of high load.

The capacity in large parts of the Norwegian grid is currently either occupied or reserved. A high number of applications for grid connection in recent years has led to a backlog of cases among both grid companies and the energy authorities, which contributes to longer lead times. However, the latest analyses by the Norwegian Water Resources and Energy Directorate (NVE) indicate that there is great uncertainty about the development in consumption in the next few years, and thus the impact on the Norwegian power balance in the short term. In the market analysis towards 2028, NVE expects a weaker power balance, but a continued energy surplus.¹⁵ NVE assumes that there will be little new power production, although renewable power will be needed for more and more purposes.

In the analysis, NVE also points out that *the energy balance* will become weaker towards 2028. A lot of the new consumption, such as large industry, data centres and petroleum plants, depend on the availability of power every hour throughout the year. However, new power production will mainly be weather-dependent and not necessarily be able to produce power for parts of the year or in situations where the need for power is highest. Over time, this may challenge the ability to balance consumption and production in the short term, i.e. the energy balance.

15 <https://www.nve.no/media/16077/nves-forventninger-om-utvikling-av-kraftbalansen-til-2028.pdf>

Depending on developments in the countries around us, a tighter power and energy balance in Norway will result in higher and more volatile power prices. In the analysis, NVE highlights the uncertainties related to future consumption trends. NVE points out that the major drivers for consumption trends are the establishment of business activities and climate policy. For the business sector, expectations of power prices and framework conditions will affect the pace and level of development, while a lack of grid capacity may limit developments. However, based only on what is assumed to be a relatively safe estimate of consumption growth, NVE assumes that Norway will still have a significant energy surplus towards 2028. NVE bases its analyses on historical developments, the current situation and what is known about Norway's premise, framework conditions and plans for the next five years.

NVE also bases its projections on existing policy instruments, including existing subsidy schemes for the business sector, in its assessment of future consumption trends. NVE will present new long-term analyses for the power market in autumn 2023.

Political initiatives and processes

The Energy Commission was appointed on 11 February 2022, broadly composed of members with different areas of interest and from different professional backgrounds. The Commission was, among other things, tasked with assessing future energy needs, investigating the possibilities for new energy production, and providing a basis for the long-term energy policy choices for Norway. The Energy Commission submitted its report NOU (Norwegian Official Report) 2023: 3 *Mer av alt – raskere* ('More of everything – faster' – in Norwegian only) on 1 February 2023.¹⁶ The report shows that there is a need for significant investment in power production, grid development and energy efficiency. The majority proposes that Norway should adopt a goal of developing 40 TWh of new renewable power production and 20 TWh of energy efficiency by 2030. To achieve these goals, the Commission proposes measures in five main areas:

- ✧ Measures for more efficient and flexible energy use
- ✧ Measures for district heating, bioenergy and heat pumps
- ✧ Measures for increased power production
- ✧ Measures for faster and better processing
- ✧ Measures for increased grid capacity

16 <https://www.regjeringen.no/en/aktuelt/energikommisjonens-rapport-levert-til-olje-og-energiministeren/id2961401/>

The Grid Development Committee (Strømnettutvalget) submitted the report NOU 2022: 6 *Nett i tide – om utvikling av strømmettet* ('Just in time – on developing the power grid' – in Norwegian only) to the Minister of Petroleum and Energy on 14 June 2022, with recommendations for measures to reduce the time it takes to develop and license new network installations, ensure the socio-economic development of the power grid at a time of great uncertainty about the consumption trend, and potential improvements in the mandatory connection system.¹⁷ The Ministry of Petroleum and Energy implemented several measures already in autumn 2022 and, in that connection, asked NVE to update its application guides and to further develop the fast track scheme for simple and small cases. The licensing authorities were given an historical funding increase in the national budget for 2023. This gives both NVE and the Ministry of Petroleum and Energy the opportunity to hire more people to process licence applications. NVE has also been allocated funds for digitalising grid planning and processing licence applications.

The Energy Commission's report has been submitted for consultation. An input meeting was also held on 30 March. The Government is already in the process of following up on some of the Energy Commission's proposed measures, and has, among other things,

- ✧ Increased the case processing capacity of NVE and the Ministry of Petroleum and Energy.
- ✧ Started legislative work to enshrine in law the responsibility of power producers to contribute to security of supply.

- ✧ Started preparing an action plan for energy efficiency in all parts of the Norwegian economy.
- ✧ Reopened the processing of licence applications for onshore wind power.
- ✧ Announced a competition for project areas in the first phase of Sørlige Nordsjø II and Utsira Nord.

The Government's action plan for faster grid development and better utilisation of the grid was launched in April 2023.¹⁸ The action plan is an important part of the Government's follow-up of the Grid Development Committee. The measures in the action plan (see fact box) will contribute to faster licensing of cases by the licensing authorities, more efficient connection to the power grid and better utilisation of current grid capacity.

- ✧ The Government's ambition is to increase the capacity of the power grid and to reduce licence processing times.
- ✧ The Government is still in the process of considering the Energy Commission's recommendations.
- ✧ The Government has increased its case processing capacity to contribute to faster licensing of grids and power production.
- ✧ The Government has facilitated better fixed-price agreements for electricity through changes in the ground rent tax for hydropower, which entered into force on 1 January 2023.

¹⁷ <https://www.regjeringen.no/no/aktuelt/ny-side2/>

¹⁸ <https://www.regjeringen.no/no/aktuelt/regjeringen-legger-fram-handlingsplan-for-raskere-nettutbygging-og-bedre-utnyttelse-av-nettet/>

- ✧ The Government will continue to facilitate large-scale development of offshore wind. The goals of the offshore wind initiative are to contribute to industrial development, innovation, technology development and increased emission-free power production. The Government has now announced the first competitions for offshore wind project areas on the Norwegian continental shelf. Offshore wind has great potential to increase power production in Norway, and the Government's ambition is to allocate an area with a potential for 30 GW offshore wind production by 2040, cf. section 4.1. The Government's ambition corresponds to approximately 75 per cent of the current capacity of the Norwegian power system. An investment in offshore wind of this size will allow for the use of various grid solutions.
- ✧ The Government will increase hydropower production, partly on the basis of the Storting's decision to introduce a cash flow-based tax for hydropower and by continuing to prioritise the upgrading and expansion of existing hydropower plants in the licensing process. There is still some potential for brand new hydropower.
- ✧ The Government will allow wind power developments on land in places where there are good wind conditions and local acceptance. Due consideration must be given to safeguarding important natural assets. The Government has allowed for consideration of completely new wind power projects, and has asked NVE to accept new notifications for consideration. It is a prerequisite that the host municipality agrees, and the Planning and Building Act has now been amended so that onshore wind power plants subject to a licencing requirement must have a zoning plan. The Government wants more of the value creation to accrue to the local community.
- ✧ The Government will facilitate more solar power and other local energy production. The Ministry of Petroleum and Energy (MPE) has asked NVE to assess the potential for solar power development and the possibilities of achieving a target of 8 TWh by 2030. In addition, the MPE has asked NVE to assess the potential for developing renewable energy production in degraded areas. The MPE has also asked NVE to prepare technical documentation to simplify the licensing processes. In addition, the MPE has asked the Norwegian Energy Regulatory Authority (RME) to assess and propose a sharing scheme adapted to commercial areas so that the sharing of self-generated renewable electricity between electricity customers, beyond the existing scheme, can be carried out in a manner that efficiently promotes the interests of society.
- ✧ The Government aims for more efficient use of energy and will present an action plan for energy efficiency in all parts of the economy.

FACTS

The Government's action plan for faster grid development and better utilisation of the grid

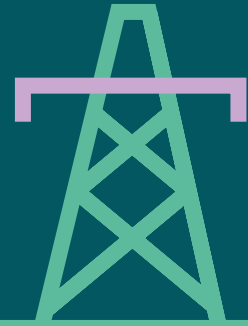
The Government's action plan for faster grid development and better utilisation of the grid was launched in April 2023. To help accelerate grid development, the Government will:

- ☀️ Ask NVE to start fast-tracking cases that are well prepared and have little impact on public and private interests.
- ☀️ Raise the limit for when a notification and an assessment programme is required in relation to 132 kV new power lines. The limit is raised from 15 km to 50 km. However, the grid companies retain a right to notify a project if they deem it appropriate.
- ☀️ Continue and improve the Concept Study (KVU) scheme, including by reducing case processing time.
- ☀️ Carry out an evaluation of the KVU scheme with a view to further improving and streamlining the process.
- ☀️ Establish a dialogue with NVE and Statnett on how area plans can facilitate a more efficient grid development process.

- ☀️ Encourage grid companies to be at the forefront of looking at possibilities and applying for licences for grid measures when they have the capacity.

To contribute to better utilisation of the grid, the Government will:

- ☀️ Provide more detailed guidance on what is meant by 'normal consumption' that should be kept outside the connection queues.
- ☀️ Propose regulatory amendments that require grid companies to take into account the maturity of the project when allocating capacity and to develop a neutral and non-discriminatory maturity assessment practice. The wording of the criteria should help ensure that existing activity is prioritised so that it can grow and adapt, then facilitate new jobs and increased value creation in line with the Government's Roadmap for the Green Industrial Initiative.



- ⚡ Encourage the grid companies to keep a good overview of their own connection queues and provide good information about where there is and will be capacity in the grid.
 - ⚡ Consider additional measures, including changes to the investment contribution regulations, the introduction of reservation fees and other price signals that can help ensure good allocation of available grid capacity. In particular, measures shall be considered to prevent unutilised capacity forming an obstacle to other start-ups that need grid connection or increased power output.
 - ⚡ Propose regulatory amendments that mean that, in special cases, grid companies can reduce the maximum permitted power output in accordance with the customer's actual needs.
 - ⚡ Propose regulatory amendments involving a requirement that grid companies must establish principles for operationally viable assessments, and that these assessments are documented and made available to customers on request.
- In order to facilitate regular dialogue with the industry, the Government will:
- ⚡ Establish a dialogue with the grid industry with biannual status meetings about the industry's work on more efficient development and utilisation of the grid.

2.2 Land, marine areas and local infrastructure



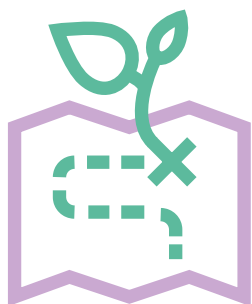
Norwegian industry must have access to good land and marine areas, efficient infrastructure and high-speed internet. Green industrial establishments must be well-anchored in local communities, have as little impact as possible on the surroundings, preserve nature, the environment and wildlife and facilitate social meeting places locally.

A prerequisite for establishing industrial activities is access to suitable commercial areas which can be adapted for production relatively quickly. This applies both to industrial activity on land and at sea.

Norway's scattered settlement pattern means that physical and digital infrastructure, such as power grids, roads, ports, and broadband, has been developed in large parts of the country. Although these are good conditions for business activity, there may still be challenges related to the above factors when establishing new businesses.

Actors should take responsibility for reducing the environmental footprint of their projects and activities by incorporating considerations for nature and the environment from the first phase of planning. When planning developments, the hierarchy of measures must be followed.¹⁹ The first priority is to prevent the development from harming nature. Then, measures must be taken to limit the damage, and to repair or restore it. Finally, it should be considered whether it is necessary to compensate for any remaining harm to nature after the other measures have been carried out. The industry's reduction of the climate and environmental impact of its activities is key to making industry greener.

¹⁹ <https://www.miljodirektoratet.no/ansvarsomrader/overvaking-arealplanlegging/arealplanlegging/konsekvensutredninger/finne-gode-miljolosninger/forebygge-skadevirkninger-for-miljoog-samfunn/>



The Green Industrial Initiative shall include all of Norway and help create vibrant cities and rural communities.

Use of land and marine areas and planning processes

The government authorities are responsible for planning and clarifying the use of marine areas from one nautical mile outside the baseline through sectoral regulations for the various industries and the overall management plans for the marine areas. The Government announced in the Hurdal Platform that it will ensure good coexistence between the ocean industries, among other things by preparing an Ocean Industry Plan for Norwegian Ocean Areas. This work will develop a set of overarching principles for spatial use of our ocean areas.

For land-based activity, the municipalities are the planning authority and have main responsibility for clarifying the use of land, both for business activities and other purposes. In order to increase its attractiveness as a host municipality, the individual municipality can also actively contribute to the regulation of land and ensure sufficient physical and digital infrastructure is available within a relatively short period of time. The Government will propose regulatory amendments that require grid companies to take into account the maturity of the project when allocating capacity and to develop a neutral and non-discriminatory maturity assessment practice.

Municipal planning is essential to ensuring attractive commercial areas for industry. Comprehensive plans for land use are necessary for good trade-offs bet-

ween different interests, so that sufficient account is also taken of the climate, soil protection, nature, cultural environment, health, landscape, local communities, transport, Sami interests and traditional industries such as fishing and reindeer husbandry. The municipalities can reduce the negative consequences of new developments by considering reuse and more efficient use of existing commercial areas and infrastructure before developing new areas.

Several of the existing and the new green industries require large areas, grid capacity and a lot of energy. They may also require more housing, better infrastructure and land-intensive support functions. The county authorities can contribute to a good basis for making assessments by preparing regional analyses of access to and need for land for the relevant purposes in light of realistic access to energy. When planning the use of land for new business development, socio-economic profitability must be taken into account, both by the municipalities and the counties, as well as the impact on the climate and environment. Regional plans can be a good tool for looking at commercial areas in light of, among other things, energy needs, power production and capacity in the power grid and other infrastructure. Regional assessments and trade-offs could help reduce conflicts, assess land and energy needs across municipal boundaries and strengthen development in the region. The Ministry of Local Government and Regional Development is working on introducing its own



All businesses should have access to high-speed broadband by 2025.



land-use objectives for solar power, data storage centres and energy-intensive industry in municipal plans and zoning plans, including solar power in combination with agricultural, nature, outdoor recreation and reindeer husbandry objectives. The same will be done for land-use zones in regional plans. This will give the county authorities and municipalities better tools for planning land use and facilitating such activities.

The Ministry of Climate and Environment has initiated work on establishing ecosystem accounts for Norway, based on the UN standard for environmental economic accounting. This will strengthen the knowledge base for making decisions on land use, and such ecosystem and local land accounting will be used as a basis when prioritising between different land-use considerations in future. The Government also announced in the Hurdal Platform that a new long-term goal will be set for the maximum redistribution of 2 000 acres of cultivated land annually.

As of today, to secure investment-ready industrial areas currently entails long lead times, as a result of time-consuming processes for work on regulations and studies, queues for access to grid capacity and

a lack of construction and delivery capacity to implement infrastructure. This increases uncertainty for industry stakeholders, who may face a long facilitation process. However, our experience is that, for example, several of the implemented initiatives in the battery value chain in Norway have already 'found a site', where regulation has been implemented or is in progress, and are well under way as regards to adaptation of infrastructure etc.

This applies, for example, to the battery cell initiatives Freyr, Morrow, Beyonder and Elinor, the material manufacturer Vianode and Hydrovolt, which will recycle batteries. In that connection, EIT InnoEnergy highlights that Norway and Sweden are consistently effective in facilitating industrial sites compared with a number of other European countries. This is supported by experience from the Norwegian process industry.

An important prerequisite for efficient and good planning is that the municipalities and other authorities have sufficient case processing capacity. It is also important that the municipalities take advantage of the opportunities for simplification and parallel case processing inherent in the current planning



system. Good impact assessments, early clarifications and a good dialogue throughout between the municipality in question, other affected authorities and other parties, can result in more efficient implementation of these processes. For example, it can contribute to necessary progress in housing projects that have been initiated in connection with large start-ups, in order to ensure good housing provision in the area following the expansion of the local labour market. In many places, good housing provision is considered an advantage for local companies in the competition to attract external labour with the right skills. In this context, the Norwegian State Housing Bank can be a good dialogue partner, including with regard to management of municipal rental housing, start-up loans and loans for high-quality housing. Vibrant and attractive city and town centres are also considered a competitive advantage for a region to ensure that migrant workers settle there.

Physical and digital infrastructure

Businesses located in Norway help keep the climate footprint low due to access to renewable electrical energy. Access to ports with storage facilities and access to water for cooling systems are also important competitive advantages for Norwegian locations.

Furthermore, it will often be essential to minimise transport and utilise energy flows (heat). It will also often be useful to co-locate different actors in the value chain to optimise the logistics of goods, expertise and energy, not least from a sustainability perspective. Reuse of 'grey areas' will be essential to ensure sustainability. Moreover, such areas are often fully zoned, have the necessary infrastructure, and can have a favourable location for co-location in the value chain and other positive synergies.

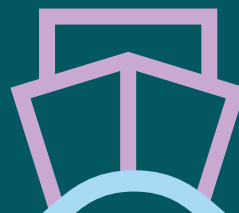
The planning and location of new green industrial projects must take the companies' need for transport infrastructure into account. Many new industrial projects will have a long way from the production site to the market, and will also depend on the supply of external input factors. When determining a location, it is essential to take into account the overall transport needs and the availability of efficient and secure freight transport. Access to transport solutions with the least possible greenhouse gas emissions and impact on land use and biodiversity is also necessary to achieve Norway's climate and environmental goals.

In the same way as access to electricity and road networks, access to digital networks is essential for industry. Digital availability requires a well-functioning digital infrastructure with good capacity that can be scaled as needed. To take advantage of the opportunities offered by new technologies and ever-increasing amounts of data, industry needs access to high quality, secure data centres, broadband and mobile networks. The Government will facilitate this so that companies can address future tasks in a good and sustainable manner. In the Hurdal Platform, the Government stated that all households and businesses should have access to high-speed broadband by 2025.

Political initiatives and processes

- ✦ The Government will work continuously to enhance dialogue between the authorities in the planning processes and avoid unnecessary use of protests. In recent years, the Planning and Building Act has been amended to streamline planning processes and make regional planning forums mandatory.
- ✦ The Government will prepare a short guide that shows the requirements for location, area assessments and studies in connection with the establishment of green industry, especially aimed at actors in the industry and relevant authorities.
- ✦ The Government will present a national strategy for the preparation of green industrial areas and industrial parks with international competitive advantages across Norway.
- ✦ The Government wants green industrial start-ups to use land effectively without unnecessary impact on nature. Municipalities should aim to facilitate industrial start-ups in line with climate and environmental interests of national or significant regional interest.
- ✦ The Government will develop a set of overarching principles for the spatial use of Norwegian ocean areas. This is intended to create predictability and a basis for coexistence across ocean industries, while nevertheless safeguarding marine ecosystems and the needs of the Norwegian Armed Forces. These principles will be presented in the Government's Ocean Industry Plan for Norwegian Ocean Areas and mentioned in the whitepaper to the Storting Norway's integrated ocean management plans
- ✦ The Government has commissioned DOGA (Design and Architecture Norway) to develop knowledge and inspiration materials on how design and architecture can be used to create green industrial start-ups that promote social and environmental sustainability.
- ✦ The Government will in the spring of 2024, present a white paper on the National Transport Plan 2025–2036. Its goals include contributing to achieving Norway's climate and environmental goals as well as increased competitiveness for the business community. The business sector's need for transport infrastructure and efficient freight transport will be an important consideration in this work.

Access to transport solutions with the least possible greenhouse gas emissions and impact on land use and biodiversity is also necessary to achieve Norway's climate and environmental goals.



2.3 Raw materials and circular economy



The transition to a society based on net-zero emissions, switching from a fossil energy system to a renewable one, requires significant amounts of minerals and metals for energy production, power grids, electric vehicles and batteries, among other things.

According to the International Energy Agency (IEA), the demand for a number of the raw materials needed will multiply if the world is to achieve its renewable energy targets.²⁰

On 21 June 2023, the Government presented a new mineral strategy.²¹ The Government's overarching ambition is for Norway to develop the world's most sustainable mineral industry, and our country is well positioned to succeed in this. We have significant mineral resources that can generate value creation and profitable jobs and, moreover, make important contributions to handle global challenges associated with the transition to a greener economy. The Government will facilitate greater resource efficiency, profitable reuse and recovery of raw materials, and work closely with the rest of Europe to secure critical value chains.

Norway is also participating in the Minerals Security Partnership, a US initiative aimed at stimulating public and private investment in strategic mining, processing and material recycling projects with high sustainability standards.

²⁰ <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>

²¹ <https://www.regjeringen.no/no/aktuelt/norge-skal-utvikle-verdens-mest-barekraftige-mineralnaring>

The Government will work closely with the rest of Europe to secure critical value chains.



In addition to increased extraction of raw materials, recycling and reuse will increasingly be important sources of many raw materials, especially metals. Norwegian industry has a great potential for increased circularity and resource efficiency. In some industrial sectors, much of the growth is already within circularity. This can be achieved both by using and processing secondary raw materials and other materials, and through the design and development of materials, products and business models that promote reuse, maintenance and material recovery. New European regulations for products and value chains will also contribute to this transition, and will offer Norwegian businesses competitive advantages and opportunities if they set high climate and environmental ambitions for their production. The Government will strengthen its work on the circular economy as a tool to drive the green transition and will present an operational action plan.

Norwegian R&D communities and parts of Norwegian industry are currently participating in several European collaborative projects on recycling critical raw materials from secondary sources. The strategic industrial partnership with the EU, including our work on the EU's action plan for critical raw materials, will, among

other things, help ensure access to raw materials for both Norway and Europe.

Biomass

Biomass is also a key raw material for the green transition, in part because it can replace fossil carbon in a number of areas.

Challenges and possibilities

Demand for a number of minerals and metals is expected to increase in the years ahead. However, new extraction projects take a long time to develop, and supply is therefore not expected to increase as quickly, which may lead to shortages and higher prices. The IEA has warned that the world's climate ambitions are disproportionate to the availability of the critical minerals necessary to implement the green transition based on current technologies.²²

A large part of the world's mineral and metal extraction and processing takes place outside Europe and Western countries, which can jeopardise reliable access to this type of raw material for industrial value chains in Norway and other European and Western countries.

22 <https://www.iea.org/news/clean-energy-demand-for-critical-minerals-set-to-soar-as-the-world-pursues-net-zero-goals>

It is therefore necessary to ensure that Norwegian industry has access to critical raw materials that are produced in accordance with social, economic and environmental sustainability criteria. This must be done through international trade, increased recycling, better provision for reuse, maintenance and circular solutions, and increased recovery in the Norwegian mineral industry. Long-term, sustainable management of resources is a fundamental principle underlying the Government's policy. The Norwegian mineral industry must therefore form part of the circular economy through increased resource efficiency, reuse and material recovery, and thus reduce the need for disposal sites.

On the other hand, as Norway and Europe are working to make better use of the mineral resources available, efforts are being made to develop alternative materials. For example, sawdust and other residual products from the forestry industry, and

carbon, captured through processing can be used as input factors for battery production, while biochar can be used as a reducing agent in the process industry.

Norway has an advantage through its good access to bio-resources from land, forest and sea, which can provide a basis for increased recovery and new materials/products, provided that the resource base and environmental values are safeguarded. There are also opportunities for more efficient use of residual raw materials, increased reuse, recycling of the materials from resources already in use, and cultivation of new resources from the sea. There are, however, other challenges associated with bio-resources, such as profitable extraction, long-term production and adaptation to the changing climate and various environmental requirements (discussed in more detail in section 4.7).

FACTS

The Government's Mineral Strategy



Norway has an active mineral industry, an extensive metallurgical industry and great potential for the further production of critical minerals. Mineral extraction and the production of metals are not only important to achieve green Norwegian and European value chains, but also to Norway's position in relation to our strategic alliances and partners. The Government's ambition is for Norway to be a stable long-term supplier of minerals for the green transition.

The Mineral Strategy shows what steps the Government will take to address challenges relating to Norway's access to raw materials and to facilitate more profitable and sustainable land-based extraction of critical raw materials.

The Government's five priority areas:

1. Norwegian mineral projects must be implemented faster
2. The Norwegian mineral industry must contribute to the circular economy
3. The Norwegian mineral industry must become more sustainable
4. Norwegian mineral projects need good access to private capital
5. Norway will continue to be a stable supplier of raw materials for green value chains

FACTS

Seabed mineral activities on the Norwegian continental shelf



The extraction of seabed minerals can help ensure global access to important metals and provide opportunities for the development of Norwegian mineral extraction and Norwegian businesses.

In order to increase resource mapping and exploration, it will also be important to mobilise the private sector. The Government wishes to facilitate profitable and sustainable seabed mineral activities and has presented a white paper on opening areas on the Norwegian continental shelf for mineral activities and a strategy for managing the resources.

Norway strives to be a world-leader in pursuing fact-based and knowledge-based management, including of seabed mineral resources, that is holistic, sustainable and responsible. Norway has a long-standing tradition of such sound resource management that facilitates the exploitation of natural resources while safeguarding environmental values and other interests.

Norway has strong research and technology communities in oil and gas, the ocean and marine resources. This is a good starting point for developing profitable mineral business on the seabed. Over many years of operations, Norwegian-based environments have successfully taken leading positions in global marine industries. Norway is thus well placed to become a supplier of knowledge and technology for a new global industry based on the extraction of seabed mineral deposits.





Long-term, sustainable management of resources is a fundamental principle underlying the Government's policy.

Political initiatives and processes

- ✧ The Government has prepared a mineral strategy. Given the importance of minerals for the green transition, it is natural to see the work on the Green Industrial Initiative and the Mineral Strategy in context.
- ✧ The Government will consider the recommendations of the Minerals Act Committee, which delivered its report on amendments to the Minerals Act in June 2022. The report has been submitted for consultation, and the Ministry of Trade, Industry and Fisheries is now reviewing the input.
- ✧ The Government will facilitate profitable and sustainable mineral activities on the seabed and has presented a white paper on the possibility of opening areas on the Norwegian continental shelf for seabed mineral activities and a strategy for managing the resources.
- ✧ The Government has submitted proposals for consultation for new legislation on sustainable products and value chains to facilitate the implementation of new regulations aimed at products and priority value chains.
- ✧ The Government will contribute to the development of European value chains for critical raw materials, including extraction, processing and recycling, among other things through strategic industrial partnerships with the EU and selected countries. The goal is to ensure the parties involved reliable and stable access to such raw materials over time.
- ✧ The Government will present an action plan for a circular economy.

FACTS

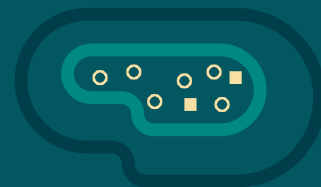
Common European regulations for products and value chains

One of the most important areas under the European Green Deal is the transition to a circular economy as enshrined in the EU's 2020 Action Plan. A more sustainable production and consumption pattern must become the new normal and the use of secondary raw materials must double over the next ten years. The main new approach is a strengthened product framework for sustainable products. A comprehensive, legally binding framework is proposed to promote sustainably designed products (eco-design). In addition, new demands will be made of increased sustainability at all stages of the entire life cycle of the seven priority product areas of great economic and environmental importance: Packaging, plastics, food, textiles, electrical and electronic products, batteries and vehicles and building materials.

Norwegian legislation has no equivalent to the legislation currently being developed in the EU to promote the basic sustainability characteristics of products and value chains. The current legislation on pollution and control of health and environmentally hazardous chemicals in products aims to prevent and reduce harmful effects in Norway. The EU's strengthened product framework will also promote positive sustainability in a global perspective. It extends beyond the scope of the Pollution Act and the Product Control Act. The Government will ensure that Norway has the necessary legal authority to implement these types of new requirements.



The green transition requires good access to building blocks in the form of raw materials from the mineral sector, materials from the process industry and components from manufacturing. How we acquire these input factors has a significant impact on nature and climate.



2.4 Capital



The Government will mobilise as much private capital as possible for the green transition and will provide government risk mitigation to accelerate industrial investment in Norway.

The transition to a low-emission society will require major investments and private capital flows must be geared up and diverted in the direction of sustainable investments.

