Norwegian Ministry
of Local Government and Modernisation

Meld. St. 22 (2020–2021) Report to the Storting (white paper)

Data as a resource

The data-driven economy and innovation

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approved in the Council of State on the same day.
(The Solberg Government)

1 Introduction

1.1 The Government's goals and ambitions

The purpose of this report to the Storting is to present the Government's policy for value creation using data as a resource. The Government wants Norway to leverage the potential of data to enhance value creation, create new jobs, and to improve public sector efficiency. Better use of data is important if Norway is to succeed in the transition to a more sustainable society and a greener economy.

The emergence of the data economy is expected to be a key driver of economic growth. The data economy is defined as value creation based on data as an essential input factor in the production of goods and services or when data constitute a driver of innovative solutions.

The Government's ambition is to see increased data sharing within the private sector and between the private and public sectors. Data now account for an increasing proportion of value creation in most Norwegian industries and sectors, but the private sector must become even better at using its own data and at sharing data with others. Greater access to and better use of data within the private sector can help start-ups, growth companies and established businesses develop new business models, products and services. This in turn can help make Norwegian business and industry more competitive, both nationally and internationally.

The public sector must make more data available to the private sector. Reuse of public sector information is about giving businesses, researchers and civil society access to data from the public sector in ways that allow the data to be used in new contexts. Better use of data from private or public sources can lead to better services, new insights or other value-creating activities and products.

More public sector information should be shared, and the quality improved, in order to make it easier to reuse data in new contexts. Norway is falling in international rankings for public availability and sharing of data. Norway was ranked no. 29 in the EU's Open Data Maturity survey for 2020. In 2017 Norway was ranked no. 9 in the same survey. The Government will facilitate a more efficient and secure digital infrastructure for sharing and reusing public sector information. A sound regulatory framework and sufficiently strong incentives for data sharing must be established, as well as models that ensure that data sharing benefits society.

The education and research system must be designed to give the labour market access to the necessary knowledge and competence in and for the data economy. Having the right type and level of competence is vital for creating value using data as a resource. To meet the demand for skills in the labour market, there will be a need to provide more candidates with specialist ICT education and

to give those already active in the labour market opportunities to develop their skills through further education and other courses.

The Government will facilitate a responsible data economy in Norway and work to ensure that data is used in fair, ethical and responsible ways. Security and privacy must be safeguarded. Consumers' rights must be protected, and fair competition rules for Norwegian and international businesses facilitated. Artificial intelligence and big data analytics can help make services better adapted to individual needs. It is also important to prevent discrimination, data manipulation and misuse. Transparency, equal treatment and legal certainty are important democratic principles that must also apply in the data economy.

Many of the challenges of the data economy must be resolved through international cooperation. This includes ensuring fair competition and regulating the activities of multinational companies in the data economy. One of the key priorities in the Government's national IT policy is that Norway should be an integrated part of, and active participant in, the Digital Single Market in Europe.

More efficient use of data as a resource will also help Norway succeed in the transition to a more sustainable society and a greener economy. The European Commission's data strategy and digital strategy from February 2020 explicitly express the importance of having a common digital policy in the EU. The overarching goals for the digital strategy are that Europe's digital development should benefit both people and the environment, align with the European Union's social principles, and advance the objectives of the European Green Deal for a sustainable, climate-neutral and resource-efficient economy. Norway faces the same major challenges as the EU. There is therefore no reason why Norway should have lower ambitions in this area than the rest of Europe.

Norway is well placed to take on an active role in the data economy.

Norway is well placed to take on a more active role in the global data economy. In the past 10 years, Norway has established several national measures and policy instruments to promote the sharing and use of public sector information (data) in order to facilitate a more efficient public sector, innovation, research and business development.

Norway is at the forefront of digitalisation in both the public and private sectors. The country has a robust economy, competent industrial and technology communities, and a population of early adopters of new digital technologies. In Europe, only Denmark and Luxembourg have more digitally literate populations than Norway.[1] Along with Denmark, Norway has the best mobile and broadband access in Europe.[2]

Many of Norway's public services are already digitalised, and national registers and many public data sets hold a high standard. These are valuable data that must be managed properly and responsibly if they are to benefit society.

The fact that Norway has many good public registers is also linked to the population's consistently high level of trust in the authorities' management of the data collected. A high-trust society and good cooperation between the authorities, employers and unions, academia and research communities are important advantages which Norway must leverage and preserve while the data economy is developing.

1.2 National principles for data sharing and use

The Government sets the following principles for its data policy; see Figure 1.1:
1. Data must be as open as possible and as closed as necessary.
2. Data should be findable, accessible, interoperable and reusable (FAIR).
3. Data must be shared and used in ways that create value for the private sector, the public sector and society.
4. Data must be shared and used in ways that respect fundamental rights and freedoms and preserve Norwegian social values.

The Government's principles for data policy should underpin efficient sharing and use of data within safe and responsible parameters, and should ensure that value created from data benefits the private sector, the public sector and society. The principles should also facilitate mutual trust between entities that share and use each other's data, and public trust that data will be shared and used to the benefit of society.

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[1]   OECD (2017): *Digital Government Review of Norway. Boosting the Digital Transformation of the Public Sector* and SSB (2020): *ICT usage in households* www.ssb.no/ikthus

[2]   European Commission (2020): *The Digital Economy and Society Index (DESI)*

1

Data must be as open as possible and as closed as necessary

Data must be shared and used in a responsible and trustworthy manner. Good information management and information security are important when deciding which data can be shared and opened and which data must be protected for reasons of privacy, security, intellectual property rights or commercial interests.

2

Data should be accessible, findable, reusable and interoperable

Data should be made available in ways that make it possible to realise their value. To achieve this, data should be searchable and hold high quality, and it should be possible to connect them to other datasets in a secure manner. This implies that data must be complete and updated, be described with good metadata, and be machine-readable. Relevant national and international standards, terminology and references to other datasets should be complied with. Access should be given to data via open APIs and a licence clearly stating what purposes the data may be used for and how they can be used should accompany the data.

3

Data must be shared and used in ways that create value for the private sector, the public sector and society

Value that is created through sharing and using data must benefit Norway's private sector, public sector and society at large. Any value created in a data value chain should be shared in a fair manner, for example between the data provider and the data consumer. In some cases it may also be appropriate to set requirements for sharing private sector data with the public sector in areas where this will significantly benefit society. Data that are generated by activities in the private sector commissioned by or under permit or licence from the public sector must in principle be deemed a public good to be shared with others.

4

Data must be shared and used in ways that respect fundamental rights and freedoms and preserve Norwegian social values

Responsible and ethical use of data is important for preserving trust in Norwegian society. Data must be shared and used in ways that respect fundamental rights and freedoms. For example, increased sharing and use of personal data for new purposes may challenge privacy and individual autonomy. Enterprises that share and use data must not only evaluate the legality of using personal data and other sensitive data, but also undertake an ethical assessment. The ethical principles for artificial intelligence can be useful for such evaluations.

Figure 1.1 National principles for data sharing and use

The principles are founded on applicable legal requirements and policy guidelines within the EU and the OECD, as well as in Norway. The principles must also be practised in accordance with Norway's international trade agreements. The principles shall not prevent public sector organisations from charging for data, and the choice of funding models for sharing and use of data for reuse in different sectors must be respected.

1.3 The data economy and data as a resource

The value of the data economy

The data economy has vast potential for growth in the coming years. In its data strategy (2020), the European Commission projects the value of the data economy in EU27 will increase from EUR 301 billion in 2018 to EUR 829 billion by 2025. In 2020 Norway's data economy was estimated to account for annual value creation equivalent to NOK 150 billion and for 100,000 jobs. If the right conditions are created, these figures could double by 2030.[3]

Technologies such as artificial intelligence and big data analytics facilitate value-adding activities that were not previously possible. See Box 1.1 for an overview of important technology drivers in the data economy.

Technological development has driven fundamental changes in manufacturing, service provision and digital collaboration, and large amounts of data are today generated from many different sources. The European Commission considers industrial and commercial data to have the greatest value-creating potential for the private sector and for society.[4] This is largely because the already large data volumes from industrial and commercial applications will continue to increase. Increased sharing and better use of the data will increase value creation. Industrial data comprise data from sensors and control systems in manufacturing, maintenance scheduling systems and equipment data. Commercial data can comprise customer data, transactions, and so forth. In line with development of new digital services and platforms that target consumers, several commercial service providers also collect, use and share con-
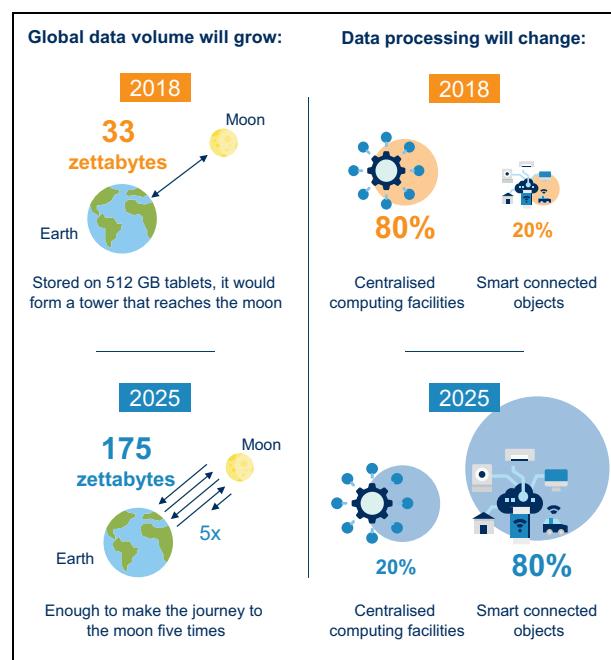
Figure 1.2 Expected changes in data volume and data processing

Source: European Commission (2020)

sumer data. These data are bought and sold in large volumes and used for purposes such as targeted marketing and improvement of products and services. When it comes to data sharing and use, an important distinction is drawn between personal data and data that cannot identify specific individuals. The *General Data Protection Regulation* sets rules for the processing of personal data; see chapter VII.

Important characteristics of data as a resource

Data are collectively referred to as non-rival goods. This means that data can be used and reused repeatedly, for example in algorithms and programmes. Data are thus often worth more if they are shared.

Combining different datasets can provide greater insights and form a basis for greater value creation than a single dataset. Increased sharing and use of data can generate new knowledge and alternative solutions that can be of greater benefit to society than if access to the data is confined to the individual data owner.

Data use generates economies of scale. Combining two complementary datasets can provide more insights than individual datasets, and it can be more efficient to process large datasets than to process datasets separately. Nonetheless, large

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[3] Menon Economics (2019) *Er verdiskaping med data noe Norge kan leve av?* [Can Norway live off value creation from data?] Menon publication no. 88/2019. 88/2019

[4] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions *A European strategy for data* COM/2020/66 final

Box 1.1 Technology drivers in the data economy

Cloud computing

Cloud computing refers to data storage and processing performed outside an enterprise, usually in large data centres. A common feature of cloud services is that they are paid for according to capacity used. Cloud computing is often provided by large international companies which also offer additional services such as security, statistics and analyses, machine learning, etc. For many companies cloud services are necessary to leverage the potential of data science and artificial intelligence because they provide access to computing power and frameworks for machine learning that cannot be established locally.

Sensor technology and the Internet of Things (IoT)

The Internet of Things (IoT) refers to objects ('things') that have sensors, software and communication technology that allow them to communicate with other objects connected to the internet. Gradually, as developments in sensor technology have provided better, smaller and cheaper sensors, and as technologies for wireless communication have improved, this network of things has grown. Various sources estimate that at the end of 2020, between 20 and 30 billion objects were connected to the internet. The data volume generated by such objects has therefore grown enormously in recent years.

When these objects are used in services that depend on computing in real time, such as autonomous vehicles or advanced manufacturing processes, the data processing must often be performed locally on the object (edge computing); that is, in the actual vehicle or the industrial sensor network. Such networks will often use 5G for fast and secure communication. As edge computing becomes more widespread and data volumes increase, a significantly smaller proportion of the total data volume will be processed in cloud services and centralised systems; see Figure 1.2.

Big data analytics

Big data analytics is the analysis of large data volumes composed of many different data sources with structured, unstructured and real-time data. The purpose is to find new interrelations and insights that cannot be derived through traditional methods of data analytics. Examples of areas that may benefit from this are medical diagnostics, consumer behaviour or crime prevention.

Artificial intelligence

Artificial intelligence is a collective term for information technologies where machine learning, machine reasoning and robotics are key elements. Artificial intelligence systems perform actions, physically or digitally, based on interpreting and processing structured or unstructured data. Artificial intelligence can also 'learn' and adapt by analysing and taking into account the effects of previous actions on the environment. Some examples of practical applications of artificial intelligence are pattern recognition, language technology and autonomous vehicles. Access to high-quality data is essential to leverage the potential of artificial intelligence.

High performance computing (HPC)

In many areas where work is performed on large datasets, the need for computing power to process data far exceeds what any enterprise can establish alone or procure through traditional cloud services. HPC will become increasingly important for industry and for the public sector, for example in connection with analysing the vast datasets generated by DNA sequencing, satellite observation or climate modelling. Norwegian research organisations and businesses have access to HPC facilities under the European High Performance Computing Joint Undertaking (EuroHPC).

Box 1.2 Key terms

Data essentially means any physical representation of information, knowledge, opinions, etc., and can be unstructured or structured. Data form the basis for information, but the distinction between data and information is not always clear.

Structured data are usually found organised in a database, list or table. *Unstructured data* is everything else, such as images, audio files, films, e-mails, documents and other information that is not organised. Between 70 and 90 per cent of all data is estimated to be unstructured.

A *dataset* is a collection of data in the form of, for example, a table, list or database that can be made available as a downloadable file and/or be accessed via an application programming interface (API).

A *data catalogue* is a structured collection of descriptions of datasets. A data catalogue makes it possible to find information about datasets, who administers the data and how the data are made available to others. Data.norge.no is an example of a data catalogue.

Data sharing is where an enterprise makes data available for use by one or more other enterprises, public and/or private, with or without terms of use (licences).

A *data producer* generates data through its activity. A *data provider* shares its own data or that of others with one or more parties. In many cases the same enterprise can act as both data producer and data provider. A *data consumer* (data user) uses its own data and/or that of others in processes, products, services, analyses or for other purposes.

Open data refers to information that is made accessible so that it can be read and interpreted by machines and humans and which everyone can access, use and share. *Closed data* refers to information only authorised and authenticated users have access to. Access to the data may be restricted for commercial or privacy reasons.

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datasets or data sharing alone will not create value. Data can only create value when they are placed in a context, analysed and processed.

Nor is it the case that datasets are either open and accessible to everyone or closed. The OECD employs different levels of openness and accessibility, from data restricted to individual enterprises, via data that are available to specific stakeholders or user groups, to data that are publicly available. Data can be accessible to different groups on different terms and at different times.

For many enterprises, creating value from data is about gaining an overview of and using their own data in order to improve, renew or innovate. It is estimated that approximately 90 per cent of value created from data is related to increased productivity in existing businesses and public sector organisations, while five per cent is related to innovation.[5]

Figure 1.3 presents a simplified description of how different types of data can be collected from different sources that are connected to the internet. The data are stored, processed and analysed in digital computer platforms 'in the cloud'. These platforms can be provided by the public sector, businesses, or by both in partnership.

New insight can be derived from the analyses. This insight can be used by the enterprises to improve, renew or innovate. Better use of data as a resource can, for example, contribute to managing some of the major societal challenges the world faces, and to generating new business opportunities and economic growth for individual companies.

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[5]   Menon Economics (2019) *Er verdiskaping med data noe Norge kan leve av?* [Can Norway live off value creation from data?] Menon publication no. 88/2019. 88/2019
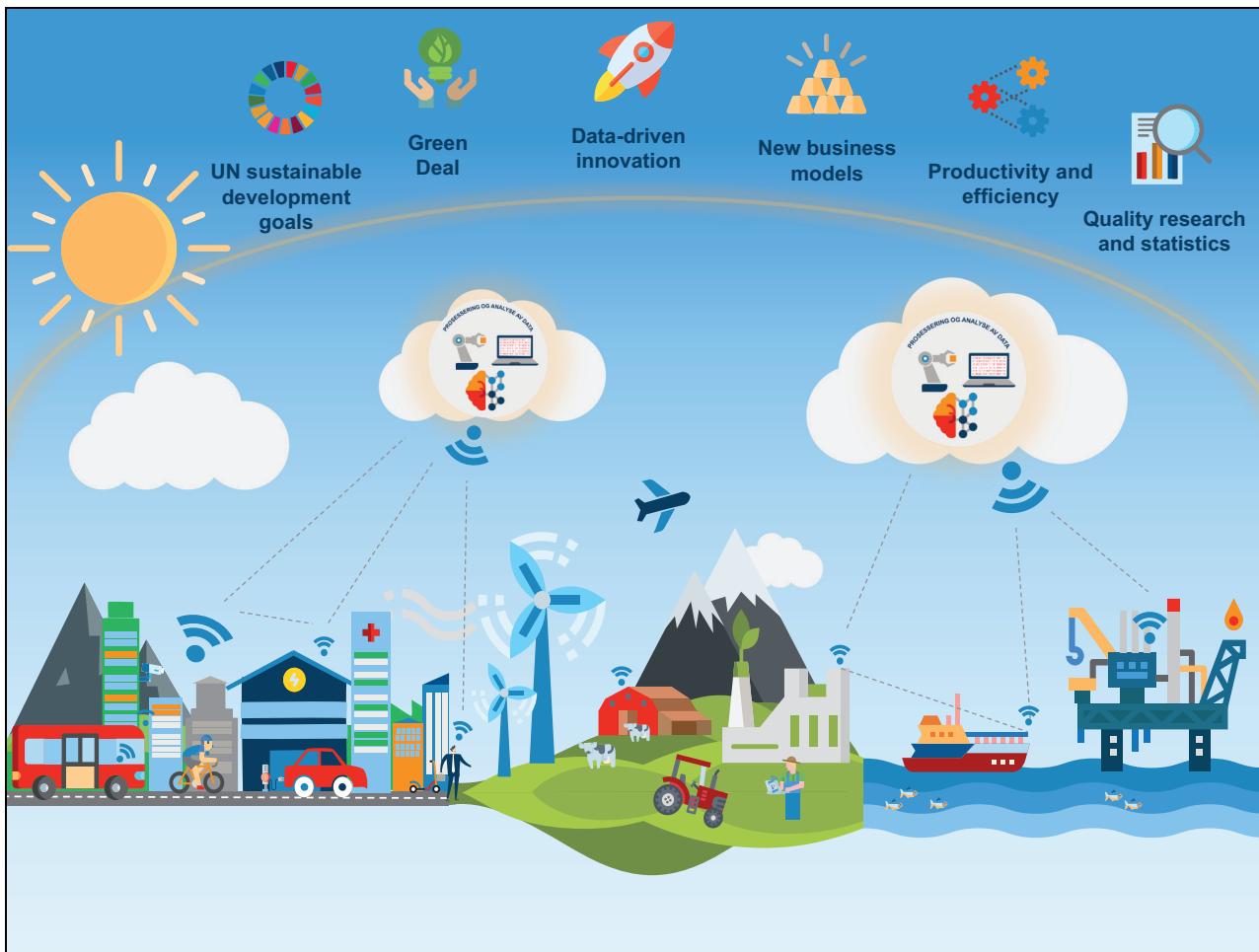
Figure 1.3 Value creation using data as a resource

2 Summary

The data economy has vast potential for growth in the coming years. In its data strategy (2020), the European Commission projects the value of the data economy in EU27 will increase from EUR 301 billion in 2018 to EUR 829 billion by 2025. The data economy in Norway is estimated to represent annual value creation equivalent to NOK 150 billion in 2020. If the right conditions are created, these figures are expected to double by 2030.[1] In a data economy, value creation occurs when data constitute a key input factor in the manufacture of goods and services or when data constitute a driver of innovative solutions. New technologies such as artificial intelligence and big data analytics makes it possible to derive more value from data than previously.

The purpose of this report to the Storting is to present the Government's policy for value creation using data as a resource. The Government wants Norway to leverage the potential of data to enhance value creation, create new jobs throughout the country, and to improve public sector efficiency. Better use of data is important if Norway is to succeed in the transition to a more sustainable society and a greener economy.

The Government's ambition is to see increased data sharing within the private sector and between the private and public sectors. Although data now account for an increasing proportion of value creation in most Norwegian industries and sectors, the private sector must do even better at using its own data and at sharing within established value chains. Increased digitalisation and better use of data will be important if Norwegian business and industry are to be competitive nationally and internationally.

Public sector information also has value for business and industry when it is used in new contexts and combined with other data, contributing to innovation and to new products and services. Data are already being shared in some sectors and areas of society, and good cooperation models across the public and private sectors have already been established in many areas. Nonetheless, many more public-sector datasets could be made available for reuse. The proportion of public agencies that publish datasets on data.norge.no is still small, and the quality of the data shared could be better. Public agencies could also do better at disseminating knowledge about their own data, motivating others to use them, and facilitating dialogue with business and industry.

The Government wants to see more value created using data as a resource, and wants to facilitate a responsible data economy so that the population can trust the products and services that are based on them. The Government has therefore set the following principles for its data policy:

1. Data must be as open as possible and as closed as necessary.
2. should be findable, accessible, interoperable and reusable (FAIR).
3. Data must be shared and used in ways that create value for the private sector, the public sector and society.
4. Data must be shared and used in ways that respect fundamental rights and freedoms and preserve Norwegian social values.

Chapter 1: Introduction

Chapter 1 describes the Government's goals, ambitions and principles for its data policy. It also presents the key terms and necessary conditions for a data-driven economy.

Chapter 3: International cooperation

Chapter 3 discusses the importance of international cooperation for developing Norway's data economy. Norway is affected by policy and regulatory developments in the EU because several regulations and directives are incorporated into Norwegian law via the EEA Agreement. It is therefore important that digitalisation efforts in Norway are designed to align with EU solutions and strategies in areas that are important for

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[1]   Menon Economics (2019): *Er verdiskaping med data noe Norge kan leve av?* [Can Norway live off value creation with data?]. Menon publication no. 88/2019

Norway's data economy.[2] The Government will exert its influence and actively contribute to moving common EU regulations and policies in a direction that benefits Norway, and will give priority to doing this in cooperation with the other Nordic countries.

Chapter 4: Data as a resource in business and industry

Chapter 4 describes key conditions for increased sharing and use of data in the private sector and how the Government will encourage greater value creation using data as a resource in the private sector. The extent to which business and industry manage to leverage the value-creating potential of data as a resource will have great significance for the country's future economy. Increased access to high-quality data will enable start-ups, growth companies and the established business sector to improve their business models, products and services or develop new ones. Better use of data in established value chains will also strengthen competitiveness in Norwegian industry. In some areas Norwegian industry has come a long way in sharing data, such as in the oil and gas industry. Other areas have vast untapped potential, though there are positive signs in agriculture, aquaculture and the building and construction industry.

If the private sector is to share and use more data, businesses and industries need to cooperate on developing common standards for data development and on establishing digital infrastructure that allows enterprises to collect, store, share and analyse data. The private sector also needs access to broadband (fibre and 5G) throughout the country and good data storage capacity. Several public-private sector development projects have been established in which better information flow and data sharing are important components. The Government continually considers possibilities to establish new public-private sector development initiatives.

Increased data sharing makes it more challenging to clarify data access and usage rights (ownership of data). The Government will appoint an interdisciplinary expert group on private sector data sharing to consider common guidelines on responsibility, ownership and usage rights in connection with sharing industrial data. The expert group will also look at roles and responsibilities where public and private entities are involved in the same data value chain.

The Government supports Norway's participation in the EU programmes DIGITAL and Horizon Europe, and will use its participation to help Norwegian companies and research communities gain access to cooperation partners and resources in artificial intelligence, supercomputers (high performance computing), ICT security and advanced digital skills. These are areas where Norway would have difficulty establishing capacity alone. The Government will also establish *Datafabrikken* (The Data Factory), a common platform for public and private entities. It will give small and medium-sized enterprises and start-ups easier access to high-quality data, advanced analytics technology for research and innovation, and to consultancy and advisory services. The Norwegian Digitalisation Agency's National Resource Centre for Data Sharing also plays an important advisory role for public and private sector entities.

Chapter 5: Public sector information as a resource for business and industry

Chapter 5 discusses public sector information (PSI) as an important source of innovation and business development. The Government will facilitate increased sharing of data in an efficient and secure manner. The Government will evaluate stronger incentives for sharing public sector information for reuse, and will appoint a public committee to consider new regulations for data reuse. In addition, the Ministry of Local Government and Modernisation will conduct a survey and evaluation of the data economy in the public sector and make recommendations on various organisational and funding models for sharing public sector information for reuse.

Chapter 6: Skills and research for a data-driven economy

Chapter 6 discusses the importance of skills and research for developing the data economy in Norway. If the potential for value creation in the data economy is to be realised, Norway must have a sufficient supply of the right skills. To meet the demand for skills in the labour market, Norway needs to educate more candidates with specialist ICT skills and to give those already active in the labour market the possibility to develop their skills through courses and further education. There is also a need for more knowledge about

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[2]   Report to the Storting no. 27 (2015–2016) *Digital agenda for Norway: ICT for a simpler everyday life and increased productivity*

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the data economy. Many of the issues the data economy raises cut across technology, law, economics and the social sciences. Increased inter-disciplinarity in research, study programmes, courses and further education programmes will therefore be important.

Chapter 7: Fair, ethical and responsible use of data

Chapter 7 discusses issues related to what is fair, ethical and responsible use of data and how the Government will facilitate a responsible data economy. A key issue is the work for a level playing field in international competition. It is also important to ensure that the value of data benefits Norwegian society. National and international cooperation will play an important role in this regard.

The Government will also ensure the provision of user-friendly and secure digital products and services for its citizens. Public and private entities will be encouraged to develop solutions that simplify individuals' access to information on their personal data and control of how the data are processed. The Government will explore the possibility of creating a common solution where citizens can easily find out what type of personal data relevant public agencies hold on them and what possibilities exist to manage the access to and use of their data.