Access to capital is thus essential for the realisation of projects in green value chains. The individual projects have different needs for financing adapted to their specific situation, including business and financing model, ownership, and their position in the development process.

According to BloombergNEF, total global investments in technologies for the green transition amounted to USD 1,100 billion in 2022, an increase of 31 per cent from the previous year. The analysis highlights that this is the first time such investments exceed USD 1,000 billion and that for the first time, investments in green technologies reached the same level as investments in fossil energy. BloombergNEF's calculations show that investments in green technologies must increase to much higher levels if the world is to move towards net-zero emissions and thus meet the climate goals of the Paris Agreement. According to BloombergNEF, the world must invest an annual average of USD 4,550 billion in such technologies for the rest of the 2020s, which is more than triple the level in 2022. ²³

²³ <https://about.bnef.com/blog/global-low-carbon-energy-technology-investment-surges-past-1-trillion-for-the-first-time/>



Investment needs for green industry towards 2030

In March 2023, the European Commission presented a proposal for new regulations on green industry, called the Net-Zero Industry Act (NZIA). This is a key part of the EU's Green Industrial Plan and aims to strengthen the EU's production of components and other industrial products that are part of zero-emission technologies such as wind and solar power and batteries etc. The ambition of NZIA is for the EU to be self-sufficient in at least 40 per cent of the industrial products in the *strategic zero-emission technologies* needed to achieve the EU's climate goals by 2030.

The European Commission has carried out an analysis of the investment required to achieve this self-sufficiency target in five of the strategic zero-emission technologies; batteries, wind power, solar power, heat pumps and electrolysers.²⁴ The analysis shows that overall investments of at least EUR 89 billion are required, which is about 84 per cent more than continuing with the current self-sufficiency rate ('status quo' requires 48 billion in investments). Investments in expanded battery production capacity in the EU constitute by far the largest part of this scale-up (approximately EUR 68 billion), based on the expected growth in demand for electric vehicles, while investment needs in wind power, solar power and heat pumps are estimated at approximately EUR 6–7 billion in each area. Investment of an estimated 1.3 billion is required for the production of electrolysers.

The Commission also estimates the ratio of private to public capital to achieve the targets for the green transition/emission cuts at 17–20 per cent, i.e. a 1:5 ratio between public and private capital. This has been calculated on the basis of experience of previous programmes in energy, industry and climate.

²⁴ The Commission staff working document on investment needs assessment and funding availabilities was published as an appendix to the NZIA proposal on 23 March 2023: 'Investment needs assessment and funding availabilities to strengthen the EU's Net-Zero technology manufacturing capacity': https://single-market-economy.ec.europa.eu/system/files/2023-03/SWD_2023_68_F1_STAFF_WORKING_PAPER_EN_V4_P1_2629849.PDF



To achieve our climate targets, private capital flows must be geared up and diverted in the direction of sustainable investments.

Opportunities and challenges

Any mixed economy depends on a well-functioning capital market, which, among other things, channels and accumulates financial capital, and redistributes and spreads risk across several actors. The capital market also helps price risk so that market participants can make sensible trade-offs between profitability and risk in projects. This enables companies to finance assumed profitable investments without taking the full risk themselves, which also increases willingness to invest and stimulates business development.

Even a well-functioning capital market may not be sufficient for certain market segments or categories of investments. Various forms of market failure can contribute to socially profitable projects not being profitable for private investors, and thus not being financed and realised. The opposite is also the case, in that profitable business projects can have negative effects on society that do not have to be covered by the responsible actor. An example of the latter is companies that emit greenhouse gases or damage nature without them having to cover the real societal costs.

Through its policy, the state can intervene to correct deviations between what is profitable for private and public interests, with the goal of realising more socially profitable projects. This can take the form of regulation or tax (such as a carbon tax) and/or by

contributing state capital (grants, loans etc.). Which instruments are most effective depends on the case in question.

Public capital is mainly geared towards projects related to research, innovation and early-stage projects, where it is assumed that the capital market works most poorly. Some of the schemes are subsidised, for example to encourage more research and knowledge sharing, while others take place on market terms, to increase the supply of capital in a sector/niche. The state owns several companies that invest directly and indirectly in promising early-stage companies, such as Nysnø and Investinor.

Global and national climate policy affect access to capital for climate-friendly projects in the business sector. A lack of carbon pricing (tax on emissions) and climate and environmental externalities make climate-friendly projects appear less profitable than they should be for private investors/companies, while non-climate-friendly projects appear more profitable. Putting a price on emissions is one of the main tools in the long-term climate policy to stimulate and adopt new solutions. However, an ambitious national or regional climate policy leading to carbon leakage should be avoided. In Norway and many other countries, especially in Europe, there are mechanisms for pricing emissions, although the current price is too low in most cases. The Government will therefore gradually increase the carbon

tax for the sectors not included in the EU Emissions Trading System (EU ETS) to NOK 2,000 per tonne by 2030. For cuts and restructuring in sectors covered by the EU ETS, the price and gearing of the system are pivotal. Globally, however, only 23 per cent of emissions are priced, according to the World Bank.²⁵ The very different pricing of emissions globally means carbon leakage may reduce willingness to invest in climate-friendly projects in Norway and Europe. However, the effect of carbon leakage is uncertain and will generally vary between sectors and companies. For long-term investments, it must be expected that, among other things, the Paris Agreement and geopolitical tensions are weighed against the 'advantage' of being located in countries that currently have weak climate regulations.

To achieve our climate targets, private capital flows must be diverted in the direction of sustainable investments. A survey from Menon Economics on access to capital for Norwegian climate technology highlights the lack of access to risk capital for green capital-intensive industrial projects as a challenge.²⁶

The fact that the financial markets actors have lacked a common definition of what is sustainable can make it difficult to identify which investments are in line with long-term climate and environmental goals. This is why the European Commission has proposed and adopted several EEA-relevant regulations for the financial markets. The EU's classification system for sustainable economic activity (the taxonomy) is

a key measure to make it easier for banks and investors to identify sustainable investments. The Act that makes the Taxonomy Regulation in Norwegian law entered into force on 1 January 2023.

A new Corporate Sustainability Reporting Directive (CSRD) was adopted in the EU in 2022. The changes to the directive entail the introduction of more comprehensive and standardised requirements for reporting on greenhouse gas emissions, climate risk and other environmental and sustainability information. Among other things, companies must report on their plans to ensure that the business model is compatible with the transition to a sustainable economy and limit global warming to 1.5°C above pre-industrial levels in line with the Paris Agreement. On 22 May 2023, the Securities Law Committee submitted a report on the implementation of the directive into Norwegian law.²⁷ The Committee's report was out for consultation until 4 September 2023. The Ministry of Finance aims to present a proposal to the Storting in time to enable the new rules to be introduced in Norway at the same pace as in the EU, so that the regulations will start to apply to the largest listed companies from the 2024 financial year.

Taxonomy and nature

A significant proportion of the world's value creation is directly and indirectly dependent on nature. On the other hand, our economic activity impacts nature and ecosystems. If this leads to damage to

25 <https://carbonpricingdashboard.worldbank.org/>

26 Menon Economics (2022). *Kapitaltilgang for norsk klimateknologi* ('Access to capital for Norwegian climate technology' – in Norwegian only). Menon publication no. 25/2022.

27 Norwegian Official Report (NOU) 2023: 15 *Bærekraftsrapportering – gjennomføring av direktivet om bærekraftsrapportering* ('Sustainability reporting – implementation of the sustainability reporting directive (CSRD)' – in Norwegian only)

or the disappearance of nature, it also entails financial risk. In international professional and policy environments, there is increasing awareness of the risk loss of nature and biodiversity may pose to actors in the financial markets. In June 2021, with the support of, among others, the United Nations Development Programme and the United Nations Environment Programme's Finance Initiative (UNEP FI), a working group was appointed to develop a framework for managing financial reporting on nature-related risk (Taskforce on Nature-related Financial Disclosures, TNFD).

Safeguarding biodiversity and ecosystems is one of the environmental objectives of the EU Taxonomy for sustainable economic activities and one of the topics on which companies should report under new European rules on sustainability reporting. The state also expects state-owned companies to identify and manage risks and opportunities related to nature, set goals and take measures to reduce their own negative impact and increase their positive impact on biodiversity and ecosystems, and report on goal attainment.

Political initiatives and processes

The green transition will require major investments in technology and industry and a number of new investment projects are emerging that can be realised in Norway in the coming years. The state must be a driving force and an active facilitator in the development of new, profitable industry. Private capital will lead the way, and the Government's goal is to mobilise as much private capital as possible for these projects. Norway should have internationally competitive risk mitigation schemes for private

profitable green industrial projects. The Government will provide targeted risk mitigation for good, profitable business projects within the nine priority areas of the Green Industrial Initiative. This may include different types of loans, guarantees and equity. The Government has assumed that the need for risk mitigation for projects under the Green Industrial Initiative is extensive and growing. In 2022, the policy instrument system estimated a need for risk mitigation in the order of NOK 60 billion in the period leading up to 2025.

As part of this work, the Government has already stepped up support via Enova, established green growth loans in Innovation Norway and improved access to investment funds from the EU. We have expanded Eksfin's mandate to include loans for domestic climate projects with export potential. Furthermore, the Government has significantly increased Norwegian participation in the EU's InvestEU funding programme. These changes make more capital available to trigger more private investment and accelerate the green transition.

In 2021, an expert committee for climate-friendly investments was appointed, to, among other things, assess whether the current framework conditions contribute to a well-functioning market for socially profitable and climate-friendly investments. The committee's report was presented in June 2022.²⁸

The Tax Committee issued its report on 19 December 2022 (Norwegian Official Report (NOU) 2022: 20).²⁹ The Tax Committee was asked to assess how more correct environmental pricing and other economic policy instruments can contribute to

28 <https://klimavennligeinvesteringer.no/>

29 <https://www.regjeringen.no/en/aktuelt/skatteutvalget-har-lagt-frem-sin-utredning>

better resource utilisation, promote climate-friendly investments, increase circular production and consumption patterns, and stimulate value creation and employment based on circular solutions. The Committee believes a broad study of measures is needed to promote circular activities. The Government is now following this up.

The Government expects large Norwegian companies to report on how they are affected by and deal with climate and environmental risks, and how their activities impact the climate and environment. Systematic reporting also by smaller companies could contribute to investments shifting in a more sustainable direction, and the Government therefore also encourages smaller companies to report information relevant to the climate and environment on a voluntary basis.³⁰

On 30 June, the Government presented five new measures to accelerate the green transition in the business sector, which supplement the lists of measures below, cf. section 1.8.

- ✧ The Government will mobilise as much private capital as possible for the green transition, including through internationally competitive schemes for risk mitigation.
- ✧ The Government is following up on its promises from 30 June to strengthen the capital instruments under the Green Industrial Initiative to increase investment in green industrial projects, and it will propose significantly increasing capital infusions to Nysnø and Siva. The Government will return to this in connection with the changes to the national budget for 2023 at the end of November.
- ✧ The Government will provide targeted risk mitigation for good, profitable business projects within the nine priority areas of the Green Industrial Initiative. This may include different types of loans, guarantees and equity.
- ✧ The Government will dimension the policy instrument system to meet the growing need for guarantees and loans for green industrial projects. Increased government risk mitigation requires good projects and a willingness to invest privately. The policy instrument system estimated in 2022 that the need for risk mitigation related to the Green Industrial Initiative may be in the order of NOK 60 billion by 2025.
- ✧ The Government will continue to strengthen Eksfin's role as an instrument for green industrial development to help realise more large, green industrial projects in the next few years.
- ✧ The Government will review the recommendations made by the expert committee on climate-friendly investments and consider further measures to stimulate new profitable climate-friendly investments.
- ✧ The Government will review the Tax Committee's assessments of how correct environmental pricing and other economic instruments can contribute to better resource utilisation, circular production and consumption patterns, and encourage value creation based on circular solutions.

30 For more information, see Report No 12 to the Storting *Finansmarkedsmeldingen 2022* ('White paper on financial markets 2022' – in Norwegian only)

FACTS

Overview of key policy instruments for green industry

Through the *guarantee and loan schemes in Export Finance Norway (Eksfin)*, financing can be provided for the export of goods and services related to green industry and green industry investments in Norway. Eksfin's main guarantee scheme, the general guarantee scheme, has a guarantee framework of NOK 145 billion in 2023.

Loans can also be granted to green industry through *Innovation Norway*. Among the relevant loan schemes, the Innovation Loan scheme and the Low-Risk Loan scheme had annual lending frameworks of NOK 3.1 billion and NOK 2.5 billion respectively in 2022. Up to NOK 600 million of the lending framework for innovation loans is reserved for *Green Growth Loans*, which is a new loan scheme that intends to help implement more and larger green projects throughout Norway. Innovation Norway also has district-oriented loan schemes. The Risk Loan scheme for low and zero-emission ships has a lending framework of NOK 470 million in 2023. Under the scheme, loans may be granted for the purchase of zero and low-emission vessels or for investments in a used vessel that is retrofitted to reduce emissions.

The Green Platform is a joint competitive arena organised by the Research Council of Norway, Innovation Norway and Siva, and aims to promote the green transition. NOK 1.125 billion was announced for three-year projects under the Green Platform in 2020, up to NOK 750 million in 2022 and up to NOK 600 million in 2023.

The *Environmental Technology scheme* is a grant scheme under Innovation Norway that supports pilot and demonstration projects to contribute to the commercialisation of innovative solutions based on environmental technology. Approx. NOK 505 million was allocated to the scheme for 2022.

The Research Council of Norway has a number of industry-oriented policy instruments that both contribute to the development of green technologies and solutions that facilitate a future low-emission society and that promote competitiveness and increased value creation in the industries.

Green Investment Grants are aimed at industrial companies that carry out major investment projects with a positive environmental impact. The scheme managed by Innovation Norway, had a framework of NOK 100 million in 2022, and is aimed at industrial companies in rural areas.

Enova offers support with the aim of helping to achieve Norway's climate commitments and contributing to the transition to a low-emission society. Enova's activity is aimed at late-stage technology development and early market introduction, with a view to achieving lasting market changes so that solutions adapted to the low-emission society are preferred even without support in the long term. The Climate and Energy Fund, which Enova manages, is allocated NOK 4.1 billion annually.

Gassnova will promote technology development, competence-building and cost-effective solutions for carbon capture, transport and storage (CCS). Gassnova manages the state's interests in the test centre for CCS technology at Mongstad (TCM). NOK 161 million has been allocated to TCM in 2023. The CLIMIT programme offers support for the development of CCS technologies, and is a collaboration between Gassnova and the Research Council of Norway. NOK 148 million has been allocated to CLIMIT in 2023.

Nysnø Klimainvesteringer AS is a state-owned investment company that aims to reduce greenhouse gas emissions through profitable investments. The company shall invest in unlisted companies and/or funds aimed at unlisted companies that have business operations in or based in Norway. The company received NOK 600 million in February 2023.

Bionova has been established under Innovation Norway, and will be a tool that contributes to achieving Norway's climate goals for 2030 and to it becoming a low-carbon society in 2050. In addition to being one of the main tools for achieving the climate goals in agriculture, Bionova will contribute to innovation and value creation through the transition to a more circular bioeconomy based on renewable biological resources from the land and sea. The value creation programme for renewable energy and technology in agriculture, as well as the bioeconomy scheme, are part of Bionova's portfolio. The total allocation to Bionova for 2023 was just over NOK 89 million.

Norway has entered into an agreement with the EU to participate in the EU's new investment programme *InvestEU* in the period between 2021 and 2027. InvestEU gives the business sector access to financial instruments of a scope Norway does not offer through its national policy instruments. At least 30 per cent of the programme's investments will contribute to achieving the EU's climate goals.

2.5 Research, technology development and digitalisation



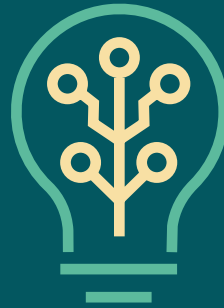
Research, technology development and innovation are essential for the realisation of the Government's ambitions for the Green Industrial Initiative and for social development in general. This requires strong, collaborative educational, research and expert communities throughout Norway of the right dimension, in parallel with the industrial initiative.

Green products and solutions for the future must largely be developed by the companies themselves, in collaboration with an ecosystem of suppliers, customers, and education and research communities.

A comprehensive policy instrument system has been established in Norway to promote technology development, innovation, business development and internationalisation. This system is key to the Government's approach towards green technologies, restructuring and green business development. The range of instruments is broad and supports different phases, from idea to market. This is especially true in the energy area, where the Government supports research, technology development and innovation through significant grants, primarily to the Research Council of Norway, Enova and Innovation Norway. PILOTE, for example, is a joint funding programme for Norwegian industry that enables completely new environmentally friendly products and services to be developed and taken into use more quickly.

FACTS

Public administration and research institutes



The Norwegian institute sector accounts for about one-fifth of all R&D activity in Norway. The institutes contribute to the development of new technology and know how and to their dissemination and application in business and industry. Furthermore, the institutes own and operate research infrastructure that has great value for industrial research. The institutes play a particularly important role for small and medium-sized companies, which may have limited ability to carry out research and development work themselves, and they cooperate with universities and university colleges. Many institutes operate in international markets, where they help bring new technology to Norwegian business and industry.

Historically, the institutes have made significant contributions to the development of Norwegian industry, and now play a key role in the green transition. The Government is funding the building of the Norwegian Ocean Technology Centre, which will ensure Norway's position as a leading maritime nation. The centre will be run by NTNU and SINTEF and will help us find the solutions the world needs in terms of transport, energy and food production at sea. IFE began researching solar cells and battery technology many years ago and now has research groups with sound experience to support Norwegian companies, such as Norsun, Scatec, Ocean Sun, Cenate, Morrow Batteries, Beyonder and others. NGI is engaged in technology development and transfer from oil and gas to offshore wind, and provides R&D and services to the offshore wind industry in the North Sea. The Norwegian Institute of Bioeconomy Research makes important contributions to a sustainable forest and timber industry and business development based on our renewable biological resources.

There is a close connection between green transition and digitalisation, often referred to as the 'twin transition'.³¹ Digital technologies contribute, among other things, through streamlining, service provision, smarter interaction and predictions. Now that all industries need to become climate neutral, circular and digitalised, we need to increase performance and value for customers and users through incremental innovation (improvements based on current solutions). We also need to bring about more fundamental changes that break with established systems, contribute to the creation of new industry and new businesses, and established actors need to adapt (radical innovation). The roll-out of electric vehicles in the Norwegian market is an example of climate-friendly system changes consisting of radical innovations in a holistic value chain that is facilitated through digital services to consumers, which has led to new business models and changed consumer behaviour. More generally, digital platforms, the sharing economy, autonomous systems and blockchain are examples of radical digital innovati-

ons with the potential for major changes to systems related to transport, energy and finance.

We need companies that are able to develop, commercialise and apply new technology and know-how to achieve more efficient production in existing and new value chains, produce new products and services, improve products, and bring about better quality control and new business models.

Opportunities and challenges

Many Norwegian companies are well under way on their digital journeys, and have racked up exciting and educational experience. A number of companies have come a long way in adopting advanced digital technologies. Nevertheless, few Norwegian industrial companies consider themselves to be at the 'Industry 4.0 level' in the utilisation of digital technologies.³²

31 https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/twin-green-digital-transition-how-sustainable-digital-technologies-could-enable-carbon-neutral-eu-2022-06-29_en

32 Round-table meetings on manufacturing conducted by the Ministry of Trade, Industry and Fisheries in 2023

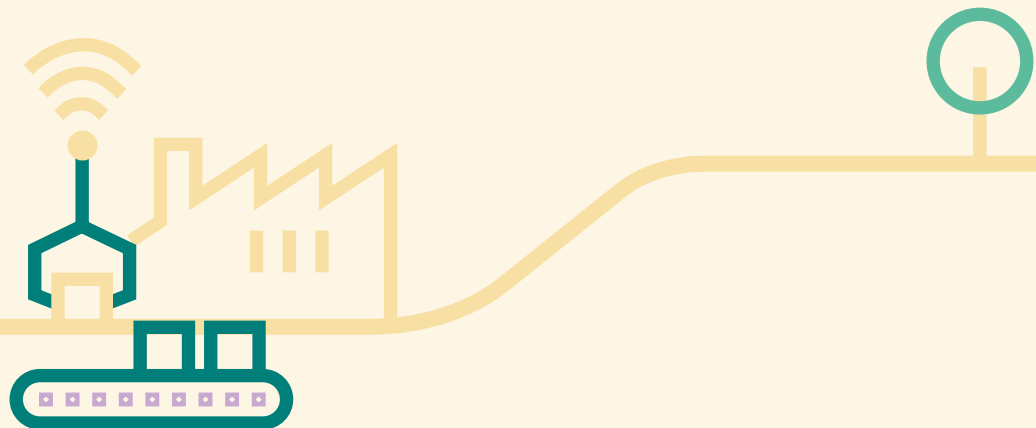
Industry 4.0

The concept of Industry 4.0 is barely ten years old and was launched by the German government to leverage the ability of innovation programmes to boost the competitiveness of German industry. In simple terms, the Industry 4.0 level consists of three elements:

1. Integrating the different links in the value chains more closely together, vertically and horizontally
2. Digitalising and linking products and services
3. Disruptive business models that offer customers new and tailored solutions

What makes the technological transformation different from previous industrial revolutions is the linking of different technologies in the use of sensory technology and the Internet of Things (IoT), which brings previous individual technologies together in cyber physical systems (CPS). In an industrial context, CPS typically consists of a digital and a physical production line, where the physical capabilities have digital representations that are updated in real time along the entire production line. This makes it possible to continuously monitor status from start to finish. Furthermore, Industry 4.0 consists of a number of technologies that, through their different properties, support opportunities for developing an Industry 4.0 platform. Digital21 discusses different variants of these technologies, some of which are base technologies while others are system technologies.

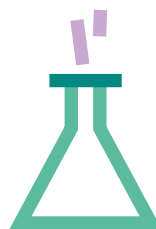
Source: Siva



Norway is among the leading countries in Europe with respect to digitalisation and is well above the average among EU countries in terms of broadband and mobile networks, digital literacy, use of digital services in business and society and use of public digital services.³³ This gives Norway a good starting point for succeeding with the green and digital transition. Still, most Norwegian industrial companies have the potential to exploit new technology to a greater extent than they do today, representing significant value creation.

Due to high cost levels, Norwegian industry must constantly use more advanced technology to develop its competitive position in a global market. Technology developments can also reduce the impact of labour costs on where companies choose to produce, leading to increased emphasis on factors such as delivery time, quality, flexibility, development opportunities, and proximity to competence environments, suppliers and customers.

There are a huge number of new digital technologies, and they need to be of use to someone to prove useful. This means that companies and industries must be able to identify, select and implement technologies that provide benefits, and have the ability to understand what skills they must acquire in that context and when. Many companies in Norwegian industry address this by carrying out small local projects where they test a technology, as a basis for verification, learning and adjustment, before they start rolling out the technology in more



Most Norwegian industrial companies have the potential to exploit new technology to a greater extent than they do today, representing significant value creation.

of the business. Section 1.7 discusses how Norwegian companies achieve value creation effects by combining experience and new knowledge, with the close involvement of employees.

New technology involves as much organisational development as technology development, and the danger of overlooking the organisational aspect means that consequences for competence, structure, roles, functions and management are not considered. Those who are able to take advantage of this interaction may also be able to produce and deliver more advanced and complex products. This can provide higher value creation per employee, and further develop the power of the Norwegian model.

33 DESI index (Digital Economy and Society Index) 2021 <https://digital-strategy.ec.europa.eu/en/policies/desi-norway>

FACTS

‘Learning from the best’

The executive forum for digitalisation in industry, which was initiated in connection with Report No 27 to the Storting (2016–2017) *A greener, smarter and more innovative industry*, has examined the hypothesis that the Norwegian working life model in combination with our industry expertise and know how gives us an advantage when industry around the world is to be digitalised. In this context, SINTEF conducted in-depth interviews with 175 key employees at different organisational levels in a sample of 33 of our leading companies from different industries to gain insight into how these companies work to create value from digital tools. One purpose of the survey has been to spread such experience-based knowledge to companies that are in an earlier phase of their digital journey. The SINTEF report *Lær av de beste* (‘Learn from the best’ – in Norwegian only) shows that the Norwegian working life model provides industrial companies with invaluable support in digitalisation for increased competitiveness.³⁴ The report highlights the following findings:

1. Active participation in national and international arenas is essential to identify new technologies and suppliers.
2. An operation-focused management is vital, and employees’ own commitment and thirst for knowledge increases companies’ ability to capture new technology and new business models.
3. Acquiring expertise for your own business as a means of systematic concept development has a great impact.
4. Companies have good experience of implementing a few technologies at a time to ensure successful digitalisation.
5. Digital transformation enhances the Norwegian model and value creation.

³⁴ <https://www.norskindustri.no/kampanjesider/industrifuturum/artikler/ny-studie-hvordan-skafter-de-beste-bedriftene-seg-konkurranseskraft-igjennom-digitalisering/>

FACTS

Norway is participating in the EU programme DIGITAL 2021–2027

Norway is participating in DIGITAL (2021–2027), the EU programme initiative for digital transformation and the building of digital infrastructure and capacity. The programme will increase the business sector's competitiveness, provide better and more efficient solutions for the public sector and ensure that European countries can be at the forefront in five particularly key areas: high-performance computing and supercomputers, artificial intelligence and data, cybersecurity, advanced digital competence and best use of new technologies. These are areas that are also very important for Norway, both for research and innovation efforts and the further development of digital solutions. Several of the measures under DIGITAL focus on supporting the goals of the European Green Deal. The capacity developed through DIGITAL will be available to research institutions, the public sector and the business sector. In addition, ground-breaking technological solutions developed through research and innovation projects in Horizon Europe or national research programmes will be tested on a large scale and deployed through DIGITAL.

One of the opportunities that digitalisation provides is to make value chains more transparent. Developing common platforms enables the actors in the value chain to exchange information. They will be able to 'look' into each other's processes, progress in production and have a more integrated approach to design and product development.

Norway has a high level of public funding for research, while the business sector finances around 40 per cent. In addition to its own research, the business sector purchases R&D services from others. The Government aims to increase the business sector's R&D to 2 per cent of GDP. Industry's own investments in R&D have long been important for enabling Norwegian industry to deliver low-emission technology and products to a rapidly growing market, both in Europe and globally. Business-oriented instruments under the Research Council of Norway contribute to increasing the business sector's participation and the scope of its research and development. Participation helps ensure relevance and contributes to increased competitiveness and increased value creation in the business sector.

Norwegian actors actively participate in international research and innovation cooperation, and do well in competition for funding in the EU Framework Programme for Research and Innovation, Horizon Europe. Horizon Europe will build on green and digital transition (twin transition). Many of the Norwegian projects that have done well in the competition are characterised by collaboration between research institutes, the business sector, universities and university colleges and the public sector.

Nevertheless, the Norwegian business sector continues to invest less in R&D than the average for OECD countries. This may be partly due to the fact

that much of the value creation in Norway takes place in industries with relatively low R&D intensity. There is probably a lot to be gained by increasing research efforts, strengthening links between different sectors and improving the interaction between research and innovation. If we are to achieve the ambitions of the Green Industrial Initiative, we are also dependent on new climate and environmental technologies being commercialised and implemented quickly. Policy instruments for the demonstration and piloting of new solutions must help support opportunities for commercialisation and value creation in the market. Well-functioning instruments for interaction and cooperation, such as centre initiatives, clusters, catapults and the Green Platform scheme, help increase industry's ability to employ new technology, innovate and contribute to the transition going forward.

Political initiatives and processes

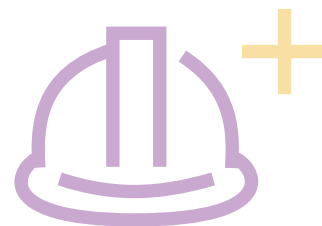
- ✨ The Government has reviewed the policy instrument system to further consolidate its efforts towards the green transition in the business sector and support the Green Industrial Initiative. The Government has, among other things, introduced the main principle that projects that receive funding through business-oriented policy instruments should play a role in the journey towards the transition target for 2030, and that Norway should be a low-emission society by 2050.
- ✨ The Government and the policy instrument system work to develop parameters to measure the system's contribution to the green transition and will monitor developments over time. This includes considering how the principles of the EU taxonomy can be used and how policy instrument statistics can be made as comparable as possible to similar statistics in the EU.

- ✦ The Government has strengthened its efforts to establish easier access to the policy instrument system. It should be easy to find the right scheme, and the work on the digital one-stop shop solution (Én vei inn) is a step in that direction.
- ✦ The Government prioritises Norwegian participation in important EU programmes, such as Horizon Europe, InvestEU, the DIGITALEuropa programme, the European Defence Fund (EDF) and the EU space programme. This gives industry the opportunity to further develop international networks, use digital infrastructure and test facilities and receive public funding.
- ✦ The Government will encourage a shift in the industry's research and innovation activity towards climate and environmentally friendly solutions, green transition and circular economy in line with the Long-term plan for research and higher education (LTP) for the period 2023–2032.
- ✦ The Government has decided, in connection with the work on the Long-term plan (LTP), to use social missions to solve complex social challenges. Social mission is the term for cross-sectoral initiatives implemented to achieve a specific goal within a given deadline.
- ✦ The Government has initiated work on the social mission on sustainable feed from LTP 2023–2032.
- ✦ The Government wants Norwegian industry to be a leader in Industry 4.0 and will therefore consider schemes to bring about promising projects in the field of automation and digitalisation of industry, including the possible creation of a national Industry 4.0 programme.
- ✦ The Government will facilitate increased value creation with data by encouraging increased sharing and use of data in and across sectors and industries.
- ✦ The Government has created the funding programme 'Industry 2050', aimed at industrial point emissions, where Enova supports the development and realisation of technology leaps that contribute to an industry adapted to the low-emission society.
- ✦ The Government will present a strategy to increase research in the business sector.

The knowledge and research needs for the green transition are central to the Government's Long-term plan for research and higher education.



2.6 Labour and skills



Norwegian industry must have access to a competent labour force. The tripartite cooperation will facilitate continuous skills development, and the Government is pursuing an active policy to include more people in the labour market.

Norway has abundant natural resources, but our most important resource is skilled labour. Access to sufficient labour with the right skills will be key to Norway's green transition and the Green Industrial Initiative. These are skills that must be continuously maintained and developed. The opportunity to take education and continuing education is also important for the individual and pivotal in a just transition.

Opportunities and challenges

The Norwegian labour market is skill-intensive, has a high ICT intensity and there are relatively few routine jobs in industry and the service industries.³⁵ Norwegian industry has a work culture that is flat and trust-based, with short lines of communication between the management, engineer and skilled worker.

³⁵ Report No 14 to the Storting (2022–2023) *Utsyn over kompetansebehovet i Norge* ('Outlook on the skills needs in Norway' – in Norwegian only)

Changes in the Industry Agreement

Changes in production processes and the organisation of work have blurred the traditional distinction between workers and office staff. Today, highly qualified skilled workers often perform work that foremen, planners and engineers did in the past – and engineers participate in direct production. The changes that are coming in technology and the green transition will reinforce this development.

The blurred lines between work tasks mean there is no reason to maintain the distinctions in the agreements, with one agreement for workers, one for foremen and planners, one for office workers and one for engineers. Collective wage agreements cannot be an obstacle to companies' development and flexibility or to the individual's development of skills. Industry is in a unique position. No other sector is subject to the same innovation and development pressure.

Traditionally, in Norway the industrial sector – referred to in this context as the frontline sector ("Frontfaget") – will start the bargaining round. The role of the Industry Agreement in

the front sector reinforces the need for changes. The front sector-model assumes that the organisations representing the industries exposed to competition are able to collectively manage wage determination. This is based on the assumption that the agreement is such that it represents the employees in these industries.

All employees, regardless of background, contribute to the individual company's result, which provides the basis for the salaries the company can pay. The previous distinctions between the different categories of employees can no longer be an obstacle to all employees being covered by the same agreement.

It was on this background that the United Federation of Trade Unions made demands for changes to the Industry Agreement in 2020. In 2022, consensus was reached with the Federation of Norwegian Industries that office positions in industry such as engineers, technicians, programmers, inspectors and supervisors can also be covered by the Industry Agreement.³⁶

³⁶ <https://www.fellesforbundet.no/globalassets/lonn-og-tariffsaker/tariffavtaler/overenskomster-2022-2024/33025-industrioverenskomsten-innmat-2022-2024-nett.pdf>

Many Norwegian businesses are at the forefront of efficient use of resources, automated solutions and other digital technologies. The companies have employees with high theoretical and practical expertise in all parts of production, and the employees tend to operate with a high degree of autonomy. In sum, the Norwegian working life model means that many businesses can carry out more work with fewer employees, which results in high productivity in Norwegian industry.

Norwegian industrial environments have expertise and extensive operational know how in areas such as oil and gas, renewable energy, metallurgy, and the maritime and marine sectors. Many strong industrial environments have been developed through employees' ability to develop and use new solutions and good interaction between industry and research and education environments.

We also have a generally high level of education in the population, a social safety net for everyone and a regional profile that ensures the decentralised

provision of education, welfare and infrastructure across the country. Therefore, high-tech, export-oriented businesses can be located close to natural resources and still be connected digitally and have short lines of communication with suppliers, customers and partners at home and abroad. The authorities provide predictable framework conditions which in particular promote development, restructuring and market access. There are short lines of communication between the authorities and the business sector, between businesses in different industry clusters and between businesses and academia. The Norwegian working life model is unique and gives us overall strong industrial capability. See also the discussion in sections 1.7 and 2.5.

To realise the Green Industrial Initiative in Norway, we need skilled labour from all levels of education, from skilled workers to technologists. We also need access to labour that can develop and deploy enabling and industrial technologies such as artificial intelligence, big data analysis, robotics and the Internet of Things. Knowledge of digitalisation in general,



Many Norwegian businesses are at the forefront of efficient use of resources, automated solutions and other digital technologies. The Norwegian model is unique and gives us overall strong industrial capability.

data security and data analysis is increasingly important. Industry also needs employees with insight into innovation, entrepreneurship and sustainability and with cooperation and change competence.

The Norwegian unemployment rate has been very low in recent years and many companies are struggling to meet their labour and skills needs.³⁷ There is reason to believe that there may also be a shortage of labour in the future, partly because of the great need for labour in several sectors and because the retired population will be larger than the working population. On the other hand, innovative, green companies can succeed in recruiting relevant skills, even in a strained labour market, because they are perceived as having a clear purpose and role in the restructuring of society.

The proportion of older people in the population is increasing, and there will be limited recruitment of foreign labour for various reasons.³⁸ Lack of labour and relevant skills can be a barrier to increased activity and value creation in the industry in the years ahead, and the industry must tackle this by investing in automation and 'smart production', training and reskilling upgrading for employees, by offering attractive jobs to young people choosing an education and career path and including people who are wholly or partly outside the labour market. Even with the limitations on recruitment of foreign labour, many companies may find it relevant to attract expertise from abroad, thus providing valuable skills transfer, among other things, to Norwegian companies.

37 Norges Bank (2022). Regional Network. National report. (No 4 2022). Norges Bank. <https://www.norges-bank.no/en/topics/Monetary-policy/Regional-network/>; Rørstad, K., Børing P. and Solberg E. (2023). The Confederation of Norwegian Enterprises (NHO) competence barometer 2022 – A survey of NHO's members' skills needs in 2022. (Report 2023:1). The Nordic Institute for Studies in Innovation, Research and Education (NIFU). <https://hdl.handle.net/11250/3050853>

38 Report No 14 to the Storting (2020–2021) Long-term Perspectives on the Norwegian Economy 2021

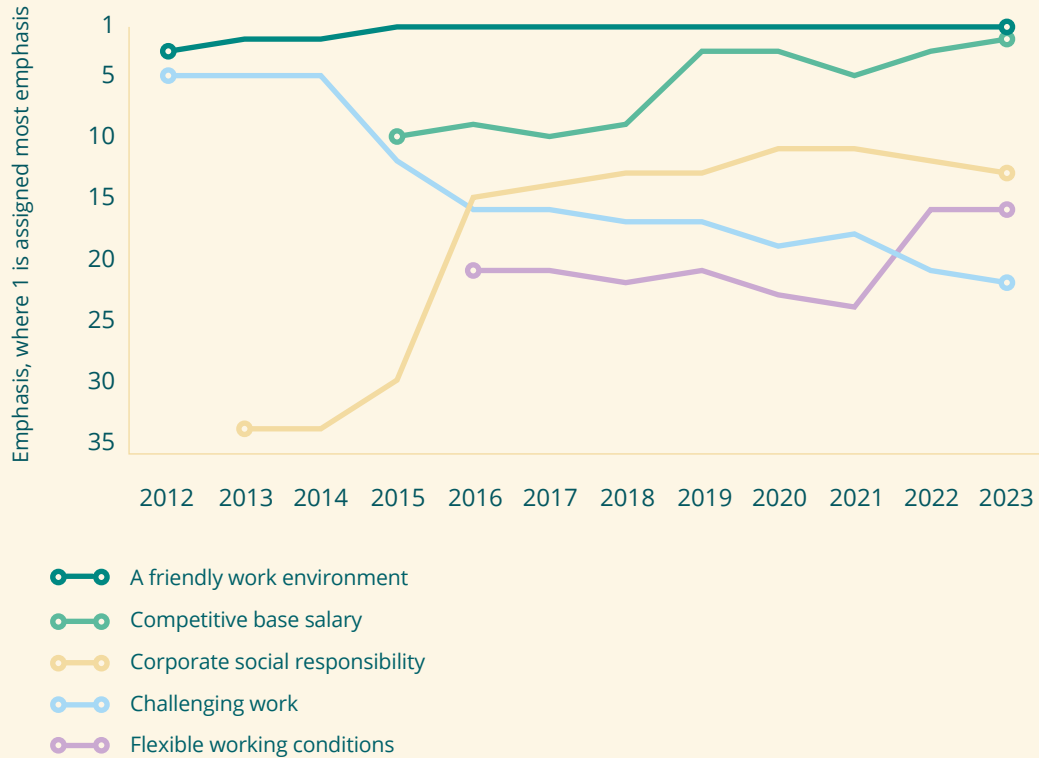
FACTS

Where do young people want to work?

The vast majority of businesses are keen to attract people with the right skills. To succeed in this, it is essential to understand the preferences that form the basis for young people's choice of education and career, and how a business can best attract young talents and safeguard talents in its own organisation. It is well known that generations of cohorts have many common features across countries that, among other things, impact their job choices. Changes in such commonalities between generations can potentially bring about significant changes for society and businesses, which is potentially a good sign for the green transition. Innovative, green companies will probably succeed in recruiting relevant skills nationally and internationally, even in a strained labour market, because they have a clear purpose and role in the restructuring of society.

FIGURE 5

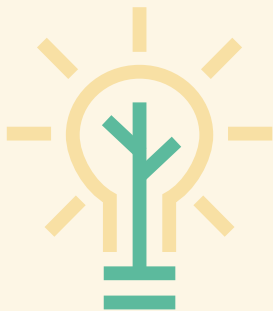
Survey of what Norwegian students emphasise in an employer.



In surveys of preferences, many analyses emphasise that today's young talents born between 1996 and 2010, often referred to as 'Generation Z', have grown up in a digitally connected society, which particularly characterises interaction and consumer behaviour, and thus also business models. It is further highlighted that many of today's young people have significant 'climate anxiety' because they see the world steers towards inevitable, destructive global warming. Others also point out that this generation has been marked by the lock-downs in connection with COVID-19. The preceding generation, born between 1981 and 1995, often referred to as 'millennials', have also lived much of their lives with smartphones and other digital technologies. Other characteristics that are highlighted for this generation are globalization, where, among other things, digital techno-

logies have laid the foundation for significant interaction between young people across countries, impacting, for example, where they decide to study and how often they change jobs. Looking at today's 40-year-olds, in a Norwegian context, they are the children of the radical '1968 generation', and the first generation Norwegians to grow up in a truly prosperous society. This provides a basis for different choices, priorities and approaches to work, family and leisure than for previous generations.

Since 1988, the company Universum has conducted an annual survey of which employers Norwegian students consider most attractive, and what Norwegian students value and emphasise when choosing their employers. Figure 5 shows such data for the period 2012–2023.



Sustainability is now increasingly seen as a necessity and a prerequisite for all value creation, not as idealism or as ‘smart for value creation’.

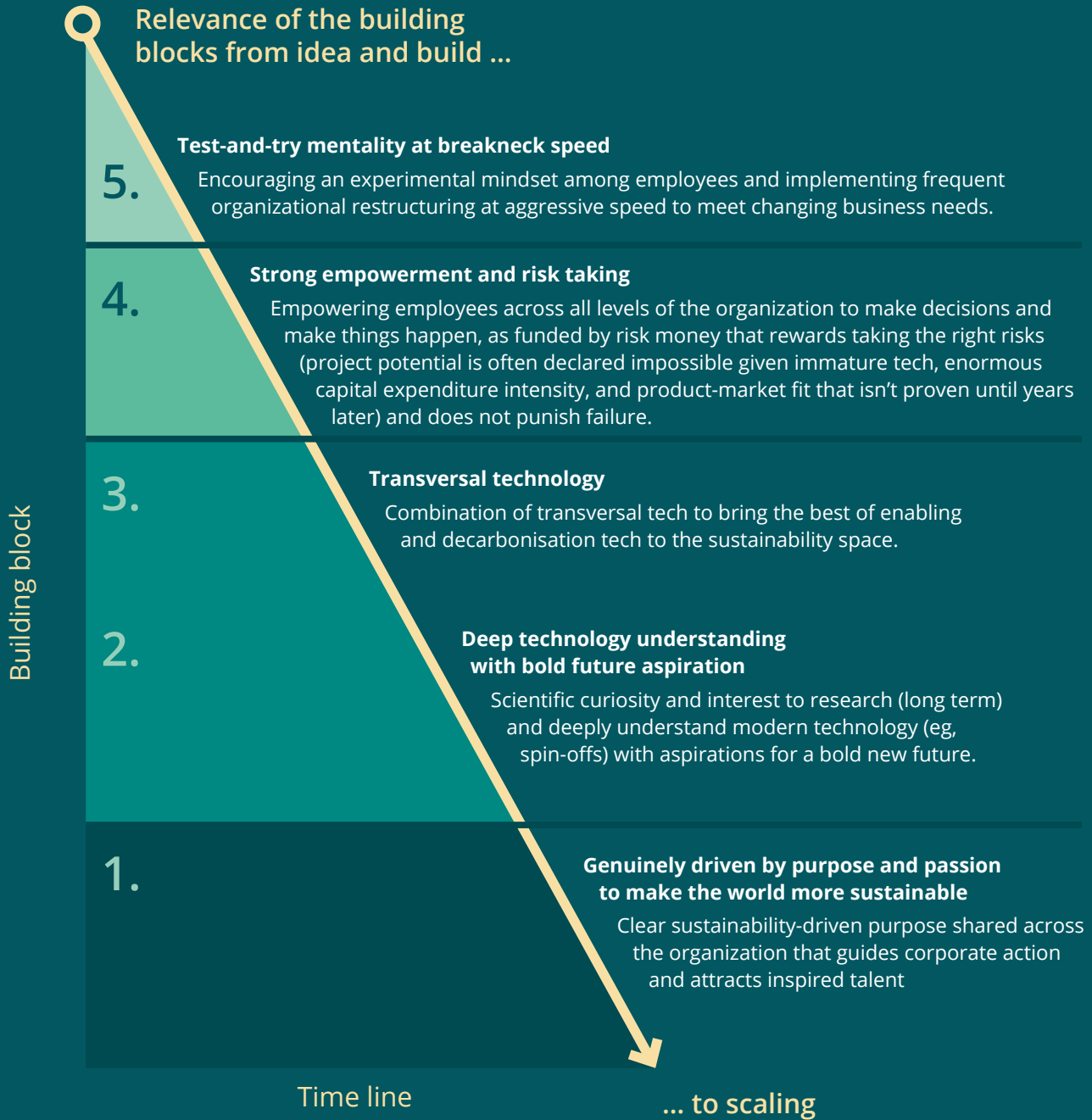
Several companies find that young people have a strong desire to contribute to the green transition, be part of a solution that does not exist today, and have a job where the work they do actively contributes and coincides with their own values.

McKinsey highlights how a number of trends have an overall impact on employer attractiveness and more specifically how new, green technology companies can find it easier to attract talent and derive value creation from new technology, compared to established industrial businesses.³⁹ Firstly, it emphasises that the business sector has a radically different approach to sustainability today than it did just over ten years ago. Sustainability is now increasingly seen as a necessity and a prerequisite for all value creation, not as idealism or as ‘smart for value creation’. Secondly, a number of generic, advanced technologies of importance to new businesses, such as digital technologies, are largely accessible to ‘everyone’. In addition, a number of companies are gaining a strong market position by being early adopters of new technology, i.e. daring to take risks. Thirdly, an increasing number of talents across fields of education, including young people, have a strong interest in interaction, creativity and working in value-driven companies.

McKinsey points out that many established companies face the dilemma of strengthening their core business versus being at the forefront of change, related to technology, market and business models. It takes considerable courage for established companies to explore new business models in parallel with the core business being able to generate profitability. McKinsey emphasises that for several reasons, it may be easier for green start-ups to exploit the potential of technology and sustainability than for established companies. McKinsey highlights five building blocks as a basis for the success of green, technology-based growth companies (cf. figure). The arrow indicates that the respective building blocks will have different relevance in the phase from idea/concept until the project is realised on a large scale. In practice, many innovative companies will work continuously on all five building blocks, according to continuous improvement work (cf. the Norwegian model) and because such companies like to explore new products, new concepts and ‘play’ with new technology in parallel with individual projects maturing and being introduced to the market.

39 <https://www.mckinsey.com/capabilities/sustainability/our-insights/building-a-green-business-lessons-from-sustainability-start-ups>

Start-ups are drawing on five building blocks to win in techenabled sustainability



Reproduced with the permission of McKinsey

In 2019, nearly 300,000 people who were out of work said they wanted to work. More of those who drop out of education and working life must be given a real chance to contribute using their abilities and talents. This is important for the individual, for the companies that need labour and for society as a whole. The Government is working to raise the completion rate in vocational education and training. The Government wants everyone who can and wants to work to have the opportunity to do so, and uses workfare as a basis for employment and welfare policy.

There is a need to offer relevant educational courses in order to succeed with the green transition. Effective and enhanced dialogue between business, educational institutions and education authorities at the national and regional level will further facilitate access to relevant skills in the future. Interaction between the vocational programmes at upper secondary schools, vocational college, university colleges, universities and the labour market can contribute to subjects being renewed and more relevant study

programmes being developed and established. Cooperation with the social partners is key to vocational education and training, including the role of the vocational training boards regionally, and the local training offices.

Many of the young people who fall outside the labour market represents a great resource to the labour market with some adjustments. Cooperation between NAV, educational institutions and companies will therefore be important.

More people will need new skills in the future as a result of the transition of the labour market. On 12 June 2023, the Norwegian Committee on Skill Needs delivered a new thematic report, *Fremtidige kompetansebehov: utfordringer for grønn omstilling i arbeidslivet* ('Future skills needs: Challenges for the green transition in the workplace' – in Norwegian only), to the Ministry of Education and Research.⁴⁰

40 <https://kompetansebehovsutvalget.no/utvalget-lanserer-temarapport-2023-2/>

FACTS

The tripartite industry programme

The tripartite industry programmes are based on cost-sharing, where the state pays for education and training at all levels of education, while companies and individual employees invest their time. The skills courses available through the programmes should be short and flexible, and should be possible to combine with work. It is the industry itself that defines the training needs and which courses are relevant. An tripartite industry programme for industry and construction was established in 2019 and re-established in 2022 with an expanded catchment area. The re-established programme includes the disciplines battery, offshore wind, hydrogen and carbon capture and storage. In 2023, there are programmes in the following industries: waste and recycling, agriculture, forestry and horticulture, industry and construction, oil, gas and the supplier industry, and the maritime industry. The tripartite industry programme is managed by the Norwegian Directorate for Higher Education and Skills on behalf of the Ministry of Education and Research.

Political initiatives and processes

✧ The Government will follow up Report No 14 to the Storting (2022–2023) *Utsyn over kompetansebehovet i Norge* ('Outlook on the skills needs in Norway' – in Norwegian only), which highlights the skills needs of the labour market in the short and long term. The Government indicates in the white paper that skills needs resulting from the green transition will be a priority in the years ahead.

Among other things, the Government will:

- Prioritise the skills necessary for a highly productive and competitive business sector and the skills necessary to implement the green transition.
 - Prioritise study places in technical subjects, health and care professions and areas that are particularly important for the green transition in future allocations of study places to the tertiary vocational colleges, and facilitate dialogue with the county authorities on how they can follow up these priorities in their management of the sector.
- ✧ The Government will consider the recommendations of the latest report of the Norwegian Committee on Skill Needs (submitted to the Ministry of Education on 12 June 2023), *Fremtidige kompetansebehov: Utfordringer for grønn omstilling i arbeidslivet* ('Future skills needs: Challenges for the green transition in the workplace' – in Norwegian only), which will look at skills needs for the green transition.

✧ The Government will invest in education throughout the country. The focus on flexible and decentralised education enables people to take education where they live, based on local skills needs. Technology and the green transition are two of the priority areas.

✧ The Government is in dialogue with the parties in the leading sector settlement concerning industry's special skills needs, and how the skills policy instruments can be arranged to better meet these.

✧ The Government supports the continuation of the Skills Policy Council. The Government will work on skills policy in collaboration with the Council.

✧ The Government is continuing arrangements aimed specifically at the industry's skills needs, such as the industry programme and the Industrial Training School (*Industrifagskolen*), in cooperation with the parties.

✧ The Government will assign vocational education and training a key role in the skills reform. The Government will give the vocational college a greater role in educating skilled professionals, and further educating and developing the workforce throughout the country.

✧ The Government will in 2025 introduce a new funding system for universities and university colleges that gives them more freedom to prioritise future skills needs in the short and long term and to strengthen education across Norway.

2.7 Export markets



In the Hurdal Platform, the Government indicated its goal to increase non-oil and gas exports by at least 50 per cent by 2030. To succeed in this and the green transition, we rely on international markets and well-functioning value chains for key input factors.

Norway benefits from well-functioning trade relations with our closest trading partners, not least through the EEA Agreement, which includes Norway in the EU single market, but also through an extensive network of free trade agreements. Transitioning the world's energy systems is a massive, complex task that requires cooperation between countries. In addition, the Government has taken the initiative to strengthen cooperation on the green transition through partnerships with a number of trading partners in order to exploit the opportunities the green transition provides for Norwegian industry and contribute to restructuring and robust value chains with our closest trading partners.

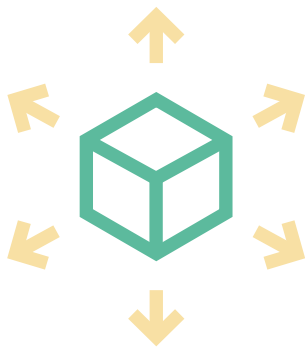
Norway's trade agreements

Norway has one of the world's most extensive networks of free trade agreements, covering over 80 per cent of Norwegian exports of goods and services. The EU is by far Norway's most important market, accounting for around two thirds of total exports, followed by the UK, which is the market for around one fifth of Norwegian exports.

EEA – our most important trade agreement

The Agreement on the European Economic Area (EEA) signed in 1992 is an international agreement that makes the EFTA countries Iceland, Liechtenstein and Norway part of the EU single market. At the heart of the EEA Agreement are the 'four freedoms'; the free movement of goods, services, people and capital. The only areas not fully covered by these provisions are fisheries and agriculture. In practice, the EEA Agreement expands our domestic market of 5 million people to more than 400 million people.

Full participation in the single market without being an EU member means that the EFTA countries continuously adopt EU regulations into the EEA Agreement if they are relevant or are important for the EEA countries to adopt for other reasons. Thereafter, the regulations are interpreted and applied uniformly in both the EU and the EFTA countries, enabling Norwegian companies to compete on equal terms with other European companies in the single market.



The close and binding cooperation with the EU through the EEA Agreement makes Norway a reliable trading partner, while providing stable framework conditions for the Norwegian business sector in its most important market.

The close and binding cooperation with the EU through the EEA Agreement makes Norway a reliable trading partner, while providing stable framework conditions for the Norwegian business sector in its most important market. The agreement ensures predictability and legal security for citizens and businesses alike, including the opportunity to challenge the authorities' compliance with obligations arising from the agreement.

It is also a great advantage for green industrial development in Norway that many climate and environmental requirements are rooted and harmonised in common European regulations, which removes trade barriers and ensures equal conditions of competition with other European actors.

Bilateral free trade agreements

Norway has an extensive network of bilateral trade agreements. In addition to a free trade agreement with the UK, Norway, together with the other EFTA member states (Iceland, Liechtenstein and Switzerland), has signed 30 free trade agreements with a total of 41 countries and customs territories. Through EFTA, Norway is negotiating new free trade agreements with Thailand, Vietnam, India, Kosovo, Malaysia and

Mercosur. Norway is also in bilateral negotiations with China. The free trade agreements help ensure that Norwegian companies have increased market access, competitive access to global supply chains and better predictability for exports of goods, services and investments.

Both in new free trade negotiations and in updating existing free trade agreements, Norway presents a chapter on trade and sustainable development. The chapter deals with the safeguarding of climate and environmental considerations through commitments on, among other things, trade and forestry management, biodiversity, climate change, multilateral environmental agreements and fisheries and aquaculture. The chapter on trade and sustainable development supports a shift towards more sustainable trade and production.

Stronger cooperation for the green transition

The current situation is characterised by geopolitical tensions and uncertainty regarding, among other things, the delivery of input factors Norway depends on for the green transition. This makes strategic cooperation with our most important partners

particularly relevant. The Government has taken new initiatives for closer cooperation with several of our international partners and is participating in a number of initiatives with our partner countries.

Green Alliance with the EU and industrial partnerships on raw materials and batteries

On 24 April 2023, Prime Minister Jonas Gahr Støre and President of the European Commission Ursula von der Leyen signed a new, stronger climate, energy and industry cooperation agreement.⁴¹ The Green Alliance is establishing a superstructure for green sectors where Norway and the EU have a mutual interest in cooperating in areas such as carbon capture and storage, offshore wind, hydrogen, green shipping, batteries and critical raw materials. The Green Alliance is followed up on an ongoing basis between the EU and Norway.

One of the deliveries under the Green Alliance is the partnership on value chains for raw materials and batteries announced by Minister of Trade and Industry Jan Christian Vestre and Vice-President and Commissioner of the European Commission Maroš Šefčovič in a joint statement on 27 June 2022.⁴² The business community, the social partners and other stakeholders are also involved in the work on the partnership. For example, in December 2022, a liaison meeting for companies and financial institutions was held in Oslo in connection with the partnership in collaboration with NHO and Innovation Norway, among others, where EIT InnoEnergy

and EIT Raw Materials contributed. Through the work on the partnership, Norway, among others, has had the opportunity to participate in the ministerial meeting of the EU European Battery Alliance.

Partnership with Germany on closer cooperation on climate, renewable energy and green industry

On 5 January 2023, the Minister for Trade and Industry Jan Christian Vestre and Germany's Vice Chancellor Robert Habeck signed a joint statement on a partnership on climate, renewable energy and green industry.⁴³ The partnership further develops the already close cooperation with Germany in a number of areas that are key to the green transition: Norway and Germany will cooperate more closely on offshore wind, CCS, batteries, raw materials, processing industry, green shipping and microelectronics.