3 International cooperation

One of the Government's key priorities in its national IT policy is that Norway should be an integrated part of, and active participant in, the European Digital Single Market. National priorities in IT policy are largely affected by international trends. Norway's efforts are particularly directed at the EU, the OECD and the Nordic-Baltic cooperation. Developments in the EU have significance for Norway because several regulations and directives are incorporated into Norwegian law via the EEA Agreement. It is therefore important that digitalisation efforts in Norway align with EU solutions and strategies in key areas. Norway must exert its influence and contribute to ensuring that developments in the EU move in a direction that benefits Norwegian business and industry. The Government will prioritise this in cooperation with the other Nordic countries.

3.1 Nordic cooperation

Nordic cooperation is one of the world's most extensive regional cooperation fora. The cooperation includes Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland. The Nordic countries share many of the same characteristics and are highly advanced in terms of availability and use of digital services. It is therefore natural for them to cooperate and learn from each other. In August 2019 the Nordic prime ministers adopted the common vision *The Nordic Region – towards being the most sustainable and integrated region in the world*. Digitalisation is a key component in realising this vision.

The Nordic Council of Ministers is an important arena of Nordic cooperation. Under the Norwegian presidency of the Nordic Council of Ministers in 2017, a common Nordic-Baltic ministerial declaration on digitalisation – *Digital North* –– was prepared and adopted. A separate Nordic Council of Ministers for Digitalisation (MR-DIGITAL) was established at the same time. MR-DIGITAL will, among other things, support the exchange and use of digital services across national borders in the region, as well as joint efforts to promote 5G, artificial intelligence and data sharing.

In 2020 the ministerial declaration was revised in *Digital North 2.0*. The declaration sets out three overriding objectives for the Nordic-Baltic cooperation:
- increased mobility through a common platform for cross-border digital services
- green economic growth and development through data-driven innovation and a fair data economy with efficient sharing and reuse of data
- promote Nordic-Baltic interests in the EU/EEA and globally to achieve a sustainable and inclusive digital transformation in society

Data sharing has been identified as a possible area for Nordic synergies. A Nordic-Baltic working group has therefore been formed to develop common initiatives related to artificial intelligence and data sharing. In 2020 a survey was conducted to identify available datasets from the public sector in the respective Nordic countries. The survey also asked how business and industry could benefit from having access to these types of data at the Nordic level.[1] Because many activities in this area are already undertaken by the European Commission, there was a wish to find areas where Nordic efforts could complement EU initiatives.

In connection with strategic Nordic-Baltic cooperation on digitalisation, an important objective has been to support European cooperation on digitalisation and realisation of the Digital Single Market. Reaching agreement on important positions or suggestions to the European Commission in areas of strategic importance for the Nordic region is a concrete example of Nordic cooperation in practice.

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[1] Nordic Council of Ministers (2020): *Nordic cooperation on data to boost the development of solutions with artificial intelligence*

3.2 The OECD's work on data sharing

For several years now, both the EU and the OECD have emphasised the growing importance of data as a basis for further development of the digital economy. The OECD's cross-cutting project, Enhancing Access to and Sharing of Data, has particularly contributed to drawing attention to data as a resource and a basis for value creation, particularly in the context of developments in artificial intelligence and the Internet of Things. The OECD emphasises that the growing number of datasets from sensors and other data sources, along with increasing use of technologies such as artificial intelligence, will make data important for a country's ability to innovate and compete in the future.

The objective for Enhancing Access to and Sharing of Data is to develop general principles for data sharing. The OECD has already made recommendations concerning public sector information, research data, environmental data and health data, among others. The project receives funding from Norway through the Ministry of Local Government and Modernisation and the Ministry of Education and Research. The project published its first report in 2019. The report singles out three challenges that need to be addressed in order to realise the benefits from the data economy[2]:

– The benefits of data sharing must be weighed against any risks associated with data protection, competition and national security.
– Stakeholders must be willing to cooperate on finding solutions for data sharing that do not conflict with their own business interests. This can prove complicated and resource-intensive.
– Incentive mechanisms that reduce uncertainties around data ownership and usage rights must be put in place.

The report reviews strategies for data sharing from 37 countries. The review shows that most countries still have strategies that focus on making public sector data available, and that only a few of them focus on sharing data across the private sector.

3.3 EU data policy

The EU is Norway's most important trading partner, and Norway already cooperates with the EU in several important areas. The measures the EU implements in the Digital Single Market, including the data market, have direct consequences for Norway and for Norwegian business and industry. EU cooperation is also important because it carries weight in negotiations with third countries and multinational corporations. Therefore, one of the Government's key priorities in its national IT policy is that Norway should be an integrated part of, and active participant in, the EU's Digital Single Market.

In February 2020 the European Commission published its digital strategy: *Shaping Europe's digital future*. At the same time, the Commission published *White paper on artificial intelligence – A European approach to excellence and trust* and *A European strategy for data*.

In its data strategy the European Commission refers to data as the lifeblood of economic development. The strategy established that data represent an essential resource for start-ups and small and medium-sized enterprises, as well as for the development of artificial intelligence. Europe wants to international leadership in the data-driven economy. The European data economy must be founded on common rules that safeguard the European Union's fundamental values, respect for privacy and human rights, and a vision that the human being is and should remain at the centre.

Personal data as well as commercially sensitive information should be adequately protected, and businesses should have easy access to high-quality industrial data. The strategy sets out four pillars for achieving this objective. The EU will

– establish cross-sectoral governance framework for data access and use
– strengthen capacity and infrastructure
– strengthen the skills of citizens and small and medium-sized enterprises
– establish common European data spaces in strategic sectors and domains of public interest

3.3.1 Common European data spaces

An important task in realising the objectives of the data strategy is the establishment of a framework for nine European data spaces in key sectors. These are: health, industry and manufacturing, agriculture, banking and finance, mobility, European Green Deal, energy, public administration, and skills; see figure 3.1. The framework for the data spaces will comprise standards, tools, and infrastructure for storing, processing and sharing data both within and between EU member states. The framework should also give data managers

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[2] OECD (2019): *Enhancing Access to and Sharing of Data: Reconciling Risks and Benefits for Data Re-use across Societies*

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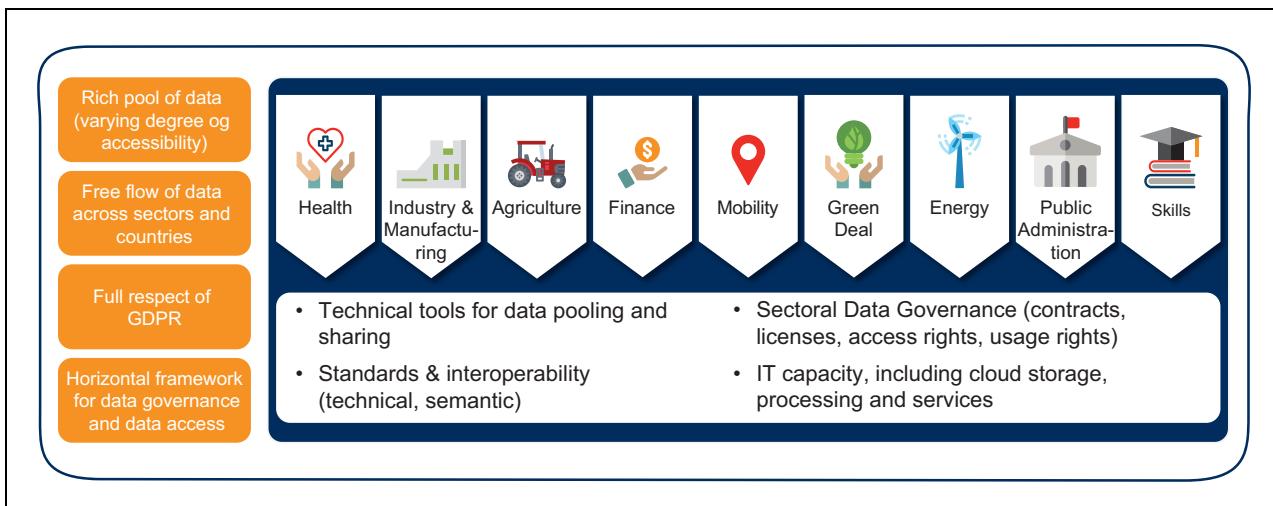
Figure 3.1 The EU's common European data spaces and related frameworks and policy areas

Source: European Commission

and users the rights, tools and skills to have control of their own data.

3.3.2 Legislative development and regulatory frameworks for data policy

Open Data Directive

An important body of rules for the data-driven economy comprises what are referred to as the *Reuse Directive* and the *PSI Directive* (Public Sector Information Directive).[3] The directives set out how public sector should share data which can be used to create value. In 2019 these directives were replaced by a new directive on open data and reuse of public sector information, known as the *Open Data Directive* (ODD).[4] The

purpose of the amendments in the directive is to make public sector information more widely available free of charge or at marginal cost. The directive defines six thematic categories where use of public sector information has major benefits for the economy and society, known as 'high-value datasets'; see Figure 3.2 The work on identifying which datasets should be included in this cate-

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[3] Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information and Directive 2013/37/EU of the European Parliament and of the Council of 26 June 2013 amending Directive 2003/98/EC on the re-use of public sector information

[4] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast)
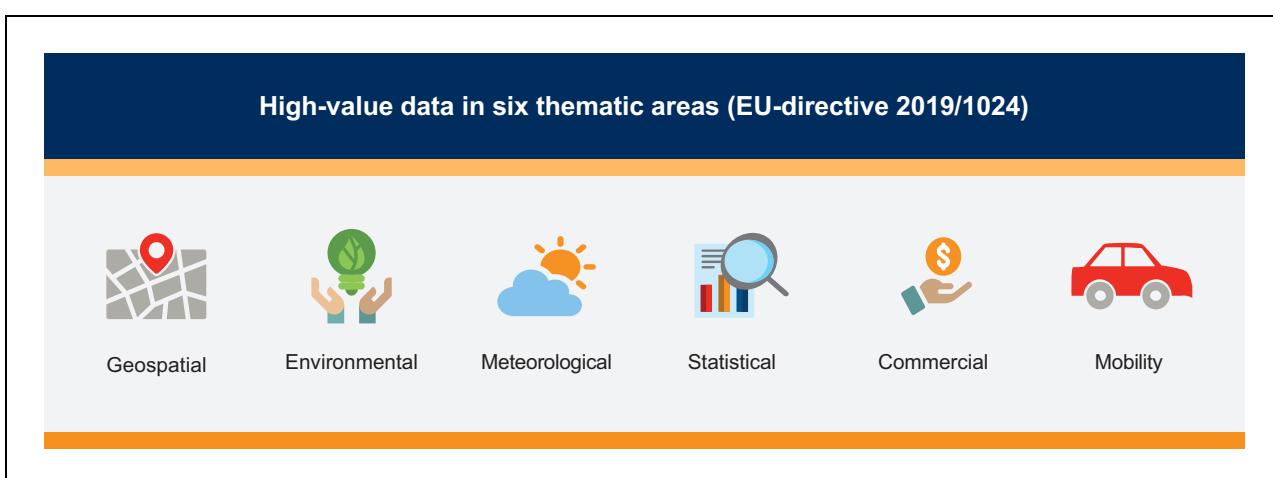
Figure 3.2 The EU's six thematic categories where datasets have high value for society

Source: European Commission

gory is currently being conducted in the EU/ EEA, and Norway is participating in this work.

The EU's PSI Directive was incorporated into Norwegian law through the *Freedom of Information Act*. Norway and the other EEA/EFTA states are considering whether to incorporate the new *Open Data Directive* into the EEA Agreement and if so, how.

The regulation on the free flow of non-personal data in the European Union

An important barrier to a Digital Single Market and a data-driven economy in the EU is the lack of data mobility. In 2018 the EU adopted a regulation introducing the principle of the free flow of non-personal data in the European Union, the *FFD Regulation*.[5] The purpose of the regulation is to remove national requirements to locate data in specific geographic areas. Together with the *General Data Protection Regulation*[6], the *FFD Regulation* creates a legal framework to ensure the free flow of data throughout the EU/EEA area. An exception applies to data concerning public security. The regulation is being considered by the EFTA states, and the Ministry of Local Government and Modernisation is working on its implementation in Norway.

Data Governance Act

In November 2020 the European Commission announced its proposal for a regulation on European data governance, the *Data Governance Act*.[7] The regulation has a number of objectives:
– The regulation will support establishment of the nine common European data spaces.
– The regulation will set requirements on the reuse of data from the public sector where third-party rights are involved (for example, intellectual property rights, trade secrets and personal data). When public agencies share such data, anonymity and confidentiality shall be maintained, and the conditions for sharing shall be based on non-discriminatory, proportionate and objectively justified conditions. No

duty is imposed on public agencies to share these types of data. It shall be easier for individuals to voluntarily share their own data for the benefit of society (referred to as 'data altruism') while ensuring data protection.
– The regulation contains rules on 'neutral data intermediaries' which shall act as trusted providers of data-sharing services between individuals and companies. The intermediaries shall help make it easier and safer for private companies and individuals to voluntarily make their data available to the general public under regulated conditions.[8] The data intermediaries must meet certain requirements: they must be neutral with respect to data that are shared, they must ensure compliance with national competition rules, and they must ensure that individuals' rights under the *General Data Protection Regulation* are safeguarded.

Furthermore, a board or expert group on data-driven innovation (Data Innovation Board) shall be created to provide advisory support to the European Commission.

The regulation is planned for adoption in the fourth quarter of 2021, with a 12-month implementation period. Norway will be affected by the proposal, and the Government will follow up and promote Norwegian interests in the further process in the EU.

EU framework for health data

In the wake of the Covid-19 pandemic, the European Commission has highlighted health as a priority area for developing a European common data area: the European Health Data Space. The Commission has announced that it will present a proposal for a directive in October 2021. The Council of Europe has asked the Commission to give priority to developments in this area. In February 2021 a two-year joint action commenced in which member states will prepare a proposal for a framework for the health data space. They will assess whether there is scope for further harmonisation of GDPR, technical and semantic standards, principles for architecture and infrastructure and guidelines on data altruism. They will also consider testing the exchange of data between different national platforms by national health authorities wherever these are established

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[5] Regulation (EU) 2018/1807 of the European Parliament and of the Council of 14 November 2018 on a framework for the free flow of non-personal data in the European Union

[6] Regulation (EU) 2016/679 of the European Parliament and of the Council (GDPR) was incorporated into Norwegian law in the Personal Data Act of 2018 (LOV-2018-06-15-38)

[7] Proposal for a Regulation of the European Parliament and of the Council on European data governance (Data Governance Act) COM/2020/767 final

[8] These are referred to as 'recognised data altruism organisations' in the European Commission's proposal

(health data permit authorities). Norway is participating in several projects in this initiative.

Intelligent Transport Systems Directive

Development and implementation of intelligent transport systems (ITS) is an important contribution towards achieving transport policy objectives, and a directive dealing specifically with ITS was adopted in the EU in 2010.[9] The directive was incorporated into the EEA Agreement on 30 September 2011.

The *ITS Directive* outlines a framework for the deployment of ITS in Europe, defines processes and gives the European Commission the authority to develop specifications and standards to ensure compatibility, interoperability and continuity for ITS across borders between the EU member states. Article 2 of the ITS Directive specifies the areas to which EU has given priority for developing specifications and standards:
– optimal use of road, traffic and travel data
– continuity of traffic and freight management ITS services
– ITS road safety and security applications
– linking the vehicle with the transport infrastructure

The European Commission began work on revising the directive in the autumn of 2020.

INSPIRE Directive

INSPIRE[10] is the EU's initiative to establish a central access point to maps and geographical information. The directive sets requirements for data sharing and technical requirements for documentation and interoperability. The directive covers data on addresses, geographic names, properties, heights and depths, lakes and rivers, transport networks, energy sources, utilities and government services, and a long list of themes relevant to environmental policy. The data shall be available for search, viewing and download via standard electronic services. The directive has been implemented in Norwegian law through the *Spatial Data Act*.[11]

Data Act

The next legislative measure planned by the European Commission to follow up the EU data strategy is the *Data Act*, which is expected in the third quarter of 2021. In its work on the regulation, the European Commission will
– foster the sharing of data that are of public interest from the private sector to the public sector
– foster data sharing within the private sector, in particular addressing issues related to usage rights for co-generated data and that are typically set out in private contracts
– identify and address any undue existing hurdles hindering data sharing
– clarify rules for the responsible use of data, such as legal liability
– facilitate voluntary data sharing as a general principle; data sharing should only be made compulsory under specific circumstances
– evaluate the intellectual property rights framework in order to enhance data sharing

The European Commission will also announce a separate implementation regulation on high-value datasets in 2021, under the *Open Data Directive*.

Many of the challenges posed by the data economy must be resolved through international cooperation. The Government will therefore engage in international cooperation and participate actively in developing common European legislation on data.

3.3.3 The connection between EU data policy and the European Green Deal

According to the European Commission, increased digitalisation and better use of data are important for increased competitiveness, the green shift and growth in Europe. The European Green Deal is the EU's follow-up of the UN Sustainable Development Goals and the Paris Agreement, which also provide direction for Norwegian policy.

The European Commission's follow-up of the European Green Deal has direct and indirect links with the Commission's digital and data policies. The strategy sets out three overarching goals for Europe's digital development to benefit both people and the environment, align with the European Union's social values, and advance the plan

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[9] Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of intelligent transport systems in the field of road transport and for interfaces with other modes of transport

[10] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

[11] Act on an infrastructure for geographical information (Spatial Data Act) LOV-2010-09-03-56

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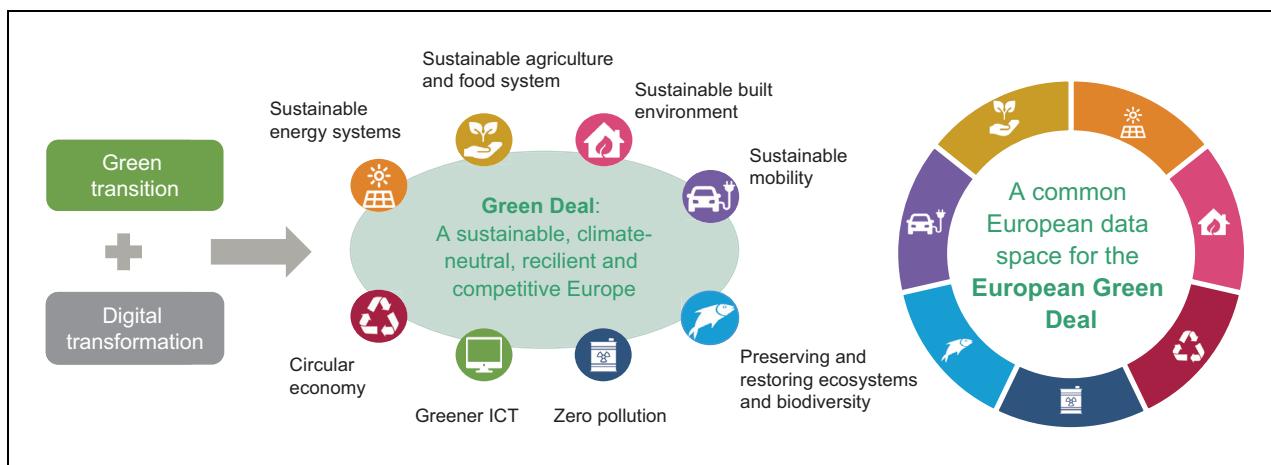
Figure 3.3 The connection between EU data policy, data strategy and the European Green Deal

Source: European Commission

of the European Green Deal for a sustainable, climate-neutral and resource-efficient economy. Digitalisation and use of new technologies, including better use of data, will be essential for achieving the aim of a climate-neutral Europe by 2050.

A separate data space will be established for the European Green Deal under the new data strategy; see Figure 3.3. The data space will unlock the potential of data that support the EU climate policy objectives. These include transitioning to a circular economy, the zero-emissions vision, protection of biodiversity, reduced deforestation, and control over the implementation of measures.

Climate reporting has attracted increasing attention in the private sector in recent years, and the EU's work on sustainable finance to channel capital towards sustainable investments is a key driver in this respect. If businesses are to become more sustainable, it is important that they can track direct and indirect emissions in the value chain, meaning at every step in the production process, from raw materials to finished goods. Increased digitalisation and better use of data can also make it easier for businesses and public sector procurers to require their suppliers to submit documentation proving that their products are low-carbon and sustainable. The EU has announced plans to develop a digital product passport to make it easier for consumers to find information on a product's contents, life cycle, repairability and recyclability.

In early 2021 the Government presented its white paper on climate.[12] The white paper presents targets and measures for how the Govern-

ment intends to reduce greenhouse gas emissions between 2021 and 2030. Better use of technology and climate-related data in ways that provide deeper insights into environmental impacts are important for identifying measures to reduce the carbon footprint. The Government has also presented a white paper on the UN sustainable development goals.[13]

The Government will align the national IT and data policies in a way that helps Norway achieve its climate and environment targets and its sustainable development goals by 2030.

3.4   The Government will

The Government will

- enable the national IT and data polices to contribute to green transformation and private sector growth, and help Norway achieve its sustainable development targets and its climate and environment targets
- influence the development of international legislation that is relevant to the development of the data economy
- implement the regulation on the free flow of non-personal data in the EU
- prepare implementation of the Open Data Directive
- follow up and promote Norwegian interests in the further legislative process for the EU's proposed Data Governance Act

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[12] Meld. St. 13 (2020–2021) *Klimaplan for 2021–2030* [Climate plan for 2021–2030]

[13] Meld. St. 40 (2020–2021) *Mål med mening – Norges handlingsplan for å nå bærekraftsmålene innen 2030* [Norway's action plan to reach the UN Sustainable Development Goals by 2030]

4 Data as a resource in business and industry

4.1 Background

In the private sector, data has traditionally been regarded as an important competitive advantage, and most businesses have been protective of their own data. The retail industry collects customer data for loyalty programmes, industry collects process data, and agriculture and aquaculture collect increasing amounts of information from their local environments. Increased access to data and the realisation that the more data, the better the analysis have led a growing number of businesses to see the advantages of sharing their data with others and of using data from other sources in their own activities.

In some sectors, such as oil and gas and aquaculture, Norwegian companies are leading the way in data sharing. This often applies to the sharing of industrial data, which are collected as part of the operation and production processes. Such data are often used in combination with geographic data (geospatial data) to establish location information. They can also be combined with important data from the local environment. such as meteorological data, pollution data and soil data.

Although some industries are already sharing data certain data types, vast potential remains. The health industry is one area with vast value-creating potential, and the Government has launched a separate white paper on the health industry.[1] However, health data also present challenges because many of the most valuable datasets contain personal data. In other industries the main challenge is competitively sensitive information.

In the spring of 2020, the Minister of Regional Development and Digitalisation appointed an expert group on private sector data sharing, and the group's work forms an important knowledge base for this white paper. The expert group's mandate and recommendations are discussed in detail in Box 4.1 As early as 2017, a '21 process' on digitalisation was initiated. A '21 process' is industry-driven national strategy work commissioned by the Government or a ministry to promote research-based value creation and development in key areas of society. Digital21 is therefore a strategy by and for the private sector. The strategy makes recommendations on how the private sector can develop and benefit from skills, technology, research and development in order to succeed with digitalisation. The recommendations cut across different business sectors and industries, with participation from the private sector and knowledge communities. Data resources represent an important area for the strategy. The expert group on private sector data sharing used Digital21 as the starting point for its work.

4.2 Prerequisites for increased data sharing and use in the private sector

Increased data sharing in the private sector will help give more enterprises access to a sufficient volume of high-quality data to advance data-driven innovation. This particularly applies to small and medium-sized enterprises (SMEs) and start-ups which do not generate large volumes of data from their own activities.

4.2.1 The ability and willingness to share and use data in the private sector

In a data-driven economy, the ability to convert data into insight will be important in determining which companies and industries will succeed in the future. It will be particularly important for companies to learn about the potential in new technologies. But new technologies alone provide no benefit unless companies are willing to implement the necessary changes in their organisations, work processes and business models. Management has a strong influence on how a company and its employees use and adopt new technology. Many companies in the industries that are leading the way in data sharing and use

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[1] Meld. St. 18 (2018–2019) The health industry. Report to the Storting (white paper) Summary in English

Box 4.1 Expert group on private sector data sharing

The expert group's mandate has been to examine the following questions related to the sharing of data from the business sector:

– what problems arise when data are shared in value chains in the business sector and between (competing) companies?

– what data from the business sector, beyond those mentioned in the EU's Open Data Directive, might be of particular public interest?

– what conditions must exist before such data can be shared?

The expert group emphasises that, for most businesses, the ability to use their *own data* will be the key enabler of value creation and a condition for being able to benefit from data from other sources. It is therefore important to strengthen the capacity of individual businesses to understand and use their own data. Data sharing alone does not create value, according to the expert group.

There are four conditions in particular that need to be in place; see Figure 4.1. The most important motivation for the business sector to share data is to advance their own business interests. Value can only be created once the companies have gained a thorough understanding of the underlying challenges that need resolving and can formulate a sound strategy for realising the potential value. They must also have access to data in sufficient volumes and of the right quality. Moreover, they need access to sufficient skills and capacity to properly process the data, including software and other digital tools for analysing and using them. Finally, they need access to sufficient amounts of risk-bearing capital and competitive conditions.

The expert group highlights several challenges associated with sharing data in the business sector, and suggests measures to address them:

There is a need for generalist and specialist skills in areas that are important for data sharing, such as ICT specialists, computer scientists and experts in the interface between law and ICT:

Focus should be placed on educational programmes, combined with more cooperation between the business sector and academia on research centres. Research centres linked to the
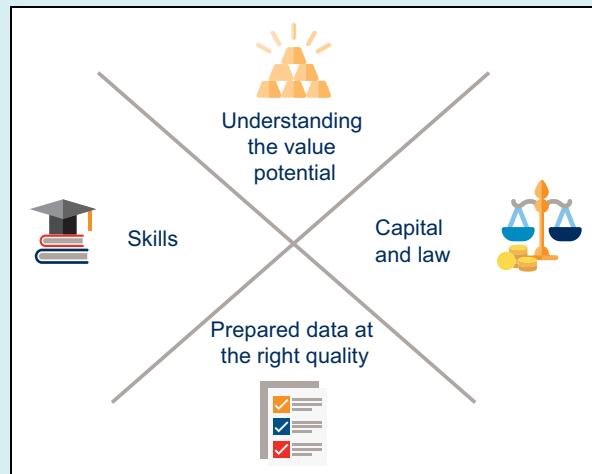
Figure 4.1 Conditions for succeeding with data sharing

work on using datasets of particular public interest should be established.