Minister of Petroleum and Energy Terje Aasland and Vice Chancellor Habeck also signed a separate declaration on hydrogen. Among other things, the declaration confirms the intention to ensure large-scale transport of hydrogen from Norway to Germany by 2030. This will be based on a step-by-step, industry-driven approach to explore the technical and financial feasibility of such solutions. A feasibility study has therefore been conducted that has looked at options for transporting hydrogen from Norway to Germany. The initiative also includes carbon infrastructure, which can be used to transport CO₂ from industrial sources and carbon captured during

41 <https://www.regjeringen.no/en/aktuelt/norway-and-eu-establish-green-alliance/id2973440/>

42 <https://www.regjeringen.no/no/aktuelt/norge-og-eu-enige-om-forsterket-industrielt-samarbeid-om-batterier-og-ravarer/>

43 <https://www.regjeringen.no/en/aktuelt/tettere-samarbete-mellom-norge-og-germany-for-a-utvikle-gronn-industri/>

hydrogen production in Germany/Europe. The cooperation with Germany is followed up through regular political dialogue and in close cooperation at the official level. The business sector, the social partners and other stakeholders are involved. For example, Minister of Trade and Industry Vestre visited Berlin in May 2023 to follow up the collaboration with NHO and numerous Norwegian battery and hydrogen companies.

Partnership with Sweden

On 2 May 2022, Minister of Trade and Industry Jan Christian Vestre and Sweden's Minister of Foreign Trade Anna Hallberg and Minister of Business, Industry and Innovation Karl-Petter Thorwaldsson entered into a joint declaration between Norway and Sweden with the aim of strengthening and further developing new green Swedish-Norwegian value chains.⁴⁴ The new Swedish government is behind this. The aim of the collaboration is to create more jobs in the export industries and contribute to increased value creation on both sides of the border.

Partnerskap med Danmark

Denmark is a close and important partner in green solutions both bilaterally and in the Nordic context. During the King and Queen's official visit to Denmark in June 2023, Minister of Trade and Industry Jan Christian Vestre and Denmark's Minister for Industry, Business and Foreign Affairs Morten Bødskov signed a joint declaration between Denmark and

Norway with the aim of strengthening cooperation on green industrial cooperation and the transition to a low-emission society.⁴⁵ The ministers' ambition is to make Norway and Denmark, and the Nordic Region, a green industry and energy region based on natural resources, knowledge communities, industrial expertise and shared values.

Partnership with the US

There is a strong wish on both the Norwegian and American side to achieve more targeted and structured cooperation in business areas associated with the green transition. The US is one of Norway's most important trading partners. In that context, Norway and the US are making efforts to further develop the bilateral trade policy dialogue to facilitate more targeted business cooperation that will help create new and sustainable value chains and jobs, increase exports, improve energy security, and cut global greenhouse gas emissions. The partnership builds on already established cooperation, and facilitates more targeted and structured government dialogue and business cooperation on the green transition. Norway is already participating in several US-led initiatives aimed at helping important value chains to become more sustainable and resilient, including the Minerals Security Partnership and the Joint Statement on Cooperation on Global Supply Chains, as well as initiatives focused on accelerating the development and availability of new and sustainable technologies and solutions, such as the First Movers Coalition.

44 <https://www.regjeringen.no/no/aktuelt/vil-styrke-naringslivssamarbeidet-med-sverige/>

45 <https://www.regjeringen.no/no/aktuelt/signerer-i-dag-norsk-dansk-felles-erklaring/>

Political initiatives and processes

- ✧ The Government is developing strategic industrial partnerships with the EU and other relevant countries to achieve the goal of increasing exports. The Government will follow up the cooperation with the EU on climate, energy and industrial transformation under the framework of the Green Alliance, which includes work on partnerships on value chains for raw materials and batteries.
- ✧ The Government will strengthen its work on the implementation of EEA regulations to contribute to equal framework and competitive conditions for Norwegian companies throughout the EEA.
- ✧ The Government will follow up the cooperation in partnership with Germany and continuously assess relevant activities in consultation with German authorities and stakeholders.
- ✧ The Government will follow up and concretise cooperation in partnership with Sweden and Denmark and prioritise closer cooperation with the Nordic countries in relevant areas for green industrial development.
- ✧ The Government will strengthen dialogue and cooperation in partnership with the US and facilitate business cooperation for sectors related to the green transition.
- ✧ The Government will continuously consider further bilateral cooperation for green industrial development with countries where similar cooperation would be appropriate.
- ✧ The Government will further develop Norway's Export Strategy (*Hele Norge eksporterer*) and ensure that the work on strategic export initiatives is more closely linked to the Government's other work, such as the Green Industrial Initiative and the work on simplifying the policy instrument system.
- ✧ The Government will give priority to new trade agreements with countries that make the greatest possible contribution to trade and value creation and that ensure basic standards, climate and environmental considerations and labour rights. This includes prioritising the completion of EFTA's negotiations with India, Kosovo, Malaysia, Mercosur, Thailand and Vietnam.

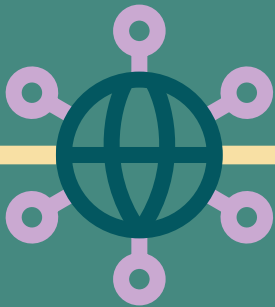
Norway's Export Strategy

As part of Norway's Export Strategy (*Hele Norge eksporterer*), the Government has established the Export Advisory Council comprising business representatives from across the country, which will draft advice and input to the Minister of Trade and Industry on export and devise proposals for 5 to 10 major strategic export initiatives. The first two such initiatives in offshore wind and more and greener maritime exports have already been adopted and launched by the Government. The Government has also decided that the third major export initiative will be in the design and finished goods industry, and that the fourth export initiative will be in the health industry.

An application-based scheme has been established in Innovation Norway where companies can apply for funding to participate in international trade fairs and joint business promotion activities. The Government will also take the initiative to establish a new national brand programme – 'Made in Norway' – through the development of a national skills programme in Innovation Norway. The programme will develop effective tools that enable companies to take international positions through the strength of the Norway brand. A new national brand scheme will also be established, in which Norwegian-produced goods and services can be given a recognised seal of quality. The goal is to increase the willingness to pay for Norwegian solutions.

03

Closer national and regional interaction



Introduction

We must be well organised and join forces to put our goals and ambitions into practice. In order to succeed, a comprehensive and vigorous policy is needed for industry, energy, climate and the environment that is effective, results-oriented and pulls in the same direction. This requires both well-coordinated efforts at government level and closer interaction between the business sector and the authorities.

3.1 Stronger coordination in the public administration



The business sector must meet a forward-looking and well-coordinated public administration that is interested in finding good solutions and that actively facilitates the realisation of green and socially profitable industry projects.

The responsibility for the framework conditions and policy instruments that are essential for realising the ambitions of the Green Industrial Initiative lies with several ministries and is divided between several administrative levels. Efforts must therefore be coordinated across sectors, both nationally and regionally, and in international cooperation. It is the Government's task to ensure that the different green transition initiatives are well linked and that the responsibility for these initiatives is clearly shared between ministers and ministries, agencies and public enterprises.

Through the Green Industrial Initiative, the Government has among other things strengthened cooperation between the ministries. The roadmap promotes a common understanding of issues and provides direction for the work. The roadmap also provides an overview of ongoing and planned processes in relevant policy areas, and the relationship between them.

The Government will facilitate dialogue with the county authorities and regional stakeholders on the

Green Industrial Initiative, in order to ensure that national initiatives and developments draw on and support regional opportunities and advantages. Cooperation has been established between the county authorities, Innovation Norway, Siva and the Research Council of Norway in all counties, and there are regional partnerships for regional business development. The Government is developing regional growth agreements as an instrument in its regional policy and has initiated dialogue with the counties Nordland and Rogaland.

Major green investment projects are being planned in several parts of the country, and some of them are large in relation to the size of the affected communities. Major industrial start-ups require facilitation and action from many different actors, both from the public and private sector. Competent personnel must be recruited, which requires education and relocators. People who relocate will need housing and their family members will need work and to go to school and get municipal services. Major private investments can necessitate public investments in infrastructure, which must take climate, nature and



the environment into account. If start-ups are to have a positive local impact, efforts are required by many different public bodies which are both coordinated and co-located. The investments can challenge the sectorised state, in that many decisions must be coordinated in time and pull in the same direction. There is a risk that a lack of cooperation between sectors and administrative levels will lead to processes dragging on in time. The municipalities may find it difficult to maintain a unified and targeted dialogue with the state about the challenges and needs at the local level.

Political initiatives and processes

- ✦ The Government will facilitate dialogue with the county authorities and regional stakeholders on the Green Industrial Initiative, in order to ensure that national initiatives and developments draw on and support regional opportunities and advantages.
- ✦ The Government will assess the need to appoint a national coordinator for large industrial start-ups in northern Norway.

FACTS

Green growth cooperation between funding agencies

The transition to a low-emission society will require sweeping innovations over a short period of time – also as a means of giving Norwegian industry a competitiveness in emerging markets. Demanding innovation processes require a seamless policy instrument system that is well coordinated to ensure effective use of instruments from research to the market. Therefore, the Research Council of Norway, Innovation Norway, Enova, Siva and Gassnova are strengthening and further developing the collaboration on green growth through an updated agreement that will contribute to the green transition and improve services for customers, research and business.⁴⁶ The agencies have different roles and instruments that, through good coordination, can be utilised to achieve common and overarching goals. The agreement includes cooperation on instruments, mobilisation, system development and digitalisation.

⁴⁶ <https://www.forskningsradet.no/nyheter/2022/ny-avtale-styrker-samarbeidet-om-gronn-naringsutvikling-og-vekst/>

3.2 Closer cooperation with industry, social partners and knowledge communities

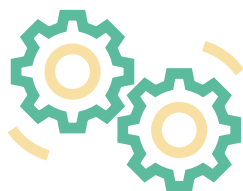


The Government will facilitate good cooperation between all relevant social actors that can help accelerate the green transition.

Closer cooperation with industry, knowledge communities and the social partners will be crucial for achieving the ambitions of the Green Industrial Initiative. Industry must take the lead with major investments and engage in industrial projects in areas they believe are or will become profitable business ventures. The knowledge communities contribute to developing technology and know-how that can cut emissions and increase profitability – and willingness to invest – in green value chains. The social partners are pivotal during times of transitioning and major structural changes in society. New and existing arenas for strategic dialogue with industry, knowledge communities and the social partners will provide a solid foundation for the Government to design a policy for the Green Industrial Initiative that is relevant, targeted, knowledge-based and helps ensure a just transition in the workplace.

Executive meetings on the Green Industrial Initiative chaired by the Prime Minister

In order to strengthen cooperation across the board and obtain relevant input for the work on the Green Industrial Initiative, the Government will hold regular thematic executive meetings chaired by the Prime Minister. Participation will depend on the topic of the meeting, but include executives from the social partners, NGOs, the business sector, research actors, the municipal sector and the state. The aim of these meetings is to strengthen the



Closer cooperation with industry, knowledge communities and the social partners will be crucial for achieving the ambitions of the Green Industrial Initiative.

Government's decision-making basis in key areas. Meetings have already been held on the battery and offshore wind value chains.

Green Industry Council chaired by the Minister of Trade and Industry

The Government will establish a Green Industry Council chaired by the Minister of Trade and Industry, where the social partners, industry stakeholders, the environmental movement and research and development communities can discuss challenges and develop a common understanding of the roles and responsibilities of different stakeholders with respect to green industrial development. The specific topics for this work will be those discussed in this roadmap, such as the industry's access to renewable power, skills and policy instruments. The Council's task will be to strengthen the knowledge base on industry-related challenges and ensure that relevant issues are highlighted and raised. The work and discussions in the Council can provide important input, which will be incorporated in the Government's decision-making basis and the overall assessments made in connection with the Green Industrial Initiative. There will be rolling representation.

5G Industry Forum

In collaboration between the Minister of Local Government and Regional Development and the Minister of Trade and Industry, a 5G industry forum

has recently been established, which aims to enable industry and business to take advantage of the enabling properties of fifth-generation mobile technology (5G). Smart use of 5G in various industrial processes is an important input factor for implementing the Green Industrial Initiative. The forum brings together stakeholders from industrial companies, the electronics industry and the authorities. Bi-annual meetings at executive level (Strategic Council) are planned.

Political initiatives and processes

- ☀ The Government will conduct a series of thematic executive meetings chaired by the Prime Minister, to boost cooperation with the business community and obtain relevant input for the work on the Green Industrial Initiative.
- ☀ The Government will establish a Green Industry Council chaired by the Minister of Trade and Industry, where the social partners, industry representatives, the environmental movement and research and development communities can discuss challenges and develop a common understanding of the roles and responsibilities of different stakeholders with respect to green industrial development.

3.3 Climate partnership between the authorities, the social partners and industry



Climate partnerships enable us to work together to ensure that Norway achieves its climate goals, starting where the potential is greatest.

The Government has developed climate partnerships as an arena for structured dialogue between government and industry at the industry/sector level. The purpose is to accelerate work on emission reductions and the green transition in the business sector. Another objective of the climate partnership is to promote increased sustainable value creation, increased competitiveness in Norwegian business and increased exports of green products to international value chains.

Climate partnerships shall contribute to a common understanding of what it takes to achieve the climate goals. The work will identify and secure support for the necessary emission cuts and identify the potential for further green measures in the industry, including energy and resource efficiency improvements and increased circularity. Climate partnerships shall facilitate systematic exchange of experience on the effect of policy instruments and the

need for changes in their use, without reducing the state's overall scope for action in climate policy.

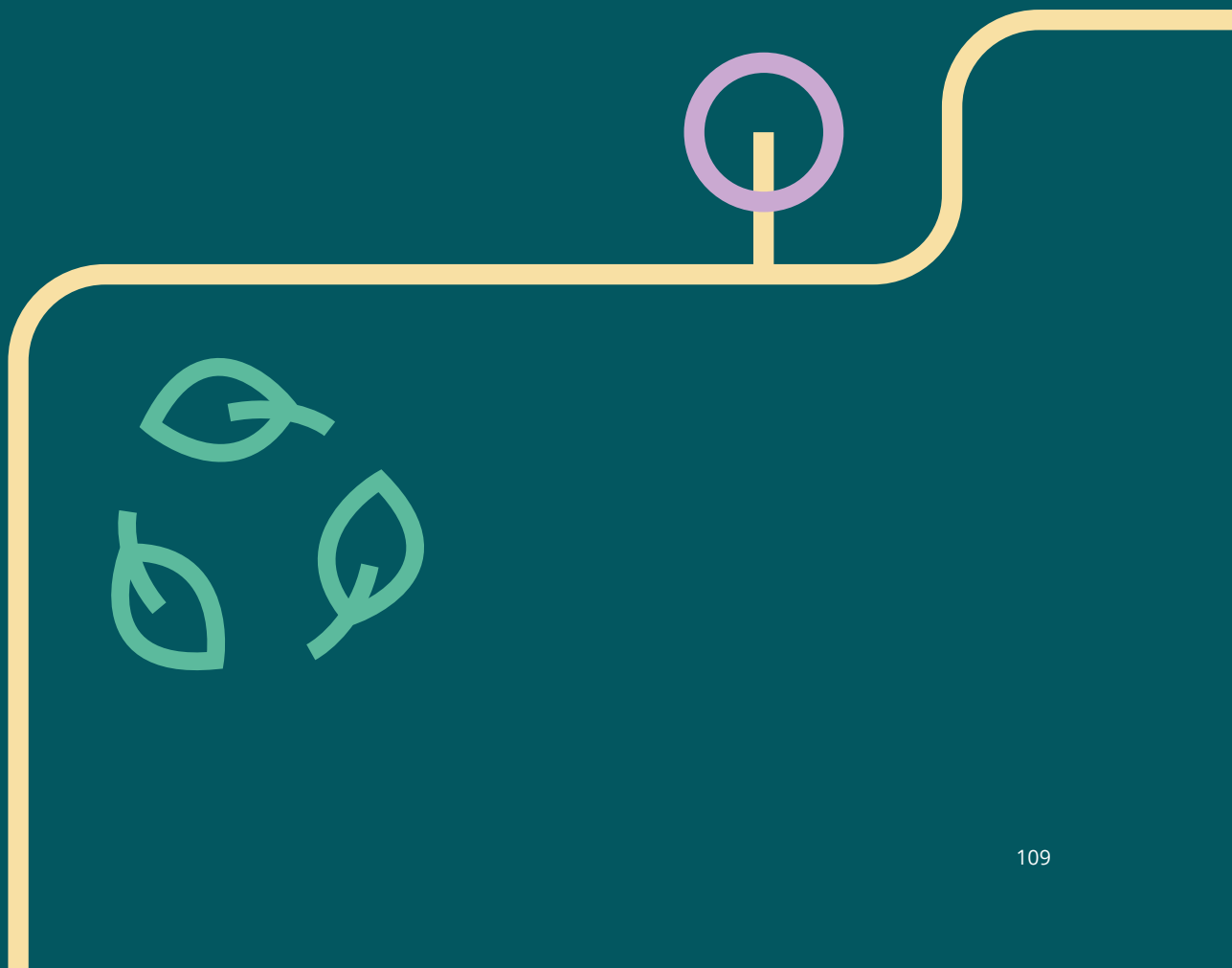
Dialogue has been established on climate partnerships for three industries, the maritime industry, the building, construction and real estate industry, and the process industry. The Government will take a position on the conclusion of further climate partnerships once experience has been gained from the work on these initial partnership agreements. The climate partnerships are designed in line with a fixed framework and are based on mutually binding agreements. The Government entered into an overall memorandum of understanding with the main labour market organisations in January 2023, on the framework for climate partnerships.⁴⁷ The industry partnerships are at slightly different stages, but the aim is to sign all the partnership agreements in 2023.

Political initiatives and processes

- ✦ The Government will enter into binding agreements on climate partnerships with the three industries, the maritime industry, the building, construction and real estate industry, and the process industry.
- ✦ The Government will facilitate the implementation of sustainability reporting, in line with new regulations. Norwegian actors will be required to meet detailed sustainability reporting requirements through new EU regulations.

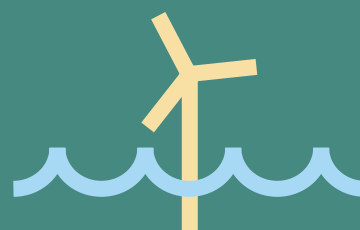
⁴⁷ <https://www.regjeringen.no/contentassets/958ee332aa5243c986f08ace2514ebfd/230112-intensjonsavtale-endelig-versjon.pdf>

Climate partnerships shall contribute to a common understanding of what it takes to achieve the climate goals.



04

Priority areas



Introduction

The Government has highlighted priority areas in its work on the Green Industrial Initiative. They are offshore wind and the solar industry, batteries, hydrogen, carbon capture and storage, the process industry, manufacturing, the maritime industry and the forest and timber industry, as well as other bioeconomy sectors. High demand is expected in all these areas going forward, which could offer great opportunities for sustainable production and value creation in Norway. Moreover, these are areas where Norwegian expertise and experience combined with our natural resources can provide the basis for developing and realising groundbreaking industrial and energy projects, which can significantly contribute to the green transition and reducing emissions, both in Norway and globally. Some of these initiatives are already mature, while others will mature in the near future or in a few years' time.

4.1 Offshore wind power



Norway will become a leading nation in the field of offshore wind, with an industry that develops and builds superior wind power solutions. The Government's ambition is to allocate areas with potential for 30 GW of offshore wind production on the Norwegian continental shelf by 2040.



The first competition for offshore wind project areas was announced in March this year, and, in April, the Norwegian Directorate of Water Resources and Energy (NVE), on behalf of the Government, recommended 20 new areas for further investigation for possible offshore wind development.

Market opportunities

Offshore wind has the potential to become a key source of renewable energy worldwide and in Europe, which is illustrated, among other things, by the high

ambitions the EU and countries around the North Sea have set in this area. The market for floating offshore wind has long shown a positive trend. Increasingly ambitious global climate and renewable energy policy increases the need to develop renewable production capacity across national borders.

Several countries are increasing their quantified targets for offshore wind development in general, and some have also presented ambitious figures for floating offshore wind in their national energy and industrial policies. The cost level associated with floating offshore wind is expected to fall as more floating offshore wind is developed, increasing market potential in both the short and long term. The more competitive floating offshore wind becomes relative to other renewable technologies, as well as other measures to reduce global greenhouse gas emissions, the higher the rate of development we can expect.⁴⁸

In a report written by TGS/4C Offshore in June 2023, Norway was ranked second in the world for attractive markets for floating offshore wind.⁴⁹ Norway has several competitive advantages in the prospective offshore wind market, with a world-leading supplier industry, which has relevant experience and references from the oil and gas sector that are directly applicable to the offshore wind market.

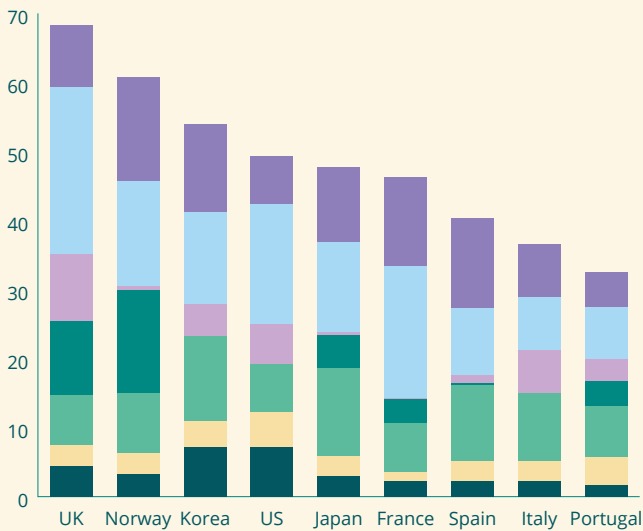
⁴⁸ Report on Floating Offshore Wind, Menon Publication 53/2022, p. 3 (in Norwegian only)

⁴⁹ <https://www.tgs.com/press-releases/global-floating-wind-energy-ambition-stifled-by-slow-market-development>

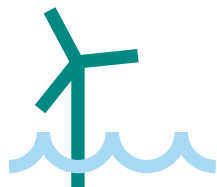
FIGURE 6

Global ranking of the attractiveness of different countries for investments in the floating wind value chain

Category	Criteria	Max points	UK	NO	KR	US	JP	FR	ES	IT	PT
Potential	<ul style="list-style-type: none"> • Technical potential • Wind resource • 4C Outlook 	10	4,4	3,3	7,1	7,2	2,9	2,2	2,3	2,2	1,7
Ambitions	<ul style="list-style-type: none"> • Floating targets (explicit and implicit) • Market openness 	5	3,0	3,0	3,8	5,0	3,0	1,4	2,8	3,0	4,0
Context	<ul style="list-style-type: none"> • Decarbonisation drivers • Substitution by alternatives • Cost context 	15	7,3	8,6	12,3	7,0	12,7	7,0	11,0	9,8	7,4
Deployed	<ul style="list-style-type: none"> • Volume of projects post-FID 	15	10,7	15,0			4,8	3,6	0,3		3,6
Pipeline	<ul style="list-style-type: none"> • Volume with site exclusivity / leasing underway • Volume of proposed projects 	10	9,7	0,6	4,7	5,7	0,4	0,1	1,2	6,2	3,2
Regulatory	<ul style="list-style-type: none"> • Process maturity in (i) leasing, (ii) consenting and og (iii) offtake 	25	24,2	15,2	13,2	17,4	13,0	19,0	9,7	7,7	7,6
Supply chain	<ul style="list-style-type: none"> • Domestic capability 	20	9,0	15,0	12,8	7,0	11,0	13,0	13,0	7,7	5,0
Total Available Points		100	68	61	54	49	48	46	40	37	33



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Norway has several competitive advantages in the prospective offshore wind market, including a world-leading supplier industry with relevant experience and references from the petroleum industry, which is directly applicable to the offshore wind market.

Norway has substantial land areas, but its marine areas are five times the size. Combined with good wind conditions along the Norwegian coast, this provides a good starting point for producing power from offshore wind. The geographical distance to European markets is also short, and the development of offshore wind power is expected to play an important part in meeting the growing demand for renewable energy expected in Norway and Europe in the years ahead.

The Government's ambition to allocate areas with potential for 30 GW of offshore wind production on the Norwegian continental shelf by 2040 will correspond to approximately 75 per cent of the current capacity of the Norwegian power system. Offshore wind in Norway also has an industrial potential, in that it can provide new market opportunities for the Norwegian supplier industry. Through calls for offshore wind areas in Norway, Norwegian suppliers will have good opportunities to participate in the competition, due to proximity to the market and experience from the Norwegian continental shelf.

Challenges

Several challenges have to be overcome in the development of offshore wind, including high investment costs, long lead times and use of marine areas. The floating offshore wind market is still immature, and technology development, innovation and scaling are needed to reduce costs and build competence in supply chains. Much of the technology has, however, been tested and proven, and is thus mature.

Offshore wind competes for marine areas that are in part used by other stakeholders. A prerequisite for offshore wind production is to ensure that it can coexist with fisheries, shipping and other industries while safeguarding important environmental and social interests.

Competitions for offshore wind project areas announced

In March, the Ministry of Petroleum and Energy announced competitions for offshore wind projects in two areas on the Norwegian continental shelf: Sørlige Nordsjø II and Utsira Nord.

The project area for the initial phase in Sørlige Nordsjø II will be awarded to one actor through a pre-qualification round followed by an auction. The winner of the auction will be awarded the project area. The installed capacity in the project area shall be between a minimum of 1,400 MW and a maximum of 1,500 MW. The pre-qualification is intended to contribute to good, sustainable development and to ripple effects for society. Applicants must also document that they possess satisfactory technical expertise and financial strength and that they meet relevant requirements of health, safety and the environment. The pre-qualified applicants will then be given the opportunity to take part in an auction. In Proposition No 93 to the Storting (Resolution) (2022–2023), the Government proposes entering into a two-sided contract for difference for support for offshore wind power from the first phase of Sørlige Nordsjø II. The support from the state under the contract for difference will be limited by a ceiling.

Utsira Nord has been opened for a capacity of 1,500 MW, and three projects will be awarded project areas through a competition based on qualitative criteria. The competition will facilitate innovation and the development of floating offshore wind power technology, among other things. Once the project areas have been allocated, the actors will have to conduct impact assessments and mature the areas further before applying for a licence. A competition for state funding will take place as part of the licensing process. The Ministry of Petroleum and Energy will submit a Proposition to the Storting proposing a cost ceiling and a commitment authorisation. In the Proposition, the Ministry of Petroleum and Energy will propose that one of the projects is not to be granted state funding and that the successful projects are granted support for 500 MV each. The project that is not granted state funding will retain the right to the area for a time and may use general policy instruments and participate in any future competitions for state funding for offshore wind.

Political initiatives and processes

Access to new areas and predictable framework conditions are important preconditions for the establishment of an offshore wind industry in Norway. The Government is facilitating the development of offshore wind by announcing areas for renewable power production.

- ✧ The Government will facilitate large-scale development of offshore wind on the Norwegian continental shelf and its ambition is to allocate areas for 30 GW of production by 2040.
- ✧ The Government will award project areas for offshore wind in the areas Sørilige Nordsjø II and Utsira Nord.
- ✧ The Government will facilitate an offshore wind development that allows for the use of various grid solutions. Cables with two-way power flow, radials to Europe and radials to Norway will be assessed for each call. When choosing an offshore grid solution that involves connection to the Norwegian power system, its technical design must ensure national interests, including security of supply and reasonable power prices for households, industry and business.
- ✧ The Government will facilitate innovation and technology development. By allocating project areas in Utsira Nord according to qualitative criteria, we will facilitate innovation and technology development that can contribute to future cost reductions for floating offshore wind and develop the supplier industry.
- ✧ The Government will facilitate a long-term investment in offshore wind in Norway with several rounds of opening areas for offshore wind. The next round is scheduled for 2025.
- ✧ The Government will follow up NVE's proposals for new areas to be opened for offshore renewable energy production.
- ✧ The Government will work to streamline the licensing process leading up to the completion of the first wind power projects in Norwegian marine areas. The goal is to enable the first projects to be put into operation before 2030.
- ✧ The Government has given Statnett responsibility for planning the offshore grid, in addition to offshore system responsibility.



The cost level associated with floating offshore wind is expected to fall as more floating offshore wind is developed, increasing market potential in both the short and long term.

4.2 Batteries



Norway will further develop a coherent and profitable battery value chain, ranging from sustainable mineral extraction to recycling of batteries. Norway strives to be an attractive host country for profitable activity along the entire battery value chain and attract large battery investments and gigafactories.

Batteries play a crucial role in the transition to renewable energy, particularly in the transport sector. Batteries are also relevant for a variety of other purposes, such as power grid stabilisation, power supply and energy storage. In practice, the various purposes of use will provide a basis for the production of different types of batteries.

Norway has been a driving force for changing the battery market by encouraging the purchase and use of electric vehicles and promoting the development and use of electric ferries. Norway has the largest share of electric vehicles in relation to its population, with as many as 650,000 electric vehicles on the roads of Norway, making up about 20 per cent of all registered vehicles.⁵⁰ Several companies have already established activity in the battery value chain in

Norway, and several companies are working to realise large-scale projects.

Per i dag har en rekke aktører etablert aktivitet langs batteriverdikjeden i Norge, og flere aktører arbeider for realisering av storskala prosjekter.

Market opportunities

Because Norway was among the first countries to use batteries on a large scale, it will also be one of the first markets where large quantities of used car batteries will be available for collection, reuse and recycling.

The global battery market is expected to grow to 14–20 times its 2022 size and the European battery market to 7–12 times its 2022 size by 2030.⁵¹ The transport sector will remain the primary market going forward, while batteries for energy storage are expected to account for nearly one third of demand for batteries in the period up until 2030.

Since 2017, the EU has engaged in targeted efforts to develop Europe's battery value chains for the purposes of producing the world's greenest batteries, protecting its own industry and avoiding a situation where Europe is dependent on imports. The EU's new Batteries Regulation, which is now in force, will actively facilitate the development of a circular, green and competitive European battery industry. The Regulation is considered to be beneficial to battery companies operating in Norway. By 2030, battery production in Europe is expected to account for about 15 per cent of global production. The US has also put a lot of effort into developing its battery value chain.

⁵⁰ <https://elbil.no/om-elbil/elbilstatistik/>

⁵¹ Source: The European Battery Alliance and others.



The EU Batteries Regulation

The EU's new Batteries Regulation was adopted by the Council on 10 June this year.⁵² All companies that wish to sell batteries to EEA countries must comply with the Regulation, including enterprises in non-European countries.

The Regulation promotes sustainability in a comprehensive manner by stipulating requirements that apply to all levels of the battery value chain, including the minerals extraction phase. The Regulation requires recycled materials to be used in the production of new batteries and for battery manufacturers to report on the percentage of recovered minerals used to make new batteries. There are also explicit requirements concerning environmental and social aspects of the acquisition of minerals. When electric vehicle batteries are replaced, they must be reused for new purposes or sent for material recycling at a facility that meets the recycling efficiency requirements.

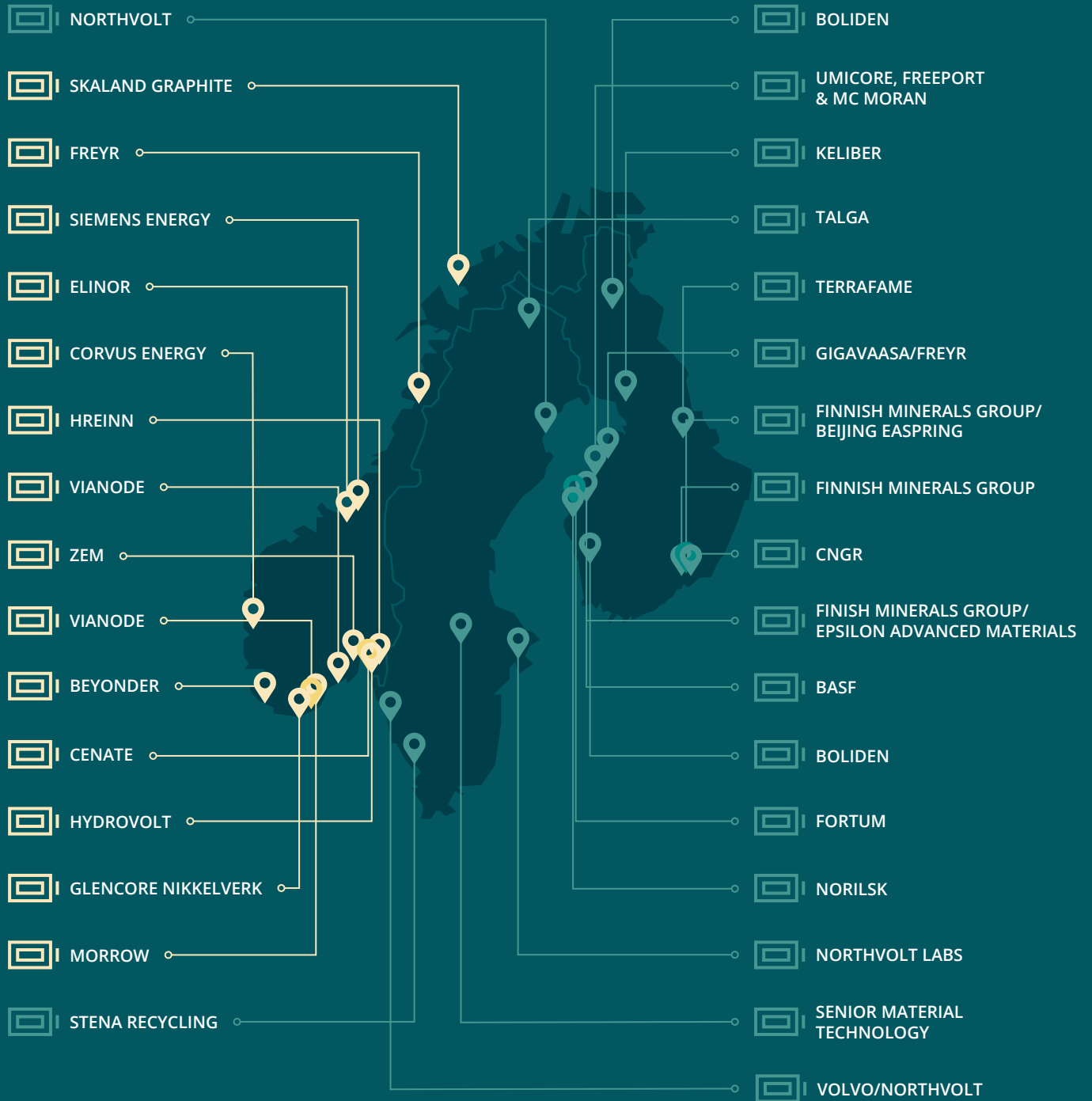
The Batteries Regulation stipulates requirements for access to and sharing of information about each battery by means of digital solutions such as QR codes and a 'battery passport'. The information will include information about the origin of the battery's raw materials, including ethical considerations, as well as information about the battery's emissions/climate impact.

A number of product requirements are defined for batteries to be placed on the EU market, including requirements that mobile phones and other products must be re-designed to make it easy for consumers to replace the batteries themselves.

⁵² <https://www.consilium.europa.eu/en/press/press-releases/2023/07/10/council-adopts-new-regulation-on-batteries-and-waste-batteries/>

FIGURE 7

Shows new large industrial projects in Norway, Sweden and Finland.



Norway is well positioned to become a key actor in the development of a more sustainable battery industry and thus help speed up the transition from fossil energy sources to green energy. Our position is particularly advantageous in relation to the production of more sustainable batteries (materials, clean energy), in recycling and in use of batteries in market areas such as vehicles, the maritime sector, energy production and grid stabilisation. As discussed in section 1.7, the Norwegian collaborative working life model and the industry's experience of improvement work are well suited to ensuring profitable battery production.⁵³

The battery industry is now set to develop in the direction of better and more sustainable batteries. Numerous new solutions are ahead of us. Mastering today's mature production technologies, like the established Asian actors, does not automatically make you the most skilled at utilising new technology and new material chemistries for the production of tomorrow's batteries.

Companies who are able to benefit just a few percentage points more from production will be able to achieve significant profitability. The Norwegian working life model and well-trained operators are very important to be able to quickly use and master ever-changing technology. The Norwegian battery industry may be able to ride the technology wave better than existing companies whose production is based on older technology.

An analysis conducted by Boston Consulting Group (BCG) shows that payroll costs will account for less than 10 per cent of the production costs of batteries (cells) at the current cost levels and will therefore not be decisive for Norway's competitiveness.⁵⁴ The

analysis also shows that Norway is one of the most attractive countries in Europe in which to establish sustainable battery production.

The Nordic countries are all well positioned to participate in a growing European battery value chain. Companies in all parts of the value chain are already present in Norway, Sweden and Finland, with a potential for inflow of foreign investments. These countries also have complementary comparative and industrial strengths that, together, make the region a good host.⁵⁵ The European Battery Alliance (EBA) expects the Nordic countries to become one of three key locations for the European battery industry, along with Germany and Hungary.

Challenges

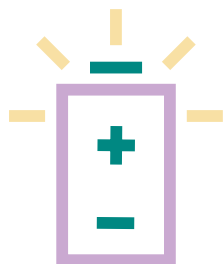
Although the battery markets are significant, both individually and seen as a whole, and are expected to grow substantially in the coming years, the battery value chain is largely immature, particularly in Europe. Actors from other regions currently have a head start on Europe, and pressure on costs, technological developments and the fluctuating prices of raw materials may give rise to considerable uncertainty for actors wishing to establish themselves in the industry.

New actors that wish to set up industrial activity in the European battery value chain generally have to manufacture products based on technology that has already been developed, and that often involves a step-by-step process to prove to customers and investors that they master large-scale production in accordance with given criteria. Research and development must primarily focus on the solutions of tomorrow that will be launched in the market years from now (improved power, range and duration,

53 <https://e24.no/energi-og-klima/i/PRjve6/norsk-samarbeidsmodell-er-superkraften-inn-i-batterier>

54 Reproduced with the permission of Boston Consulting Group (BCG)

55 https://businitiativewebsites.blob.core.windows.net/nordics-battery-collaboration/assets/Nordic_Battery_Report_June_2023_f62fa7ab86.pdf



Norway is well positioned to become a key actor in the development of a more sustainable battery industry and thus help speed up the transition from fossil energy sources to green energy.

service life, combinations of materials, safety etc.), and this development will often have to take place in parallel with production based on present mature technologies and material solutions. It can be difficult for new actors to obtain sufficient capital during such a start-up phase, see discussion in Norway's Battery Strategy (pp. 53–54).

The rapid development and growth in demand in the battery industry puts pressure on the value chains' ability to deliver on expectations of sustainability, and requires capital and expertise to be mobilised. The production of battery materials, battery cells, and, to a certain extent, recycling of used batteries, are capital-intensive operations, and financial economies of scale means that companies will often want to build large factories. Each project could entail financing needs in the order of tens of billions of Norwegian kroner with a long repayment period. Such investments also entail technological and commercial risks associated with the rapid development of products and processes. Large amounts of capital will thus have to be raised for individual investments, which can be demanding for the companies. The investment needs challenge both the capital markets and the policy instruments' ability to realise projects.

The production of battery materials and battery cells will nevertheless require a significant amount of power due to their size, among other things, and this could potentially necessitate strengthening of the power grid. New factories will also require industrial sites, efficient freight transport solutions and a highly skilled workforce. Taken together, these factors could make it challenging to establish large new initiatives in the battery value chain. Developing the battery value chain will require workers to retrain and new education programmes to be established, providing a collective boost for further and continuing education. The above-mentioned challenges are something we have in common with many other European countries.

The EU-UK Trade and Cooperation Agreement (TCA) stipulates clear limits for use of input materials from third countries if the finished goods are to be defined as originating in the EU or the UK and thus qualify for duty-free trade between the two areas. Norway is defined as a third country, which presents concrete challenges in relation to battery components manufactured in Norway that are to be used in the production of electric vehicle batteries in the EU and batteries manufactured in Norway used in electric vehicles to be exported between the EU and the UK.

The Government is working with the EU and the UK to resolve this challenge.

Political initiatives and processes

Battery production is a key topic in the dialogue between Norway and the EU. The Norwegian Minister of Trade and Industry attends permanently the regular ministerial meetings held by the European Battery Alliance. In December 2022, a matchmaking session between Norwegian battery industry actors and actors from EU countries was held in Oslo as part of the industrial collaboration between Norway and the EU on raw materials and batteries.

Batteries are also a key topic in the dialogue between Norway and Germany as well as at the Nordic level⁵⁶. Following Germany's invitation to new participants to join IPCEI EuBatIn in January 2023 and the changes made by the EU to the Temporary Crisis and Transition Framework (TCTF) in March 2023, we are actively cooperating with Germany to connect Norwegian battery industry companies to the European cooperation on tomorrow's battery solutions.⁵⁷ Innovation Norway has completed a national pre-qualification for admission as an associate partner in IPCEI EuBatIn in autumn 2023, and based on this,

selected Norwegian companies will participate in the matchmaking session in Vienna on 27-29 September.⁵⁸

Three of the actions presented by the Government on 30 June 2023 are deemed to be particularly relevant to the battery industry: i) innovation grants for major battery projects of an IPCEI nature, ii) strengthening the capital policy instruments in the Green Industrial Initiative, and iii) government loans to more green projects, see discussion in section 1.9.

- ☀ The Government has presented a Battery Strategy.
- ☀ The Government proposes in the national budget for 2024 an innovation grant for major battery projects of an IPCEI nature. Strict requirements apply in terms of innovation height, industrial scalability, ripple effects, implementation capacity, binding European cooperation and environmental impact. The innovation grant has a budget of around NOK 1 billion over five years, and it will be managed by Innovation Norway.

56 <https://www.nordicbatterycollaboration.com/reports-and-presentations>

57 <https://www.regjeringen.no/no/aktuelt/melder-norge-pa-europeisk-batterisatsing/>

58 <https://www.innovasjon Norge.no/artikkel/europeisk-batteriproduksjon-prekvalifisering-til-matchmaking>

FACTS

Norway's Battery Strategy

The Government presented Norway's Battery Strategy in June 2022. The strategy presents ten actions for sustainable industrialisation that should together be impactful enough to attract the private capital required to establish factories throughout the value chain in Norway.

Action 1:

Leadership in sustainability along the entire battery value chain.

Action 2:

Promote Norway as an attractive host country for green investments.

Action 3:

Enter into industrial partnerships with key countries.

Action 4:

Provide capital, loans and guarantees that mobilise private capital.

Action 5:

Improve access to relevant expertise.

Action 6:

Pave the way for greater access to renewable power.

Action 7:

Contribute to provision of suitable sites and other central infrastructure.

Action 8:

Ensure predictable, efficient and coordinated public processes.

Action 9:

Support pilot municipalities during the growth phase.

Action 10:

Become a leader in tomorrow's battery solutions and leveraging the opportunities afforded by digital technologies.

Following the presentation of Norway's Battery Strategy, the actors in the Norwegian battery value chain have joined forces through Battery Norway.⁵⁹ The social partners have, in cooperation with Battery Norway and Process21, completed the BattKomp project, whose three phases have consisted of mapping, analysing and promoting a number of concrete measures aimed at meeting the battery industry's skills needs going forward. The recommendations were submitted to the Minister of Trade and Industry in January 2023.⁶⁰

Increased cooperation can contribute to promoting concepts and common needs, which, among other things, can reduce commercial risk for investors, thereby mobilising private capital. A structure has been established under which biannual meetings are held between Battery Norway and the Minister of Trade and Industry concerning the realisation of the battery strategy's ambitions, and the industry cooperates in the periods between meetings.

59 <https://batterynorway.no/battery-norway-opens-up-for-new-members/>

60 <https://www.norskindustri.no/dette-jobber-vi-med/energi-og-klima/batteriindustrien/battkomp/>



4.3 Hydrogen



Norway will develop a value chain for the production, distribution and use of hydrogen produced with low or zero emissions and contribute to developing the hydrogen market in Europe.

Hydrogen produced with low or zero emissions is an energy carrier with significant potential to reduce greenhouse gas emissions from a range of sectors.⁶¹This is especially relevant where direct electrification, batteries or other zero-emission technology is not suitable, primarily in industry and the transport sector. However, hydrogen is a costly energy carrier both to produce and use.⁶²

Market opportunities

Hydrogen with low or zero emissions can be produced through electrolysis based on renewable power or by reforming natural gas with carbon capture and storage. A high proportion of renewable power production, access to natural gas resources and proximity to carbon storage mean that Norway is well placed to contribute to value chains for hydrogen. Norway also has competitive and competent industrial and technology environments for hydrogen.

As hydrogen use becomes more widespread nationally and globally, profitable jobs can be established in developing skills, technology and equipment for hydrogen use and production.

Challenges

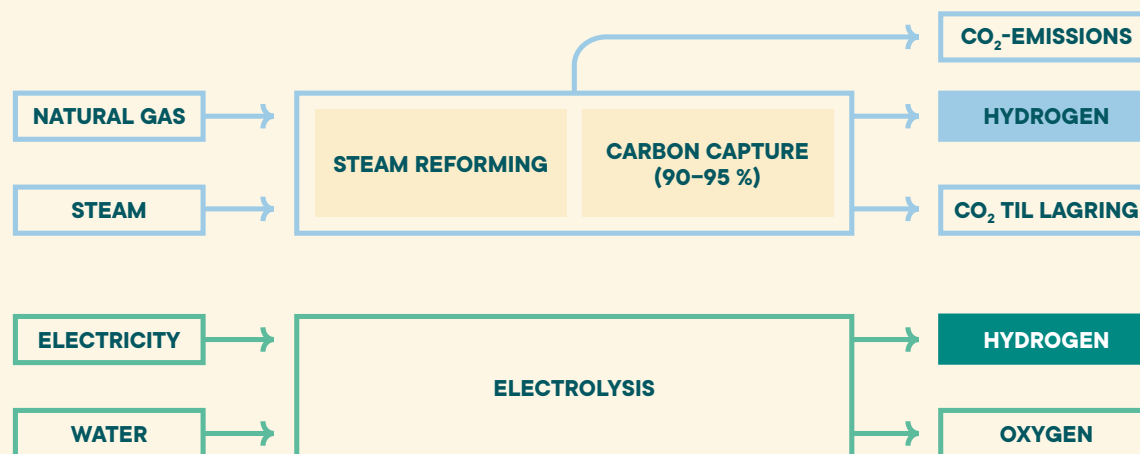
Hydrogen can replace fossil energy sources and reduce emissions in industry and the maritime sector, among others, but the solution has yet to be competitive on the market. There is little production of hydrogen with low or zero emissions today, and there is great uncertainty about whether and when a hydrogen market will achieve a significant size. There is also uncertainty about which sectors hydrogen will eventually succeed in. This will largely depend on technology development and cost reductions for both hydrogen-based solutions and competing technologies, including which energy carriers will be in demand in the market in the future.

61 The term hydrogen also includes hydrogen carriers such as ammonia, liquid organic hydrogen carriers etc.

62 Ammonia is currently transported on a large scale.

FACTS

Production process for hydrogen with no or low emissions



Hydrogen is a costly energy carrier both to produce and use, for example compared to direct use of electricity. Large amounts of energy are required to produce hydrogen, either in the form of renewable power or from natural gas with carbon capture and storage. The production of hydrogen also entails a significant energy loss, which poses a challenge to its profitability. It is also more demanding to transport hydrogen than, for example, natural gas, and there are safety challenges associated with its use.

Political initiatives and processes

There are many projects across Norway today that plan to produce, distribute and use hydrogen produced with low or zero emissions. According to a survey presented by the Norwegian Hydrogen Forum in April 2023, there are around 126 such projects at present. Most of them are in the early stages and have received funding from the state through various schemes. To help develop a market and a comprehensive value chain for hydrogen, the

state currently contributes through a number of policy instruments, including support for research, development and demonstration, support for the establishment of hubs and infrastructure, and through public procurement requirements.

Hydrogen production, especially by electrolysis, requires a lot of electricity. The Government's measures to increase power production and grids will therefore facilitate the development of hydrogen value chains in Norway, in addition to other green industrial start-ups.

The Ministry of Petroleum and Energy initiated an external study in autumn 2022. The final study, carried out by Oslo Economics, SINTEF and Green-sight, was published in May 2023. The study outlines relevant assessments to be made if Norway is to take a position in a future hydrogen market (see fact box). This will form an important part of the basis for determining how the Government can best



Hydrogen produced with low or zero emissions is an energy carrier with significant potential to reduce greenhouse gas emissions from a range of sectors.

contribute to the development of a financially viable value chain for hydrogen.

The EU is in the process of establishing a EUR 800 million pilot auction under the EU Innovation Fund to support the production of green hydrogen, with a planned announcement in the fourth quarter of 2023. The new instrument is referred to as the European Hydrogen Bank. The support will be provided as a fixed subsidy per kg of produced renewable (green) hydrogen for up to ten years. The EU Innovation Fund is the leading support scheme for investments in new technologies in the EU's climate strategy. The scheme is funded through the EU's emissions trading system (EU ETS), in which Norway participates. Enova is responsible for Norway's participation in the EU Innovation Fund. The Government's aim is for Norwegian renewable hydrogen production projects to participate in auctions under the European Hydrogen Bank.

In January, the Norwegian and German authorities signed a joint declaration to strengthen collaboration in the hydrogen area. Among other things, the declaration confirms the intention to ensure large-scale transport of hydrogen from Norway to Germany by 2030. This will be based on a step-by-step, industry-driven approach to explore the technical and financial feasibility of such solutions.

In follow-up of the joint declarations signed with Germany to strengthen collaboration in the hydrogen area, an industry-led feasibility study has been initiated to determine whether a hydrogen value chain between Norway and Germany is technically and commercially feasible. The work is led by Gassco on the Norwegian side and Dena (Deutsche Energie-Agentur) on the German side. The study will consider and compare different options for hydrogen export from Norway to Germany. This includes several possible hydrogen production sites in Norway and transport through a new hydrogen pipeline, possibly partly or fully reusing existing available gas infrastructure. Another option is for hydrogen to be produced in Germany using gas from Norway, and the captured carbon then being transported back to the Norwegian continental shelf. CO₂ infrastructure from Belgium is also under consideration, as is CO₂ transport by ship. Several companies are taking part in the study and sharing the costs.

Norway and the UK have also enhanced their collaboration on hydrogen. An annex to the Norwegian-British MoU on carbon capture and storage cooperation was signed on 1 March 2023. The annex confirms an extended cooperation between the authorities in the two countries, including regular exchange of knowledge and experience related to the use of hydrogen in industry, production of low-carbon hydrogen, transport and storage, as well as developing standards and certification.

- ✧ The Government will contribute to building a coherent value chain for hydrogen produced with low or zero emissions where production, distribution and use are developed in parallel.
- ✧ The Government will map the market opportunities for hydrogen in Europe and investigate the potential for exporting hydrogen from Norway through various production and distribution solutions. This has been done, among other things, through an external study that has also looked at how the state can best contribute to building a coherent value chain for hydrogen produced with low or zero emissions, where production, distribution and use are developed in parallel.
- ✧ The Government will contribute to the development of a market for hydrogen in Europe by, among other things, participating in relevant cooperation forums and programmes for hydrogen, developing regulations for hydrogen in Europe as an EEA country, research cooperation, bilateral cooperation with relevant countries and by creating a national market for hydrogen.
- ✧ The Government has carried out an external study that has helped give the state a better foundation for contributing to building a coherent value chain for hydrogen. State ownership as an instrument was part of the assessment. The report from the study was submitted in May 2023.
- ✧ The Government's ambition is to facilitate the production of hydrogen with low or zero emissions to meet national demand in 2030. The goal is to help reduce Norwegian greenhouse gas emissions.
- ✧ The Government will facilitate the establishment of socially profitable production of blue hydrogen, among other things through Gassco's architectural function, by allocating areas for carbon storage under the Storage Regulations for stakeholders with storage needs, and processing relevant applications for developments under the Storage Regulations quickly and efficiently.
- ✧ The Government aims to enable Norwegian projects to participate in the EU Innovation Fund's upcoming hydrogen auction as soon as possible. The programme will provide a ten-year grant for green hydrogen production, and the first call is scheduled to take place towards the end of 2023 with a budget of EUR 800 million.

FACTS

Study of coherent value chains for hydrogen

Oslo Economics, SINTEF and Greensight have conducted a study on hydrogen value chains on assignment for the Ministry of Petroleum and Energy. The study makes a comprehensive assessment of the technology for and market status of the production and use of hydrogen in Norway, and identifies the trade-offs we face if Norway is to take a position in a future hydrogen market. It outlines three scenarios for future production and use of hydrogen in Norway. The study has also identified market failures and which government instruments will provide the greatest value in building an economically sustainable value chain for hydrogen.

Industry and maritime transport are expected to be the main hydrogen users in Norway in 2030, but the volume used will probably be limited. Towards 2050, it is considered likely that domestic use will increase, and hydrogen is also expected by then to be essential for heavy transport on land. However, there is considerable uncertainty about what will happen, and about which climate technologies will eventually succeed.

Although Norway is well placed to take positions in a hydrogen market, developing hydrogen value chains could lay claim to scarce resources that could be otherwise employed. The study shows that a scenario involving high production of hydrogen in 2050 (10 million tonnes) will

require around 65 TWh of renewable power and a natural gas consumption equivalent to 31 per cent of Norwegian gas production in 2021.

The study concluded with the following recommendations to the Norwegian authorities:

- 1. Prioritise instruments that facilitate emission reductions and green value chains in general.** This includes considering the possibility of increasing national carbon taxes and introducing requirements for low or zero emission solutions. Measures that ensure access to input factors for hydrogen value chains are also recommended, including facilitating renewable power production and grid infrastructure, and measures to improve access to labour, relevant skills and areas. Standardisation work is also important.
- 2. Continue subsidy schemes for research and technology development for hydrogen solutions.** Subsidies are still needed for technology development, piloting and market introduction in the hydrogen area. The current subsidy schemes are mostly fit for purpose and should be continued. The subsidies can be prioritised to sectors where Norway has significant financial and strategic interests and comparative advantages.

3. Consider production or operating subsidies to support scaling of mature technology if a more rapid development of hydrogen value chains is desirable. Introducing contracts for difference for hydrogen, for example, could be a well-aimed policy instrument that would lower the level of uncertainty regarding the development in price differences compared with fossil alternatives. However, it is pointed out that such a scheme will also entail large costs for the state and a risk of inefficient use of resources. According to the study, such contracts would probably be most effective if aimed at green hydrogen production, but only if mature projects exist on the consumer side.

4. Alternatively, a market base can be created through direct regulation, licensing requirements and public procurement. For example, requirements applicable to public procurement may be suitable in sectors that are characterised by large-scale public procurements and where hydrogen has a significant potential.

5. Infrastructure needs should be considered on a regular basis. Inadequate infrastructure development could represent a barrier to the development of hydrogen value chains in the long term, for example in the maritime sector. However, it remains uncertain what the most effective climate solution will be. Measures that involve committing to a single technology and large-scale infrastructure development entail a risk of unsuccessful investment and unfortunate market distortion. Therefore, the authorities should initi-

ally prioritise ‘regulatory infrastructure’ such as standards and regulatory development.