There is a lack of trust between the players, and businesses fear that sharing data will weaken their position in the market:

Through a combination of good data-sharing architecture and standard agreements, it is possible to create mechanisms that enable businesses to protect their rights to a large extent.

Companies feel they have little scope for action because they are worried about violating complicated rules and regulations:

There is a need for advisory bodies that can help businesses understand their scope for action, particularly with regard to competition rules, data protection regulations and rules governing illegal state aid. Norway must support and contribute to the EU's efforts to create better competition opportunities for smaller companies in the battle against the multinational tech giants.

There is a lack of capital for start-ups:

The private start-up ecosystem in Norway is not strong enough, and more involvement from the public sector is therefore recommended.

Source: *Rapport fra ekspertgruppen for datadeling i næringslivet* [Report by the Expert Group on Private Sector Data Sharing] April 2020

have established their own strategies or road maps for how they will digitalise and leverage their own data to improve and renew their business or to innovate.

Having the right skills is an important prerequisite if companies are to benefit from data. Many highlight the lack of relevant skills as an important reason why companies, and SMEs in particular, fail to leverage the value-creating potential of their data. They often lack employees with insight into the potential of, for example, data analytics and artificial intelligence.[2] Moreover, the IT industry cites difficulties in recruiting candidates with specialist IT skills.[3] Skills and research for the data economy are discussed in chapter 6.

4.2.2 Digital infrastructure and standards for exchanging data

Industry principles and standardisation

The private sector is encouraged to take the initiative to develop common infrastructures for data sharing within the respective industries and sectors. Several of the industries in which Norway is at the forefront of digitalisation and data sharing in the private sector have come together to define and/or develop standards and frameworks for data sharing and use. Such standardisation is an important prerequisite for increased digitalisation of businesses and better use of data for greater value creation.

For data to be useful to others, they must be made available in ways that enable other enterprises to realise their value. To do this, the data must be searchable and of high quality, and it must be possible to connect different datasets securely and effectively. It is therefore important that datasets are complete and updated, described with good metadata and machine-readable.

Companies that make their data available to others should preferably grant access to the data via an open application programming interface (API). APIs are used to exchange data between applications. API documentation describes the interface, which data are exchanged and how other programmes should proceed in order to

communicate via the relevant API. A standard interface is an advantage.

In Norway, standardisation is conducted through interaction between the public and private sectors. The state plays an important part in the development of new standards, as client, technical authority and user. In many areas there is a close connection between government regulations and standards. Common standards contribute to higher levels of productivity and quality and facilitate increased innovation. The state should therefore take the initiative and involve the private sector in order to stimulate a good and cross-disciplinary environment for further development of standards.

International standardisation activities

Standards, specifications and guidelines are developed internationally through the standardisation organisations ISO and CEN. These are standards with which Norwegian business and industry must comply in order to participate in the European and international markets.

By influencing international standards on data sharing and use within different sectors and industries, Norway can help ensure that these standards are relevant for Norwegian enterprises. Such influence is exerted by participating in international standardisation activities and by chairing working groups in areas that are important for Norway. It is most often the large companies that take an active part in standardisation activities. The threshold for participating in this type of activity can be high for many SMEs for various reasons, such as travel costs and the time involved.

The Government will encourage Norwegian business and industry to participate in national and international standardisation activities related to the data economy. The Government will help promote the work on international standardisation related to data sharing and use, particularly with regard to encouraging SMEs to participate in this work. This can be done by, for example, establishing common industrial projects in industries where the potential to increase value creation using data is largely unrealised. This is happening today in the building and construction industry and the petroleum industry, among others.

For example, work on AI activities is being conducted in the standardisation organisations ISO and EIC, and at European level in CEN and CENELEC. Standard Norway has created a mirror committee in this area (SN/K 586 *Kunstig*

[2] KPMG (2020): *Hindre for digitalisering av forretningsprosesser* [Barriers to digitalisation of business processes]. Report commissioned by the Ministry of Local Government and Modernisation

[3] Samfunnsøkonomisk analyse (2021): *Norges behov for IKT-kompetanse i dag og framover* [Norway's need for ICT competence today and in future]. R1-2021

intelligens). The committee is composed of representatives from research, business and industry, national authorities and various interest groups. Standard Norway currently has a number of such national mirror committees in the areas of data and digitalisation.

Electronic communication networks

Many of Norway's most important industries are located along the coastline, such as the seafood, aquaculture, oil, energy and maritime industries. Good infrastructure for electronic communication, such as networks for fixed and mobile broadband, have significance for competitiveness, value creation and employment throughout the country. Good broadband infrastructure is critical for many emerging industries that are driven by digitalisation, such as the data centre industry. The fibre infrastructure has been strengthened in recent years, in part through establishment of several new international connections.

The Government will continue to pursue its market-based approach to broadband policy. The private sector is investing considerable amounts in Norwegian mobile and broadband networks; more than NOK 12 billion in 2019. The Ministry of Local Government and Modernisation provides states subsidies to fund broadband rollout in areas where commercial rollout is considered unprofitable.

The size of the annual state aid for broadband deployment has been larger under the current government than under the previous one. This reflects the increasing importance of digital infrastructure. Many municipalities and regions spend considerable amounts on subsidising broadband deployment in sparsely populated areas where rollout is not commercially viable.

Building and construction work, such as excavation, account for a large share of the costs of broadband deployment. Measures to reduce the cost of broadband deployment can therefore ensure profitability in deployment projects, and thereby greater coverage and better offerings in new areas.

The Broadband Development Act (*bredbåndsutbyggingsloven*) came into force on 1 July 2020. This legislation is intended to make it simpler for developers to access existing infrastructure like utility poles and pipes, thereby reducing the complexity and cost of further developing the broadband. The Government expects that this will speed up the development of high-capacity networks and give Norwegian citizens more broadband at a lower cost. The Norwegian Communications Authority (Nkom) will develop a website to provide information about such existing infrastructure and planned building works.

Development of fifth generation mobile networks (5G)

International comparisons show that Norway's mobile networks are among the best in the world.[4]

Deployment of fifth generation (5G) mobile networks is especially important for the data economy. 5G can contribute to new solutions and increased productivity in all sectors of society. Many services are already provided over 4G, but 5G will facilitate even more services that require extremely high speeds/capacity, low latency and that can handle a large number of connected devices. This will make it possible to provide services such as support for autonomous vehicles, remote surgery on patients and industrial applications. A latency rate as low as 1 millisecond (one thousandth of a second) is an important property in contexts like these.

5G will facilitate machine-to-machine (M2M) communication on a far larger scale than has been possible up until now. M2M has many different applications, such as sensor networks, energy monitoring, equipment tracking, smart homes, smart cities and intelligent transport services. This is particularly important for realising the Internet of Things (IoT).

It is therefore important that 5G also is deployed outside of central urban areas. In 2021 the Government launched a regional package for high-speed broadband. This can amount to over half a billion Norwegian kroner in a targeted investment in fast, wireless broadband in areas where such services do not exist today. This is done by offering 5G network providers discount on the attractive frequencies needed to roll out 5G if they roll out broadband capacity in sparsely populated areas.

The Government presented a white paper on electronic communication in the spring of 2021.[5]

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[4] European Commission (2020): *The Digital Economy and Society Index* (DESI). The 'connectivity' index measures a combination of factors that are associated with broadband coverage and mobile coverage

[5] Meld. St. 28 (2020–2021) Vår felles digitale grunnmur – Mobil-, bredbånds- og internettjenester [Our common digital foundation – Mobile, broadband and internet services]

4.2.3 Trust, data ownership and usage rights

Data sharing in the business sector is usually conducted via established value chains within the same business or industry. The arrangement is based on trust, cooperation and interdependence. A key driver of data sharing is the opportunities it offers companies for growth and enhanced competitiveness.

Basically, all businesses own their own data, and it is up to them to decide how they will be used. Good information management and information security are important to ensure that each business has an overview of what data it possesses, which data can be shared, and which data must be protected for reasons for privacy, security, intellectual property rights or commercial interests. One of the reasons why businesses do not share their data with other businesses is the fear of making mistakes. This fear is particularly related to improper management of personal data and potential violations of the *General Data Protection Regulation*, but also to protection of trade secrets.

Many businesses are also uncertain about how much scope they have to share data they have obtained from external sources, and what responsibility they may have for use of the data if they are shared with others. To avoid uncertainty about permits, the data should be issued with a licence clearly stating who may use the data and how they may be used. Business and industry should cooperate on developing standard licenses to resolve such issues.

It is not necessarily the case that the business collecting the data is the only one to benefit from them, or that benefit is only derived by businesses within the same value chain. For example, large amounts of data can be generated in connection with a vehicle. That data may be valuable to a number of stakeholders, such as the vehicle manufacturer, the parts supplier, the workshops that will maintain and repair the vehicle, the transport authorities, the insurance companies, and so forth. Moreover, the driving data are generated by a driver who may not necessarily be the owner of the vehicle. The challenge that may arise concerns questions about who owns what data, who should have access to them, and for what purpose they should be allowed to use them. This is becoming increasingly relevant as more and more products and machines are installed with sensors that are connected to the internet and the amount of data collected grows. Thus, ownership and usage rights are important issues in the data-driven economy.

A study was conducted on the issue of data ownership in the agricultural and seafood industries.[6] The study shows that, on a detailed level, ownership of data is not immediately clear when data are shared and reused. Among other things, the line is blurred between the producer of the raw commodity (the farmer or fish farmer) and the industry that processes the raw commodities. The lines between these businesses and the technology providers are also blurred, as well as between the public sector, the farmer, the fish farmer and industry. The situation is further complicated by the fact that some companies regulate ownership of data in agreements on the use of products and services, which may not relate to the actual data flow and data processing. The report concluded that the general principle should be that ownership of data should follow the processes and products that initially generate the data. In other words, data on agricultural products belong to the farmer and data on fish to the fish farmer. The parties are continuing the work on defining principles for data ownership on a more detailed level. Industry initiatives, such as this example from agriculture and aquaculture, can help reduce the uncertainties many have around these issues.

Protecting intellectual property rights

The more enterprises that cooperate on sharing and using each other's data, the greater the level of complexity. In a data value chain involving multiple enterprises there are often issues with clarifying ownership and access to data, as well as questions around usage rights.

Protecting intellectual property rights is important to ensure that the market for the data-driven economy develops in the right way. It is unfortunate if it is not clear to all who owns the data, how they are licensed, and how access to the data is granted, i.e. whether they are free of charge or must be paid for. Most of these challenges can be resolved through agreements between the parties, where ownership and access and usage rights are clarified in the contractual agreement. However, some value chains can be so complex that drawing up and complying with agreements can prove extremely difficult.

In Germany, a framework for data sharing in the industry sector, International Data Spaces,

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[6] DNV-GL (2020): *Utredning om eierskap til data i Landbruks- og Sjømatnæringen* [Report on ownership of data in the agricultural and seafood industry]

was established as part of the Industry 4.0 initiative. The framework has been expanded to industry sectors in other countries, and SINTEF has enabled Norwegian companies to use the framework in Norway. The framework offers a common infrastructure for the secure storage of industrial data. The framework gives companies control of their own data while enabling them to share them if they wish to do so.

The Government wants Norwegian companies to make informed and competent decisions regarding protection, use and enforcement of their intellectual assets and rights, and to have a professional approach to the way they handle the rights of others. Norwegian companies should have the increased market access and value creation which professional protection and use of copyright law can afford them. Having their ownership rights protected can prove extremely important for companies, especially in connection with internationalisation. The Ministry of Trade, Industry and Fisheries has begun mapping competence levels and needs related to intellectual property rights in Norwegian industry, and will assess whether the guidance provided in the system of policy instruments is adequate.

Expert group on private sector data sharing

The Government will appoint an interdisciplinary expert group on private sector data sharing. The group will consider solutions and make recommendations on how to clarify challenges relating to responsibility, ownership and usage rights for industrial data in the private sector and in data value chains when public and private entities cooperate, for example in public-private sector development initiatives. The work is being initiated by the Government, but will be carried out by the private sector in cooperation with relevant actors from the public sector, the private sector and research communities.

The work must be viewed in connection with the Government's measures in the national strategy for artificial intelligence regarding development of guidelines on how public agencies should deal with ownership rights when cooperating with the private sector on artificial intelligence. The EU's proposal for the *Data Act*, which is due to be published in the third quarter of 2021, will also have significance for this work. The proposed legislation is part of the European Commission's follow-up of its data strategy. It aims to facilitate access to and use of data, including business-to-business and business-to-government, and to

review the rules on the legal protection of databases.

4.3 Data sharing within industries important for Norway

Norway has several industries where data are shared to create value. Some of these industries are world leading and have cooperated on data sharing for many years, whiles others have only just started. These data-sharing initiatives demonstrate the huge potential in creating value with data as a resource.

In the private sector, data are shared mainly through exclusive cooperation and within existing value chains. Such sharing is voluntary and is motivated by business opportunities. Data can be bought and sold between the companies, and access to them can be obtained through subscription plans or other payment models. The businesses can also make use of public sector information. There are also examples of private enterprises making datasets openly available to everyone free of charge.

Cooperation organised by trade associations and/or operated by the leading companies in established value chains are important for creating infrastructure and standards for data sharing. In some cases, public authorities facilitate such cooperation,

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Box 4.2 Public-private partnerships on sector development

A significant part of the Government efforts to simplify business-government interaction consists of facilitating socio-economically profitable public-private partnerships in certain business sectors. The Ministry of Trade, Industry and Fisheries acts as facilitator, with the Brønnøysund Register Centre providing operative support for information management. The concept is known as public-private partnerships on sector development (*offentlig-privat sektorutvikling* (*OPS*)), and places emphasis on business development based on value-driven digital transformation. Representatives from business and industry take the lead in these initiatives. The priority sectors are currently finance, aquaculture, agriculture, energy, building, construction and real estate and fisheries.

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Data as a resource

Figure 4.2 Aker Solutions Digital World

Photo: Aker Solutions

either because the public sector plays a central role with respect to the industry in question or because access to public sector resources or public register data is important for success.

4.3.1   The oil and gas industry

The oil and gas industry is important for Norway. Even in 2020, with low oil prices and a global economy affected by the Covid-19 pandemic, this sector accounted for 11 per cent of Norway's total value creation. The industry is one of the country's biggest regional industries, with around 210,000 direct and indirect employees.

Diskos National Data Repository

In cooperation with the public sector, the oil companies operating on the Norwegian continental shelf have established the Diskos National Data Repository. Diskos is a national database containing information that is extremely important for the oil and gas industry. Seismic, well and production data are stored in Diskos. The database was established in 1995 by the Norwegian Petroleum Directorate and oil companies operating in Norway. The large datasets stored in Diskos provide a unique basis for analyses that can make new oil or gas discoveries possible. Furthermore, users are assured that the quality of the data meets a pre-agreed standard and can be retrieved in a pre-agreed format.

All the members have access to their own data and to data belonging to production licences in which they are licensees. They also have access to a large volume of non-confidential data. The Diskos platform also allows the companies to exchange or trade data with each other. The Norwegian Petroleum Directorate also encourages companies with production licences that are drilling in the same geological formation, to exchange relevant data.

In recent years Diskos has also extended membership to other enterprises than the oil companies, known as associated members. Research communities from universities and university colleges in Norway and abroad have also been given access to the database in recent years.

Work is currently under way to further develop Diskos. The aim is to create a scalable and flexible solution that will facilitate more efficient use of data. The inclusion of analytical tools based on machine learning and artificial intelligence is considered, as this may help members derive even more value from existing data.

Other initiatives on private sector data sharing

Northern Lights is a joint venture between Equinor, Shell and Total. Well data have been made available under the project via Equinor's OMNIA platform. The released data provide partners, suppliers and academia with access to the most recent datasets. This enables them to con-

tribute ideas and digital solutions that will help accelerate decarbonisation of the world's energy systems.[7] The data can be downloaded via APIs and are free of charge.

In 2018 Equinor, together with the Volve licence partners, released all subsurface and production data from the Volve field. The data were made freely available via APIs. It was the first time this type of data had been made available in this manner.[8]

Through the Open Industrial Data project, Aker BP and Cognite make real-time data from a compressor in the Valhall field in the North Sea available via an open API. The idea behind sharing industrial data in this way is to accelerate innovation in areas such as condition monitoring and advanced visualisation techniques.

Equinor and Shell have signed a memorandum of understanding on development of digital solutions and methods through the exchange of expertise within areas like data science, artificial intelligence and 3D printing. The companies are already collaborating closely in the Open Subsurface Data Universe (OSDU) programme and the associated OSDU Forum. The latter is an international forum which cooperate on developing an open standards-based data platform that will bring together exploration, development and well data. The cooperation grew from the recognition that the industry can achieve more value creation by making better use of data across business sectors.

4.3.2 The maritime industry

The Norwegian maritime industry comprises shipowners, shipbuilders, equipment suppliers and specialist service providers. In 2018 the industry created value of around NOK 89 billion and had approximately 84,000 employees throughout the country.[9]

In its white paper on the maritime industry[10] the Government presented an overall perspective of digitalisation in the maritime industry. Digitalisation is one of the major drivers for change the

industry is facing in this decade. Autonomous vessels and cyber security are particularly important areas in this work.

Digitalisation and automation are becoming increasingly relevant in the maritime industry in the form of automated processes on board vessels and more integrated systems. This creates opportunities for optimising operations and improving communication and safety. Increased digitalisation may affect trading patterns, production methods, monitoring and operations in the sector. Digitalisation in the maritime industry will lead to more data which can be used for purposes such as machine learning. This can result in more efficient, safe and environmentally friendly shipping, as well as increased value creation. The development of digital solutions for regulatory supervision of the industry will also be important for a competent and efficient shipping administration.

As part of the work on following up the white paper on the maritime industry the Government will conduct a study to identify ways to facilitate increased digitalisation in the maritime industry. Digitalisation will also be given priority in the Government's future focus on maritime competence, research, development and innovation.

Initiatives for cooperation and data sharing in the maritime industry

Ships have become increasingly complex over the past few decades, with far more software, and with integration between technical systems supplied by a range of different suppliers. It is challenging to ensure optimal interaction between the different components without being able to simulate how they work together; for example, to assess the potential impacts of upgrading or changing a single component.

The Maritime Data Space project is a good example of collaboration across the maritime industry. The solution is being jointly developed and operated by Wilhelmsen Ship Management, NAVTOR, DNV, Goodtech and SINTEF. The solution offers maritime enterprises from all parts of the value chain to share and exchange data while still retaining ownership of their respective data.

There are also examples of established enterprises creating their own digital platforms and associated services based on data-driven business processes as part of their core activities. Platforms like Veracity from DNV and Kognifai and Vessel Insight from Kongsberg Digital are examples of this. These platforms contain typical data and ana-

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[7] Equinor (2020): *Deling av data fra Northern Lights-brønn* [Sharing data from the Northern Lights well]. Press release 19 October 2020

[8] Equinor (2018): *Alle data fra Volve-feltet offentliggjøres* [All data from the Volve field made public]. News article on Equinor's website dated 14 June 2018

[9] Statistisk sentralbyrå (2020): Statistikk for maritime næringer [Statistics for maritime industries] commissioned by the Ministry of Trade, Industry and Fisheries

[10] Meld. St. 10 (2020–2021) *Grønnere og smartere – morgendagens maritime næring* [Greener and smarter – the maritime industry of tomorrow]

Figure 4.3 Digital twin

Photo: Open Simulation Platform

lytical tools that can be used by customers to make optimal use of their own data.

Ship models and digital twins

The maritime industry has long traditions in using ship models for optimising ship design and testing stability. The concept of digital twins bears similarities to such models. Digital twins are digital replicas of physical objects, such as vessels, usually with additional data that says something about context, production and other information. Such digital twins can be used to optimise design, build

and operate vessels, and to simulate interaction between components.

4.3.3 The aquaculture industry

The aquaculture industry is the country's second-largest industry. In 2019 Norway exported seafood to a value of NOK 107.3 billion, and the industry and the related supply industry provides 44,000 jobs, most of them outside the large cities.

Aquaculture has traditionally involved manual labour. In 2001 the aquaculture industry, in collaboration with the Ministry of Fisheries and

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Box 4.3 Open Simulation Platform

The Open Simulation Platform (OS) is an open-source industry initiative. OSP will provide the industry with tools and processes for the construction and maintenance of digital twins for system integration, testing and verification. The idea is to make it possible to simulate maritime equipment, systems and ships.

OSP will make it possible to reuse simulation models across organisations without exposing sensitive trade secrets by protecting the models and software inside a 'black box'. The project

will also develop standards for connecting models and control systems for co-simulation.

The work on OSP was started in 2017 by DNV, Kongsberg Maritime, SINTEF and NTNU, and has since been expanded to include several international partners. Some of the technical development of OSP takes place in projects supported by the Research Council of Norway.

Source: Open Simulation Platform.

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Data as a resource

Figure 4.4 AI for combating salmon lice

Photo: Clarify by Searis

Coastal Affairs, established Havbruksdata (Aqua-culture data), which was subsequently incorpo-rated into BarentsWatch; see Box 5.2. As a result, the industry has increasingly used data to improve fish farmers' ability to monitor, control and document fish farming processes. Steady growth in production volumes, stricter require-ments from authorities and consumers, and increasing global competition have brought about rapid developments in automation and new tech-nology. The industry has moved from a situation where a few manual measurements were taken daily to one where continual streams of data are obtained from sensors around the clock, all year round. This creates many new opportunities as well as demands for new and modern technology. It also demands new types of competence and new ways of collaborating on data. Sensors for auto-matic data capture that are transmitted from the fish farms and the environment to a cloud service platform will become key technologies, as will development and use of artificial intelligence that can provide new insight.

The aquaculture industry is in a unique posi-tion with respect to the value of sharing and col-laborating on data. Both small and large compa-nies have equipment in the same fjords and use the same operating methods, and therefore face the same challenges. These require joint efforts

and measures. Long-term growth in the industry will depend on information sharing and on tech-nology that can support sustainable farming prac-tices and management of resources.

Public-private sector development in the seafood industry: OPS Sjømat

The seafood industry wishes to strengthen its competitiveness through increased access to information for the purposes of innovation, ratio-nalisation, resource management and profitability.

Box 4.4 NCE Seafood Innovation Cluster

The Norwegian Centre of Expertise (NCE) Seafood Innovation Cluster is recognised as one of the world's most complete industry clusters and knowledge hubs in the seafood industry. The cluster comprises 70 partners representing a total of 150 small and medium-sized enterprises. The cluster is concentrated in Hordaland, but is represented along the entire Norwegian coastline and in interna-tional seafood regions.

Box 4.5 AquaCloud

AquaCloud is an example of collaboration on data sharing by enterprises from the seafood supply industry. AquaCloud will develop guidelines and protocols for data and data exchange based on open standards in three main areas: sensor data, environmental data and fish health data. This will achieve, for example, early warning of increases in sea lice, algae populations or impending critical weather conditions.

The current lack of high-quality data from the industry is preventing software developers and other companies from generating new innovations and products based on data. Simpler access to data through AquaCloud APIs will increase the number of new solutions and lower the threshold for innovation.

Through the public-private sector development initiative, the authorities will have far easier access to the information they need to supervise the industry and conduct policy formation properly and efficiently.

One of the focus areas in the collaboration is data sharing. More accessible high-quality data will contribute to increasing value creation in the industry. Good and relevant data will provide better decision support and enable the industry to operate more sustainably. Documented sustainability will also create a competitive advantage in a market where this is in increasing demand.

The initiative for data sharing via OPS Sjømat is called Sjømatdata (Seafood Data). The initial aim of Sjømatdata is to establish a well-functioning data sharing service for the seafood industry that is owned by the industry's interest groups. Data collected at individual fish farms can have a range of applications of value to the facility itself, to neighbouring facilities and public administration, as well as to research communities and commercial developers.

4.3.4 Agriculture

Norwegian agriculture is important for sustaining food security, value creation, settlement and cultural landscapes. There are agricultural properties throughout the country, covering a total area of more than three quarters of the mainland.

Norway is a country with high cost of living, and with a climate and topography that affect the economy in food production. These cost disadvantages mean that Norwegian food production must become more efficient if it is to be competitive, while preserving the distinctive character of Norwegian food production.

Agricultural technology: agritech

Agritech is the use of technology in agriculture aimed at improving yields, efficiency and profitability. These solutions will in many cases also be more sustainable. Norwegian farmers have been good at adopting new technology in order to optimise their production. Technological development, including new machinery and automation, has increased productivity, saved labour and changed agricultural practices. Along with national production of new agricultural machinery, research and development have been important for the innovation and adoption of new technology that have taken place in Norwegian agriculture. Norwegian agriculture is highly mechanised by global standards.

A survey conducted by NIBIO[11] shows a clear potential to enhance competitiveness in the fruit and vegetable sector through automation, for instance using mobile robots for plant treatment. There are already examples of such robots developed in Norway, including Thorvald, a robot developed at the Norwegian University of Life Sciences (NMBU). This autonomous agricultural robot is battery powered and is the first step towards electrifying the agricultural vehicle fleet.

In addition to data on agricultural activities in Norway, it is important to have good data on input factors that are produced in other countries and used in Norwegian agriculture, for instance soya. Information about how the soya is produced is important for an agriculture that aims to be sustainable, so that it does not contribute to deforestation or harm other ecosystems. Through the climate and forest initiative, Norway has supported several tools that contribute to sustainable land in general, and to combating deforestation in tropical countries in particular.

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[11] NIBIO (2016): *Økt konkurransekraft innen grøntsektoren i Norge gjennom automatisering av manuelle, ressurskrevende oppgaver – behov og muligheter* [Increased competitiveness in the green sector in Norway through automation of manual, resource-intensive tasks: Needs and opportunities]. NIBIO Report 2(10) 2016

Box 4.6 Satellite images to combat deforestation

In the autumn of 2020, the Ministry of Climate and Environment entered into a contract to buy high-resolution satellite images of land areas in tropical countries. Every month, new images are delivered and made available to everyone: authorities, academia, business and industry, indigenous peoples and to the population in general. This will give everyone the opportunity to see and use the information about what is happening in the forests in the tropics.