6. Utilise current public ownership, rather than creating a new non-commercial state hydrogen company. It is the natural role of state-owned infrastructure companies to coordinate and, if relevant, finance infrastructure in the long term. Established state-owned companies with a position in the hydrogen value chain should have the opportunity to invest in hydrogen, but on commercial terms. The companies should not be instructed to prioritise investments in hydrogen. That could make the state investments less profitable, lower the required rate of return in the industry, and displace rather than supplement private capital.

4.4 CCS



Norway will continue to work on world-leading industrial solutions for carbon capture, storage and utilisation that create profitable jobs in Norway and that cut global climate emissions in a cost-effective manner.

Market opportunities

The industrial sector accounted for about 24 per cent of total global greenhouse gas emissions in 2019, the majority of which come from large point emissions. Several industrial processes today emit CO₂ as an inevitable part of the process, for example cement production, in which CO₂ is released when limestone is broken down, and where there are few good options to the materials produced. Although it will be necessary to develop new low-emission industrial technologies, it will be difficult to eliminate all emissions from industry by 2050. In order to achieve net zero emissions in 2050, carbon will have to be permanently removed from the atmosphere. Carbon capture and storage (CCS) from point emissions in industry can make a significant contribution to this, because some of the emissions are a natural part of the cycle (biogenic emissions).



Norway's suitable geological storage formations can play a central role in the further development of CCS as an important climate measure.

Norway has had a holistic approach on CCS for many decades. It builds on 27 years of experience of carbon storage on the Sleipner and Snøhvit fields, support for research and development through, among other things, the CLIMIT programme and the test centre for CO₂ capture technology at Mongstad, and the Longship project's demonstration of a full-scale value chain for CCS. Longship facilitates learning about the regulation and stimulation of CCS for use in subsequent projects in Europe and the rest of the world. Several Norwegian industrial enterprises have also worked on CCS projects for their facilities over time.⁶³

New commercial carbon storage projects are now also being developed on the Norwegian continental shelf. Norway's suitable geological storage formations can play a central role in the further development of CCS as an important climate measure. Carbon storage also enables the production of hydrogen and ammonia from natural gas with very low emissions. This can open up for value chains based on hydrogen produced in Norway and for hydrogen

produced at the landfall location in Europe with carbon storage on the Norwegian continental shelf. Transport and storage infrastructure can potentially attract new industry to produce low-emission products, green cement, chemicals and metals, as well as negative emissions through the storage of bio-carbon and carbon capture from air.

CCS will thus be able to create new and retain existing jobs, while also enabling emission cuts from waste incineration and from industry that has no other real options in a zero-emission world.

Carbon can also be used as an input factor in industrial production, for example to create materials for battery production. The use of captured carbon can potentially contribute to the inclusion of carbonaceous products in a circular economy, reduce emissions and create new industrial activity. In order to achieve a climate effect, the carbon must be permanently stored in the product, which is recycled after use, or incinerated with CCS.

63 https://www.prosess21.no/contentassets/4b5aa8b90a534b48bc71b7aa26124f20/prosess21_CO2-handteringsrapport_def_091120.pdf



Norway has a leading position in carbon capture and storage in Europe and has worked for a long time with broad political support to develop CCS internationally. The goal is for CCS to become a cost-effective climate measure.

Challenges

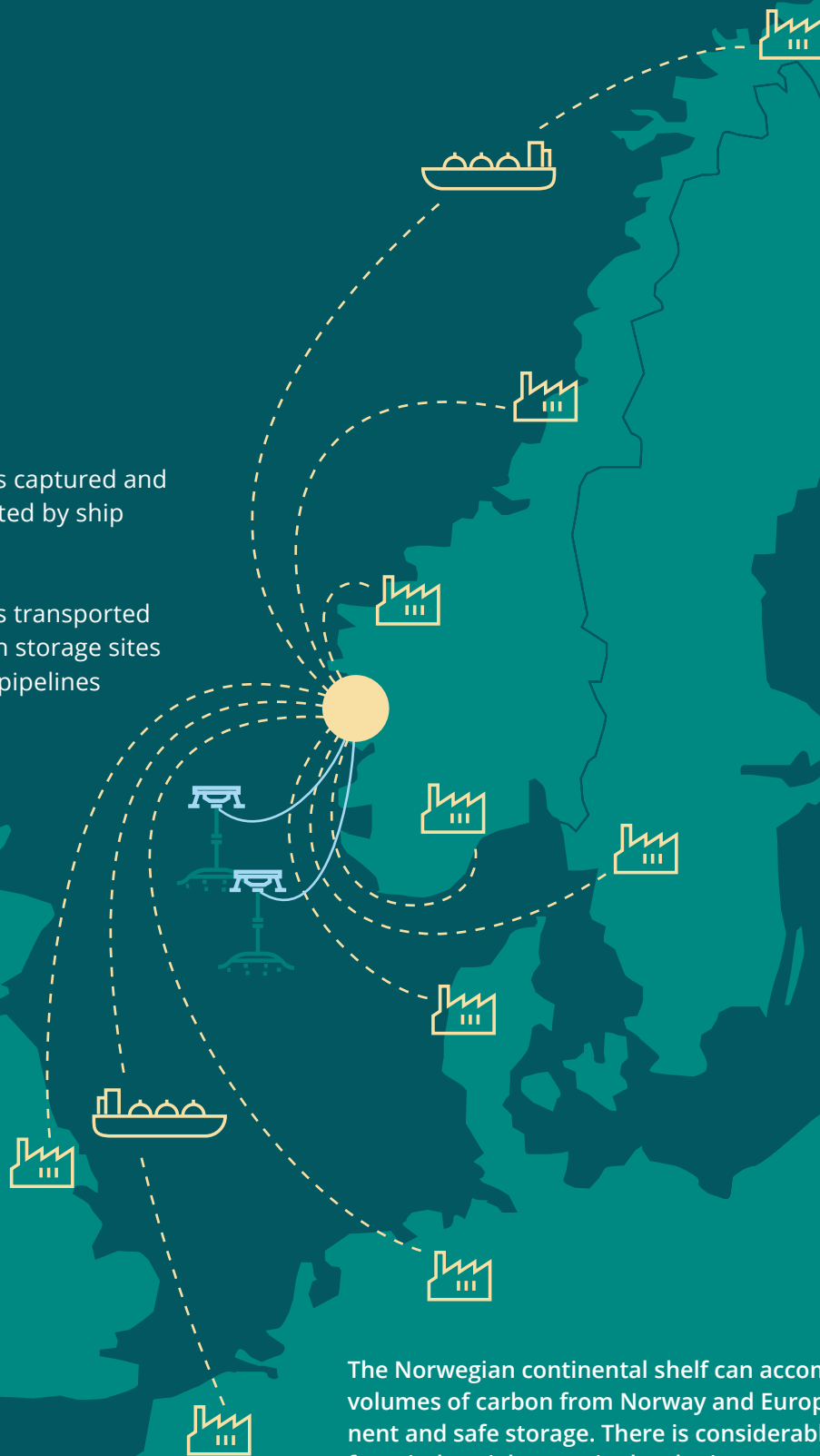
It has been widely believed that investing in carbon capture and storage merely postpones the necessary transition to renewable energy, recycling of materials, emission-free production processes and alternative materials and products. However, it is important to regard CCS as complementing, not replacing, other measures to cut emissions. Reports from the Intergovernmental Panel on Climate Change and the IEA show that it is very difficult, if not impossible, to achieve the necessary emission cuts without this technology. Scepticism towards CCS is now declining in several countries, but is still present.

CCS is a well-proven technology, but is not widely adopted in full-scale industrial value chains. Significant costs are associated with technology and knowledge development, while the experience and advantages it lays the foundation for in terms of technology choices and costs typically benefit many more than those who develop it. How profitable CCS will be for individual actors will also to a large extent depend on an established and wide-spread infrastructure/system for transport and storage. Carbon capture directly from the atmosphere or from biogenic emission sources, which are then stored, will contribute negative emissions which, according to the UN Intergovernmental Panel on Climate Change, are necessary in order to achieve the 1.5 degree target set out in the Paris Agreement and the goal of achieving balance between emission and absorption by the middle of this century.

FIGURE 8

CCS

- Carbon is captured and transported by ship
- Carbon is transported to carbon storage sites through pipelines



The Norwegian continental shelf can accommodate large volumes of carbon from Norway and Europe for permanent and safe storage. There is considerable interest from industrial actors in developing commercial carbon storage projects. Ship transport is a flexible transport solution. For large volumes, pipe transport can be cost-effective. In collaboration with the industry, Gassco and German DENA are studying various solutions for transporting carbon for storage in Norway.



Norway has had a broad focus on CCS for many years. The initiative is based on 27 years of experience of carbon storage on the Sleipner and Snøhvit fields, research and development support to e.g. carbon capture from industry, the test centre for carbon capture technology at Mongstad, and the demonstration of a full-scale CCS value chain in the Longship project.

Political initiatives and processes

Norway has a leading position in carbon capture and storage in Europe and has worked for a long time with broad political support to develop CCS internationally. The goal is for CCS to become a cost-effective climate measure.

- ✧ The Government will continue Norway's overall efforts to support technology development in the area and promote CCS as an important climate measure internationally.
- ✧ The Government will contribute to the implementation of the Longship project by demonstrating a full-scale chain for CCS, as a key Norwegian contribution to developing the necessary climate technologies.

- ✧ The Government will ensure that Northern Lights is able to recruit Norwegian and international customers.
- ✧ The Government will facilitate commercial carbon storage on the Norwegian continental shelf by awarding storage areas to companies with concrete industrial plans that entail a need for storage.

FACTS

The Longship project

In autumn 2020, the Storting decided to implement the Longship project in line with Report No 33 to the Storting (2019–2020) and the Ministry of Petroleum and Energy's Proposition No 1 to the Storting (Resolution) (2020–2021). Longship consists of the capture of around 800,000 tonnes of CO₂ per year from the Heidelberg Materials cement factory in Brevik in Porsgrunn municipality and Hafslund Oslo Celsio's waste incineration plant in the City of Oslo. The carbon is transported by ship to Øygarden municipality, where it is piped for permanent and safe storage 2,600 metres below the seabed. Northern Lights JV is responsible for the transport and storage aspects of the Longship project.

The state's total costs in the Longship project are expected to amount to around NOK 21 billion, including a share of the annual operating costs until 2034. In addition, the state has assumed significant risk, related, among other things, to the interaction between capture, transport and storage in Longship.

In March 2023, a supplementary external quality assurance was carried out, which shows that the Heidelberg Materials project in Brevik is expected to come to around NOK 1.3 billion (2023) (P50) higher than KS2 (Quality assurance of management documentation and cost estimates), which was carried out in 2020 and which was the basis for the Storting's authorisation to award grants to the project. Operation start-up is scheduled for 1 March 2025, about six months later than the original estimate. The external quality assurance assessment concluded that completion is likely to be later, because the project is the first of its kind, and there are therefore risks in connection with testing and start-up. The project is being carried out at a 107-year-old cement factory and is more than 60 per cent complete.

Hafslund Oslo Celsio announced in March 2023 that updated cost estimates for the carbon capture project would exceed the maximum budget in the grant agreement with the state, if implemented on the current project basis. The company has put the project on hold to reduce costs.

The transport and storage part of Longship, Northern Lights, is more than 80 per cent complete.

4.5 Process industry



Norway will have the world's cleanest, most modern and energy-efficient process industry, based on high-tech solutions and great value creation.

Market opportunities

The process industry is characterised by a high export share and competes in international markets. Much of the production in this industry consists of materials or semi-finished products such as aluminium ingots, silicon, ferro-alloys, plastic raw materials, cardboard, paper and cement. Many of these products are key input factors in the various goods we use in our daily lives, and they are building blocks in the green transition with a broad range of uses, including solar cells, batteries, windmills and the health industry. The products form part of complex, global value chains before they reach consumers. McKinsey, Eurometaux etc. describe the enormous amounts of minerals and refined raw materials required for utilising the new zero-emission technologies. Illustrated by Figure 9, which also highlights that the Norwegian process industry is well positioned for further growth.

FIGURE 9

The Norwegian process industry is the main supplier to Europe of a range of materials for the green transition. The overview shows the expected global demand for minerals and raw materials in 2050 compared to 2020 levels.



		%		%	
Li	Lithium	2109	Si	Silicon	62
Dy	Dysprosium	433	Tb	Terbium	62
<u>Co</u>	<u>Cobalt</u>	<u>403</u>	<u>Cu</u>	<u>Copper</u>	<u>51</u>
Te	Tellurium	277	<u>Al</u>	<u>Aluminium</u>	<u>43</u>
Sc	Scandium	204	Sn	Tin	28
<u>Ni</u>	<u>Nickel</u>	<u>168</u>	Ge	Germanium	24
Pr	Praseodymium	110	Mo	Molybdenum	22
Ga	Gallium	77	Pb	Lead	22
Nd	Neodymium	66	In	Indium	17
<u>Pt</u>	<u>Platinum</u>	<u>64</u>	<u>Zn</u>	<u>Zinc</u>	<u>14</u>
Ir	Iridium	63	Ag	Silver	10

 Norwegian companies

The degree of specialisation and tailoring to customers' needs is constantly increasing and constitutes an important source of increased profitability. Norway is Europe's biggest producer of aluminium, silicon, ferro-alloys and certain refined metals including nickel and zinc. This makes Norway particularly well placed to succeed in developing new low-emission technologies, and we have many companies that could utilise such technologies. If we succeed in achieving this, it will reduce our emissions, spread emission-reducing technology internationally, and also form the basis for green, profitable jobs in Norway in future.

The developments we have seen in recent years in terms of access to raw materials and vulnerability in important industrial value chains have strengthened the Norwegian process industry's position in a European context. This is part of the reason why Norway and the EU are strengthening their cooperation on raw materials (including advanced materials from the Norwegian process industry) and batteries.

The Norwegian process industry has streamlined its production processes over decades, and several Norwegian businesses are world leaders in their

industry when it comes to climate and resource efficiency, both because of technology and renewable energy. The industry has reduced its emissions by more than 40 per cent since 1990, while value creation has increased by about 30 per cent adjusted for inflation.⁶⁴ As climate policy is gradually tightened globally, the Norwegian process industry will, thanks to its low-emission technology, be able to gain a competitive advantage compared with foreign actors.

There are also opportunities to increase value creation through more efficient use of resources and circular business models. Circularity and material efficiency have been highlighted by the Intergovernmental Panel on Climate Change as key to achieving net zero carbon emissions in industry.⁶⁵ The Norwegian strategic industry forum Process21 also points to the possibility of increased specialisation and production of more complex products to move away from markets where there is primarily competition on price.⁶⁶ Norway's production of pharmaceutical products such as io-dine-based contrast media and other types of medication are also characterised by efficient utilisation of resources and a high degree of specialisation that also helps reduce vulnerability.

64 Statistics Norway, statistical tables 09170 (2022) and 08940 (2021).

65 IPCC Sixth Assessment Report, Working Group III contribution (2022): Main findings in the third part of the Sixth Assessment Report) - Norwegian Environment Agency (miljodirektoratet.no)

66 Process21 (2021), main report: proses21_rapport_hovedrapport_web_oppdaterert_060821.pdf



In a global context, the Norwegian process industry already has a small climate footprint. Process21 shows that many brand new low-emission solutions will have to be developed if we are to achieve the goal of minimising emissions by 2050.

Challenges

In a global context, the Norwegian process industry already has a small climate footprint. Nevertheless, it accounts for almost all of the greenhouse gas emissions from Norway's mainland industry, corresponding to around 20 per cent of total Norwegian greenhouse gas emissions. The need for building blocks from the process industry is growing in step with global growth and population growth and, not least, a steep increase in demand from green value chains. Stronger efforts are therefore needed across the entire breadth of the process industry to develop tomorrow's materials produced sustainably with zero or minimal emissions.

The technologies currently used in the process industry are mature, meaning that their output potential has largely been realised in terms of resource efficiency and emissions. Work to develop low- or zero-emission technologies has been under way for years, both through academic activity and under the auspices of the industry. Several such development projects are under way, but development is moving too slowly and more resources are needed. Many companies have invested significant capital in existing production facilities optimised for specific processes and products, while the development of new and improved processes is often very capital-intensive, and the technology pathways from

research and development to piloting and commercialisation can be both long and risky.

The process industry is power-intensive, with an annual consumption corresponding to approximately a quarter of Norway's normal annual power production. Developments in the process industry are therefore closely linked to developments in the Norwegian power market. The conversion of processes and further electrification will mean even more power will probably be required.

The work from the first phase of the forum Process21 (2018–2021) shows that many brand new low-emission solutions will have to be developed if we are to achieve the goal of minimising emissions by 2050.⁶⁷ As developing new processes in this industry normally are very time consuming a lot of the basic research and development efforts need to take place in the coming years if we want such solutions to be implemented and technologies industrialised by 2050.

The forum Process21, with its established industrial networks, is assisting the Ministry of Trade, Industry and Fisheries in implementing the Green Industrial Initiative. In 2023 the Government has continued the Process21 forum and have updated the remit for its work.

67 <https://www.prosess21.no>

FACTS

Process21

Process21 was announced in Report No 27 to the Storting, *A greener, smarter and more innovative industry* as a long-term strategy forum for the process industry and established in spring 2018 on assignment for the Government represented by the Ministry of Trade, Industry and Fisheries. It is tasked with providing strategic advice and recommendations on how Norway can best move towards minimal emissions from the process industry by 2050 while also facilitating sustainable growth for enterprises in this industry during the period in question. According to its remit, Process21 must focus on emissions from the Norwegian process industry as well as how this industry indirectly contributes to reducing emissions from other enterprises and sectors in Norway and globally. Process21 is based on the principle that emission reduction in the Norwegian process industry should not be achieved by moving emissions to countries with less ambitious climate policies (carbon leakage).

The work carried out during the period 2018–2021 is summarised in a main report that Process21 submitted to the Prime Minister of Norway in February 2021. It has also led to ten expert group reports and four thematic reports on areas that Process21 deems to be of strategic importance to realising sustainable growth and emission reductions in the process industry. In total, the main report and the expert group reports contain more than 120 individual measures. The work is summarised in the ambition to double the export value of the process industry (> NOK 300 billion) by 2030 and achieve climate neutrality by 2050. The measures proposed by Process21 can be categorised as follows:

- ☀ Power conditions, power system and protective measures vis-à-vis third countries (carbon leakage). Process21 considers this a prerequisite for the green transition of existing industry.
- ☀ The potential for emission cuts by 2030. Process21 points out that emissions from the Norwegian process industry have remained virtually unchanged since 2008, and that the process industry can reduce its emissions by around 2.5 million tonnes of CO₂ in 2030 in addition to what is regulated through emission quotas. Process21 proposes attempting to trigger this reduction by means of an environmental agreement ('climate partnership').
- ☀ Developing new low-emission technology for production processes during the period from 2030 to 2050. This is a prerequisite for achieving the 2050 emission goals, and it will require stronger long-term efforts (i.e. more resources) both on the part of enterprises and the Government in order to succeed.
- ☀ The value chain for CCS will play a vital role in emission cuts in the industry during a transitional phase.
- ☀ Developing new process industry such as hydrogen (ammonia), batteries etc.

Political initiatives and processes

- ✧ The Government has continued the strategic industry forum Process21, and have updated its remit in 2023, tasking it with advising on how the Norwegian process industry can best achieve minimal emissions and sustainable growth towards 2030 and 2050.
- ✧ The Government will continue the aid scheme for the compensation of indirect emission costs in the industry (the CO₂ compensation scheme) and will work actively to safeguard Norwegian interests in connection with the EU's work to combat carbon leakage (CBAM).
- ✧ The Government will continue its work to promote CCS, hydrogen and electrification as important contributions to cutting emissions from Norwegian industry and achieving the temperature target in the Paris Agreement.
- ✧ The Government wishes to enter into a climate partnership with the process industry.
- ✧ The Government will be actively involved in the discussions in the EU on how the Emissions Trading System (EETS) should be further developed in the longer term, in order to safeguard emission cuts and profitable restructuring of Norwegian industry.
- ✧ The Government will further develop the instruments for technology development and emission cuts in industry.
- ✧ The Government will facilitate the development and use of low and zero-emission technology that will accelerate the green transition, including in the process industry.



Norway is Europe's biggest producer of aluminium, silicon, ferro-alloys and certain refined metals including nickel and zinc.

4.6 Manufacturing



Norway must have a profitable, innovative, highly efficient and sustainable manufacturing industry that, based on expertise and the Norwegian working life model, delivers top-quality products with a low climate and environmental footprint to the entire world.



Norwegian industry includes a number of enterprises that produce various types of physical products which are either sold directly to a consumer market, or which are included as components for compound products, or which constitute technology or equipment that other enterprises will use in their production. This part of industry is often jointly referred to as manufacturing.

Many Norwegian manufacturing companies are at the forefront of developing and adopting new technology to be competitive in terms of quality, delivery precision, function and price. Various digital technologies are used in product planning and development respectively, for efficient and precise production, for interaction with other components of compound products and towards customers in terms of utilisation of user data and customisation. A large amount of the Norwegian manufacturing companies constitute a supplier industry that in sum is both broad and diverse, and that can be crucial for other sectors and value chains such as renewable energy production, energy storage, carbon capture and storage, material recycling etc.

Good, close cooperation between the supplier industry and the large industrial companies, where innovation and industrialisation are prioritised, will be a success factor in reducing the industry's

climate and environmental footprint and increasing exports. This makes it vital to ensure that the manufacturing industry in Norway is efficient and sustainable. Norwegian suppliers have shown that they can be at the forefront when it comes to sustainability and environmentally friendly solutions. The supplier industry creates new jobs and growth-intensive businesses that contribute to significant value creation and are an important foundation for the development of the welfare society.

The sustainability of products is now being emphasised to a greater and increasing extent. This can eventually become decisive for whether a product is accepted in the market or the company qualifies as a supplier to other companies. This means that manufacturing companies must have strong attention on measures to minimise the climate and environmental footprint both of the product itself and in the manufacturing processes.

Market opportunities

Significant and large investments are needed globally to implement the green transition. This will entail a high demand for critical components, correct and efficient products as well as different and more advanced system deliveries in this large market.

Norwegian manufacturing companies must be internationally competitive if they are to succeed in the market. It will be vital in that context that both the business itself and the products have clear and documented environmental benefits that are better than their competitors.

The Norwegian supplier industry is generally competitive at an international level, and, in various sectors, many companies have gained recognition for their quality, innovation and technological expertise. The oil and gas supplier industry has long experience of developing and producing complex products. This is an important factor for Norwegian manufacturing companies to exploit further, and for achieving industrialisation in the green value chains.

Norwegian suppliers generally have a good reputation for working closely with their customers and offering tailor-made solutions that meet their needs. This helps them compete on quality, flexibility and customer satisfaction.

Challenges

Market opportunities, expectations and requirements mean that manufacturing companies must make even greater use of sustainable materials, emphasising designing products for repair, reproduction and reuse. They must minimise energy use, use renewa-



Many manufacturing companies are at the forefront of developing and adopting new technology to be competitive in terms of quality, delivery precision, function and price.

ble energy in production and ensure environmentally friendly production. Still, the production must be cost-effective.

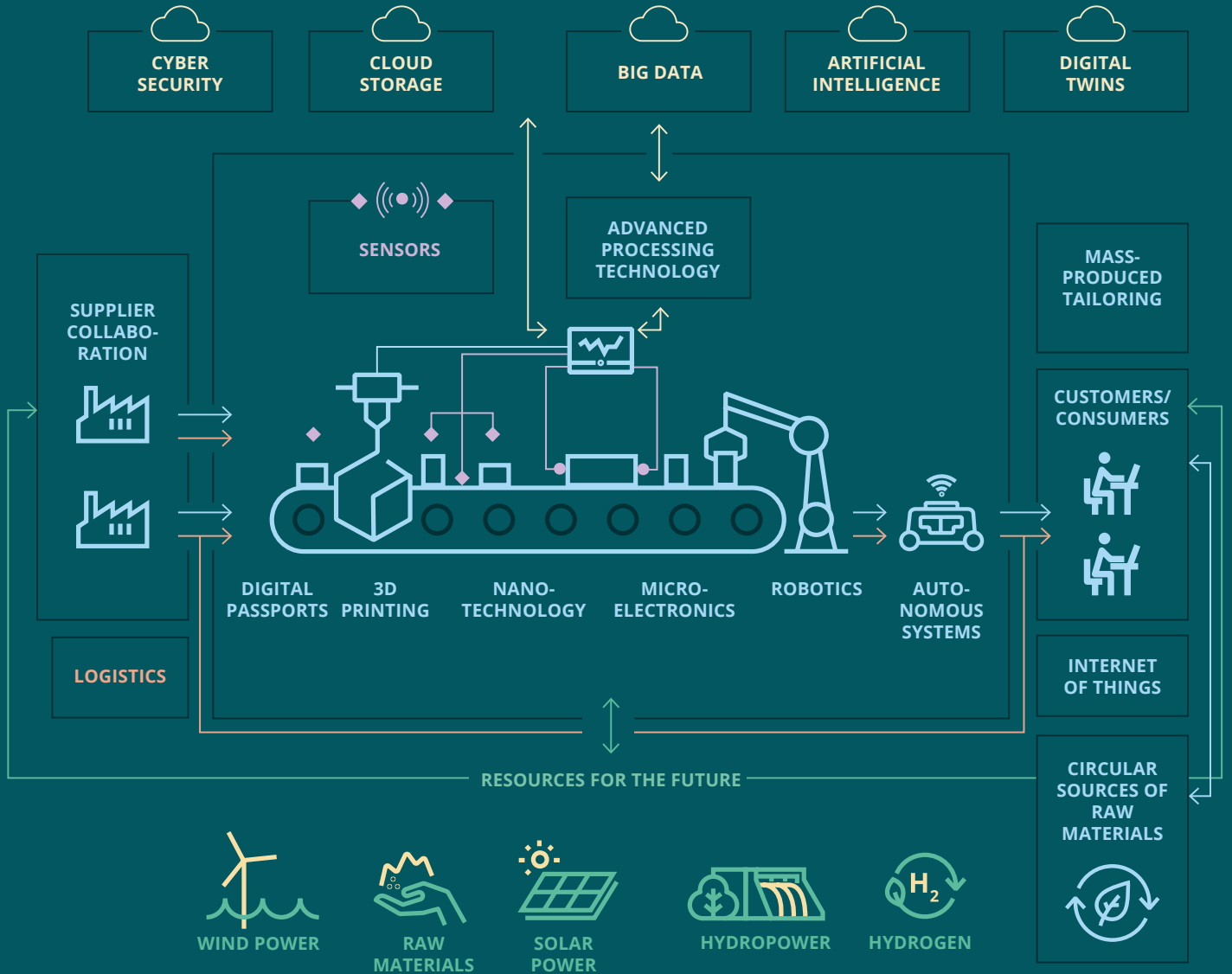
An ever-changing and challenging market and rich technology opportunities require good adaptability, and manufacturing companies must be at the forefront of research, development and innovation. It also means that companies must acquire new knowledge to take advantage of new and enabling technology, as well as use advanced production systems (Industry 4.0) to become both smarter and more productive. This must be used to increase value creation in existing industry and the new green value chains. However, in order to succeed, the pace of transitioning and industrial development must be kept sufficiently high. In the manufacturing industry, there are many SMEs that, for various reasons, may find such challenges demanding.

Political initiatives and processes

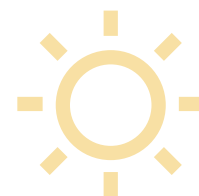
- ✦ The Government will invite the manufacturing industry to take responsibility for drafting a strategy comprising ambitions and operational measures.
- ✦ The Government will establish an executive forum that meets with the Minister of Trade and Industry on a regular basis, for example on a semi-annual basis. The main task of the forum is to link the manufacturing industry up with the new green value chains, and it will comprise participants from both the manufacturing industry and the green value chains.
- ✦ The Government wishes to include the manufacturing industry in its mapping of risks and vulnerabilities related to global supply lines for important input factors, raw materials and products imported into Norway.
- ✦ The Government will consider whether the Norwegian manufacturing industry can be marketed and profiled better abroad.

FIGURE 10

Industry 4.0 in the manufacturing industry



4.7 Solar industry



Norway will develop a profitable solar industry with the potential to grow, which can contribute to the implementation of the green transition and play a key role in the further development of the solar industry in Europe.

Solar power is becoming increasingly important to the energy supply in Europe and the rest of the world, driven by technology development and cost reductions. In the next few decades, solar power is expected to account for the largest proportion of global renewable energy production. Solar power currently accounts for around 7 per cent of the energy supply in Europe, and the Norwegian market is also increasing. The IEA expects the world's renewable energy capacity to increase by 440 GW in 2023

and that solar power will account for two-thirds. The production capacity of the world's solar panels is estimated to reach almost 1,000 GW by 2024, sufficient to meet the annual demand in the IEA's net zero emissions by 2050 scenario.⁶⁸

Norway has been a pioneer in the development of the solar value chain since the 1990s. In Norway, large-scale production of silicon-based photovoltaic products was initiated in 2005, when *Renewable Energy Corporation (REC)* established several factories in Norway and globally. Production of polysilicon, solar cell wafers and solar cell modules saw significant growth in Norway until 2011. However, overcapacity as a result of massive investments supported by the Chinese state meant that European production was unable to compete on price.

Norway still has established actors with a leading market position and expertise both upstream and downstream in the value chain. Upstream, Norwegian companies make solar cell silicon, which is currently exported for the production of virgin polysilicon, and recycled polysilicon based on wafer production scraps. Furthermore, there are experienced Norwegian companies that produce ingot and wafer. Downstream, we have Norwegian companies that are major players in the development of

68 <https://www.iea.org/reports/renewable-energy-market-update-june-2023/executive-summary>

Norway has been a pioneer in the development of the solar value chain since the 1990s. Norway still has established actors with a leading market position and expertise both upstream and downstream in the value chain, and a significant research community. In the next few decades, solar power is expected to account for the largest proportion of global renewable energy production.

photovoltaic systems. Norwegian industry and research communities are advanced in material expertise and material research, especially silicon, power electronics, solar power systems and system integration. These Norwegian companies have access to a significant competence base at e.g. IFE, SINTEF and NTNU, which work closely with the industry. Solar power research communities are spread across Norway, and a research centre for environmentally friendly energy (FME) for solar cell technologies, SuSolTech, has been established.

After more than ten years of vigorous subsidisation, China has great technological and market dominance in the solar value chain, especially upstream. This dominance is particularly evident in the processing of quartz sand and in the production of ingot and wafer, with a Chinese market share of around 95 per cent. The Norwegian company NorSun is currently the only Western manufacturer of monocrystalline silicon ingots and wafers. However their plant have old equipment in need of renewal and have struggled to be profitable over time.

There is an increasing attention in Europe and the US on reducing vulnerabilities in key value chains for the green transition, including solar power. In the EU, the focus on solar power has intensified after the second phase of Russia's attack on Ukraine, reducing vulnerability to Russian gas.

FACTS

The EU's solar ambitions

In 2022, the European Commission invited European companies to participate in the *European Solar PV Industry Alliance (ESIA)*. The initiative aims to scale up the production of competitive, innovative and sustainable solar PV products, as well as diversify imports to better protect against the risk of supply disruptions. An action plan has been developed to, among other things, identify scale-up bottlenecks, facilitate access to funding and provide a framework for cooperation and international partnerships. The ambition is to scaling up to 30 GW of annual solar PV manufacturing capacity in Europe by 2023, creating 400,000 new jobs (direct and indirect) and adding EUR 60 billion of new GDP each year.⁶⁹

⁶⁹ SolarPower Europe welcomes new European Commission Solar PV Industry Alliance – SolarPower Europe, home – European Solar PV Industry Alliance (solaralliance.eu)

Opportunities

A strong focus on efficiency and reduced costs over several years has led to silicon solar cells of a very high quality. Over the past decade, material and technology development has increased efficiency by 30–40 per cent. High material quality contributes to high efficiency and thus reduced system costs. Life cycle analyses and environmental footprint requirements will further increase throughout the value chain, and the use of renewable energy will be of great importance.

Norwegian companies are well positioned to supply materials, products and expertise to meet the EU's ambitions for increased autonomy in the solar power area. As Norway possesses key pieces of the puzzle for realising a common European strategy, it is natural to also invest in increased industrial activity to take further advantage of the expertise we possess. Norway's partnership with the EU, Germany and France forms a platform for cooperation to integrate the Norwegian contributions into the EU effort.

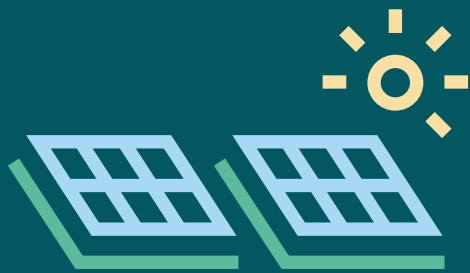
Developing and further developing high-quality silicon materials and wafers requires a high level of expertise in relevant fields such as materials technology, physics and chemistry. Expertise has been developed in the university and institute sector in collaboration with the industry, and the need for better material quality and expertise will continue to grow.

An increased attention on material quality, sustainability and resource efficiency present great opportunities for positioning the Norwegian solar industry. One initiative provides significant synergies with other important initiatives such as the process industry and battery technology.

Challenges

Competition in the global production value chains for solar power products is dominated by China, both commercially and technologically. Competing against a dominant actor requires both learning and technology transfer, technology development, changes in composition and requirements for products throughout the value chain. There is likely to be growing interest in life cycle analysis, climate footprint and resource efficiency throughout the value chain going forward. China has previously shown the ability to compete on price, so the commercial conditions for Western actors must be more about climate and environmental effects in the value chain.

Rebuilding a competitive solar value chain in Europe will require enhanced interaction between the European actors and extensive use of partnerships. Collaboration on expertise will be further strengthened between partners. Building capacity, especially in upstream energy-intensive production capacity, is capital-intensive and requires considerable expertise. Norway has actors with this expertise and we will be able to use our partnerships with the EU to realise common ambitions.



Rebuilding a competitive solar value chain in Europe will require enhanced interaction between the European actors and extensive use of partnerships. Norway has actors with this expertise and we will be able to use our partnerships with the EU to realise common ambitions. An increased focus on material quality, sustainability and resource efficiency present great opportunities for positioning the Norwegian solar industry.

FACTS

Storting petition resolution on solar power and local energy production

In connection with the consideration of the revised national budget for 2023, the Storting adopted the following six petition resolutions related to solar power and local energy production;

The Storting asks the Government:

- ☀️ To make it a requirement that solar panels and/or locally produced energy be established on all new state construction projects with pre-project start-up in 2024, unless special considerations indicate otherwise. The requirement shall also apply to major upgrades and rehabilitations.
- ☀️ During the first half of 2024, to submit a proposal for consultation requiring the establishment of solar panels and/or locally produced energy on all new commercial buildings over 500 square metres outside agricultural, natural and recreational areas (LNF areas).
- ☀️ To set a target for new solar power of 8 TWh by 2030 and draw up a concrete action plan that enables this target to be achieved in the revised national budget in 2024. Measures and policy instruments shall not prevent rational grid development.
- ☀️ To create a sharing scheme adapted to commercial areas that enables solar power exceeding 1 MW to be shared.
- ☀️ To allow NVE to exempt individual solar park projects with low levels of conflict in grey areas from the licence requirement, so that licences can be granted by municipalities under the Planning and Building Act.
- ☀️ In 2023, to remove the licence requirement for solar parks up to 1 MW in grey areas, so that licences can be granted by municipalities under the Planning and Building Act.

These resolutions affect the responsibilities of several ministries and require coordinated efforts. The Government will follow up the Storting's resolutions in an appropriate manner. The Storting has adopted several petition resolutions in this area.

Political initiatives and processes

- ☀️ The Government's ambition is for capital policy instruments for the Green Industrial Initiative and government loans for green projects to also be available for projects in the solar industry.
- ☀️ The Government wants to include the solar industry in its mappings of risks and vulnerabilities related to global supply lines for important input factors, raw materials and products imported into Norway.
- ☀️ The Government will invite the Norwegian solar industry and associated research communities into a roadmap process with the aim of delivering a strategy by the end of 2024.
- ☀️ The Government will consider strengthening cooperation on solar industry with the EU or key individual countries through, for example, strategic partnerships



Solar power currently accounts for around 7 per cent of the energy supply in Europe, and the Norwegian market is also growing.

4.8 Maritime industry



Norway shall remain an international maritime superpower, showing the way into the green shift by developing, building and utilising zero-emission solutions and autonomous vessels.

Market opportunities

The global transformation of the maritime industry has only just begun. A report by Menon shows that only 5 per cent of the world fleet consists of low and zero-emission vessels.⁷⁰ In July 2023, the UN International Maritime Organization (IMO) adopted the historic ambition of zero emissions for international shipping by 2050. It has also set targets for major emission reductions by 2030 and 2040. The revised climate strategy sets milestones on the path towards zero emissions by 2050. Over the next seven years, international shipping will reduce total emissions by 20–30 per cent, compared with 2008, and, by 2040, 70–80 per cent compared with 2008. Here, Norway has taken a leading role in establishing ambitious climate and environmental requirements for international shipping, including the pricing of greenhouse gas emissions.

Measured in tonnes, around 90 per cent of the total volume of goods in foreign trade is transported by sea, while ships account for about half of domestic freight transport measured in transport work. Norway is at the forefront of the transition to green

⁷⁰ Menon / *Grønn Maritim 2022 – teknologi, utslipp, verdiskaping og sysselsetting* ('Green Maritime 2022 – technology, emissions, value creation and employment' – in Norwegian only)

Measured in tonnes, around 90 per cent of the total volume of goods in foreign trade is transport-ed by sea, while ships account for about half of domestic freight transport measured in transport work.

90%



shipping, and the share of low- and zero emission vessels in the Norwegian-owned fleet is 24 per cent.

The EU is currently considering the European legislative package Fit for 55, which contains several measures that will have consequences for maritime transport within and between EU and EEA countries, as well as to and from third countries. Measures aimed at shipping include making maritime transport part of the EU Emissions Trading System (ETS) with effect from 2024. The rules on emissions trading for maritime transport will be an integral part of the EU Emissions Trading System, and the Government wants Norway to participate when the regulation enters into force. The FuelEU Maritime Regulations stipulate requirements for greenhouse gas emission reduction through emission intensity requirements for ship fuel and use of shore power and zero-emission technology. There is consensus in the EU concerning the Alternative Fuel Infrastructure Regulation (AFIR). Its intention is to help ensure accessible and well-functioning infrastructure for climate-friendly fuel throughout the EU. The regulation is expected to be finally adopted in autumn 2023, after which the EEA process will start.

Stricter international regulations and more ambitious climate goals for shipping could help build a market for low and zero-emission maritime solutions. The Norwegian maritime industry is among the most advanced in the world in the building of low and

zero-emission vessels, and has world-leading companies in areas such as design and construction, propulsion systems, and equipment and services.

The pace of transition must be stepped up considerably in order to achieve the ambition of halving the emissions from domestic shipping and fisheries by 2030.⁷¹ To succeed in the transition, climate-friendly fuels must be made available, and many ports have already developed shore power and adopted new technology to cut emissions. In its action plan for infrastructure for alternative fuels in transport, the Government will propose measures and policy instruments intended to help make climate-friendly ship fuel more available.

The Risk Loan scheme for short sea shipping and fishing vessels was expanded in 2023 with regards to the types of vessels that qualify for support. From 31 August 2023, the scheme includes vessels in the aquaculture industry, offshore vessels, ferries and high-speed boats, and the scheme changed its name to the Risk Loan scheme for low and zero-emission ships. Under the scheme, loans may be granted for the purchase of zero and low-emission vessels or for investments for reducing emissions by retrofitting an existing vessel. The Risk Loan scheme for low and zero-emission vessels has a lending framework of NOK 470 million in 2023.

71 *Barometer for grønn omstilling av skipsfarten* ('Barometer for the green transition of shipping' – in Norwegian only) (DNV, 2023)

Challenges

A prerequisite for the green transition of shipping is the actual realisation of an international market for green shipping. This will probably require national, European and global emission reduction frameworks to become progressively more ambitious. In particular, the zero-emission solutions for large ships sailing longer distances face both technological and financial challenges, and the infrastructure for the distribution of alternative fuels needs to be developed. The cost gap between conventional and zero-emission solutions must be closed, making it profitable to choose environmentally friendly solutions. New low and zero-emission maritime solutions should also be commercialised to a greater extent.

The right infrastructure, expertise and equipment at the Norwegian shipyards is important to be able to build low- and zero-emission vessels.

Political initiatives and processes

The Government will consider policy instruments that best and most effectively can contribute to cutting the greenhouse gas emissions.

In January 2023, the Government and industry representatives signed a letter of intent concerning a climate partnership. The dialogue with organisations in the maritime and fisheries industries started in the spring of 2023 with an ambition to entering into

a climate partnership agreement aiming to halve emissions from domestic shipping and fishing vessels by 2030.

An initiative targeting the maritime sector is included in Norway's Export Strategy *Hele Norge eksporterer*. The Government presented its maritime export initiative in May and is working on measures to increase green maritime export. The industry is a world leader in the field, but it is competing in a global market. Norwegian shipping companies often build vessels with low and zero-emission propulsion technology developed by Norwegian equipment manufacturers abroad.

- ✨ The Government will present a national plan for making climate-friendly fuel available to the shipping industry by 2023.
- ✨ The Government has followed up the Storting's petition resolution No 841 (2020–2021) where the Storting asked the Government to investigate the room for manoeuvre under the EEA Agreement to give contracts for public procurement of vessels to Norwegian shipyards. The Ministry of Trade, Industry and Fisheries commissioned Menon Economics and the law firm Arntzen de Besche Advokatfirma to assess the European market for public procurement of vessels and what room for manoeuvre there is within the scope of the EEA Agreement to stipulate requirements and criteria

that could help the Norwegian maritime industry to compete effectively for public contracts. The measures proposed in the report entail that the authorities should attach less prominence to price and more to other requirements and criteria. The report is currently being assessed by the Ministry.

- ✧ The Government has increased Export Finance Norway's (Eksfin) maximum credit guarantee ratio for the Guarantee Scheme for construction loans for ships, vessels and facilities at sea from 50 to 75 per cent. Through this scheme, Eksfin can mitigate credit risk for banks that provide construction loans to Norwegian shipyards and advance payment guarantees for shipbuyers. The Risk Loan scheme for short sea shipping and fishing vessels was expanded in 2023 to include vessels in the aquaculture industry, offshore vessels, ferries and high-speed boats, and the scheme changed name to the Risk Loan scheme for low and zero-emission ships. The Risk Loan scheme for low and zero-emission vessels has a lending framework of NOK 470 million in 2023.
- ✧ The Government has started the negotiations on a maritime climate partnership.
- ✧ The Government will further develop international and Nordic cooperation that enables demonstration and testing of green solutions through the establishment of green shipping corridors. Based

on a Norwegian initiative, the Nordic Council of Ministers has funded a pilot study to identify potential green corridors in the Nordic countries. This study will be followed up in future cooperation on green shipping between the Nordic countries.

- ✧ The Government will distribute a draft of amendments to the Greenhouse Gas Emission Trading Act with a view to an amended act entering into force by the end of 2023, so that Norway will have the legal basis required to introduce emission trading for shipping from 1 January 2024.
- ✧ The Government has submitted a proposal for consultation on new zero-emission requirements for ferries and high-speed boats for consultation. The proposal outlines the introduction of zero-emission requirements for ferries as early as possible and for high-speed boats from 1 January 2025. Exceptions are also proposed to ensure that the requirements function optimally.
- ✧ The OECD countries recently agreed on a deal proposal that would modernise the government export finance agreement. This agreement regulates large parts of Eksfin's operations, and the modernisation includes increasing flexibility in ship financing.

FACTS

Zero emissions from the fishing and aquaculture fleets



With more than 60,000 employees and an annual value creation of more than NOK 100 billion, fisheries and aquaculture make up Norway's fourth largest industry. The vessels used in this industry consume around 600–800 million litres of fossil fuels a year, which accounts for a significant proportion of Norway's total greenhouse gas emissions.

The ZeroKyst project aims to facilitate zero emissions in much of the fisheries and aquaculture fleets. The project includes one zero-emission newbuild, 10 retrofitted vessels, services for retrofitting and maintaining zero-emission vessels, and a comprehensive solution for a flexible and cost-effective supply of electricity and green hydrogen for use as maritime fuel.

The project intends to develop a zero-emission powertrain, zero-emission vessels, flexible and competitive energy supply, and regional energy infrastructure.

The research activities in the project aim to develop models, methods, tools and expertise to create safe, reliable and cost-effective zero-emission powertrains for different types of vessels, and contribute to establishing an infrastructure for hydrogen bunkering and charging of electric vessels that will be required when the new vessels are introduced. ZeroKyst will also provide a basis for an assessment of the market potential for zero-emission vessels in which risks related to sustainability and society will be analysed.

The consortium partners include powertrain developers (Hymatech and Siemens Energy), shipbuilders and shipyards (Selfa Arctic and Ballstad Slip), a shipping company (Øra), energy and infrastructure suppliers (H2 Marine, Plug and Lofotkraft), a municipality (Flakstad), a business cluster (Renergy), a research institute (SINTEF) and a university (NTNU).

ZeroKyst was awarded NOK 120 million in the Green Platform Initiative's first allocation round in September 2021. The Green Platform Initiative provides funding for comprehensive green transition projects. The projects should comprise targeted research, technology development and business development, and take a comprehensive approach to the whole process from knowledge production to the implementation, commercialisation and scaling of green technologies, processes, products and services.

4.9 The forest and timber industry and other bioeconomy sectors



Norway shall have the world's most sustainable forestry. The bioresources from sea and land will be used to make climate-friendly and profitable products, including biofuels, and contribute to the development of industrial jobs and long value chains in Norway.

Market opportunities

The forest and timber industry has been important since the dawn of industrialisation in Norway, and new challenges related to climate and sustainable production and consumption represent new opportunities for the development of a modern bioeconomy. There is a growing demand for biomass and bio-based products that can contribute to emission cuts through carbon storage and sustainable energy and production systems. Norway has significant bioresources from land and sea, which can provide a basis for increased sustainable value creation. A prerequisite for their operations is the safeguarding of the resource bases and climate and environmental values.

The volume of logging has increased in recent years. One third of the felled volume is exported. This offers potential for increased forest-based industrial value creation in Norway through profitable processing. Wood building materials are the most important value driver in the industry. In recent years, Norwegian wood architecture and the 'world-class' utilization of wood in buildings, in combination with an increased need for climate-friendly solutions, have contributed to new market opportunities for Norwegian players and increased demand for wood-



Timber from Norwegian forests shall contribute to the greatest possible value creation through further processing and export of finished goods.

based building materials. There is also increasing demand for sustainably produced biofuels, cellulose and other wood processing products.

Efficient utilization of residual raw materials can contribute to increased value creation and increased profitability in the value chain as a whole. For example, increased production of both biofuels and more advanced products can contribute to increasing the market value of residual raw materials, and thus also its degree of utilization. Norway's sound systems for resource overview and for testing new solutions in the bioindustries provide a good starting point for utilizing a larger part of the raw material. Development work is underway with the aim of producing more of the raw materials for animal feed from residual raw materials and by reusing bioresources. This may reduce the need for imports of for instance soybeans and sugar, contribute to more climate-friendly food production and increase food security in Norway and Europe. The global need for more sustainable food production means that new technology and associated services in the area are also in demand internationally.

Norway has internationally recognised competence and industrial players within advanced processing

and circular utilization of bioresources. Their production includes biochemicals, health food and pharmaceutical products from biomass. Several of the industrial players are investing in research and technology development to increase utilization of the raw material for various consumer products.

Challenges

If resources from forests, land and sea are to create value and attractive jobs to a greater extent throughout the country, it must be possible to deliver the resources to industry on competitive terms. This requires constant attention to cost-cutting measures. Challenging topography and long transport distances lead to significant costs within the forest and timber industry. An adequate infrastructure for timber transport and transport of goods in general is therefore important for the industry's competitiveness.

Competitiveness in the industrial segment of the value chain is affected by the ability to produce more efficiently and cut costs, and to exploit the potential for product development and innovation. Important factors for success are the development and upgrading of production technology, and access to capital.

FACTS

Latest generation biogas plant

The biogas at the Renevo AS plant on Stord is made from manure from livestock and fish waste from fish farms in the region. The plant will produce liquefied biogas totalling 50 GWh of bio-LNG. In addition to converting waste into biogas, carbon is captured as a by-product of the process. This is the first time such a reactor has been combined with a carbon capture system. The carbon is used to make dry ice. Bio-residue is another residual product from biogas production that can be used as fertiliser instead of mineral fertiliser. Renevo will, among other things, deliver biogas to Aker Solutions' yard on Stord, to help it achieve its goal of reducing its CO₂ emissions by 50 per cent by 2030. Biogas is one of several measures to achieve this goal.



The Government has established Bionova as a tool to contribute to climate measures in agriculture. Bionova will also contribute to bioeconomy innovation and value creation in agriculture, forestry and aquaculture.

In order to further develop the Norwegian forest-based industry, funds have been earmarked for investments in the forest and timber industry through the state-owned investment company Investinor. Investinor's funds for the forest and timber industries can be pooled in a joint fund with private stakeholders. Investinor, KLP and the forestry industry are launching 3K6 Skoginvest, a new investment fund that will invest in innovative companies in the Norwegian forestry-related sector. The fund, currently under establishment, will be the first of its kind in Norway. Investinor and KLP will each invest NOK 150 million in the fund, while the forest industry will invest through the company Shelterwood AS. The fund will be managed by Investinor.

The dialogue between the Minister of Agriculture and Food, the forest and timber industry, the knowledge communities and the policy instrument system is being followed up and continued.

Bionova has been established as an entity organised under Innovation Norway and is located at Innovation Norway's regional office in Brummundal. Bionova will serve as a tool for contributing to climate measures in agriculture. Bionova will also contribute to bioeconomy innovation and value creation in agriculture, forestry and aquaculture.

The Government has launched sustainable feed as a mission in the Long-term plan for research and higher education. This is a new policy instrument in the Norwegian context, linking research and development more closely with regulatory work and other policy development. The Research Council of Norway has recently announced a call for applications for research and innovation funds to boost the development of sustainable feed for livestock and farmed fish. The BioDigSirk project has been concluded, and its recommendations are being followed up, e.g. through the sustainable feed mission. The current regulatory framework for food and feed production was not developed for circular resource utilisation. Efforts are being intensified to develop the EEA-based regulatory framework to enable increased utilisation of bioresources currently defined as waste.

Changes to the regulatory framework for resource management can contribute to more efficient and profitable utilization of bioresources, by making it unfavourable or illegal to allow resources to end up as waste. Criteria for public procurement are also an important tool for stimulating the development of sustainable products or markets such as the use of wood in buildings and advanced biofuels.

For parts of the marine bioeconomy, more knowledge about the resource base, new technologies and new methods for sustainable harvesting will be necessary for increasing production and extraction in a profitable and sustainable manner.

Biological production systems are highly exposed to changes in climatic conditions and extreme weather events, and the management of bioresources must therefore be adapted to these challenges. In forestry, periodically lower activity and investments in forest production can also affect the industry's raw material costs and long-term access to resources.

Political initiatives and processes

Policy and established framework for sustainable forestry forms the basis for a long-term supply of raw materials to the industry. Adequate trade-offs between activities and environmental considerations, between nature and climate, and between use and protection will be central to the Government's forest policy.

The competitiveness and market opportunities of the forest and timber industry and other bio-based industries are affected by the framework conditions in several policy areas, and coordination and cooperation across sectors is therefore important.

- ✦ The Government has continued and further developed the dialogue forum for the forest and timber industry between the Minister of Agriculture and Food, the industry, knowledge communities and the policy instrument system. The aim is to exchange relevant information and facilitate discussion of key challenges for the industry.
- ✦ The Government has established Bionova as a tool to contribute to climate measures in agriculture. Bionova will also contribute to bioeconomy innovation and value creation in agriculture, forestry and aquaculture.
- ✦ The Government has launched a social mission on sustainable feed that is expected to make important contributions Norway's climate, environment, food production, employment and value creation goals, and increase the production of raw materials for concentrate feed in Norway.
- ✦ The Government will follow up the recommendations from the BioDigSirk project through, among other things, the sustainable feed mission.
- ✦ The Government will give priority to measures that increase the profitability of forestry.
- ✦ The Government will facilitate further processing within the industrial part of the value chain by developing the resource base and improving the infrastructure in forestry.

- ✧ The Government will give priority to afforestation, young forest management and other silviculture measures.
- ✧ The Government will develop a transport strategy that contributes to more industrial processing of forests in Norway and the reduction of greenhouse gas emissions. The strategy will be developed as part of the work on the new National Transport Plan.
- ✧ The Government will further develop initiatives in bioenergy and advanced biofuels in the transport sector.
- ✧ The Government will ask the ministries to consider increased use of wood in Government building projects where suitable.
- ✧ The Government will stimulate knowledge-based development of regulations for a circular bioeconomics, which ensures safe and efficient use of bioresources.
- ✧ The Government will facilitate good market access for circular, bio-based products.
- ✧ The Government will facilitate access to and increased use of residual raw materials as a basis for the development of new Norwegian industry. Its use must be safe for humans, animals and the environment.
- ✧ The Government will work in a targeted manner to bring Norwegian priorities into the EU's regulatory work with regard to food and feed production, in order to give Norwegian producers sufficient latitude to increase resource utilization within a sustainable framework.
- ✧ The Government will facilitate research and business activity for bioproducts, including seaweed and new marine resources



05

Follow-up and status of measures

List of all 100 measures in the June 2022
Green Industrial Initiative roadmap and
new measures

2.1 Power



- The Government's ambition is to increase the capacity of the power grid and to reduce licence processing times.
- The Government will consider the recommendations made by the Energy Commission and the Grid Development Committee. In light of the Grid Development Committee's recommendations, the Government will assess whether projects can be prioritised for grid connection based on various criteria, such as maturity, high value creation potential or climate impact.
- The Government will increase its case processing capacity to contribute to faster licensing of grids and power production.
- The Government will through specific measures facilitate better fixed-price agreements for people and businesses. Changes to the ground rent tax are among the measures.
- The Government will facilitate large-scale development of offshore wind, with the ambition to take the work on profitable production of offshore wind a major step further. Offshore wind has great potential to increase power production in Norway, and the Government's ambition is to allocate an area equivalent to 30 GW by 2040, with the goal of, among other things, securing industrial development, innovation, technology development and increased emission-free power production, cf. section 4.1. An investment in offshore wind of this size will allow for the use of various grid solutions.
- The Government will increase hydropower production, partly on the basis of the Storting's decision to introduce a cash flow-based tax for hydropower and by continuing to prioritise the upgrading and expansion of existing hydropower plants in the licensing process. There is still some potential for brand new hydropower.
- The Government will allow wind power developments in places where there are good wind conditions and local acceptance. Due consideration must be given to safeguarding important natural assets. The Government has allowed for consideration of completely new wind power projects, and has asked NVE to accept new notifications for consideration. It is a prerequisite that the host municipality agrees. The Government wants more of the value creation to accrue to the local community.
- The Government will assess the Hurdal Platform's ambition to set a target for the production of solar power by 2030, after the Energy Commission has presented its report. Solar power is expected to play a greater role in the Norwegian power supply by 2040.
- The Government will facilitate the development of locally produced energy in Norway, including solar power, including by conducting a survey of regulatory barriers to local energy production. The Government wishes to look into how local energy production relating to local consumption in industry and commercial property can help prevent the need for new grid investments. Among other things, the Government will consider whether new buildings should produce some of their own power needs.
- The Government aims for more efficient use of energy and is working on a comprehensive action plan for energy efficiency in all parts of the economy. (cf. section 4.7 Solar industry).