Another tool Norway has supported is TRASE, which analyses the value chain for trade with agricultural commodities from tropical countries. Information about specific commodities is linked to deforestation. These data provide valuable information about the risk of deforestation in specific value chains, and enable buyers to make informed choices about what they buy and what risk they run of contributing to deforestation.

Public-private sector development in the agricultural industry: OPS Landbruk

OPS Landbruk aims to increase the agricultural industry's competitiveness and modernise public administration in the sector through collaborating on digitalisation. The initiative is a broad collaboration between players the agricultural industry and public sector enterprises.

The following initiatives are already under way:

– *Consent-based access to data for production subsidies*: This is a solution for forwarding information on subsidy payments from the Norwegian Agriculture Agency's systems directly into the farmer's accounting system, subject to the farmer's consent. The agricultural industry, the companies supplying the accounting systems and Altinn have contributed.
– *Study of legal, ethical and competition 'rules' for ownership of data in Norwegian agriculture*: A study conducted in cooperation with the agricultural and seafood industries.
– *Farmer's dashboard*: Making available/sharing data and developing infrastructure for the purpose of providing the farmer and the farmer's business partners with better, more cohesive

decision support and more efficient and user-friendly work processes. The measure is funded by the EU's Horizon 2020 programme.
– *Digital applications for agricultural loans*: Applications for agricultural loans with consent-based access to private and public data (for example, production data, financial data, tax data, subsidy data, and so forth).

A mapping of relevant digitalisation activities in the sector, both public and private, is also in progress. Innovation, simplification and digitalisation measures should support ambitions and goals for agriculture: to produce high-quality food to a growing population and improve profitability for farmers and the agricultural industry.

Landbrukets dataflyt (Agricultural Data Flow)

Traditionally there has been little sharing of data in Norwegian agriculture, such as across livestock and plant production or between agricultural production and accounting or financial institutions. Collaboration on data sharing between different parts of the agricultural industry has developed over the past decade through the establishment of Landbrukets dataflyt (Agricultural Data Flow). Landbrukets Dataflyt handles the operative coordination of measures under OPS Landbruk. and has developed solutions that allow farmers, suppliers, accountants, banks, public agencies, research institutions and other parties to share data digitally via software interfaces (APIs). Machine-to-machine authentication has also been developed, for example for milking robots. This marks the beginning of an IoT register in the agricultural industry, where data flow and data ownership related to IoT can be connected with individuals and companies.

Agricultural Climate Calculator

The Agricultural Climate Calculator was launched in October 2020. The climate calculator is a digital tool that was specifically developed for the agricultural industry and Norwegian farmers; see Figure 4.5 It gives farmers an overview of emissions and of available measures to reduce emissions and to bind farm-level carbon. The goal is that as many farmers as possible will use the calculator. The first commodities available in the calculator are milk, grain and pigs. The other commodities will follow consecutively.

Landbrukets dataflyt (Agricultral Data Flow) has developed and will operate the climate calcula-

Methane and nitrous oxide from livestock manure
CO_2-equivalents per kg EMC (energy-corrected milk)

2018	
2017	
2016	
Comparison group	
	0,1

Nitrous oxide from soil
CO_2-equivalents per kg EMC (energy-corrected milk)

2018	
2017	
2016	
Comparison group	
	0,2

Energy consumption
CO_2-equivalents per kg EMC (energy-corrected milk)

2018	
2017	
2016	
Comparison group	
	0,01
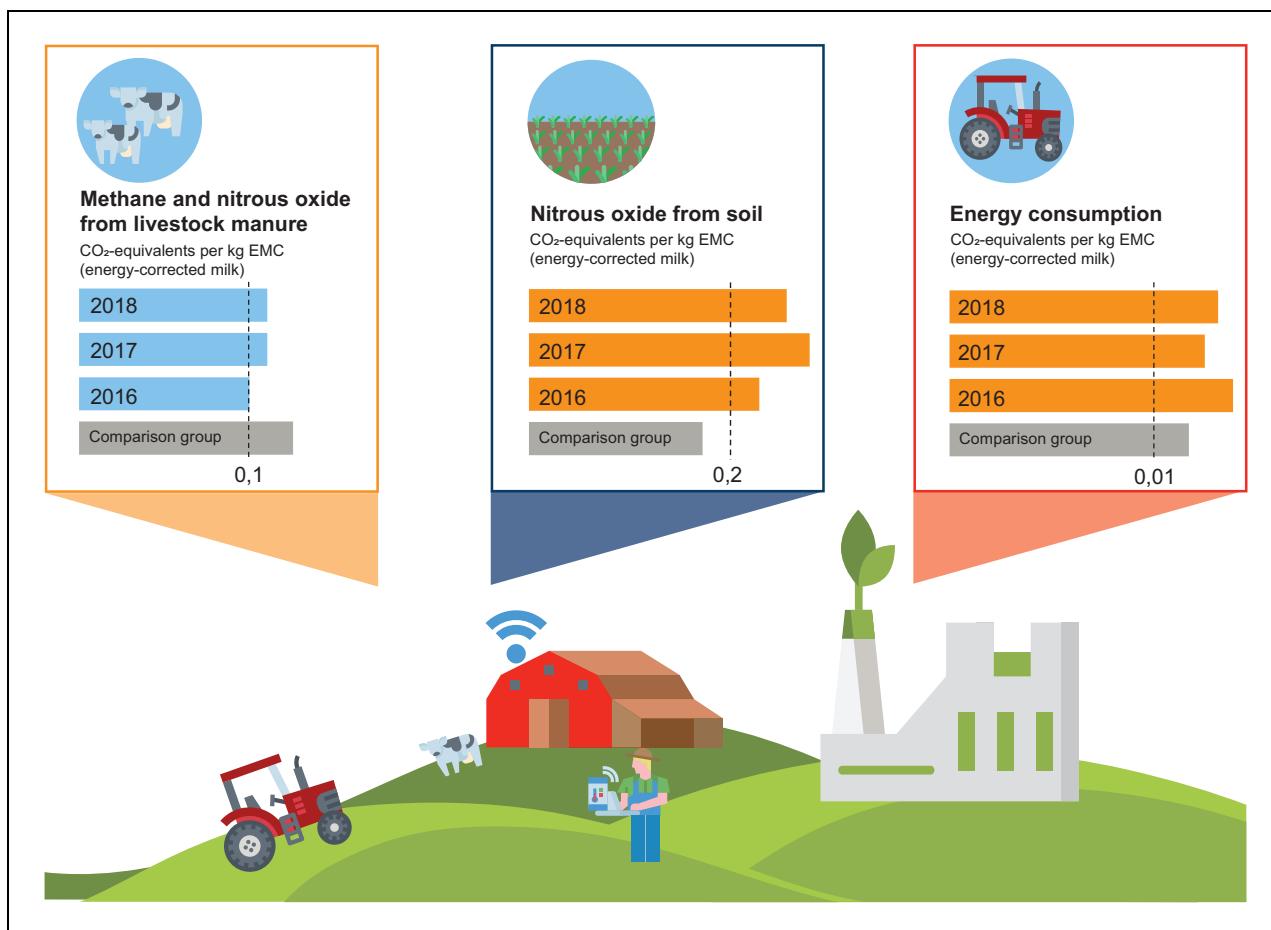
Figure 4.5 Agricultural Climate Calculator

tor on commission from Landbrukets Klimaselskap SA.

The calculator and the system for climate-smart agriculture are based on the HolosNOR calculation model and on Landbrukets Dataflyt's infrastructure for collecting and sharing agricultural data. The farmers themselves decide whether or not emissions from their farms are calculated, and consent to data being retrieved by other parties and systems via Landbrukets dataflyt.

4.3.5 The health industry

The health industry comprises businesses that develop and produce goods and services for use in public and private health and care services or in disease prevention, diagnosis, treatment and rehabilitation. The value created in the health industry is around three per cent of the mainland economy, and the industry provided around 100,000 jobs in 2016.

Norway has some of the world's most comprehensive and complete health registers, with data dating far back in time. Easier access to health data can contribute to business development of new, better and more efficient solutions, for example in pharmaceuticals or diagnostics.

New technology, combined with good health data, make it possible to realise ambitions to have a more efficient health service and simultaneously create a basis for business development. Technological development in artificial intelligence and big data analytics create new opportunities for analysis, research and development. Use of artificial intelligence, together with large amounts of health data, can also contribute to improving health and care services and to providing a better basis for research and innovation. Tasks which up to now have required a human operator can be done qualitatively better, faster and cheaper by machines with the help of technologies such as artificial intelligence. Treatment can become more personalised, with lower risk and fewer side effects.

Because health information is almost always linked to a person and can often be highly sensitive, the threshold for sharing it is high. To make

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Box 4.7 Real-world data

Real-world data is a collective term for the collection of all types of data from the health sector that are not included in randomised clinical studies. Norway has good sources for real-world data in the form of registers and biobanks. The advantages of real-world data are that they cover all patients who have received treatment and can be followed over time. This means that the effects of new treatments can be seen and compared with established treatments. They also make it possible to say something about outcome measures and to capture side effects. This can form a basis for initiating new clinical studies and for evaluating the use of resources. The Norwegian Institute of Public Health will also examine whether such data can be used in method evaluations in the future.

A pilot project, INSPIRE, has been launched by the pharmaceuticals industry in collaboration with the Cancer Registry to develop real-world data on lung cancer. Solutions will be developed for reporting drug treatment in hospitals to the Cancer Registry. This can provide information of great value to industry and the public sector.

Better use of health data, including real-world data, is a key focus area in the Government's national action plan for clinical studies (*Nasjonal handlingsplan for kliniske studier*), which was launched in January 2021.

Source: Ministry of Health and Care Services.

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it easier for both researchers and others to gain access to this type of data without compromising privacy, the Government has approved the establishment of a separate platform that will make access to health data easier and more efficient.

The health analysis platform will help improve health research, strengthen the basis for knowledge-based health and care services, and stimulate innovation and business development. The platform will facilitate advanced analyses across different data sources. It will gradually be developed to serve as a public and commercial ecosystem of analytic services for users of health data. The health analytics platform is discussed in more detail in chapter 5.

4.3.6 Building and construction industry

The building and construction industry provides over 250,000 jobs and has an annual turnover of around NOK 600 billion.[12] The industry comprises activities related to construction, renovation, rehabilitation, maintenance and demolition of buildings, as well as to the building and rehabilitation of installations. It also comprises goods and services needed to perform building and construction work, such as the building materials industry, architectural services and consulting engineering.[13] The industry is spread throughout the country.

In surveys measuring the level of digitalisation, the building and construction industry performs worse than many other industries. The Productivity Commission's first report indicates that the level of innovation in the building and construction industry is lower than in other industries, and productivity growth has been low compared with other industries.[14] The Commission points out that the supply of reasonably priced labour through immigration has made digitalisation and automation less profitable than in other industries.

Data and digitalisation as a policy instrument for sustainability

From 2013 to 2019, the Government cooperated with the industry and the authorities on the Bygg21 (*Build21*) initiative. Central industry operators participated in developing strategies to realise the building and real estate industry's potential for productivity and sustainability. The aim was knowledge dissemination and sharing of best practice, and 470 companies have signed up to support the use of best practice for a more sustainable, productive and cost-effective industry, as defined by Bygg21.

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[12] Statistics Norway table 12817

[13] Byggkvalitetutvalget (2020) *Forsvarlig byggkvalitet – Kompetanse, kontroll og seriøsitet*

[14] Meld. St. 27 (2016–2017) *A greener, smarter and more innovative industry*

Box 4.8 Building information modelling

Building information modelling (BIM) models are based on open, international standards for data storage, terminology and descriptions of business processes. BIM can make building processes more efficient, automate building application processes and facilitate smart application of ICT in the buildings themselves. When all elements in a building are described using BIM, models can be used to estimate greenhouse gas emissions when assessing choice of materials, floor plans, heating systems and other elements that affect a building's total greenhouse gas emissions. In this way,

buildings can be made as climate-friendly and sustainable as possible.

Through the large public-sector construction clients, such as the Norwegian government's building commissioner, property manager and developer Statsbygg and The Norwegian Defence Estates Agency, the public sector is a key driver of development of digital models and sustainable buildings. Sustainability is determined by environmental impacts and by the social and economic aspects of a building's entire life cycle. Statsbygg has been setting BIM requirements in all its projects since 2011.

In recent years the Federation of Norwegian Construction Industries has actively participated in efforts to increase the level of digitalisation in the industry. In October 2020 it published a roadmap to digitalisation[15] describing the need for an industry-wide boost to digitalisation and giving concrete advice to managements seeking to digitalise. The building and construction industry is data poor in the sense that it has not yet accumulated enough operating data to form a basis for big data and algorithm-based solutions and services.

The individual parts of the industry are in different phases of digitalisation, though they all have a need for digital competence and to digitalise administrative tasks.

In a future circular economy, there will be a greater need to satisfy requirements for traceability and for documentation of materials and properties included in building projects. Building information modelling (BIM) is an important tool for achieving this. In the EU's circular economy action plan, building and construction is singled out as one of seven priority areas. Furthermore, the European Commission highlights digitalisation as an important prerequisite for circular solutions and for achieving the climate targets. Development of data systems that can provide overviews of material and waste streams, and digital solutions that make data available across value chains and industries will be critical to increasing

circularity. The Government will present a national strategy for the circular economy in 2021.

Another priority area for the Government is to facilitate fossil-free building and construction sites by 2025. Documentation and data sharing will be important for achieving that goal.

Public-private sector development in the building and construction industry: Opptrinn

Opptrinn is a public-private sector development initiative aimed at facilitating smarter collaboration between public administration and the building and construction industry. Data will be connected in new ways to create more efficient as well as new, improved and simpler services.

An example of a challenge in the building industry is the fight against work-related crime and companies that disregard rules and regulations. Many solutions have been examined and proposed for obtaining sufficient information on companies, employee skills and on who performed work on a given property. Even though the public sector has such information, the actual sharing of it has proved problematic for various reasons. Concepts that can enable this information to be shared will go a long way in the fight against disreputable and criminal actors.

Opptrinn will build a portfolio of different projects. One of the first will deal with simplifying the buying and selling of commercial real estate through a self-service estate agency package. Data from different public registers, such as the Norwegian Mapping Agency and the municipality,

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[15] Byggenæringens Landsforening (2020): *Digitalt veikart 2.0. En anbefaling til ledere i byggenæringen* [Digital roadmap 2.0: A recommendation to building industry leaders]
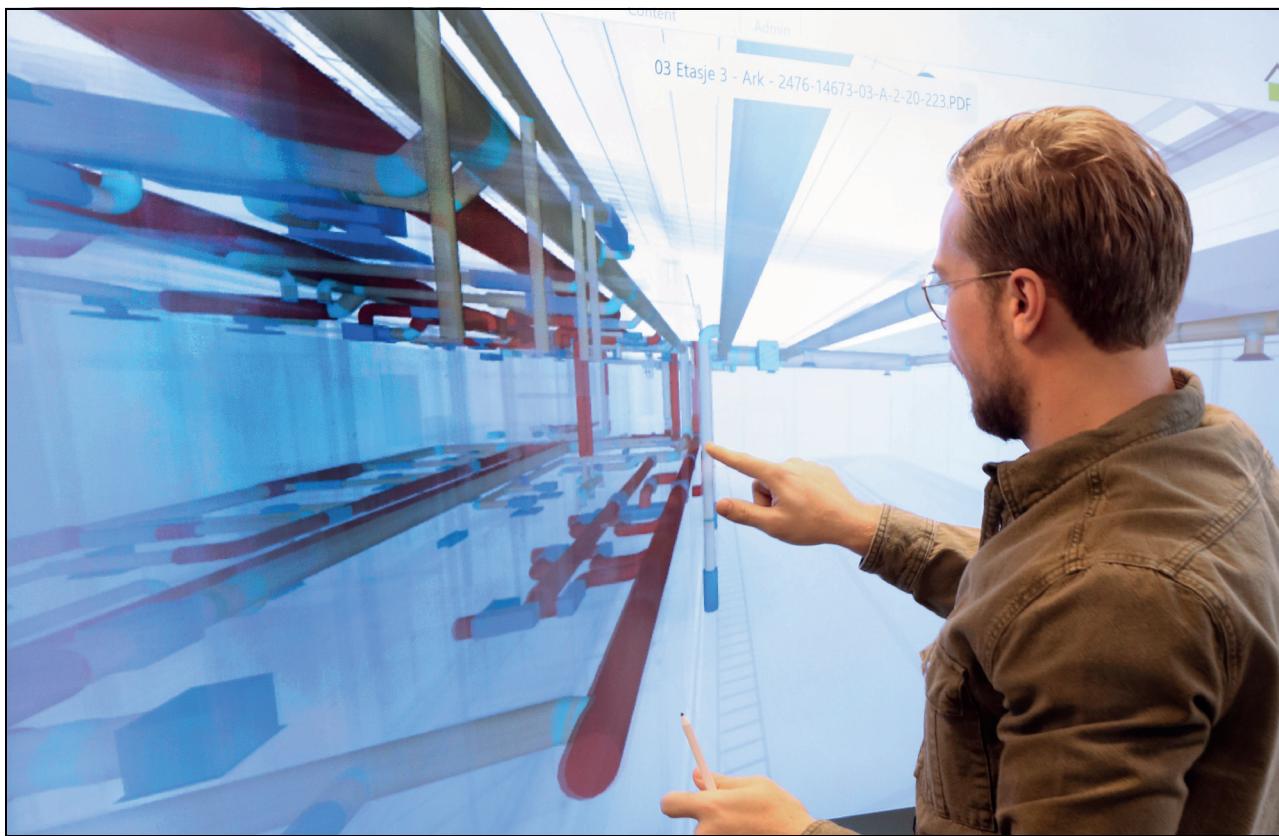
Figure 4.6 Use of BIM

Photo: Statsbygg/Trond Isaksen

will be connected to the plot and the property in new and simpler ways.

Opptrinn will be driven by the needs of the industry and the users. Important aspects of this will be to examine how the BIM model can be better used, what tasks in the industry can be automated, what new business models this can create, and so forth.

The Ministry of Local Government and Modernisation wants to facilitate sustainable consumption, reuse and digitalisation in the building, construction and real estate industries. The ministry is therefore in the process of establishing a national council for better cooperation between the industry and the government. The council will discuss what opportunities and challenges digitalisation of product information as a policy instrument will entail for Norway's building and construction industry. The council's goals will be to promote efficient digitalisation and collaboration in the industry and to drive and stimulate innovation, piloting and the sharing of best practices. Further development and use of open standards for product data will be one of several key focus areas.

4.3.7   The energy industry

The energy industry is an important sector in Norway. It covers production, transmission, trading and technological development in power and heat generation. In addition to creating immense value itself, the energy industry provides the basis for value creation in other sectors. The combination of good supplies of renewable energy and a well-functioning energy industry represents a competitive advantage for Norway.

The energy industry has been undergoing a comprehensive digitalisation process for several years now, e.g. through the introduction of smart meters. This has provided vast amounts of meter data that can be used to generate new insights.

Elhub

In 2019 the Norwegian Water Resources and Energy Directorate (NVE) established Elhub in cooperation with Statnett and the energy industry. Elhub is a central system for receiving, processing and distributing metering values in Norway. Elhub automates and digitalises the entire meter-

ing value chain in the energy market, from metering to billing customers. Elhub contributes to more efficient management of the increased amount of meter data resulting from the introduction of advanced metering systems (AMS). In addition to managing metering values, Elhub facilitates the automated exchange of information between grid companies and electricity providers. Every day, around 150,000 notifications of changes in customer data and other information are exchanged.

Through Elhub, energy suppliers and third-party providers of energy-related services receive information they can use in the services they deliver to the market. Third parties only have access to customer data if the customer gives consent. The introduction of Elhub facilitates more efficient management of services such as exchanging metering values and customer data, changes in energy suppliers and financial settlements between the enterprises. Elhub also enables new companies to develop solutions and services beyond those currently provided by more established companies.

Bigger and better datasets will also improve the Norwegian Energy Regulatory Authority's supervision of the market and regulation of the grid companies. Elhub plays a key role in the transition to a low-carbon society with a high level of electrification. The increased amount of information resulting from the introduction of Elhub can enable end customers to consume energy more efficiently. Using electricity in new and smarter ways will also be important for ensuring efficient use of existing grids.

A joint digitalisation initiative for the energy industry

Energy Norway and the industry have established DIGIN, a joint initiative for digitalising the energy industry. DIGIN is a public-private sector development initiative and will form a basis for more efficient data exchange. A number of grid companies in addition to Statnett and Nettalliansen participate, with the Norwegian Water Resources and Energy Directorate (NVE) as observer.

The aim of DIGIN is more efficient data exchange between all parties in the energy system in order to achieve mutual benefits that arise from new technologies and digital solutions. The initiative will establish the DIGIN model, a joint information model to increase digital collaboration between companies. The programme will also contribute to skills development and experience exchange in the industry. Everything that is deve-

loped under the DIGIN initiative will be available to all the grid companies and will benefit the industry.

To make it easier for the grid companies to invest in DIGIN, the Norwegian Energy Regulatory Authority has decided that investments in DIGIN will fall under the R&D framework programme. This is a funding scheme for research and development that will cover the grid companies' costs for certain R&D projects. The aim of the scheme is to motivate grid companies to invest more in R&D.

4.3.8 Data centres: a growth industry in Norway

The steadily increasing amount of data has turned the data centre industry into the world's fastest-growing energy-intensive industry. Abundant supplies of renewable energy at competitive prices, good fibre infrastructure, a cold climate and a stable regulatory environment make Norway well placed to become a leading data centre nation and to attract global data centres. Norwegian data centres have strengthened their position in the market for high performance computing (HPC) services. For example, Volkswagen has relocated simulation of its crash tests to Green Mountain's data centre in Rjukan.

The Government launched a data centre strategy in 2018.[16] It describes the general conditions that are particularly important for the industry, and gives an idea of how the data centres can contribute to greater value creation for Norway. The Government wants Norway to be an attractive host country for data centres and other data-centric businesses.

Norway is well placed to host a sustainable data centre industry. A recent analysis shows that Norway's data centre industry already provides almost 2,000 jobs and that by 2025 it could provide more than 11,000 jobs all over the country. The analysis also shows that the data centre industry invested approximately NOK 2.7 billion in new centres in 2019 and 2020.[17]

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[16] Nærings- og fiskeridepartementet (2018): *Norge som datasenternasjon. Strategi* [Powered by Nature – Norway as a data centre nation. Strategy]

[17] Implement Consulting Group (2020): *Datasentre i Norge – Ringvirkningsanalyse av gjennomførte og potensielle etableringer* [Data centres in Norway: An analysis of the ripple effects of completed and potential establishments]. Analysis commissioned by the Ministry of Local Government and Modernisation

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In 2021 the Government published a new data centre strategy,[18] as well as a guidance on how to establish a data centre in Norway aimed at international investors.[19]

4.4 General conditions for creating value from data

The public authorities play a key role in facilitating business development, and use a range of policy instruments to achieve it. The Government wants the established system of policy instruments for business development and innovation in the private sector to support new activity and increased value creation using data as a resource.

4.4.1 Access to capital, industrial policy instruments and exports

Access to capital is important for innovation and business development

Good and efficient access to capital is important for the reorganisation, innovation and development of business and industry. A well-functioning capital market efficiently brings together those who need capital with those who have it, and allows risk to be carried by those who are willing to assume it. The state also has policy instruments in the form of seed funds, loan capital, investment companies, and so forth. Under the EEA Agreement, Norway has largely the same rules for regulating the capital markets as the EU member states, and is subject to the principle of the free flow of capital in the EEA area.

In 2017 the Government appointed a commission to consider how access to capital through the Norwegian capital market functions. The Commission's overall conclusion is that the Norwegian capital market largely works well.[20] Projects and companies that are expected to be profitable generally receive sufficient and appropriate financing. Nonetheless, there is room for improvement in some areas, such as in the channelling of available capital and in connecting seekers and suppliers of capital more efficiently.

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[18] Kommunal- og moderniseringsdepartementet (2021): *Norske datasenter – berekraftige, digitale kraftsenter* [Norwegian Data Centres – sustainable, digital powerhouses]

[19] Ministry of Local Government and Modernisation (2021): *How to establish a data centre in Norway*

[20] NOU 2018: 5 *Kapital i omstillingens tid – Næringslivets tilgang til kapital* [Capital in the age of transformation – Access to capital for Norwegian businesses]

The Commission also points out that there are few new large growth companies, which may be due to limited access to capital. The Ministry of Trade, Industry and Fisheries is considering and following up the Commission's recommendations.

Business-oriented policy instruments

The underlying assumption is that companies and businesses invest less in research and development than what is profitable for society. Public authorities therefore facilitate innovation in the form of subsidies and other schemes as part of the Norwegian research and innovation system. Several policy instruments currently exist that promote research and development in the commercialisation of data as a resource. Support for the early phase, where more emphasis is placed on research and research-based innovation, is usually provided through the Research Council of Norway.

For businesses which tend not to consider data and data analytics as part of their core activity, investments in this can be perceived as unduly large and the threshold for getting started too high. A survey conducted for the Ministry of Local Government and Modernisation shows that

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Box 4.9 PILOT-E and Data-driven Road Construction Sites

PILOT-E is a collaborative funding scheme run by Enova, the Research Council of Norway and Innovation Norway that supports development of new emission-free technology in hydrogen-powered transport and building and construction activities.

The Data-driven Road Construction Sites project is one of four projects to receive support under this scheme. The project is led by Skanska, and its aim is to significantly reduce emissions by optimising driving patterns and utilisation of the machine fleet using artificial intelligence. The project will contribute to reducing emissions from existing construction sites and pave the way for the autonomous, zero-emission sites of the future. The solution it develops with be made available to other entrepreneurs in order to generate an effect beyond Skanska's own activity.