2.2 Area and infrastructure



- The Government will work continuously to enhance dialogue between the authorities in the planning processes and avoid unnecessary use of protests.

- The Government will prepare a short guide that shows the requirements for location, area assessments and studies in connection with the establishment of green industry, especially aimed at actors in the industry and relevant authorities.

- The Government will present a national strategy for the preparation of green industrial areas and industrial parks with international competitive advantages across Norway.

- The Government will develop a set of overarching principles for the spatial use of Norwegian ocean areas. This is intended to create predictability and a basis for coexistence across ocean industries, while nevertheless safeguarding marine ecosystems and the needs of the Norwegian Armed Forces. These principles will be presented in the Government's Ocean Industry Plan for Norwegian Ocean Areas and mentioned in the whitepaper to the Storting Norway's integrated ocean management plans.

- The Government will commission DOGA (Design and Architecture Norway) to develop knowledge and inspiration materials on how design and architecture can be used to create green industrial start-ups that promote social and environmental sustainability.

- The Government wants green industrial start-ups to use land effectively without unnecessary impact on nature. Municipalities should aim to facilitate industrial start-ups in line with climate and environmental interests of national or significant regional interest.

- The Government will in the spring of 2024 present a white paper on the National Transport Plan 2025–2036. Its goals include contributing to achieving Norway's climate and environmental goals as well as increased competitiveness for the business community. The business sector's need for transport infrastructure and efficient freight transport will be an important consideration in this work.

2.3 Raw materials



- The Government will prepare a mineral strategy. The work is expected to be completed in autumn 2022. Given the importance of minerals for the green transition, it is natural to see the work on the Green Industrial Initiative and the Mineral Strategy in context.

- The Government will consider the recommendations of the Minerals Act Committee, which will deliver its report on amendments to the Minerals Act in June 2022. Among other things, the committee will look at how to better facilitate sustainable mineral extraction in Norway.

- The Government will continue the ongoing opening process for seabed minerals in accordance with the Seabed Minerals Act, based on the established programme for impact assessment and the assignment given to the Norwegian Petroleum Directorate regarding resource assessment.

● The Government will consider new regulation and improved information sharing on product content in the industry. Following up the EU's circular economy strategy is an important part of this work.

● The Government will contribute to the development of European value chains for critical raw materials, including extraction, processing and recycling, among other things through strategic industrial partnerships with the EU and selected countries. The goal is to ensure the parties involved have reliable and stable access to such raw materials over time.

● The Government has submitted proposals for consultation for new legislation on sustainable products and value chains to facilitate the implementation of new regulations aimed at products and priority value chains.

● The Government will present an action plan for a circular economy.

● The Government will facilitate profitable and sustainable mineral activities on the seabed and has presented a white paper on the possibility of opening areas on the Norwegian continental shelf for seabed mineral activities and strategies for managing the resources.

2.4 Capital



● The Government will mobilise as much private capital as possible for the green transition, including through internationally competitive schemes for risk mitigation.

● The Government will provide targeted risk mitigation for good, profitable business projects within the priority areas of the Green Industrial Initiative. This may include different types of loans, guarantees and equity.

● The Government will dimension the policy instrument system to meet the growing need for guarantees and loans for green industrial projects. Increased government risk mitigation requires good projects and a willingness to invest privately. The policy instrument system estimates that the need for risk mitigation related to the Green Industrial Initiative may be in the order of NOK 60 billion by 2025.

● The Government will continue to strengthen Eksfin's role as an instrument for green industrial development to help realise more large, green industrial projects in the next few years.

● The Government will develop parameters to measure the policy instrument system's contribution to the green transition and will monitor developments over time.

● The Government will review the recommendations made by the expert committee on climate-friendly investments and consider further measures to stimulate new profitable climate-friendly investments.

● The Government will review the Tax Committee's assessments of how correct environmental pricing and other economic instruments can contribute to better resource utilisation, circular production and consumption patterns, and encourage value creation based on circular solutions.

- The Government is following up on its promises of 30 June to strengthen the capital instruments under the Green Industrial Initiative to increase investment in green industrial projects, and it will propose significantly increasing capital infusions to Nysnø and Siva. The Government will return to this in connection with the changes to the national budget for 2023 at the end of November.

2.5 Research, technology development and digitalisation



- The Government will review the policy instrument system to further consolidate its efforts towards the green transition in the business sector and support the Green Industrial Initiative.
- The Government will ask the funding agencies to consider how the principles of the EU taxonomy can be used as a reference point for assessing whether projects can be defined as green and how industries that are not covered by the taxonomy should be handled.
- The Government will take the initiative to consider how reporting and statistics procedures from the funding agencies can be developed and be as comparable as possible with similar statistics in the EU.
- The Government will establish easier access to the policy instrument system, making it simple to find the right scheme. As a first step, a digital solution has been launched where companies can receive guidance in the policy instrument system by contacting a one-stop shop.
- The Government prioritises Norwegian participation in important EU programmes, such as Horizon Europe, InvestEU, the DIGITALEuropa programme, the European Defence Fund (EDF) and the EU space programme. This gives industry the opportunity to further develop international networks, use digital infrastructure and test facilities and receive public funding.
- The Government will present a Long-term plan for research and higher education (LTP) for the period 2023–2032 in autumn 2022. The knowledge and research needs for the green transition will be central to the long-term plan.
- The Government is, in its work on the long-term plan, investigating the possibility of using social missions in research and higher education policy. 'Social mission' is the term for cross-sectoral initiatives implemented to achieve a specific goal within a given deadline.
- The Government wants Norwegian industry to be a leader in Industry 4.0 and will therefore consider schemes to bring about promising projects in the field of automation and digitalisation of industry, including the possible creation of a national Industry 4.0 programme.
- The Government will facilitate increased value creation with data by encouraging increased sharing and use of data in and across sectors and industries.

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- The Government has created the funding programme 'Industry 2050', aimed at industrial point emissions, where Enova supports the development and realisation of technology leaps that contribute to an industry adapted to the low-emission society.
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The Government will encourage a shift in the industry's research and innovation activity towards climate and environmentally friendly solutions, green transition and circular economy in line with the Long-term plan for research and higher education (LTP) for the period 2023–2032.

The Government has initiated work on the social mission on sustainable feed for LTP 2023–2032.

- The Government will present a strategy to increase research in the business sector.

2.6 Labour and skillst



- The Government will present a report to the Storting highlighting the skills needs of the labour market in the short and long term. The overall goal of the report will be to meet society's skills needs in the future, and ensure that citizens throughout the country have access to education.
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- The Government will invest in education throughout the country. The focus on decentralised education enables people to take education where they live, based on local skills needs. Technology and the green transition are two of the priority areas.
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- The Government will implement a broad skills reform for the labour market based on tripartite cooperation. The Government is concerned with how a broad skills reform can be implemented, with particular emphasis on industry's future challenges.
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- The Government will continue the Skills Policy Council. The Government will work on skills policy in collaboration with the Council.
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- The Government will continue arrangements aimed specifically at the industry's skills needs, such as the tripartite industry programme and the Industrial Training School (Industrifagskolen), in cooperation with the parties.
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- The Government will assign vocational education and training a key role in the skills reform. The Government will give the vocational college a greater role in educating skilled professionals, and further educating and developing the workforce throughout the country.
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- The Government will consider how the recommendations of the expert committee that has considered the funding system for universities and university colleges should be followed up. An important priority will be to equip the sector to meet society's skills needs going forward.
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- The Government will follow up Report No 14 to the Storting (2022-23) *Utsyn over kompetansebehovet i Norge* ('Future skills needs in Norway' – in Norwegian only), which highlights the skills needs of the labour market in the short and long term. The Government announces in the report that skills needs arising from the green transition will be a priority in the years ahead. Among other things, the Government will:
 - Prioritise the skills necessary for a highly productive and competitive business sector and the skills necessary to implement the green transition.
 - Prioritise study places in technical subjects, health and care professions and areas that are particularly important for the green transition in future allocations of study places to the tertiary vocational colleges, and facilitate dialogue with the county authorities on how they can follow up these priorities in their management of the sector.
- The Government will consider the recommendations of the latest report of the Norwegian Committee on Skill Needs (submitted to the Ministry of Education on 12 June 2023), *Fremtidige kompetansebehov: Utfordringer for grønn omstilling i arbeidslivet* ('Future skills needs: Challenges for the green transition in the workplace' – in Norwegian only), which will look at skills needs for the green transition.
- The Government is in dialogue with the parties in the leading sector settlement concerning industry's special skills needs, and how the skills policy instruments can be arranged to better meet these.
- The Government will in 2025 introduce a new funding system for universities and university colleges that gives them more freedom to prioritise future skills needs in the short and long term and to strengthen education across Norway.

2.7 Export markets



- The Government will develop a strategic industrial partnership with the EU and other relevant countries to achieve the goal of increasing exports.
- The Government will further develop Norway's Export Strategy (*Hele Norge eksporterer*), where the authorities, the business sector and the policy instrument system will join forces to develop ambitious export initiatives abroad.
- The Government will through Norway's Export Strategy ensure that the work on strategic export initiatives is more closely linked to the Government's other work. It is particularly important to see the work on export promotion in the context of the rest of the industrial policy, such as the Green Industrial Initiative and the work to simplify the policy instrument system.
- The Government will work to ensure the completion of ongoing trade agreements negotiations with, among others, [Malaysia](#), [India](#), [Kosovo](#), [Moldova](#), [Mercosur](#), [Vietnam](#) and [Thailand](#).

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- The Government will give priority to new trade agreements with countries that make the greatest possible contribution to trade and value creation and that ensure basic standards, climate and environmental considerations and labour rights, and to updating the trade agreements with [Canada](#), [Chile](#), [Mexico](#) and the [South African Customs Union](#) (Botswana, Eswatini, Lesotho, Namibia and South Africa).

 - The Government will develop a strategic industrial partnership with the EU to position Norway as a partner in the green transition and strengthen opportunities to create jobs throughout Norway. Examples include batteries, critical raw materials and renewable energy.

 - The Government will follow up the dialogue with Germany on energy and industrial restructuring, and carry out specific activities in sectors such as hydrogen, offshore wind, CCS and green industry.

 - The Government will affirm the industrial cooperation with Sweden and Denmark through the joint declarations. This will be achieved by establishing closer links between the funding agencies with respect to export promotion, bilateral dialogue, simplifying the opportunities for scaling up businesses with easier access to Nordic markets, cooperating on technology development, and developing regulatory frameworks and common standards.

 - The Government will give priority to closer cooperation with the Nordic countries in relevant areas and continuously assess other countries where similar dialogues would be appropriate, with an emphasis on Europe.

 - The Government will strengthen its work on the implementation of EEA regulations to contribute to equal framework and competitive conditions for Norwegian companies throughout the EEA.

 - The Government will strengthen dialogue and cooperation in partnership with the US and facilitate business cooperation for sectors related to the green transition.

3.1 Stronger coordination in the public administration



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- The Government will facilitate dialogue with the county authorities and regional stakeholders on the Green Industrial Initiative, in order to ensure that national initiatives and developments draw on and support regional opportunities and advantages.

 - The Government will assess the need to appoint a national coordinator for large industrial start-ups in northern Norway.
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3.2 Closer cooperation with industry, social partners and knowledge communities



- The Government will conduct a series of thematic executive meetings chaired by the Prime Minister, in order to strengthen cooperation with the business community and obtain relevant input to the work on the Green Industrial Initiative.

- The Government will establish a Green Industry Council chaired by the Minister of Trade and Industry, where the social partners, industry representatives, the environmental movement and research and development communities can discuss challenges and develop a common understanding of the roles and responsibilities of different actors with respect to green industrial development.

3.3 Climate partnership between the authorities, social partners and industry



- The Government will start work on climate partnerships by inviting the central organisations to dialogue and the conclusion of a memorandum of understanding on the overall framework for climate partnerships. Both employer and employee organisations will be involved.

- The Government will prioritise engaging in dialogue on climate partnerships with the industries that account for the largest emissions and where the potential for rapid emission cuts is greatest.

- The Government will facilitate implementation of the UN Sustainable Development Goals in Norwegian industry.

- The Government will enter into binding agreements on climate partnerships with the three industries, the maritime industry, the building, construction and real estate industry, and the process industry.

- The Government will facilitate the implementation of regulations for companies' sustainability reporting, in line with the new regulations. Norwegian actors will be required to meet detailed sustainability reporting requirements through new EU regulations.

4.1 Offshore wind power



- The Government will facilitate large-scale development of offshore wind on the Norwegian continental shelf by allocating areas for 30 GW of production by 2040.
- The Government will facilitate the realisation of the first 1,500 MW from Sørilige Nordsjø II with a connection to Norway.
- The Government will facilitate an offshore wind development that allows for the use of various grid solutions. Cables with two-way power flow, radials to Europe and radials to Norway will be assessed for each call. When choosing an offshore grid solution that involves connection to the Norwegian power system, its technical design must ensure national interests, including security of supply and reasonable power prices for households, industry and business.
- The Government will facilitate innovation and technology development. By allocating areas in Utsira Nord according to qualitative criteria, we will facilitate innovation and technology development that can contribute to future cost reductions for floating offshore wind and develop the supplier industry.
- The Government will facilitate a long-term investment in offshore wind in Norway with several rounds of opening areas for offshore wind. The Government has therefore commissioned NVE to identify new areas for renewable energy production at sea based on input from a directorate group.
- The Government will work to streamline the licensing process leading up to the completion of the first wind power projects in Norwegian marine areas. The goal is to enable the first projects to be put into operation before 2030.
- The Government will give Statnett responsibility for planning the offshore grid, in addition to offshore system responsibility.
- The Government will award project areas for offshore wind in the areas Sørilige Nordsjø II and Utsira Nord. The Government will facilitate a major offshore wind development that allows for the use of various grid solutions.
- The Government will facilitate a long-term investment in offshore wind in Norway with several rounds of opening areas for offshore wind. The next round is scheduled for 2025.
- The Government will follow up NVE's proposals for new areas to be opened for offshore renewable energy production.

4.2 Batteries



- The Government will present a battery strategy in summer 2022.

- The Government proposes in the national budget for 2024 an innovation grant for major battery projects of an IPCEI nature. Strict requirements apply in terms of innovation height, industrial scalability, ripple effects, implementation capacity, binding European cooperation and environmental impact. The innovation grant has a budget of around NOK 1 billion over five years, and it will be managed by Innovation Norway.

4.3 Hydrogen



- The Government will contribute to building a coherent value chain for hydrogen produced with low or zero emissions where production, distribution and use are developed in parallel.

- The Government will map the market opportunities for hydrogen in Europe and investigate the potential for exporting hydrogen from Norway through various production and distribution solutions.

- The Government will contribute to the development of a market for hydrogen in Europe by, among other things, participating in relevant cooperation forums and programmes for hydrogen, developing regulations for hydrogen in Europe as an EEA country, research cooperation, bilateral cooperation with relevant countries and by creating a national market for hydrogen.

- The Government will carry out an external study that will give the state a better foundation for contributing to building a coherent value chain for hydrogen. State ownership as an instrument will be included in the assessment.

- The Government's ambition will be to facilitate the production of hydrogen with low or zero emissions to meet national demand in 2030. The goal is to help reduce Norwegian greenhouse gas emissions.

- The Government will facilitate the establishment of socially profitable production of blue hydrogen, among other things through Gassco's architectural function, by allocating area for carbon storage under the Storage Regulations for stakeholders with storage needs, and processing relevant applications for developments under the Storage Regulations quickly and efficiently.

- The Government aims to enable Norwegian projects to participate in the EU Innovation Fund's upcoming hydrogen auction. The programme will provide a ten-year grant for green hydrogen production, and the auction is scheduled to take place towards the end of 2023 with a budget of EUR 800 million.

4.4 CCS



- The Government will continue Norway's overall efforts to support technology development in the area and promote CCS as an important climate measure internationally.
- The Government will contribute to the implementation of the Longship project as a key element in its CCS policy and Norway's contribution to developing the necessary climate technologies.
- The Government will ensure that Northern Lights is able to recruit Norwegian and international customers.
- The Government will facilitate commercial carbon storage on the Norwegian continental shelf by awarding storage areas to companies with concrete industrial plans that entail a need for storage.

4.5 Process industry



- The Government will continue the aid scheme for the compensation of indirect emission cost in the industry (the CO₂ compensation scheme) and work actively to safeguard Norwegian interests in connection with the EU's work to combat carbon leakage (CBAM).
- The Government will continue its work to promote CCS, hydrogen and electrification as important contributions to cutting emissions from Norwegian industry and achieving the temperature target in the Paris Agreement.
- The Government will prioritise engaging in dialogue on climate partnerships with the industries that account for the largest emissions and where the potential for rapid emission cuts is greatest, including the process industry.
- The Government will be actively involved in the discussions in the EU on how the Emissions Trading System (ETS) should be further developed in the longer term, in order to safeguard emission cuts and profitable restructuring of Norwegian industry.
- The Government will further develop the instruments for technology development and emission cuts in industry.
- The Government will facilitate the development and use of low and zero-emission technology that will accelerate the green transition, including in the process industry.
- The Government has continued the strategic industry forum Process21, and have updated its remit in 2023, tasking it with advising on how the Norwegian process industry can best achieve minimal emissions and sustainable growth towards 2030 and 2050.
- The Government wishes to enter into a climate partnership with the process industry.

4.6 Manufacturing



- The Government will invite the manufacturing industry to take responsibility for drafting a strategy comprising ambitions and operational measures.

- The Government will establish an executive forum that meets with the Minister of Trade and Industry on a regular basis, for example on a semi-annual basis. The main task of the forum is to link the manufacturing industry up with the new green value chains and will comprise participants from both the manufacturing industry and the green value chains.

- The Government wishes to include the manufacturing industry in its mapping of risks and vulnerabilities related to global supply lines for important input factors, raw materials and products imported into Norway.

- The Government will consider whether the Norwegian manufacturing industry can be marketed and profiled better abroad.

4.7 Solar industry



- The Government's ambition is for capital policy instruments for the Green Industrial Initiative and government loans for green projects to also be available for projects in the solar industry.

- The Government wants to include the solar industry in its mapping of risks and vulnerabilities associated with the global supply lines for important input factors, raw materials and products imported into Norway.

- The Government will invite the Norwegian solar industry and associated research communities into a roadmap process with the aim of delivering a strategy by the end of 2024.

- The Government will consider strengthening cooperation on solar industry with the EU or key individual countries through, for example, strategic partnerships.

4.8 Maritime industry



- The Government will follow up the Storting's petition resolution No 831 to the Storting (2020–2021) where 'the Storting asks the Government to get back to the Storting with a national plan for making shore power and charging power, hydrogen, ammonia and other green fuels available'.
- The Government has followed up the Storting's petition resolution No 841 (2020-2021) where 'the Storting asked the Government to investigate the room for manoeuvre under the EEA Agreement to give contracts for public procurement of vessels to Norwegian shipyards'. The Ministry of Trade, Industry and Fisheries commissioned Menon Economics and the law firm Arntzen de Besche Advokatfirma to assess the European market for public procurement of vessels and what room for manoeuvre there is within the scope of the EEA Agreement to stipulate requirements and criteria that could help the Norwegian maritime industry to compete effectively for public contracts. The measures proposed in the report entail that the authorities should attach less prominence to price and more to other requirements and criteria. The report is currently being assessed by the Ministry.
- The Government will focus on 'more and greener maritime exports', within the framework of Norway's Export Strategy. A greener maritime industry can contribute to further growth in the industry through export of low and zero-emission maritime solutions.
- The Government will prioritise engaging in dialogue on climate partnerships with the industries that account for the largest emissions and where the potential for rapid emission cuts is greatest, including the maritime sector.
- The Government will further develop international and Nordic cooperation that enables demonstration and testing of green solutions through the establishment of green corridors/ zero-emission maritime transport corridors.
- The Government will present a national plan for making climate-friendly fuel available to the shipping industry by 2023.
- The Government has increased Export Finance Norway's (Eksfin) maximum credit guarantee ratio for the Guarantee scheme for construction loans for ships, vessels and facilities at sea from 50 to 75 per cent. Through this scheme, Eksfin can mitigate credit risk for banks that provide construction loans to Norwegian shipyards and advance payment guarantees for shipbuyers.
- The Risk Loan scheme for short sea shipping and fishing vessels was expanded in 2023 to include vessels in the aquaculture industry, offshore vessels, ferries and high-speed boats, and the scheme changed name to the Risk Loan scheme for low and zero-emission ships. The Risk Loan scheme for low and zero-emission ships has a lending framework of NOK 470 million in 2023.

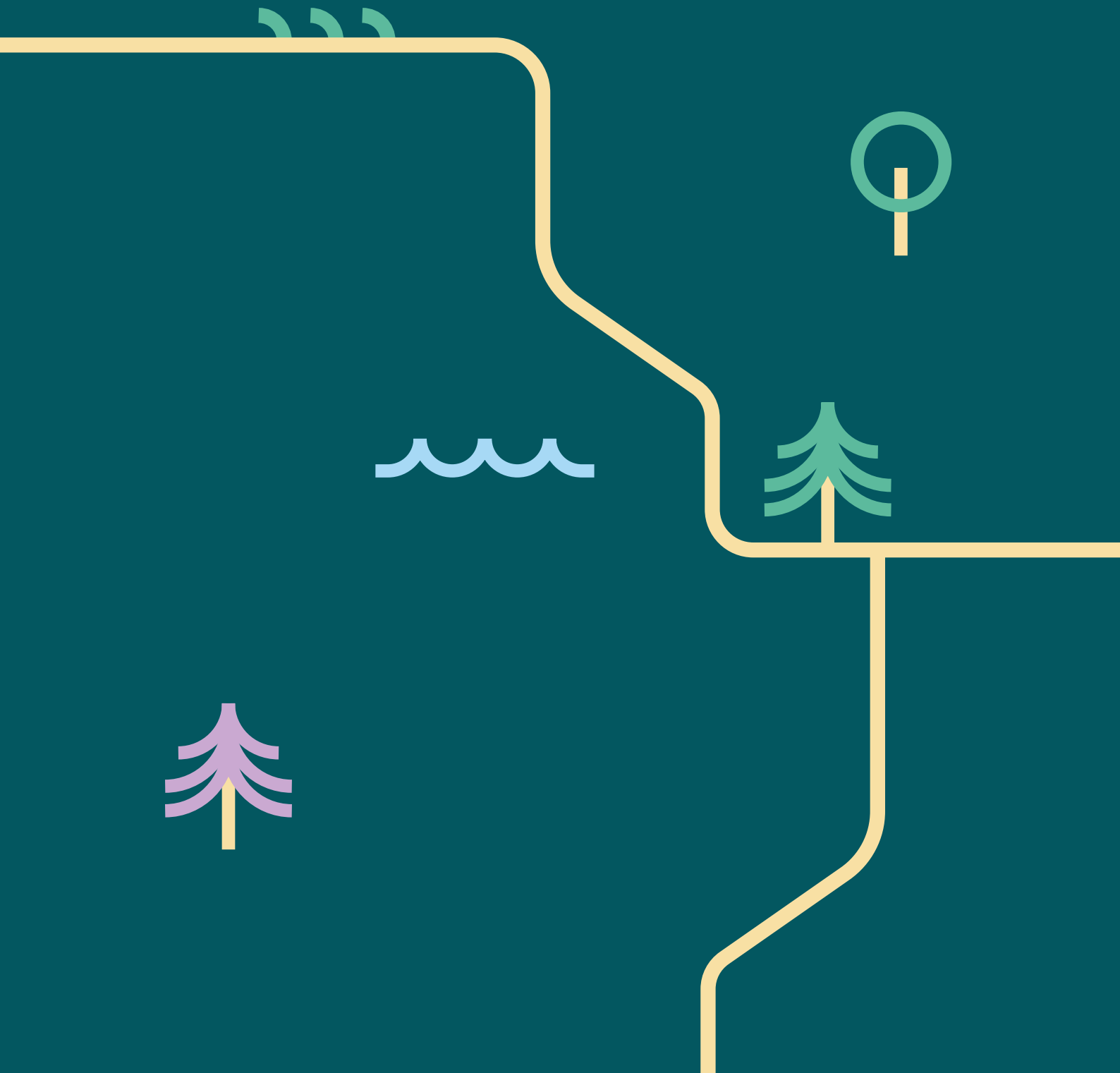
- The Government started the negotiations on a maritime climate partnership.
- The Government will further develop international and Nordic cooperation that enables demonstration and testing of green solutions through the establishment of green shipping corridors. Based on a Norwegian initiative, the Nordic Council of Ministers has funded a pilot study to identify potential green corridors in the Nordic countries. This study will be followed up in future cooperation on green shipping between the Nordic countries.
- The Government will distribute a draft of amendments to the Greenhouse Gas Emission Trading Act with a view to an amended act entering into force by the end of 2023, so that Norway will have the legal basis required to introduce emission trading for shipping from 1 January 2024.
- The Government has submitted a proposal for consultation on new zero-emission requirements for ferries and high-speed boats for consultation. The proposal outlines the introduction of zero-emission requirements for ferries as early as possible and for high-speed boats from 1 January 2025. Exceptions are also proposed to ensure that the requirements function optimally.
- The OECD countries recently agreed on a deal proposal that would modernise the government export finance agreement. The agreement regulates large parts of Export Finance Norway, and the modernisation includes increasing flexibility in ship financing.

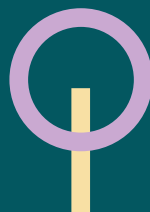
4.9 Forest and timber industry and bio-industry



- The Government will give priority to measures that increase the profitability of forestry.
- The Government will facilitate further processing within the industrial part of the value chain by developing the resource base and improving the infrastructure in forestry.
- The Government will give priority to afforestation, young forest management and other silviculture measures.
- The Government will develop a transport strategy that contributes to more industrial processing of forests in Norway and the reduction of greenhouse gas emissions. The strategy will be developed as part of the work on the new National Transport Plan.
- The Government will further develop initiatives in bioenergy and advanced biofuels in the transport sector.
- The Government will ask the ministries to consider increased use of wood in Government building projects where suitable.

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- The Government will continue and further develop the dialogue forum for the forest and timber industry between the Minister of Agriculture and Food, the industry, knowledge communities and the policy instrument system. The aim is to exchange relevant information and facilitate discussion of key challenges for the industry.
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- The Government will establish Bionova as a tool to contribute to climate measures in agriculture. Bionova will also contribute to bioeconomy innovation and value creation in agriculture, forestry and aquaculture. The goal is for Bionova to become operational in 2023.
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- The Government will stimulate knowledge-based development of regulations for a circular bioeconomics, which ensures safe and efficient use of bioresources.
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- The Government will facilitate good market access for circular, bio-based products.
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- The Government will consider follow-up of the recommendations from the BioDigSirk project on a digital marketplace for circular economies in the bio industries.
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- The Government will facilitate access to and increased use of residual raw materials as a basis for the development of new Norwegian industry. Its use must be safe for humans, animals and the environment.
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- The Government will develop a separate programme for the development of more sustainable feed and the use of carbon in feed production.
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- The Government will work in a targeted manner to bring Norwegian priorities into the EU's regulatory work with regard to food and feed production, in order to give Norwegian producers sufficient latitude to increase resource utilization within a sustainable framework.
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- The Government will facilitate research and business activity for bioproducts, including seaweed and new marine resources.
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- The Government has launched a social mission on sustainable feed that is expected to make important contributions Norway's climate, environment, food production, employment and value creation goals, and increase the production of raw materials for concentrate feed in Norway.
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- The Government will follow up the recommendations from the BioDigSirk project through, among other things, the sustainable feed mission.
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