Box 4.10 SkatteFUNN project: Offshore Simulation Centre

The Offshore Simulator Centre (OSC) in Ålesund is an example of a SkatteFUNN project. Ålesund is a pilot for the United Nations' initiative for smart cities. OSC and the visualisation and simulation groups at Campus Ålesund have developed a digital tool that will contribute to better solutions for the city's inhabitants.

Ålesund has a lot of data on the consumption of municipal services. Based on these data, OSC has made a digital twin of the city. This makes it possible to identify interactions and interdependencies and adapt the systems in order to create smart and sustainable solutions.

Offshore Simulator Centre AS has worked on technology for the maritime industry for many years, including digital twins in offshore activities. It is the competence from these industries that has now been transferred to the digital twin of Ålesund. Together with the new Ålesund municipality, Augment City AS, a newly formed subsidiary of Offshore Simulator Centre AS, will develop a tool for the UN that can be used to give politicians, businesses and citizens a better understanding of the consequences of their decisions and thus make them better placed to make good choices.

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many businesses now consider funding a major barrier to implementing digitalisation projects.[21]

Innovation Norway's main purpose is to trigger business development that is profitable from both a commercial and an economic perspective. The organisation administers a range of policy instruments to stimulate restructuring. Financial contributions and guidance from Innovation Norway will also help stimulate business opportunities in the regions. Innovation Norway's policy instruments include both regional and sector specific schemes. Innovation Norway can also offer funding and networks for innovative digitalisation projects. The Government doubled the subsidy for innovation support to the business sector through Innovation Norway from NOK 7 billion in 2019 to NOK 14 billion in 2020.

The Industrial Development Corporation of Norway (Siva) facilitates innovation through infrastructure such as business gardens, incubators and initiatives such as the Norwegian Catapult scheme. The Norwegian Catapult scheme gives Norwegian industry access to test facilities in order to enhance innovation and value creation. NOK 125 million was allocated to the scheme in the 2019 national budget. Siva gave priority to further developing the catapult scheme in 2019, in cooperation with Innovation Norway and the Research Council of Norway. Investinor is a state-owned capital investor whose purpose is to

improve access to capital in the early-stage market (that is, the market for investment capital for companies in the process of developing new products or processes).

Norwegian companies can apply for tax deductions on R&D costs under the broad scheme called SkatteFUNN. The scheme is rights-based, and has simple application processes and reporting requirements.

Forskerpool (Researcher Pool) is a scheme affiliated to SkatteFUNN. Through the scheme businesses can apply for up to 50 hours of assistance from a researcher to develop an idea or receive feedback on a problem. This scheme may be particularly relevant for SMEs, which often lack this type of in-house competence. For data-driven innovation, where there is a shortage of personnel with advanced skills, schemes like these can help more companies gain access to the expertise they need to start their projects or pilots.

The national programme for Norwegian business clusters is funded by the Ministry of Trade, Industry and Fisheries and the Ministry of Local Government and Modernisation. Innovation Norway is responsible for administering the scheme together with the Research Council of Norway and Siva. The budget for the cluster programme for 2021 is NOK 217 million, and at the turn of the year 2020/2021 the programme had 39 clusters.

The clusters in the programme include established businesses, entrepreneurs, investors, knowledge communities and public-sector developers, and the members from the business sector take the lead. There should be clear potential synergies

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[21] KPMG (2020) *Hindre for Hindre for digitalisering av forretningsprosesser* [Barriers to digitalisation of business processes]. Survey commissioned by the Ministry of Local Government and Modernisation

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Figure 4.7 Digital twin of Ålesund

Photo: Offshore Simulation Centre AS / Zheng Wei

within the cluster and with external environments inside or across value chains and technologies. Examples of business clusters that have better use of data as a key component in their collaboration are Proptech Innovation and the Cluster for Applied AI. Proptech Innovation has 82 members, and most of its activities are in building and construction. The cluster wants to make the real estate industry smart and sustainable by using knowledge, efficient collaboration, smart technology, data and artificial intelligence. The Cluster for Applied AI has 39 members and 25 collaborative partners, and is based in Halden. The cluster's vision is for the businesses to become leading, data-driven, effective and customer-centric through the development and use of AI.

A review of the business-oriented policy instruments was completed in January 2020. A key objective for following up the review is that it should stimulate value creation, business transformation and innovation within sustainable parameters.

Increased investment in exports will strengthen Norway's position

Export credit and guarantee schemes help Norwegian businesses enhance their competitiveness in the international market. Norway's export markets have long been showing signs of increasing protectionism, less predictable access to international markets and increasing competition. In 2019, IT services worth NOK 32 billion were imported to Norway, while Norway's exports of IT services were valued at NOK 19 billion. This represents an export deficit of NOK 13 billion in Norway's international trade in IT services, and the export deficit has more than doubled since 2015.[22]

International economic growth is accelerating in emerging markets, such as the platform economy and the data economy, while growth in Norway's traditional and biggest export markets in Europe is low. There is therefore need for a stronger focus on exports and for closer collaboration between the public sector and the private sector on joint export promotion initiatives.

In October 2020 the Government launched *The Norwegian Government's action plan for export*. The action plan is based on the Government's export strategy from 2017, *Strategy for export and internationalisation* and on the goals and ambitions that were set out in that plan. The measures in the action plan should lead more competitive industries to start exporting goods and services that are in demand in the global markets. One of the measures in the action plan is to strengthen the cluster programme.

In the 2021 budget the Government is strengthening the focus on export promotion, and NOK 100 million has been allocated to follow up measures in the export action plan. This focus will contribute to more value-adding exports, including skill-intensive industries and companies that base their products and services on data-driven business models.

4.4.2 Norway's participation the Digital Europe Programme

Norwegian business and industry and Norwegian expert communities should benefit from Norway's participation in EU programmes. This requires active, coordinated and targeted partici-

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[22] Samfunnsøkonomisk analyse (2021) *Norges behov for IKT-kompetanse i dag og framover* [Norway's need for ICT competence today and in future]. Report 1-2021
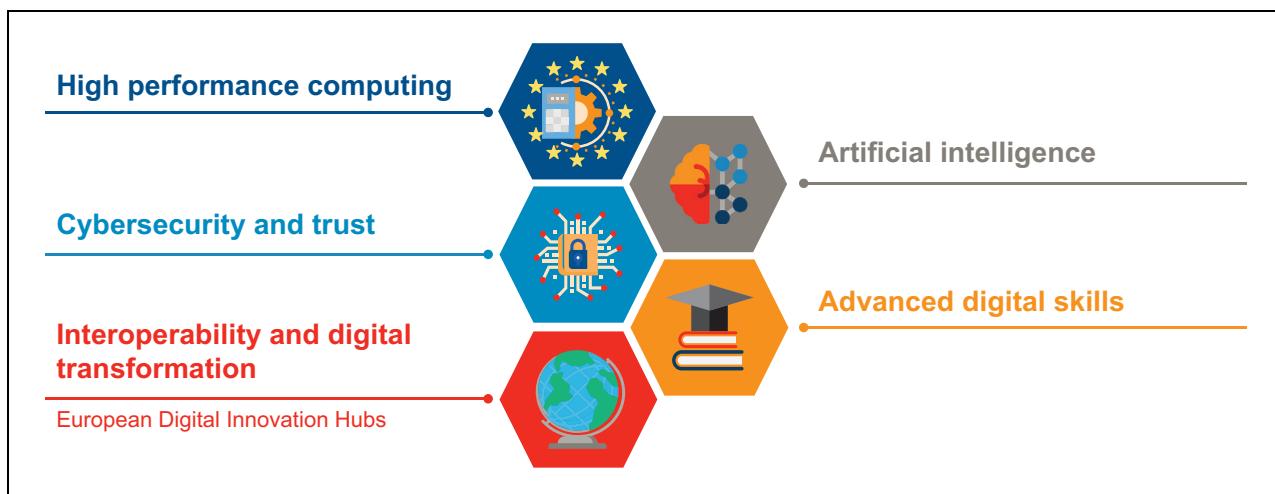
Figure 4.8 The five key capacity areas in DIGITAL

Source: European Commission

pation from Norway. The EEA Agreement allows Norway to participate in major EU initiatives in research, innovation, digital transformation and infrastructure. Several of these initiatives have been, and will continue to be, significant in unleashing the potential of the data economy in Norway. In the national budget for 2021, funds were allocated to Norwegian participation in the Digital Europe Programme 2021–2027 (DIGITAL), the EU's new investment and capacity-building programme for digital transformation and use of innovative digital technologies. Norway's participation in DIGITAL is extremely important. The programme will give Norwegian companies and research communities access to collaborative partners and resources in AI, supercomputers, cyber security and advanced digital skills. It is unrealistic for Norway to build equivalent capacity and skills alone. Participation in the programme will therefore have major significance for Norway's competitiveness in all industries, and will be a key input factor in strengthening Norway's business sector, both local and regional.

The programme has a proposed budget of EUR 7.17 billion (in 2021 prices). Norway's total contribution to DIGITAL is estimated at EUR 180 million (in 2021 prices), which is equivalent to approximately NOK 1.9 billion.

The aim of the programme is to establish the EU as a driver of the digital transformation and to promote future-oriented digital technologies that are expected to have significance for growth and employment in Europe in the coming years. Participation in DIGITAL will build on investments made in Horizon 2020 and the Connecting Europe

Facility (CEF) and Interoperability solutions for public administrations, businesses and citizens (ISA[2]) programmes in which Norway participated in 2020. This continued participation is extensive, and is related to developing and reinforcing capacities in five key areas: high performance computing, artificial intelligence, cyber security, advanced digital skills and interoperability and digital transformation.

The key capacity areas are largely interconnected. DIGITAL will have a natural interface with other EU programmes, such as Horizon Europe. The European Commission emphasises that whereas Horizon Europe covers research and early-stage development, DIGITAL will focus on building digital capacities and implementing concrete common digital solutions.

The programme has the following objectives:
– make Europe a world leader in high performance computing (HPC) by building an exascale computer and upgrading existing supercomputers
– increase the use of artificial intelligence, particularly in the areas of health, climate and environment, transport, goods manufacturing and energy, and establish common European data spaces and testing and experimentation facilities
– reinforce cyber security and trust by, among other things, establishing an infrastructure for quantum communication and a certification scheme for cyber security products
– contribute towards development of more advanced skills to, among other things, address the lack of IT experts in Europe

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through master's degree programmes in HPC, AI and cyber security

– contribute to digital transformation in areas of public interest such as health and climate, and continue the work on interoperable solutions by, among other things, providing access to key digital technologies through European Digital Innovation Hubs (EDIH)

European Digital Innovation Hubs

Digital Innovation Hubs is a policy instrument that was launched by the European Commission in 2016 and created under Horizon 2020. The purpose was – and still is – to help small and medium-sized enterprises to digitalise faster. Four enterprises were given status as Norwegian Digital Innovation Hubs under Horizon 2020: SINTEF, Oslo Cancer Cluster, DigitalNorway and GCE NODE. All of them are active facilitators for SMEs.

A new generation of larger and more binding digital innovation hubs will be introduced in the transition to the new EU programmes for 2021–2027. These will be one-stop shops, and will cover a European ecosystem that can offer expertise and guidance. The EDIHs will contribute to enabling SMEs to participate in the digital transformation and leverage the potential of AI. Funding for the projects will come from the Digital Europe Programme, among others. The process of nominating national candidates for the EDIH scheme began in 2020. Innovation Norway facilitates this process in Norway.

The EDIH scheme and Norway's catapult scheme share some common features. In Norway the clusters will be key participants in the hubs that are set up. One important task for the system of policy instruments will be to further develop complementarity between the hubs, the cluster programme and the catapult scheme.

Participation in EuroHPC

In 2017 the European Commission took the initiative to establish the European High Performance Computing Joint Undertaking (EuroHPC), which is jointly funded by the Commission and national contributions. Norway participates in EuroHPC through its participation in the EU's Horizon Europe programme and the Digital Europe Programme (DIGITAL). UNINETT Sigma2 in Norway collaborates closely with SINTEF and NORCE, the national competence centre for high performance computing in the EuroHPC partnership.

Some areas require high levels of information security while simultaneously allowing the data to be processed efficiently. Relevant examples are high-resolution MR images, DNA data, videos of patients and other sensitive data. Solutions for storing and processing such data are mainly provided through the Service for Sensitive Data (TSD), which is operated and developed through collaboration between the University of Oslo and UNINETT Sigma2.

Norwegian participation in Data for the Environment Alliance (DEAL)

A well-functioning digital ecosystem is vital for achieving global climate and environmental goals and more sustainable production and consumption. Building global digital ecosystems of environmental data demands broad cooperation between the private sector, academia and nation states. Estonia has taken the initiative to launch a global alliance, Data for the Environment Alliance (DEAL), and 22 countries from all regions have shown an interest. The Minister of Climate and Environment has endorsed Norway's participation in the alliance. This is in line with the objective set out in Report no. 11 to the Storting (2019–2020) *Digital transformation and development policy.* In addition to collecting environmental data that are open, accessible, comparable and of high scientific quality, the objective is that such an alliance will contribute to achieving the Sustainable Development Goals by creating economic incentives for the private sector. The alliance will also contribute to the new area of work in the UN's environmental programme, digital transformations.

4.4.3 Business development throughout the country

The Government wants thriving local communities and economically sustainable jobs throughout the country, and is working to promote regional balance through economic growth, equal living conditions and sustainable regions.[23]

The Official Norwegian Report on the importance of business for thriving and sustainable communities[24] discusses the importance of digital

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[23] Meld. St. 5 (2019–2020) *Levende lokalsamfunn for fremtiden – Distriktsmeldingen* [Thriving local communities for the future]

[24] NOU 2020: 12 *Næringslivets betydning for levende og bærekraftige samfunn* [Thriving and sustainable communities – the role of business and industry]

infrastructure and digital skills for business development in the regions. In the coming years, digitalisation and better use of data will play a significant role in many typical regional industries, such as aquaculture and agriculture. Efficient use of digitalisation and data in these industries requires a well-developed digital infrastructure, not only where people live, but also where businesses are operating.

The government presented three strategies for regional development in the spring of 2021: a strategy for urban areas as regional power centres, a coastal strategy, and a strategy for the mountain and inland regions. Together these strategies aim to promote economic growth, equal living conditions and sustainable development in all regions of Norway.

Small and medium-sized enterprises

Small and medium-sized enterprises (SMEs) account for more than 99 per cent of Norwegian businesses. They are found in industries all around the country. These businesses are important for ensuring viable communities throughout the country and for employment and value creation in the regions. The SMEs often lack resources to take on assignments outside their core business.

In 2019 the Government launched its launched strategy for small and medium-sized enterprises.[25] The Government's ambition is to enable

small and medium-sized enterprises to create sustainable growth and new jobs throughout the country, and to give them even better opportunities to efficiently produce the goods and services needed in a well-functioning society. Digitalisation and better use of data to operate smarter and more cost-effectively is an important means to achieving this aim.

4.5   The Government will

The Government will

- use business-oriented policy instruments so that they support the value-creating potential which development of the data economy can have for business and industry and for society
- appoint an interdisciplinary expert group on industrial data sharing that can develop guidelines on responsibility, ownership and usage rights
- leverage Norway's participation the Digital Europe Programme (DIGITAL) and the programme's policy instruments, including initiatives for increased sharing of and valuation creation with data in different sectors of society
- promote the work on international standardisation related to data sharing and use, particularly with regard to encouraging SMEs to participate in standardisation activities
- revise the national strategy for data centres
- present three new strategies for development of the regions in the spring of 2021
- present a white paper to the Storting on the digital infrastructure

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[25] Departementene (2019): *Småbedriftslivet. Strategi for små og mellomstore bedrifter* [Strategy for small and medium-sized enterprises]

5 Public sector information as a resource for business and industry

5.1 Background

The public sector produces large amounts of information or data, and all tasks performed, and services developed in the public sector involve the use of data. Public sector information (data) is viewed as a common good and should be made available for reuse within the framework of legal system in general, and within the scope of the privacy protection regulation.

Over the past decade, Norway has devoted considerable efforts to making available and sharing public sector information. There are three main reasons why giving access to and reuse of public sector information is important to society:

– *Rationalisation and innovation*: When data are shared and reused it leads to better collaboration, more rational service development and better public services.
– *Business development*: The business sector can develop new services, products and business models based on access to and reuse of public sector information.
– *An open and democratic society*: Access to information about decision-making and priorities in public administration provides citizens with insight into how decisions are followed up and the effects of political measures. This is important for maintaining societal values and a high level of trust in the Norwegian society.

By public sector information (PSI) is meant all types of information that is produced or collected by public agencies and that is, or can be, digitised and stored electronically. *Open public data* refers to public sector information that is made freely available for reuse for any purpose. Such data are usually made available in the form of datasets, which can be simple statistical lists or tables or larger extracts from public registers, databases or sector specific systems. Data can also be shared in real time using programming interfaces (APIs).

Public-sector data is an important source of innovation, research, and business development. The European Commission has conducted studies showing that the economic value of data from the public sector will increase from EUR 52 billion in 2018 to EUR 194 billion in 2020.[1] This shows that public sector information has a high value if it is properly managed and shared, and used for value-adding products and services.

The Government has an ambition to increase value creation using public sector information in the business sector and in society, and will facilitate the sharing of more high-quality data by public agencies in an efficient and secure manner. It is therefore important to put in place incentives and a good regulatory environment. This includes having rules that are adapted to data sharing, sustainable funding models for preparing and making data available, access to skills, and a culture of data sharing. It is also important with a clear division of roles and responsibilities between the public and private sectors.

Technological development and increased digitalisation present new ways of collecting, storing, and sharing data and, going forward, it will be important to find solutions that are cost-effective and fit for purpose. It will be important to identify cross-sectoral issues and needs for data, and to assess areas where it may be appropriate to develop common solutions.

5.2 Sharing of public sector information in important areas

In Report no. 27 to the Storting (2015–2016) *Digital Agenda for Norway*, five areas were identified where the Government should strengthen efforts to make public sector information openly available: map and property data (geospatial data), transport and communication data, data from research and education, and data on culture and public spending. Specific sector strategies have been prepared for the first four of these areas.

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[1] Deloitte (2018): *Study to support the review of Directive 2003/98/EC on the re-use of public sector information.* Study commissioned by the European Commission

Data on public spending are currently made available mainly through the report to the Storting on government accounts[2] and statsregnskapet.dfo.no.

Some areas and sectors, such as geospatial data (maps and property data) and mobility data (transport and communication data) are covered by sector-specific EU directives (INSPIRE and ITS). These directives set forth requirements and guidelines on data quality and availability. For several years now, many public agencies, such as the Norwegian Meteorological Institute, the Brønnøysund Register Centre, the Norwegian Public Roads Administration and the Norwegian Mapping Agency, have been actively involved in the work on making open public data available.

The five sector areas that were given priority in *Digital Agenda for Norway* largely harmonise with the areas the European Commission has defined as priority areas for common European data spaces in its data strategy and as high-value datasets in the *Open Data Directive*. See chapter 3.3 for a discussion of the EU's legislation and data policy.

It has been a while since the five Norwegian sector areas were selected as strategically important, and since then there have been positive developments regarding the sharing of public sector information for reuse. The public sector also shares more data in other important areas. Many of these areas harmonise with the EU's priorities in its data strategy and in the *Open Data Directive*.

Presented below are some examples of sector areas where Norwegian public agencies have come a long way in making data openly available.

5.2.1 Geospatial data

Good access to and use of public geographical information are becoming increasingly important. The EU has defined geospatial data as high-value datasets and wants to facilitate easier sharing and connection of such data across sectors, ecosystems and countries. Geographical information is information such as objects, events and conditions where the position (on Earth) is an integral part of the information. The term is often abbreviated to GIS (Geographical Information Systems) data.

Norway has long experience in establishing cooperation models for collecting, managing and sharing these types of data. The Norwegian Map-

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[2] Meld. St. 3 om statsregnskapet til Stortinget

Figure 5.1 Detailed elevation data in realistic 3D models

Photo: Clip and Ship – Geodata AS

ping Agency, for example, coordinates Norge digitalt (*Norway digital*) and Geovekst. Norge digitalt was established in 2005 and is a collaboration between enterprises responsible for obtaining GIS data and/or who are large consumers of such information. These include municipalities, counties, national agencies and private companies such as telecom and energy providers. Geovekst [Geogrowth] was established in 1992 as a collaboration on the joint establishment, management, operation, maintenance and use of geographical information. Among other things, the Geovekst partners conduct joint mapping projects through co-financing. These two collaborative projects have provided Norway with an abundance of GIS data, services and solutions that comply with common standards and allow integration with different services.

Detailed map and property data are today maintained and updated by the municipalities in national common systems such as *Felles kartdatabase* (FKB), the common map database, and the Norwegian Cadastre. Geonorge.no, is the national website for map data and other location information in Norway, was created as part of Norway's digital collaboration. Everyone can search for and gain access to map data, services, and interfaces.

Digital elevation model of Norway

Through the national detailed elevation model project (*Nasjonal detaljert høydemodell*), an area of 230,000 square metres will by surveyed using laser scanning to form a complete elevation model of Norway. The data will be continually made available for use through hoydedata.no, and the

model is due for completion in 2022. The mapping project costs around NOK 420 million, and is co-funded by eight ministries. The economic value of the project is estimated at more than NOK 1.6 billion.

Coastal and harbour data

Mapping of harbour data and marine base maps in the coastal area contribute to better knowledge about the coastal marine areas and harbour infrastructure. Detailed data on terrains and infrastructure on land and at sea are fundamental for ensuring safe and efficient traffic and for upscaling intelligent transport systems. Calculations of the economic benefits commissioned by the Ministry of Local Government and Modernisation show that high-resolution bathymetric data (depth data) along the coastline will generate an annual net gain of NOK 515 million for shipping alone.

Further development of spatial data infrastructure

Vast amounts of information are connected to a location. Access to an updated and easily accessible spatial data infrastructure is therefore important. The state and local authorities have been the principal parties in the collaboration on common solutions for sharing spatial data, but the infrastructure is now facing new opportunities and requirements. The private sector will increasingly create and receive geographical information and contribute to further innovation.

Accurate terrain models from land to sea and detailed map data and property data are creating new possibilities for business development and

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Box 5.1 NADAG

NADAG, the National Database for Ground Investigations, was developed by the Geological Survey of Norway (NGU) in partnership with the Norwegian Public Roads Administrations, the Norwegian Water Resources and Energy Directorate and Bane Nor. Both public and private entities share their data through this solution. The purpose of the database is to make data from all geotechnical ground investigations available in a single solution. The solution is openly available under the Norwegian Licence for Open Government Data (NLOD). The data-

base and APIs for use with GIS tools are also made available via geonorge.no as part of the geospatial infrastructure. NADAG is a useful tool in land-use planning, development and exploration. Fast access to data and information on the subsurface is also important for good preparedness in the event of accidents and natural disasters. Collecting data on ground investigations in Norway marks a big step towards building an understanding of the ground conditions in three dimensions.

Source: Norwegian Geotechnical Institute

Box 5.2 BarentsWatch

BarentsWatch is a programme led by the Norwegian Coastal Administration. A further 29 administrative agencies and research institutions contribute by sharing their own datasets and developing services. The information is based on public sector information, and the services are developed with user needs in mind.

BarentsWatch comprises one open and one closed solution. The open solution is an information system providing services for end users, presented via barentswatch.no. It covers services such as FishInfo, providing fishermen with relevant information on fishery activities; Norwegian fish health, providing a real-time overview of the incidence of lice and diseases in the aquaculture industry; Wave forecast, providing overviews of wave heights along the entire Norwegian coastline; and Marine Spatial Management Tool, supporting development of more cohesive administrative plans for the marine areas. The Marine Spatial Management Tool contains maps showing natural resources, commercial activities, environmental status, plans and regulatory measures and more, and makes this knowledge publicly available. Open data via BarentsWatch are generally licensed under the Norwegian Licence for Open Government Data (NLOD).

The closed part of BarentsWatch facilitates the sharing of information and a common situation report for Norwegian public agencies with operational tasks in marine areas. The services in the closed solution are used for purposes such as monitoring marine areas. The tasks can involve ongoing maritime transport, commercial activities, detection of criminal activity, rescue operations and environmental monitoring. These services have provided time savings and enhanced accuracy in performing and managing operations.

better public planning. Increased use of GIS data will therefore have a positive effect on the data economy in Norway. More datasets and better facilitation can make it easier for businesses without GIS competence to develop innovative user solutions using such data. More GIS data and more involvement from businesses in the digital geospatial ecosystem will demand more resources and challenge the current management and funding models.

As part of the work on following up the *National geospatial strategy towards 2025: Everything happens somewhere*, the Norwegian Mapping Agency is considering implementing a national programme to further develop the geospatial infrastructure. The goal is that the next generation sharing platform for geospatial data will be technically designed for easier sharing and interoperation with other ecosystems. Another goal is to put in place a form of governance model and funding that strengthens the Norwegian business sector's capacity for value creation and international competitiveness based on GIS data.

5.2.2 Transport and traffic data

The digitalisation of the transport sector makes it possible to achieve transport policy goals in more efficient and innovative ways. Developments in artificial intelligence are driven by access to increasingly large amounts of data, better algorithms, and access to steadily increasing computing power at a lower cost than previously. The increasing amount of data, combined with artificial intelligence, is particularly important for developing automated or autonomous solutions, interoperable intelligent transport systems and new mobility solutions based on sharing.

Since access to large datasets can give better overviews of the status of and predictions for the transport system, there is great potential in analysis, insight and prediction using artificial intelligence. This can result in better planning, more advanced forms of traffic management and influencing traffic behaviour, better passenger information, more targeted operating and maintenance efforts, better research, and a whole range of other areas of application for analysis and insight based on datasets from different sectors.

Increasing the availability of data from the transport sector can contribute to making public services in the sector more efficient, while innovation based on such data can generate significant business development and value creation. Transport and traffic data are currently followed up

through the government's strategy for making data available in the transport sector.[3]

The volume of real-time data in the transport sector is large. For example, the repository of data for the Norwegian Public Roads Administration consists of increasingly more real-time data about traffic, travel times, freight transport and road quality. These data are based on measurements obtained from sensors, among other things, but also on data registered manually. Most transport data are site-specific, meaning that they can be enriched with GIS data. Access to good map data is therefore extremely important for analysing and using transport data. The Norwegian Public Roads Administration obtains data from its own systems as well as from other sources.

In 2019 the Norwegian Public Roads Administration, together with the Norwegian Railway Directorate and Entur AS, launched transportportal.no, which contains descriptions of and links to a range of different datasets from the transport sector. The portal offers an assortment of transport-related data from the Norwegian Public Roads Administration on roads, road status, incidents, and travel times, as well as data from Entur on public transport routes and schedules, and various mobility services such as city bikes. The datasets are available in standard and specified data formats, in compliance with the *ITS Directive*. Datasets that are described in the portal are also included in data.norge.no.

Entur AS is one of several state-owned companies that share their transport data. Entur has entered into a partnership with StartupLab, which is an incubator for early-stage tech start-ups. This collaboration will help boost innovation in mobility and public transport with an emphasis on Norwegian business and industry and start-ups.

5.2.3 Research and education data

The Government aims to make research more available by encouraging more open research dissemination and more open data. In principle, it ought to be expected that data generated through publicly funded research is shared on a par with other public sector information, in line with national and international guidelines. The results from such research are a common good that has value to science and to society. Better access to research data will enhance the quality of and trust in research by enabling results to be validated and verified in better ways, and data sharing represents a social value in that other researchers and society at large can use the data in new ways and in combination with other datasets.

The research system has traditionally shared knowledge by publishing scientific articles, while the data on which the articles are based are less openly available. The research sector faces many of the same challenges as other sectors regarding the sharing of data. However, the sharing of research data presents additional challenges on account of the properties of the data, the complicated legislation regulating data rights, and the lack of incentives to share data in the research system. *National strategy on access to and sharing of research data* establishes that research data should be as open as possible and as closed as necessary.

Such access must be safeguarded by sound privacy practices and give due consideration to security, intellectual property rights and trade secrets. To achieve the main objective of more sharing and reuse of data, the appropriate use of licences is extremely important. Therefore, on commission from the Ministry of Education and Research, the Research Council of Norway has appointed a committee to examine rights and licensing issues associated with research data, the objective being that the results from publicly funded research should contribute to value creation and the public good. The result of the committee's work was published in October 2021.[4]

On commission from the Ministry of Education and Research, the Norwegian Directorate for ICT and Joint Services in Higher Education and Research (Unit) is conducting a pilot project on the sharing of data on education, research and integration. Examples of research data are data from primary and upper secondary education. The aim is to establish an infrastructure for making data available that facilitates efficient information management and creates an infrastructure for data reuse in the knowledge sector. The pilot project is based on a concept study on data sharing in the knowledge sector.[5]

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[3]   Ministry of Transport (2018): *Strategi for tilgjengeliggjøring av offentlige data – samferdselssektoren* [Strategy for making public sector information available in the transport sector]

[4]   Forskningsrådet (2021): *Hvordan skal vi dele forskningsdata? Utredning og anbefalinger om lisensiering og tilgjengeliggjøring* [How to share research data? Investigation into and recommendations on licencing and data sharing]

[5]   Unit (2020): *Fremtidig deling av data i kunnskapssektoren* [Future data sharing in the knowledge sector]. Concept study

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5.2.4   Data on culture, cultural heritage and language

The National Archives, the Directorate for Cultural Heritage and Arts Council Norway collaborate on following up the Ministry of Culture's strategy for open data.[6] The agencies have reviewed datasets, standards and common authority records and have made recommendations on making culture data available. This cooperation ensures that national guidelines, standards and solutions are adopted.

Large amounts of digitised images of objects, photographs, books, language resources and documents are currently provided in services such as the Digital Archives, nb.no and DigitaltMuseum.no, and some of this content is made available for reuse.

The Norwegian Language Bank

Current language technology works better in English than in Norwegian, and better in Norwegian Bokmål than in Norwegian Nynorsk and Sami. An important reason for this is that for the purposes of language technology, far more source material – data – is available in the more widely spoken languages. Commercial developers are reluctant to develop or adapt products to the Norwegian language if no relevant language resources are available on which to build such products.

The Norwegian Language Bank (Språkbanken) was established at the National Library of Norway in 2010 to address this challenge. The Norwegian Language Bank is the single most important measure in language technology and language policy to be implemented in the past decade.[7] The Language Bank is a collection of digital language resources (text, terminology and speech) such as multilingual terminology lists, area-specific texts and recorded speech or parallel texts in Norwegian Bokmål and Nynorsk and different Sami languages. There is a need for both written and oral data covering different dialects and pronunciation variants. The Language Bank is important for developing artificial intelligence and digital services. Developer communities can freely retrieve language resources and use them

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Box 5.3 Sharing resources through the Language Bank

Tuva is an aid for dictating text (speech recognition) and navigating a computer using voice control. The product was developed by the company Max Manus in 2017 and is provided to people with permanent disabilities. The solution uses AI and builds on resources from The Norwegian Language Bank. The dataset developed specially for this system is now openly accessible to other developers in the Language Bank.

eTranslation is a machine translation service developed by the EU that can be used by public sector employees in the EEA area. The functionality for Norwegian is based on translations by the Unit for EEA Translation Services in the Ministry of Foreign Affairs, translation assignments performed by Semantix for public agencies and on standards translated by Standard Norway. The Language Bank makes the datasets freely available to developers and researchers.

Source: Ministry of Culture.

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to engage in innovation, development and value creation.

The public sector has far more data that could be used for developing language technology than is in use today. There is a wish that more such resources be deposited with the National Library of Norway. The Government will therefore contribute to raising awareness of language data and language resources in the public sector by, among other things, addressing such data specifically in the Government's circular on digitalisation.

The initiative to deposit Norwegian and Sami language data at The Language Bank will be important for developing the Norwegian data economy. Without access to sufficient language data, it will be difficult and extremely expensive to develop digital services such as chatbots and artificial intelligence in Norwegian and Sami.

5.2.5   Meteorological data

Some meteorological data are shared through collaboration in the World Meteorological Organization, but in many countries most meteorological

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[6] Kulturdepartementet (2017): *Kulturdepartementets strategi for åpne data 2017–2022* [The Ministry of Culture's strategy for open data]

[7] Prop. 108 L (2019–2020) *Lov om språk (språkloven)*

Box 5.4 Yr weather forecasting service

Yr is a collaboration between The Norwegian Broadcasting Corporation (NRK) and the Meteorological Institute (MET). The purpose of Yr is to give users reliable weather forecasts that prepare them for all types of weather conditions. This can also contribute to safeguarding lives and assets. With several million unique users every week, Yr is one of the most popular weather forecasting services in the world.

Yr is based on the Meteorological Institute's open downloading services and on a large number of other contributors of open data, including the Norwegian Mapping Agency, NIBIO, Entur, the Norwegian Water Resources and Energy Directorate, Bane Nor and the Norwegian Polar Institute. Data from private weather stations like Netatmo and Holfuy are also used as a basis for weather forecasts on Yr.

Many countries have no systems for providing businesses and citizens with high-quality and detailed weather forecasts. This particularly applies in many developing countries where the public benefit of good weather forecasts would be immense, both for safeguarding the life and health of citizens and for increasing value creation in the primary industries. With support from the Norwegian Agency for Development Cooperation (NORAD) the Meteorological Institute is working on introducing digital solutions that are based on the same idea as for Yr to some aid recipient countries in Africa. This work is being carried out in cooperation with the local meteorological institutes.

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data are not openly available. All meteorological data in Norway have been open and freely available since 2007, and the Meteorological Institute (MET) has developed user-oriented downloading services and access solutions for its data and products. The institute also grants access to international meteorological data and products where licences permit.

The institute has downloading services and APIs for alert products (danger warnings and weather forecasts), observations and climate statistics. Weather forecasts require that users have fast, stable and easy access to updated data as a basis for good decision making. A dedicated API is available for bulk downloads of large datasets, such as computational models of the atmosphere and ocean. Data from these services can be used by the private sector, public agencies and researchers.

The institute has data access solutions for many of its data and products. The most widely used products are Yr (see Box 5.4) and Seklima (seklima.met.no). Seklima provides observations and climate statistics. The Meteorological Institute also makes data available on observations of the Earth's surface from the Sentinel satellites, which are part of the EU's Copernicus programme. This is done in cooperation with the Norwegian Space Agency.

One challenge with thematic datasets is that they are often based on thematic standards for metadata and can therefore prove difficult to use for enterprises and researchers looking to combine data from different sources. The Meteorological Institute is working on ways to make it easier to use environmental and climate data by documenting metadata and developing solutions for connecting data. Part of this work involves making sure that the data meet the FAIR principles in addition to being open. This means that the data must be findable, accessible, interoperable and reusable.

5.2.6 Environmental data and Earth observation data

Environmental data

Environmental data refers to data which the environmental authorities produce themselves or obtain from other data producers through mapping, monitoring, research and various reports. Priority environmental data that are defined as high-value datasets for reuse, include data on air quality, biodiversity (habitats/biotopes and species), emissions, nature areas subject to various forms of conservation or protection, noise, waste (including marine litter) and water. Environmental data are included in the EU's data policy under the European Green Deal and the Destination Earth initiative, which aims to develop digital twins of the Earth based on thematic categorisa-

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Box 5.5 The Air Quality in Norway

The digital service Air Quality in Norway was launched in 2019. The service provides local air quality forecasts for Norway at three different temporal scales: right now, the rest of the day, and tomorrow. The service provides high-quality data and uses data from a range of different sources including the Copernicus programme and the atmospheric service CAMS, the municipalities, the National Reference Laboratory for Air Quality (NRL) and the Norwegian Institute for Air Research (NILU).

The collaboration consists of The Norwegian Environment Agency, The Norwegian Public Roads Administration, The Norwegian Meteorological Institute, the Norwegian Institute of Public Health and The Norwegian Directorate of Health. These agencies have an overlapping responsibility to ensure the protection of health and the environment through the reduction of emissions and exposure to local air pollution.

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tions such as climate change adaptation, extreme natural disasters and biodiversity.

The Norwegian Environment Agency manages and communicates large amounts of environmental data that are shared via open APIs and dedicated services. The current sharing platforms for environmental data, Miljøstatus, Mareano and Artskart, mainly offer aggregated information, and the datasets are partly accessible via open APIs and with licences that permit reuse. Systematic work has been initiated to report on 'future environmental data', which will propose solutions for ensuring fast, efficient and reliable access to high-quality data for all parts of the value chain, from data to knowledge.

The Norwegian Environment Agency reports and coordinates environmental data both nationally and internationally. The directorate contributes to standardisation and harmonisation of national databases and registers in the environmental area, and collaborates with different bodies that collect and share data and environment-related knowledge, such as Norge digitalt, the European Environment Agency (EEA) and BarentsWatch.

Earth observation data

Earth observation data embrace hydrographic data, land cover/land use, elevation, geology, aerial images/orthophotos, oceanography and marine areas. The Copernicus programme is an important source of Earth observation data in Europe. Through a free and open data policy, the programme provides a large amount of high-resolution and highly detailed Earth observations. Copernicus produces 30 terabytes (TB) of satel-

lite data every day. It also produces large amounts of data products in its operative services for atmosphere, marine, land, climate, emergency management and security. Norway has joined the Copernicus programme and has full access to its data and services.

Through InSAR Norway, Norway has developed the world's most advanced nationwide mapping service for monitoring subsidence. The service provides the construction industry, insurance companies and municipalities with unique access free of charge to data showing how the ground in Norway is sinking or lifting to an accuracy of four billion measurement points, and the location of unstable mountain slopes.

The Norwegian Space Agency is responsible for making Earth observation data available and for encouraging their use in Norway. Several open portals for Earth observation data have been established: data from Copernicus are made openly available at satellittdata.no, lidar data at høydedata.no and aerial images at norgeibilder.no, and data showing ground motion in Norway (subsidence data) are available at insar.ngu.no.

5.2.7 Health data

Norway has some of the world's most comprehensive and historically complete health registers, including national health registers, medical quality registers, screening programmes and population-based health surveys. The Government will facilitate better use of Norway's health data to develop better, more targeted health services within the parameters of sound data protection and cyber security practices.
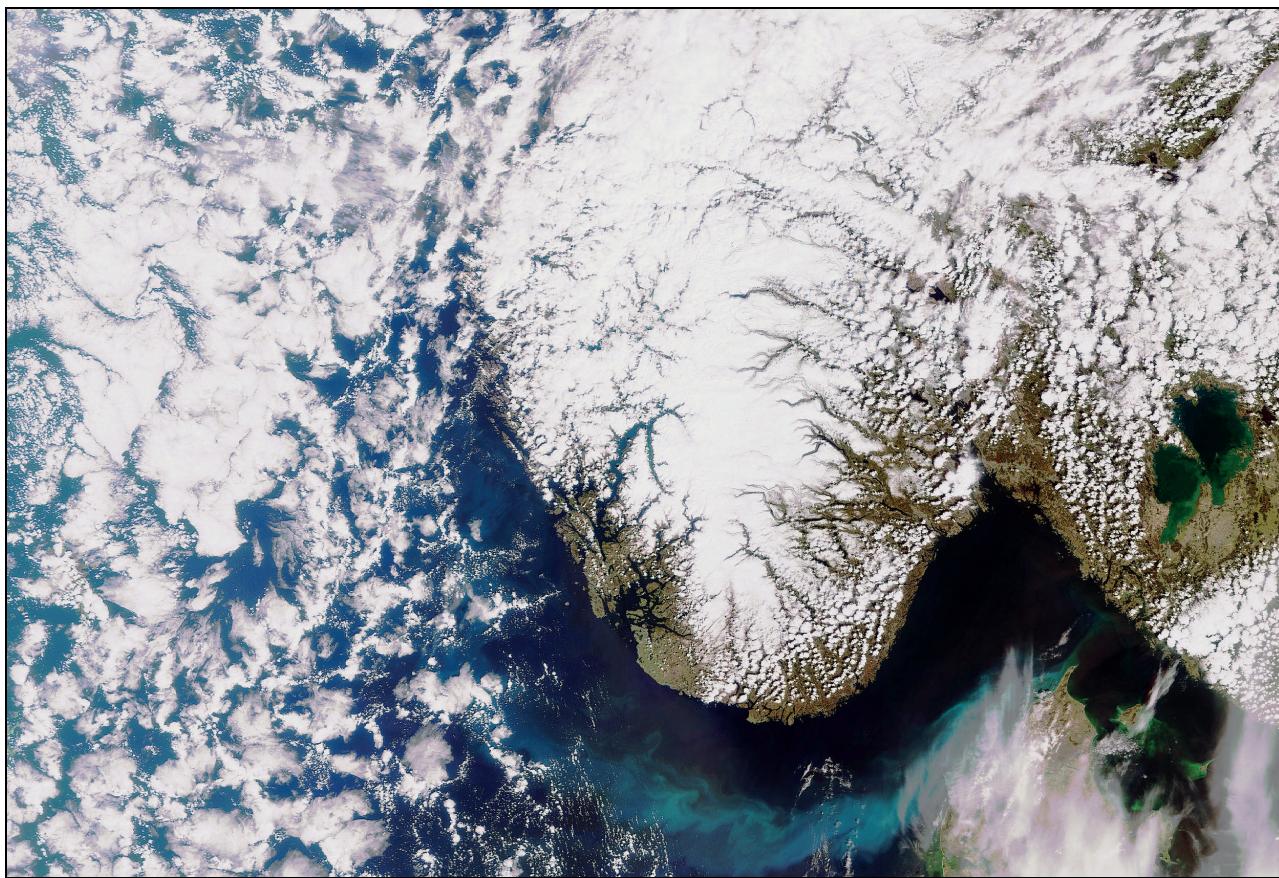
Figure 5.2 Plankton approaching Scandinavia

Photo: European Space Agency (ESA)
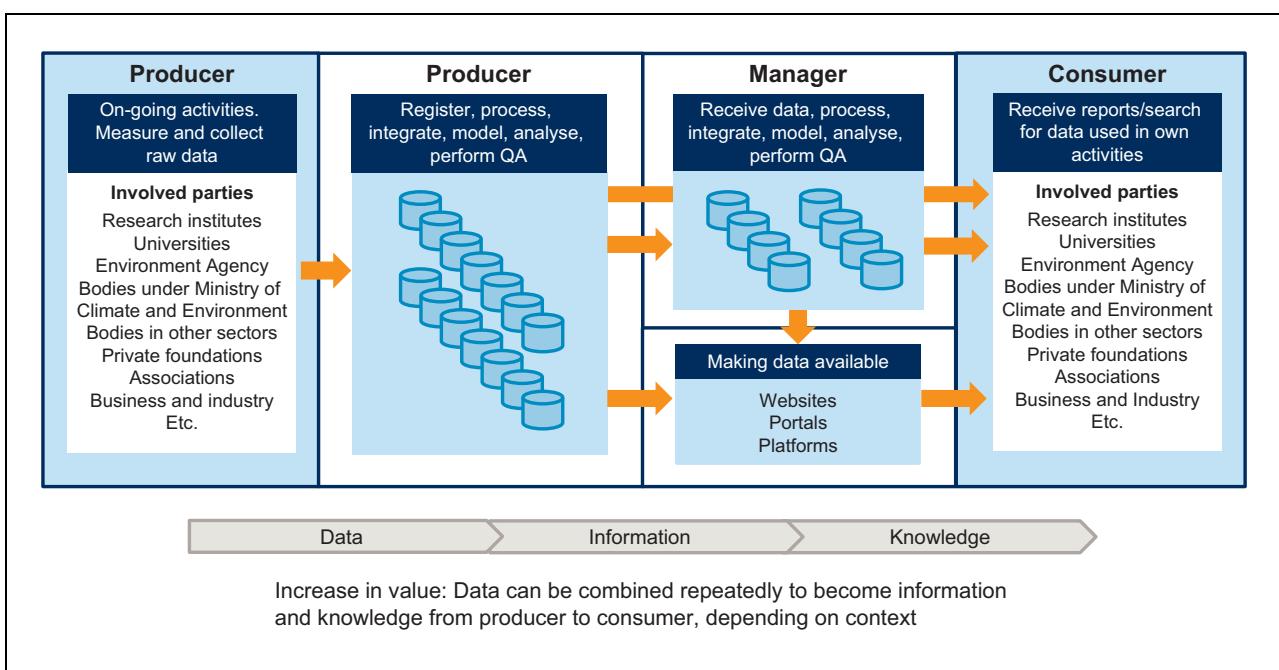
Figure 5.3 The value chain for environmental data: from data to knowledge

Source: Ministry of Climate and Environment

Making health data more widely available represents an essential policy instrument for achieving health and care policy goals and for providing knowledge that contributes to better health for everyone. The overriding objective is that health data should provide knowledge that contributes to improving the quality of the health services and to developing better treatment, prevention, monitoring and research.

National Health Analysis Platform

At present, gaining access to health data for analytical purposes can demand considerable time and resources. Establishing a national health analysis platform will help improve health research, strengthen knowledge-based health and care services, and stimulate innovation and business development. The platform will simplify access to health data and facilitate advanced analyses across different data sources such as health registers, patient records, basic data, and other information sources. See Figure 5.4.

The National Health Analysis Platform will make it possible to use health data more actively for developing drugs, medical technology and services. The development of such a platform will create new opportunities for Norway's health industry and attract international enterprises Norway. The aim is that the National Health Analysis Platform will be developed into an ecosystem for health analysis by connecting suppliers of data and health analytics services to users of health data.

Privacy is reinforced by letting the analyses be conducted on the platform, rather than locally. The needs to disclose personal data will be reduced through development of better solutions for access and consent, and by tracking the use of the information.

5.2.8   Company data and ownership data

Companies and company ownership make up one of the six thematic categories identified by the European Commission as important in the *Open*
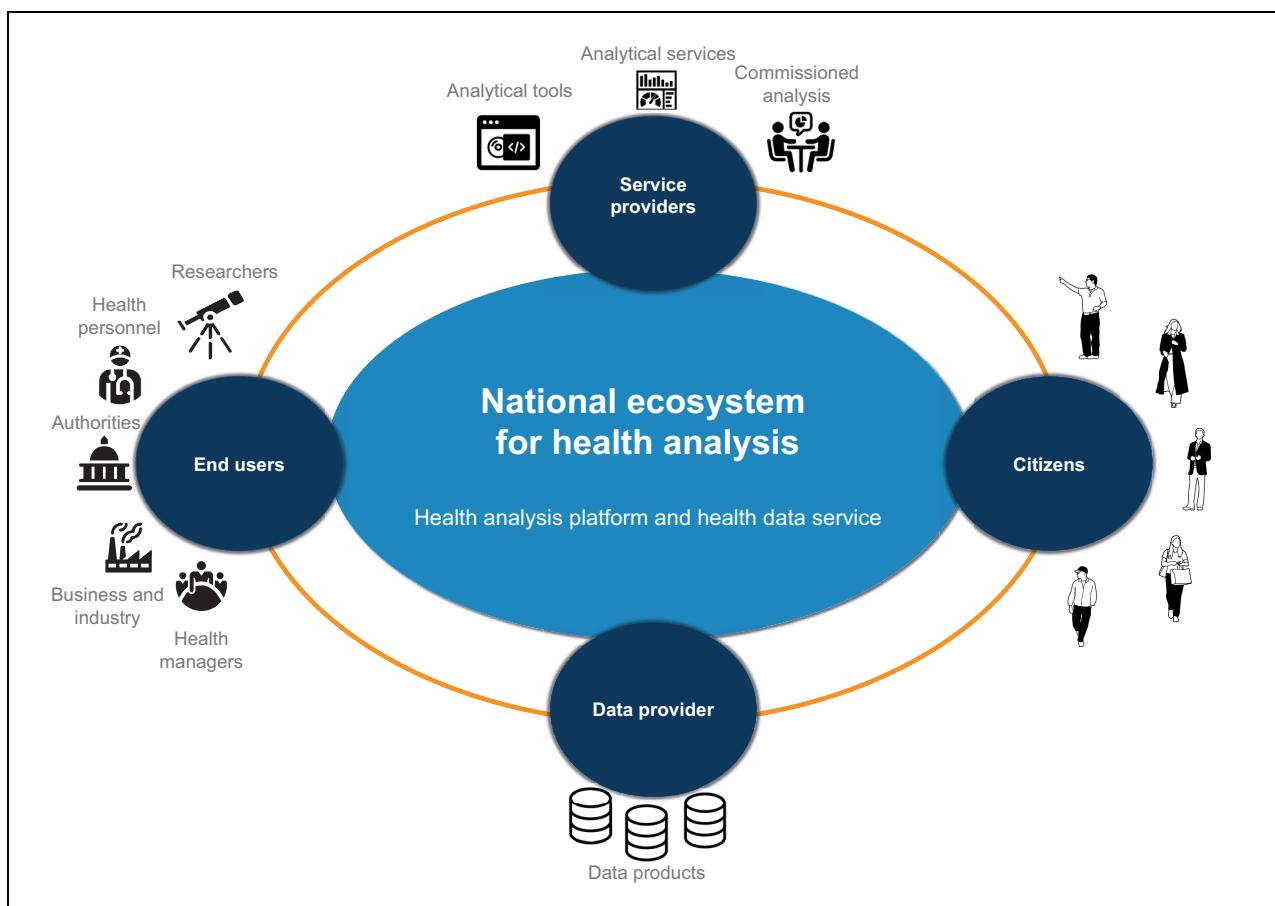

Figure 5.4 The National Health Analysis Platform: a national ecosystem for health analysis

Source: Norwegian Directorate of eHealth

Data Directive. In Norway, such data have already been available for some time. However, new initiatives are under way to make these data even more accessible and reusable.

Central Coordinating Register for Legal Entities

Norway was an early adopter in making data from private enterprises openly available for reuse. When the Central Coordinating Register for Legal Entities (Enhetsregisteret) was made available as open data in 2012, it made international news. The Central Coordinating Register for Legal Entities shall contribute to promote efficient use and coordination of public sector information on entities that are subject to registration obligations in an affiliated register. The data are provided in real time so that the service can be used by entities to clean or update their own data with the latest information, such as addresses. The Central Coordinating Register for Legal Entities is managed by the Brønnøysund Register Centre.

Register of Company Accounts

The Brønnøysund Register Centre also manages the Register of Company Accounts. The Register of Company Accounts currently provides accounting data to the credit information industry for a fee.

Altinn

Altinn is a channel for conducting digital dialogue between businesses, private individuals and public sector agencies. Altinn is also a technical platform that the agencies can use to develop digital services. Altinn is further developed, operated, and managed by several public sector agencies in cooperation. The Norwegian Digitalisation Agency manages the technical solution on behalf of this cooperation.

The Altinn platform offers all public agencies a modern national solution for development, testing and deployment of digital services. The platform also contains services for consent and authorisation for use in connection with secure sharing of data. Today the platform is used to deliver more than one thousand digital services from approximately 60 public sector agencies in different sectors.

Shareholder Register

The Storting has asked the Government to establish a public solution containing information that

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Box 5.6 The Nordic Smart Government project

Nordic Smart Government (NSG) is a collaborative project that has been running for several years between Nordic organisations that work on registry data. NSG's vision is to make it simpler for small and medium-sized enterprises to conduct business across the Nordics and to collaborate across national borders. The project collects company data and makes them available so that they contribute to the efficient use of resources and can be used to support growth and innovation.

In Norway, the Brønnøysund Register cooperates with the Norwegian Tax Administration and Statistics Norway. The goal is to make reporting to public authorities far simpler for companies than it is today. Access to better data will give increased efficiency and better oversight.

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will ensure greater transparency around ownership of private limited liability companies. Transparency around share ownership can generate trust, contribute to uncovering illegal activities and thereby help enhance the competitiveness of law-abiding companies.

The Ministry of Trade, Industry and Fisheries and the Ministry of Finance have asked the Norwegian Tax Administration and the Brønnøysund Register Centre to establish a pilot project to find an integrated and simplified solution for reporting and making available information on Norwegian private companies. The pilot project will be based on the needs of society, place emphasis on simplification for the business sector and increase public openness. The aim is to give both the general public and the public sector easier and better access to information on owners of private companies. At the same time, the business sector's total reporting burden associated with updating such information will be reduced.

5.2.9   Civil protection data

In 2020 the Directorate for Civil Protection and Emergency Planning (DSB) launched *Kunnskapsbanken* (Knowledge Bank), a technical solution that makes information and datasets on risk and vulnerability easily available. Knowledge

of risk and vulnerability is important for reducing the likelihood of adverse incidents occurring and for mitigating the impacts if they do.[8]

As well as serving as an aid for finding datasets and information on risk and vulnerability analyses, Kunnskapsbanken is a resource for researchers, journalists and other private actors such as insurance and financing companies and property developers.

Kunnskapsbanken largely contains data on risk of and vulnerability to natural hazards. It also contains some data on other areas within civil protection, such as critical societal functions. The data are retrieved from DSB's own professional systems and from other public and private entities. The Norwegian Water Resources and Energy Directorate (NVE), the Meteorological Institute (MET), the Norwegian Public Roads Administration and Finance Norway are some of the bodies which deliver data to Kunnskapsbanken.

The data managers themselves are responsible for assuring the quality of the data made available in Kunnskapsbanken. DSB maintains dialogue with the data owners to ensure a good understanding of the content of the data and that all the data are securely processed. Kunnskapsbanken is continually updated with new data sources.

NVE has, in collaboration with the MET and the Norwegian Public Roads Administration, developed the digital warning service varsom.no. NVE and MET are working on coordinating several types of hazard warnings in terms of form, content and scope. The aim is to coordinate communication with users so that the warnings are easy to understand, reach as many as possible, and trigger measures that prevent harm to health and material assets. Meteorological and hydrological stations that deliver real-time data on weather, snow and water and observer corps for avalanche warnings are important parts of the warning service. It is also important to have model computations that produce forecasts and information on weather, snow and water conditions. In addition, many individuals and external organisations contribute to the service by sharing their field observations on water, soil, snow or ice in the online registration service varsom.no/regobs, which is also available as an app. Making these types of data available is important for civil protection, and

the service is used by those engaged in local preparedness or in outdoor recreational activities.

A large proportion of the country's digital infrastructure – such as broadband and telecom networks – is owned and operated by private companies. This means that important decisions on development and security are made by the industry.

The authorities play an important role as legislator, facilitator and supervisory authority, and can investigate and prosecute data and ICT-related crimes. It is also the authorities' role to collect domestic and foreign intelligence, cooperate with international bodies and share information on potential threats.

The existing early warning system for digital infrastructure has been used to detect targeted cyberattacks for almost 20 years. The Norwegian National Security Authority is now developing new sensor technology that will build on and eventually replace the sensors used today. A new platform will be developed to use artificial intelligence and machine learning on the data collected. The platform will enable automated analysis of any malware detected as well as automated sharing of results.

5.2.10 Data from Statistics Norway

Statistics Norway (SSB) manages a large amount of source data for Norwegian society, and provides a range of services, one of which is the API open data service. The service allows the data in the statistics bank StatBank Norway to be freely used under an attribution licence. The APIs are open and require no registration.

Detailed data obtained for use in official statistics are protected by a duty of confidentiality in the Statistics Act and are therefore not openly available. It is possible for researchers and others to request access to such data once they are prepared for statistics. The new Statistics Act allows more opportunities to request access to detailed data from SSB, but the aggregate level at which the data can be made accessible will depend on who requests data and for what purpose.

SSB has also developed a platform (microdata.no) in collaboration with the Norwegian Social Science Data Services. The solution has an anonymisation interface with embedded privacy protection and allows users to conduct analyses on register data containing personal information without being able to identify individuals. Access to microdata.no is given to researchers, PhD students and master's degree students at an

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[8] Direktoratet for samfunnssikkerhet og beredskap (2019): *DSBs årsrapport 2019* (DSB's annual report) and kunnskapsbanken.dsb.no
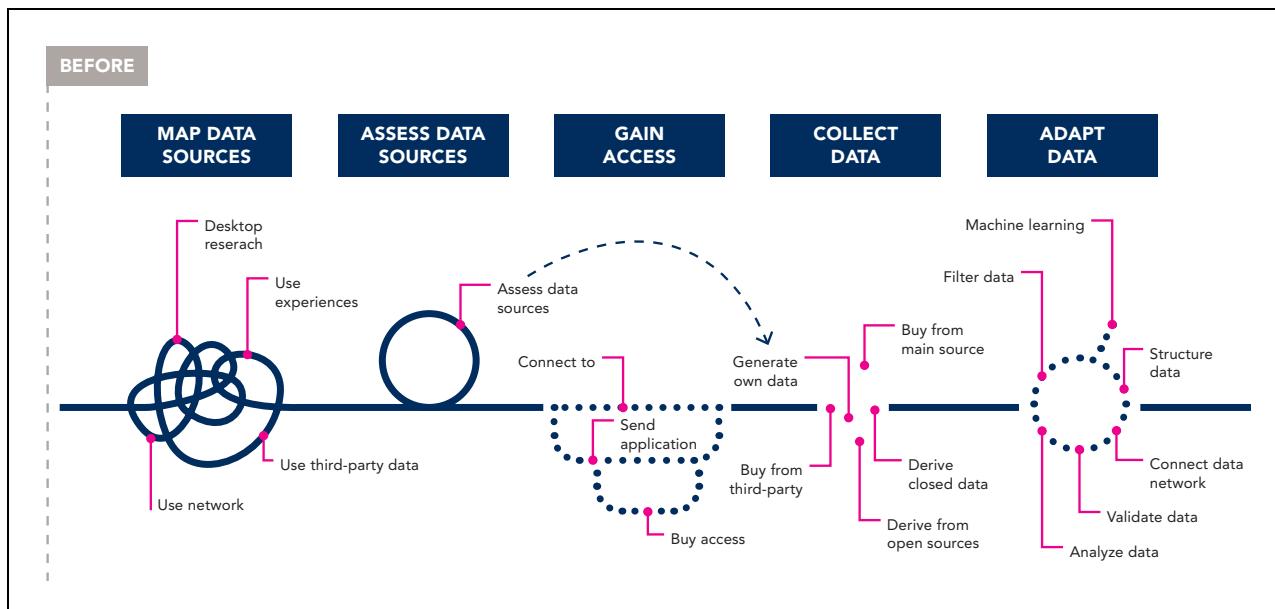
Figure 5.5 The entrepreneur's journey, pre-start-up

Source: MIT REAP Oslo and Viken

approved research institution as well as employees of ministries and directorates.

5.3 The private sectors' need for open data

There can be many reasons why public sector information is not shared with the private sector or reused by private actors. Companies may be unaware that the data exist and are openly available for reuse. Another reason may be that the quality of the data or the way the data are made available does not fit the intended purpose. It may also be that the quality of the data makes processing too expensive.[9]

Reliability in the delivery of data from the public sector are important for private companies with data-driven business models build around public sector information (data). Factors such as the frequency of updates, quality and division of responsibility can be agreed in more detail in separate contracts, such a service-level agreement (SLA).

5.3.1 Entrepreneurship and data-driven innovation based on public sector information

Start-ups and entrepreneurs building their business ideas and models around public sector information (data) face several challenges. A challenge raised by many of these entrepreneurs is that they cannot know whether their business idea can be realised before it is tested using full quality datasets. If entrepreneurs spend a lot of time or money on gaining access to data which subsequently prove to be of little value, they will have wasted precious time and resources. Many entrepreneurs find it easier to generate data themselves rather than gain access to datasets from the public sector for prototyping.

Entrepreneurs want to spend their time on prototyping and adding value to their business models, ideas and concepts rather than on gaining access to and structuring data. It is particularly challenging for businesses to succeed with value-adding services based on public sector data from municipalities. Little standardisation and varying municipal practices for making data available make it difficult to scale from idea to market because using data from only one or a few municipalities is not enough. This does not apply to municipal geospatial data, which is regulated by the *Spatial Data Act* with the Norwegian Mapping Agency as the central coordinator. National statistics on the municipalities are also available in

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[9]   OECD (2019): Data governance in the public sector. In: *The Path to Becoming a Data-Driven Public Sector*. OECD Publishing, Paris
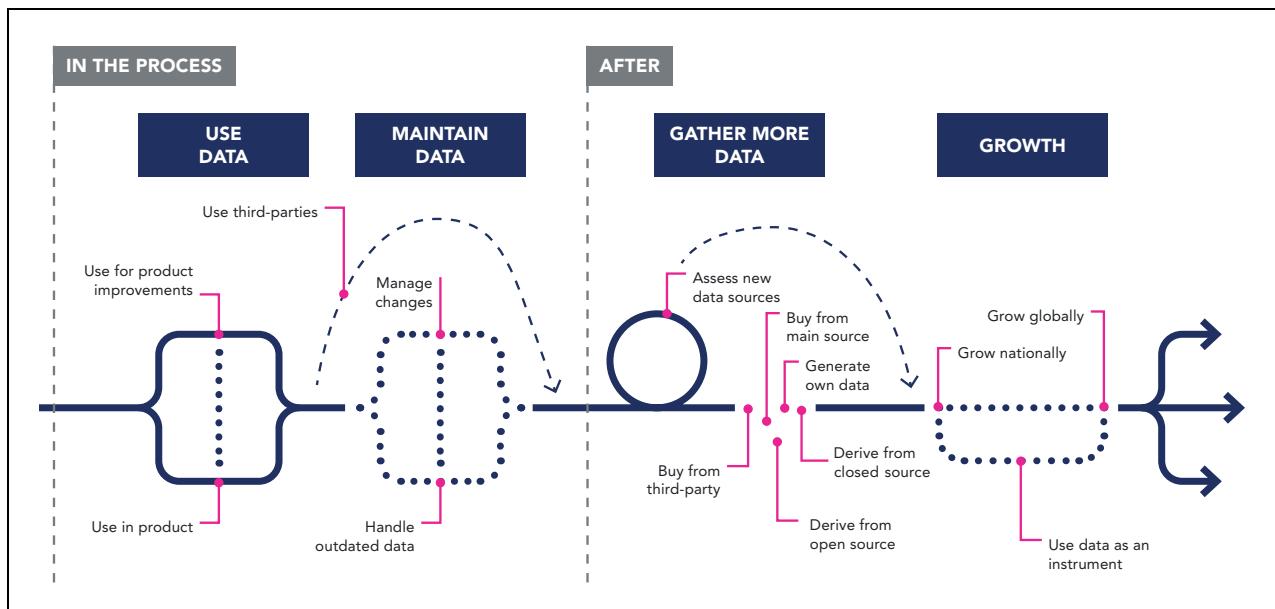
Figure 5.6 The entrepreneur's journey: during and after establishment

Source: MIT REAP Oslo and Viken

KOSTRA (Municipality-State Reporting), Statistics Norway and the Norwegian Social Science Data Services.

Oslo Metropolitan University / MIT REAP have carried out a project in which they mapped the user journeys of five start-ups in the two counties Oslo and Viken.[10] The mapping was conducted to gain more insight into the needs and challenges associated with accessing and using public sector information.

The main findings from this insight show that:
– there is a need for a general overview of what public sector information exist
– there is a need for guidance and help in the process of gaining access to public sector information
– there is a need for access to networks and competence that make the process of accessing and using data simpler and faster
– there is a need for access to datasets to do proofs of concept
– entrepreneurs are more vulnerable to waiting time, deficient datasets and lack of predictability
– entrepreneurs sometimes drop trying to gain access to data for reasons of cost, the complexity of the process or problems with data quality and structure
– differences in culture, communication and work methods between different sectors affect and delay processes associated with gaining access to data
– it is demanding to engage in lean, design-driven innovation because entrepreneurs lack the capital with which to generate and collect data multiple times

5.3.2 Knowledge about public sector information in the private sector

The Government's guidelines on making public sector information accessible recommend that public agencies spread knowledge about their own data, encourage their use, and facilitate dialogue with the private sector; see Box 5.7.[11] Public agencies can be more proactive in promoting the use of and demand for the data they can provide. In its report entitled *Digital Government Review of Norway*, the OECD remarked that public agencies must challenge the private sector and invite dialogue on what data should be made available and how.[12]

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[10] MIT REAP (2020): *Hvordan styrke Oslo og Vikens posisjon innen datadrevet entreprenørskap?* [How to strengthen Oslo and Viken's position in data-driven entrepreneurship]. Strategy from MIT REAP Oslo og Viken

[11] *Retningslinjer ved tilgjengeliggjøring av offentlige data* [Guidelines on making public sector information available]. Published on regjeringen.no

[12] OECD (2017): *Digital Government Review of Norway. Boosting the Digital Transformation of the Public Sector*

Box 5.7 Guidelines on making public sector information available

The guidelines on making public sector information available state what the data owner must think about *after* it decides that a dataset can be made openly available. The guidelines make 15 recommendations on how public sector information should be shared in order to make it possible for users to realise their value.

1. Use open licences
2. Provide data free of charge
3. Provide data without requiring user registration
4. Provide documentation of the datasets
5. Provide information on the data quality
6. Provide updated data
7. Make data visible
8. Use machine-readable and standard formats
9. Provide data via an application programming interface (API)
10. Provide full downloading capability
11. Use permanent addresses and unique identifiers
12. Publish an overview of the agency's data
13. Adapt the data to users' needs
14. Encourage use
15. Facilitate feedback

Box 5.8 Examples of reuse of public sector information in the private sector

There are several good examples of how open public data can contribute to data-driven innovation and business development in the private sector:

Otovo is a Norwegian energy company supplying solar panels for residential households. The process of carrying out inspections to assess energy production for potential customers can partly be automated by combining existing map and property data on buildings (FKB Bygning) with open data on sunlight conditions from the European PVGIS database. In 2018 Otovo estimated that the company had saved around NOK 300 million by taking advantage of existing datasets like these.[1]

Framsikt AS supplies control systems to Norwegian municipalities and makes analytical tools which largely are based on open data from KOSTRA and other data from Statistics Norway for the municipal sector. Many consultancy firms are now making good use of Statistics Norway data. Statistics Norway offers over 5,000 tables as open data via its API for StatBank Norway.

Spacemaker has developed a product for property developers to present proposals for plot developments using artificial intelligence. They use the Land Register for information on plots, detailed map data from the municipalities, and meteorological data on wind conditions and solar paths, etc. The tool makes it easy for developers to change different parameters in the project, such as building density, building stock and floor levels, and to examine sunlight conditions and plan parking spaces. Spacemaker was named entrepreneur of the year by Norwegian business newspaper *Dagens Næringsliv* in 2019.[2]

StormGeo develops advanced data analytics and consultancy services based on public meteorological data from Norway and other countries. The services are particularly directed at the power, energy and shipping markets. The company was formed as a spin-off from the television channel TV2 in 1997 and now has 550 employees in 115 countries.

[1] Jørgenrud, Marius B. (2018): *Norsk tech-oppstart har spart 300 millioner kroner på åpne data* [Norwegian tech startup has saved NOK 300 million with open data]. Digi.no, 12 March 2018

[2] Bakken, Jonas B. (2019): *Gründerbedriften har snart 100 ansatte – pekes ut som det heteste stedet å jobbe* [Startup soon has 100 employees – singled out as the hottest place to work]. Dn.no, 27 April 2019

Parts of the public sector, and particularly the municipalities, experience little demand for their data. This has been one of the reasons why some public agencies have not given priority making data accessible for reuse in the private sector.

Some providers of public sector information have events where private companies, start-ups and entrepreneurs are invited to discuss how public sector information can be shared and used for business development and innovation. For instance, has the Norwegian Mapping Agency for some years now, in collaboration with the University of South-Eastern Norway, encouraged the use of geospatial data by arranging the hack4no hackathon event, where data providers from the public sector, IT students and start-ups meet to explore new ideas based on open public sector information.

In September 2020 StartupLab arranged the Smart Mobility Hackathon in cooperation with the Norwegian Public Roads Administration. The participants were given specific challenges related to travel planning services, climate challenges and the coronavirus pandemic. They were given access to data mentors and representatives from the data providers with key expertise. The purpose was to explore how data – especially traffic data – and new technology can play a role in resolving specific industrial challenges for mobility. The actual hackathon challenge lasted 24 hours, during which time the participants were given access to a large amount of data to compete on resolving the challenges. The data providers

received useful input from the participants on datasets they lacked and tips on how data should be documented in order to be easy to use.

Collaboration between municipalities and local businesses on developing smart city solutions could stimulate demand for and interest in public sector information, particularly municipal data. The private sector is involved in societal development in the municipalities, something that can motivate engagement and participation. For example, Drammen municipality arranged an ideathon, where the municipality received input on businesses' data needs. Hackathons were recently arranged in Stavanger municipality, directed at business developers and start-ups, among others.

5.4 National measures for making public sector information available for reuse in the private sector

Several national measures and policy instruments have been established in recent years to promote the sharing and reuse of public sector information, and many of them are now managed by the Norwegian Digitalisation Agency. The Government will give priority to work on developing and improving national common solutions that will support efficient and secure infrastructure for sharing and using public sector information. This work will be needs-driven and based on national and international best practice. A description of the most important measures and future needs is presented in the following sections.

5.4.1 The national data catalogue

Value creation using public sector information requires public agencies to make their own data findable, accessible, interoperable, and reusable. A national data catalogue is created to provide access to available data and to provide an overview of the data resources held by the Norwegian public sector. The catalogue is a single entry point to open government data from the Norwegian public. The Norwegian Digitalisation Agency manages the solution. The Government's circular on digitalisation sets requirements for ministries and government agencies to publish datasets on data.norge.no.

Data.norge.no harvests the dataset descriptions automatically from local data directories in agencies such as the Norwegian Tax Administration, the Norwegian Labour and Welfare Administration and the Norwegian Public Roads

Administration. Agencies without their own local data catalogue can register their datasets manually on the website. Dataset descriptions are also exchanged with domain portals such as geonorge.no and transportportalen.no. No such solutions have yet been developed for exchanging data with other sectors, such as health or research.

In Statistics Norway's annual survey for 2020, *ICT usage in public sector*, 70 per cent of public agencies and 48 per cent of municipalities responded 'yes' or 'partly' when asked whether they shared data in line with the Government's guidelines. An overview prepared by the Norwegian Digitalisation Agency shows that since 2017 there has been a positive trend in the number of datasets published. It is primarily the agencies that already provide data that account for this growth. Figures from the Norwegian Digitalisation Agency show that as of February 2021, 62 government agencies, 25 municipalities, two county municipalities and 24 state-owned enterprises have published one or more dataset descriptions on data.norge.no. These represent a small portion of the total number of public agencies.

The public sector has considerable potential for improvement with respect to making dataset descriptions accessible and findable on data.norge.no and generally. It is estimated that there is a wide gap between the number of datasets that have been published and made findable in the national data catalogue and the number of datasets which is held by the Norwegian public sector. According to figures from the Norwegian Digitalisation Agency, probably only 10 per cent of public sector information has been documented and described on data.norge.no. Since many agencies make their data accessible via their own websites and data portals without registering them on data.norge.no, the total number of datasets published is likely somewhat higher.

A need for a better overview of public sector information from the municipalities

A report prepared by Agenda Kaupang and commissioned by the Ministry of Local Government and Modernisation shows that even the municipalities that have come furthest in data management and data sharing have fallen short.[13] There are several reasons for this. The municipalities largely use off-the-shelf IT systems supplied by small and large system providers. These standard systems are poorly suited to sharing and making

better use of data, and the municipalities' own data often become 'locked' inside the professional systems. It can be difficult for the municipalities to gain access to the data for their own use and for sharing. The municipalities also have less incentive to share data and fewer clear guidelines on doing so than government agencies. Other factors may be lack of competence in the municipalities and low demand for data from the private sector.

It is particularly challenging for businesses to succeed with value-adding services based on municipal data. Little standardisation and varying municipal practices for making data available make it difficult to scale from idea to market because using data from only one or a few municipalities is not enough. This does not apply to municipal geospatial data, which is regulated by the *Spatial Data Act* with the Norwegian Mapping Agency as the central coordinator. National statistics on the municipalities are also available in KOSTRA (Municipality-State Reporting), Statistics Norway and the Norwegian Social Science Data Services.

Further development of the national data catalogue

The Government will further develop the national data catalogue data.norge.no. The Norwegian Digitalisation Agency will consider further relevant services and new functionality with a view to making it easier for private enterprises to find and use datasets from public agencies. It will also be made easier for the private sector and other data users to engage in dialogue with data providers, for example to give feedback and ask questions on data quality and data formats. Better opportunities for dialogue and feedback between data providers and data users will also contribute to improving data quality and lowering the threshold for using public sector information in new contexts.

Data that hold high quality are characterised by being machine-readable, updated, accurate, consistent, and complete. Data providers can share information on data quality as part of the dataset descriptions on data.norge.no. In addition, an automated assessment is made of the quality of the dataset descriptions (metadata) in five categories:

1. *Findable*: The description contains good keywords, thematic categories, geographic demar-

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[13] Agenda Kaupang (2020): *Dataforvaltning og -deling i kommunene* [Data management and sharing in the municipalities]. Report for the Ministry of Local Government and Modernisation. Report no. R1021222

cation and definition of key terms in the dataset.

2. *Reusable*: Contact details and information on the licence are provided.
3. *Readable*: The dataset has a descriptive title and description.
4. *Interoperable*: The description contains unambiguous information on the formats in which the dataset is available.
5. *Accessible*: A link is provided to the dataset or to information on how to access the dataset.

The Norwegian Digitalisation Agency now works on improving the automated assessment in connection with a large-scale upgrade of the functionality and services provided on data.norge.no.

5.4.2 National Resource Centre for Data Sharing

A national resource centre for data sharing has been established within the Norwegian Digitalisation Agency. The purpose of the resource centre is to contribute to more digitalisation-friendly regulations and offer advice and guidance on data sharing in the public sector, including on reuse of public sector information in the private sector. There is a need for better legal competence when it comes to data sharing, and more knowledge about the relationships between law and technology and between business models and governance. There is also a need for more knowledge of how infrastructure in both central and local government can be adapted to facilitate data sharing.

The resource centre will assist data providers and data owners in this area and facilitate the sharing of experiences and best practice across the public and private sectors. Furthermore, the resource centre will identify needs for further developing the framework for sharing and using data in the public sector. In November 2020 new guidance on roles and responsibilities when sharing confidential information was published. The guidance is intended to help public agencies when sharing confidential information with other public entities, as well as with private businesses.

The National Resource Centre for Data Sharing will also have a more clearly defined role in guiding the private sector and other parties looking to use public sector information for business development, research and innovation. There will be a need to consider issues related to responsibilities and to ownership and usage rights so that they do not become barriers to increasing interaction between the public and private sector.

5.4.3 National toolbox for data sharing

The Norwegian Digitalisation Agency has developed the first version of a national toolbox for data sharing. The toolbox was launched in the spring of 2021 and is intended to help those looking to share and reuse data, whether it be between public agencies or from the public sector to the private or voluntary sector. The toolbox is not a physical product, but rather an online resource providing an overview of and access to agreements, solutions, standards, architectures and regulatory support, as well as an overview of roles and responsibilities.

The national toolbox facilitates simpler data sharing and reuse of public sector information by describing common public services, national common components and common standards, principles, and reference architectures. By gathering information on all the tools in one place, the toolbox will help make better use of them and identify areas where new tools are needed.

5.4.4 Framework for information management in the public sector

The framework for information management in the public sector is managed by the Norwegian Digitalisation Agency and comprises standards, guidelines and guidance material. Information management embraces activities, tools and other measures that will facilitate the best possible quality, use and protection of information in an agency. The information should be systematically organised in line with the agency's work processes.

The framework for information management will aid public agencies in leveraging the value of their own data and exchanging and sharing data with others efficiently and securely. The framework will be continually developed according to the agencies' needs.

The Government wants more data to be shared across the public and private sectors. Several sectors that already work actively on data sharing are encountering issues with data access and user rights. Both public and private enterprises need a framework that can provide guidelines on how to proceed to share data responsibly and securely.

Further development of the information management framework will build on the experiences gained from various public-private sector develop-

ment initiatives. A sector-by-sector approach to working on the framework, in close collaboration with the private sector, will ensure needs-driven development of standards, best practice and so forth.

5.4.5 Standardisation and development of standards in the public sector

A standard defines an agreement on what is best practice in each area. Standards are developed through consensus-based processes where all the relevant stakeholders are invited to participate. In the public sector, standardisation is performed in the respective sectors and in public administration. IT standards that are compulsory and that are recommended for the entire public sector are included in a reference catalogue for IT standards (*Referansekatalogen for IT-standarder*), which is managed by the Norwegian Digitalisation Agency. The development of standards and infrastructure for connecting data is driven by governments and supranational organisations.

Technical interfaces that are incompatible, and conflicting terms of use and data formats, are examples of factors that make it difficult to realise the value-creating potential of public sector information. Data that do not match standard formats must be processed and 'cleaned' before they can be used and combined with other data. This work often requires domain knowledge relating to the content of the data.

Norway's public sector has come a long way with geospatial data, where the *Spatial Data Act*, which governs data management and important international guidelines under the *INSPIRE Directive* have resulted in high-quality data that are standardised across administrative levels and countries. Other areas in the public sector have not come as far, and in these areas the Norwegian Digitalisation Agency plays an important role in providing guidance and advice.

Standardisation work demands in-depth domain knowledge, good coordination, broad support and active management if it is to succeed. International cooperation is also important. The EU currently has a number of initiatives that influence and lay the groundwork for standards that can be implemented in Norway's public sector, such as DCAT-AP; see Box 5.10. Norway is in a good position to influence European and international standardisation work, but the work is resource intensive. The public sector should use European and international standards as far as possible in order to be able to interact internation-

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Box 5.10 The DCAT standard

Data Catalog Vocabulary (DCAT) is an international standard for describing datasets, APIs and data catalogues, developed by the Wide Web Consortium (W3C). The purpose of the standard is to facilitate the exchange of dataset descriptions and data services across data portals, and to make it easier to find datasets that are published in different places.

The EU has created several application profiles (APs) based on this standard. These are specifications that are adapted to meet different needs. The Norwegian Digitalisation Agency manages DCAT-AP-NO, a Norwegian application profile of DCAT, which is included in the reference catalogue for IT standards in the public sector. DCAT-AP-NO is now used to harvest dataset descriptions from public agencies to data.norge.no, the national data catalogue, and to exchange them with the European Data Portal.

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ally and ensure interoperability across national borders. This will become increasingly important for connecting data held and managed by the Norwegian public and private sector to European data in the common European data spaces.

Implementation and development of standards for sharing and using data

In 2021 the Government has allocated funding to Standard Norway's work on IT standardisation in general and on following up cyber security standardisation. This work will contribute to the adoption and expanded use of standards, to strengthening Norway's participation in international IT standardisation efforts, and to transfer competence on these topics between Standard Norway and public administration.

Standard Norway is represented in the Norwegian Digitalisation Agency's Architecture and Standardisation Council, which has placed particular emphasis on an international perspective. The Government wants the Norwegian Digitalisation Agency to assess how it can involve Standard Norway more in the work on implementing and developing standards which support private sector needs for, for example, collecting and making real-time and sensor data available.

5.4.6 National architecture principles for digitalisation of the public sector

National architecture principles for digitalisation of the public sector will contribute to better interaction across the entire public sector so that digital services provided to citizens by public agencies are good and user friendly.

The Government's circular on digitalisation requires government agencies and ministries to use the architecture principles. They must be used when establishing new IT solutions and when making major changes to existing IT solutions, and they apply to both bespoke and 'commercial off-the-shelf' software. Regarding data sharing, the principles are clear: 'Ministries and government enterprises should facilitate sharing and reuse of data.' The architecture principles are only recommendations, not requirements, for the municipal sector.

5.5 *Datafabrikken* (The Data Factory)

The Government will facilitate increased sharing and value creation using data as a resource in the private sector. The Norwegian Digitalisation Agency will develop a 'data factory' – *Datafabrikken* – in collaboration with DigitalNorway. The data factory will provide high-quality data from the public and private sectors for developing new data-driven business ideas, products

and services. Collaboration between the public and private sectors will also be reinforced.

Small and medium-sized enterprises, start-ups and entrepreneurs represent an important target group for this initiative. Data-driven innovation is contingent on competence, large data volumes and a digital infrastructure for data storage, processing and analysis. Most small enterprises lack this competence and capacity, and have no means of building them alone. Some of the services to be provided by the data factory will therefore be guidance related to data access and usage rights, as well as on data preparation and cleaning for use in big data analytics and AI. The Norwegian Digitalisation Agency and DigitalNorway will cooperate with established competence hubs in data-driven innovation and enabling technologies such as business clusters and research centres when establishing the data factory.

In addition to offering services, the data factory will be a driving force for pilot projects that gather stakeholders, expertise and data in different domains and problems. The first pilot projects were implemented in 2021.

The establishment of the data factory must be viewed in connection with the Norwegian Digitalisation Agency's other work on data sharing, such as further development of data.norge.no and the National Resource Centre for Data Sharing. Experience gained from the data factory will also have transfer value for other areas and will be import-
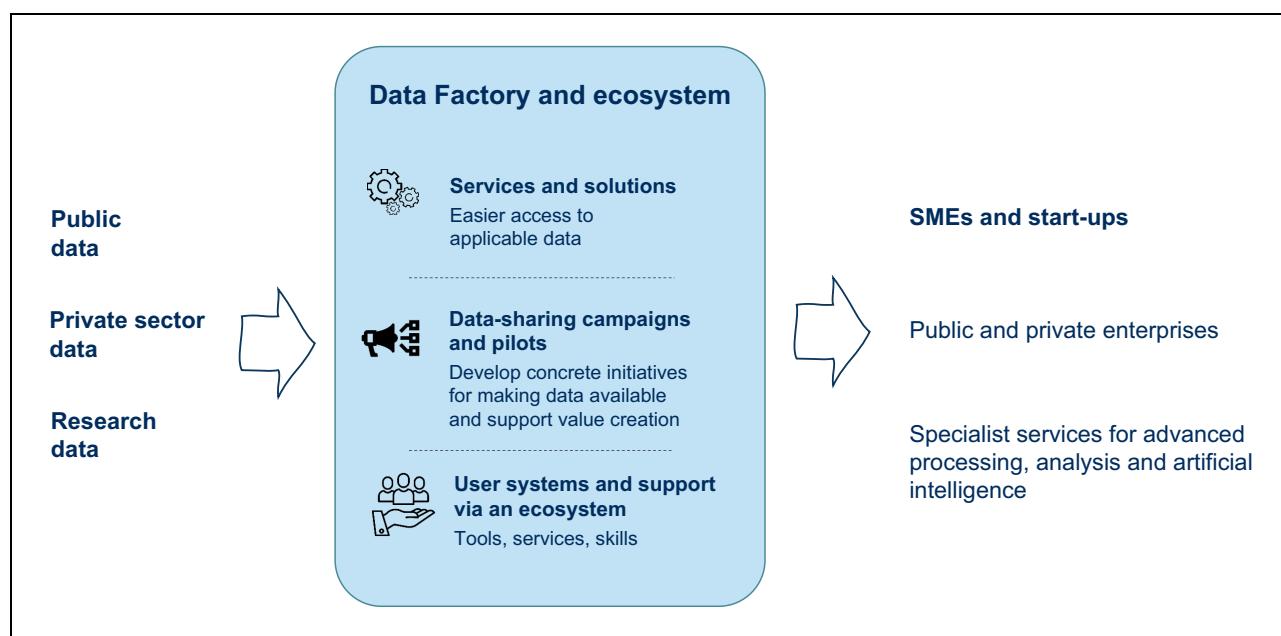

Figure 5.7 The Data Factory and its surrounding ecosystem

Source: Norwegian Digitalisation Agency and DigitalNorway

ant in the further development of best practice, standardisation, guidance and regulations.

5.6 The regulatory environment for the data economy in the public sector

5.6.1 Current requirements for and recommendations on sharing of public sector information

The current regulations on the reuse of public sector information are set out in the *Freedom of Information Act* and its associated regulations, and are largely based on the *Public Sector Information Directive*. The principle of public access is also a fundamental democratic principle and is intended not only to protect citizens' right to participate in society, but also to scrutinise the actions of public authorities.

The Government's circular on digitalisation[14] contains requirements and recommendations for public administrative bodies and ministries on making data available for reuse. Among other things, the circular requires agencies that establish new, or that upgrade existing, professional systems or digital services to register their datasets on data.norge.no. The circular also states that data must be made available in line with the provisions on reuse in the *Freedom of Information Act* and the Government's guidelines on making public sector information available.[15] The circular recommends adopting a long-term perspective to making data available, with their integrity, authenticity, usability and reliability intact. The requirements and guidelines set out in the circular must be followed up in the ordinary management dialogue. The degree to which it is given priority varies across the sectors.

No specific guidelines apply for municipalities concerning the reuse of data beyond the provisions in the *Freedom of Information Act* and the *Spatial Data Act*. In other words, the municipalities are not generally required to facilitate data sharing, but should the demand rise, they are required to make them available or share them if this can be managed using simple and cost-efficient procedures. It is up to the municipalities to decide whether to follow the Government's guide-

lines when making public sector information available.

The general rule under the *Freedom of Information Act* is that access is given free of charge. The *Freedom of Information Act*, section 4, allows for payment to be charged in certain situations. If converting to different formats or storage media is necessary and results in a significantly higher cost than regular copying, the actual cost may be charged for. In some cases, marginal costs and the costs associated with retrieving information and making it available may be charged for, with an additional charge for a 'reasonable return on investment', meaning a reasonable profit. First, this applies where the information is produced or adapted solely to meet the needs of external parties. Second, it applies when the body in question operates on a commercial basis or is fully or partly self-financed, and where it is established that payment for information will constitute part of the body's income.

The agencies may also charge for geospatial data (such as maps) and property information. The general rule in such cases is that a charge can be made for marginal costs and for the actual costs associated with collection, production, reproduction and mediation of the information. Agencies that prepare and deliver such information as one of their primary tasks may also charge an amount constituting a reasonable return on investment. This currently applies primarily to the municipalities.

5.6.2 Consideration of new rules on data sharing for reuse

EU data policy and regulatory development, combined with new technological possibilities, give good reason to consider new national regulations on the reuse of public sector information. A possible *duty* by the public sector to actively make information available, for example selected datasets, should be included in this consideration. It should also be considered whether the specific rules on reuse should be removed from the *Freedom of Information Act* and incorporated into new legislation.

Any new national legislation must be viewed in connection with the work on implementing the *Open Data Directive* (ODD). Guidelines in the European Commission's data strategy, the proposal for the *Data Governance Act* and changes arising from the *Open Data Directive* will have consequences for the Norwegian public sector.

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[14] *Digitaliseringsrundskrivet*. Curcular No: H-7/20
[15] Ministry of Local Government and Modernisation (2017): *Retningslinjer ved tilgjengeliggjøring av offentlige data* [Guidelines on making public sector information available for re-use]

An important change in the EU's new *Open Data Directive* is the introduction of the concept of high-value datasets whose reuse can have major benefits for society. Access to these datasets must be given free of charge via APIs or as bulk downloads where appropriate.[16] *The Open Data Directive* defines six thematic categories:

– geospatial data
– earth observation data and environmental data
– meteorological data
– statistics
– companies and company ownership information
– mobility data (transport data)

The work on specifying which datasets should be included within the thematic categories is currently under way in the EU, and Norway is participating in this work.

The law firm Kluge AS has examined to what degree Norwegian authorities can impose a duty on public bodies and agencies to actively, and on their own initiative, make public sector information available. The report was commissioned by the Ministry of Local Government and Modernisation. Kluge AS notes that, in principle, Norwegian authorities are free to establish such legislation, but points out that legislation which for various reasons protects information will place limits on such a duty. Such limits might involve privacy, intellectual property rights and security.

A duty to actively make public sector information available would depart from the current principle in the *Freedom of Information Act* that any person wanting information from the public sector must request access. At present, the agencies do not need to assess whether or not information can be made available until they receive a request for access. They then have to assess whether or not to impose any restrictions on the material requested prior to publication. This applies regardless of whether the request for access pertains to a document or a dataset. A duty to actively publish information will mean that continuous assessment would have to be made of whether content can be published. This also raises the question of establishing clearance procedures for publishing all the information that already existed before any new regulations came into force.

In the report, Kluge AS notes that the Government's circular on digitalisation is not perceived as particularly binding, that its status as a source of law is low, and that there is no recourse to impose sanctions on agencies that fail to comply with the orders in the circular. It should therefore be considered whether parts of the circular should be incorporated into new legislation. Consideration should also be given to the formulation of a general order to public agencies on how they may use their own intellectual property rights in a way that assures Norway's obligations under the *Open Data Directive*.

The Government will appoint a committee to consider cohesive regulation of the reuse of public sector information. The committee will look at, among other things, new legislation that can contribute to more openness and access to data, and provide Norway with a better framework for data sharing and data driven innovation that can benefit society. The committee should also consider whether a duty to make public sector information available should be included in this new regulation. If legislative changes are proposed, the economic consequences must be assessed.

5.6.3 Organisation and funding of the work on sharing public sector information

Technological development and increased digitalisation of public services allow public agencies to collect, store, use and share data in ways that were not possible only a few years ago. More public agencies are adopting technologies such as machine learning and artificial intelligence. Case processing is also being automated wherever regulations allow. For example, the Norwegian Directorate of Immigration (UDI) has adopted a system for automatic case processing of some types of applications for Norwegian citizenship. UDI uses the information it already has registered on the applicant and assesses whether the person in question may become a Norwegian citizen without an executive officer looking at the case.[17] One main impression is that new digital solutions for sharing and analysing public sector information are also being developed in areas where public administration is already far ahead, such as geospatial data, transport and traffic data and health data. Experiences from this work may have transfer value for other parts of the public sector.

The ways in which the work on sharing data for reuse is organised and funded in the public

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[16] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast)

[17] UDI: *Guide til ventetid for søknader om statsborgerskap* [Guide to waiting time for applications for Norwegian citizenship]. Published on www.udi.no

sector vary widely. These variations are related to how the sectors and the individual agencies are guided: political objectives, legislation, and economic incentives, as well as international obligations. They are also related to competence, sharing culture and innovation culture. For example, the Norwegian Mapping Agency and Statistics Norway have sharing as an important part of their social mission. For other public agencies, the task of making their own data openly available to others may be considered to lie beyond their core activities and is therefore given low priority. Some agencies have received requests from the private sector or other data users and have made datasets openly available in response. For example, the Norwegian Directorate of Fisheries has decided to make fisheries catch data available on its own website under a Norwegian Licence for Open Government Data (NLOD). These data are used for purposes such as business development and research.

Potential funding models for data reuse

There are some costs involved in making public sector information available for reuse. In addition to investing in digital infrastructure for storing and sharing data, resources are needed to identify which data can be shared, facilitate sharing (cleaning) and publication, and carrying out information activities to stimulate use. At the same time, many of these activities make up part of the agencies' efforts to keep 'Order in one's own house'. This means describing their own data, concepts, information models and APIs, and actively sharing data in accordance with national guidelines. In addition, there is a need for new measures to increase the pace of the work and achieve the goals.

Following up potential users can also demand resources. While some datasets are published annually, others are updated in real-time. It is often critical that datasets be supplied at the right time and quality because they may constitute an important part of private companies' business models. Real-time, or close to real-time, publication requires more resources than publishing a single dataset.

Some public agencies have chosen to pass the economic burden and responsibility for any adaptation and cleaning of datasets onto the users, while other agencies consider this part of the service they provide.

Charging fees for access to public sector information can have adverse consequences for open-

ness and transparency in society. Barriers to accessing information leave fewer opportunities available to verify the grounds for decisions. Moreover, in some sectors, such as the environmental sector, large parts of the data collection are funded by the private sector in connection with environmental assessments that businesses are legally required to do in order to obtain licences and permits. It would be unreasonable if the same businesses subsequently had to pay for access to the data.

Surveys show that providing public sector information free of charge rather than charging for it can prove economically profitable. Vista Analyse has estimated the economic benefit of free map and property data to be worth at least NOK 70 million annually, and that this will likely generate jobs for between 300 and 700 people.[18]

The Government wants to make it simpler to develop solutions based on property data. Data on property from the Land Registry and Cadastre will therefore be made available free of charge. This will reduce the Norwegian Mapping Agency's income from fees by an estimated NOK 11 million from 2021 onwards.[19] In addition, the Government proposes that data pertaining to ownership, which arise through title registration and property registration, be made freely available. This will reduce costs for data buyers and contribute to the development of new digital services.

The national geospatial strategy raised the dilemma between the wish to provide more geospatial data as open public data and the need for predictable funding for collecting and managing detailed map data. Increasing amounts of data and new user needs may affect the conditions for funding and collaborating on managing and maintaining geospatial data. The Ministry of Local Government and Modernisation has therefore begun to look at the challenges of existing schemes and to consider alternatives.

Regarding making health data available for secondary use, a large-scale project is under way to put in place a health analysis platform as a digital platform for sharing health data. The Norwegian Directorate of eHealth has conducted a study of the funding model for the health analysis platform and the Health Data Service as a first-line service for providing access to data. The director-

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[18] Vista Analyse (2014): *Verdien av gratis kart- og eiendomsdata* [The value of free map and property data]. Commissioned by the Ministry of Local Government and Modernisation. Report no. 2014/14

[19] Prop. 1 S (2020–2021) Ministry of Local Government and Modernisation

ate recommends a model that combines basic funding from the national budget with different forms of user financing.

Similar work is being conducted in the knowledge sector. On commission from the Ministry of Education and Research, the Norwegian Directorate for ICT and Joint Services in Higher Education and Research (UNIT) has examined different concepts for sharing data in the knowledge sector in connection with a new digitalisation strategy for universities and university colleges. This work is being followed up by the Ministry of Education and Research.

Mapping and evaluating the data economy in the public sector

Increased sharing of public sector information for reuse will create a need to ensure longevity, predictability and standardisation for those who produce and manage data. It is important to ensure continuity in data production, acquire data that hold a high quality, and to facilitate reuse. The various sectors' choice of organisational and funding models for sharing and using data must be respected. At the same time, pricing and payment models must be transparent and sustainable when upscaling, particularly in the public sector. There is also a need to develop methods for measuring the effects and benefits of open public data for society, the business sector and for the public sector. The last general report on the pricing of public sector information was published in 1994.[20]

Current knowledge is based on isolated reports within some sectors and for some types of public sector information, and is therefore fragmented.[21] [22] The Ministry of Local Government and Modernisation will map, evaluate and recommend different organisational and funding models for data sharing and the reuse of open data. As part of this work, it will also look at challenges that arise when the private, voluntary and public sectors collaborate on data. Such challenges can be division of costs, government subsidies and

procurement regulations, as well as which business models can be used. This work must be viewed in connection with the work of the committee considering a cohesive system for regulating data reuse, and with the European Commission's proposal for regulatory measures in the digital area, such as the *Data Governance Act*.

5.6.4 Public-private sector development

The Government has been working for many years on reducing the private sector's administrative costs associated with reporting to and communicating with the public sector. The Brønnøysund Register Centre plays a key role in this work and is an important national source of data on Norway's private sector.

An initiative has been taken to cooperate in a number of public-private sector development (OPS) projects. OPS projects entail facilitating economically profitable cooperation in relevant business sectors. Projects in a number of sectors are discussed in more detail in chapter 4.3. Achieving value creation through digital solutions and data sharing are important objectives of the scheme.

5.6.5 Digital collaboration between the public and private sectors

The Public–Private Digital Cooperation (*Digitalt Samarbeid Offentlig Privat* (*DSOP*)) is an initiative between the Norwegian Tax Administration, the Norwegian Digitalisation Agency, the Norwegian Labour and Welfare Administration, the National Police Directorate, the Norwegian Mapping Agency and the financial services industry. A key component in this cooperation is that any gains from the various measures should benefit the public sector and citizens, as well as the financial services industry.

By using Altinn's functionality for giving consent, citizens will be able to allow (or deny) a specific public or private third party time-limited access to their financial data. Use of consent creates more opportunities to exchange data between public and private enterprises and to develop new services while saving money for everyone involved. For example, banks can now offer their customers the possibility to see the balance on their student loans directly in their online or mobile bank, provided they have given the Norwegian State Educational Loan Fund consent to share this information with their bank. The consent must have a maximum dura-

[20] NOU 1994: 17 *Til informasjonens pris* [The price of information]

[21] Vista Analyse (2013): *Prising av Kartverkets tjenester* [Pricing of the Norwegian Mapping Agency's services]. For the Norwegian Mapping Agency. Report no. 2013/18 and Agenda Kaupang (2019): *Konsekvenser av frislipp av geodata* [Impacts of releasing geospatial data]. Report for the Ministry of Local Government and Modernisation

[22] Direktoratet for e-helse (2020): *Finansieringsmodell for Helseanalyseplattformen og Helsedataservice* [Financing model for the health analysis platform and the health data service]. Report no. IE-1066

tion of one year. The service uses a solution called *Maskinporten* for authenticating the entities using it. *Maskinporten* is a common solution for access management for entities that exchange data. The solution guarantees identities between entities and provides machine-to-machine authentication.

Another digital service that has been developed is an automatic consent-based loan application process (*Samtykkebasert lånesøknad*) which enables loan applicants to give their bank consent to retrieve information on their tax base and income from the Norwegian Tax Administration. Since this information is transferred automatically to the banks' own systems, the banks avoid having to register tax assessment and income data manually. The solution will ensure a good customer experience for loan applicants by making the process simpler and safer. Moreover, the fact that the loan applicant only consents to sharing whatever information is necessary for processing the loan application means that the solution will contribute to protecting privacy.

Other digitisation projects are being carried out under the Public–Private Digital Cooperation initiative where data sharing is important for their success. The 'Death and inheritance' initiative constitutes one of the seven life events highlighted in *One digital public sector: Digital strategy for the public sector 2019–2025*. The project on *Settlement after death* constitutes a key part of this life event.

The process of settling an estate after a death is currently a difficult and time-consuming process for the heirs. It is a manual, paper-based process that involves multiple parties. One of the main challenges is that it can be time-consuming and difficult to gain an overview of all the deceased's customer relationships. A digital user journey, where heirs can be guided from start to finish, will have value for them. It is also expected to be simpler and cheaper for the various parties involved, both public agencies and businesses. Data sharing between public and private entities is a key prerequisite for realising this solution.

Settlement after death is a collaborative project between the Norwegian Digitalisation Agency, the Brønnøysund Register Centre, the courts, the financial services industry, the Norwegian Tax Administration, the Norwegian Mapping Agency and the Norwegian Public Roads Administration. The project began in 2018 and plans to deliver a minimum viable product with key functionality in 2022.

Opportunities for the private sector to use common public IT solutions

On commission from the Ministry of Local Government and Modernisation, the law firm Wikborg Rein prepared a report on private entities' use of common public IT solutions and assessed the legal barriers and opportunities.

The report addressed the challenges associated with legislation governing government subsidies and procurement. The assessment shows that making common public IT solutions freely available to private entities would be problematic. To comply with regulations, private entities' use of public IT solutions must support the exercise of public authority, and access must be incorporated into any contracts entered into with the solution providers.

The Norwegian Digitalisation Agency will consider how the report's conclusions should be followed up in further work on the common solutions managed by the agency.

5.6.6 Access to data through procurements and partnerships

Some activities performed in the business sector are commissioned by the public sector. The regulations for public procurements are primarily intended to promote efficient use of resources in the public sector, but can also be used to achieve other objectives that are important for society. For example, the public sector can set guidelines on data access in notices of public tenders, and can seek better and innovative use of data through its procurements. This opportunity to stimulate data-driven innovation in the private sector is currently not taken full advantage of.

Using procurements as a policy instrument to stimulate the data economy can entail giving the private sector access to public sector information for developing new solutions. It can also secure the public sector's rights to data that are a part of deliverables to the public sector, either for internal use or for making the data openly available.

Data rights requirements in notices of public tenders and contracts

Greater awareness of and knowledge about data and data sharing may lead to more public sector procurements requiring suppliers to make it possible to access and share data. A major problem today is that data in many cases are 'locked in' to the specialised systems used in the public sector.

This creates a major barrier to good data management and sharing, particularly in the municipalities. Setting common requirements in procurement processes can make it easier to get suppliers of such systems to develop their solutions so that public-sector customers can easily access data from them, both for their own analyses and for sharing with others.

The Government will consider amending standard government contracts and developing separate contract templates to give public agencies the possibility to define rights to data that are collected in connection with deliverables from the private sector. Guidance from the Norwegian Digitalisation Agency and the Norwegian Government Agency for Financial Management will make it easier for small and medium-sized public agencies to assess when they ought to set requirements for access to such data in connection with procurements. The use of standards and templates will give the business sector more predictability around issues of ownership and usage rights to data in procurement processes.

Cooperation with the market through innovative procurements

Public agencies must avoid competing with the private sector on developing digital solutions and instead take advantage of the innovative power in the private sector to develop public digital services. The Government sees a need for new ways in which to cooperate with the market by leveraging the potential of innovative public procurements. In the autumn of 2020, the Government launched StartOff, a programme for innovative procurements from start-ups. StartOff will make it easier for start-ups to become suppliers to the public sector by facilitating fast and simple procurement processes, setting less detailed specifications and short development pathways. By setting requirements in the procurement processes, the public sector can also facilitate more cooperation between large established companies and start-ups. This type of innovative procurement process will also offer start-ups opportunities to use public sector information to develop new products and services.

5.6.7 Access to public sector information using licences and regulations

Data that are generated by activities in the private sector commissioned by or under permit or licence from the public sector must in principle be deemed a public good and can therefore be used by others. Some activities in the business sector are performed for the public sector or under permit or licence granted by public authorities. A licence grants a private business a specific right to financially exploit something that is owned by or at the disposal of the state. Conditions can be attached to this right, which gives the public sector an opportunity to set requirements for making data available in connection with awarding licences or granting permits. Requirements for data sharing can also be set out in regulations.

In some cases, it may also be appropriate to set requirements for sharing private sector data with the public sector in areas where this will significantly benefit society. The Government will consider when it may be in the public interest to require that data from the business sector be made available. The Government will also examine whether requirements for data access in connection with granting government licences might be a suitable policy instrument in this regard.

The Government has set out the following principles for sharing data from the business sector:[23]

– Voluntary data sharing is preferable, particularly between parties with a mutual interest in sharing data.
– The authorities can facilitate the sharing of data which businesses themselves see no value in sharing, if sharing such data will enhance public benefit.
– Data sharing can be made compulsory if necessary, for example for reasons of public interest.
– Data must be shared in such a way that individuals and businesses retain control of their own data. Privacy, security and business interests must be safeguarded.

Some examples

Aquaculture is operated on a licensing system. The *Aquaculture Act*, the *Food Production and Food Safety Act* and the *Animal Welfare Act* state provisions governing duty of disclosure. The aquaculture industry is currently required to report detailed information to the authorities. Under the *Aquaculture Act*, the Ministry of Trade, Industry and Fisheries may require anyone engaging in aquaculture to have and use equip-

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23 The principles were inspired by the Dutch Ministry of Economic Affairs and Climate Policy (2019*): Dutch vision on data sharing between businesses*

ment and software with specific reporting functions.

The Ministry of Petroleum conducts annual licensing rounds in which production licences for the Norwegian continental shelf are awarded through the Awards in Pre-defined Areas (APA) scheme. The scheme was first introduced in 2003 to facilitate exploration activity in the best-known areas of the Norwegian continental shelf. Because the areas are already well known, no new major discoveries are expected. Exploration often focuses on smaller discoveries that would not justify independent development. Such discoveries may nonetheless be profitable if they are developed in conjunction with other discoveries and/ or can utilise existing or planned infrastructure. If a company is awarded an area but does not wish to develop it, it may relinquish the production licence. The possibility to relinquish production licences also means the release of collected data under the scheme. This allows many companies to gain access to valuable data.

The *Petroleum Regulations* were amended with effect from 1 January 2021 to require the release of interpreted data in the reports submitted to the authorities when areas are relinquished. This will improve data access for other companies thinking of applying for licences in previously awarded areas.

Work on land use plans and zoning plans usually involves conducting impact assessments to ensure that consideration is given to the environment and society when the plans are drawn up. The *Regulations on impact assessments*[24] contain provisions intended to ensure high professional quality in impact assessments and that the data collected in connection with conducting impact assessments are systemised and made available to public authorities.

5.7   The Government will

The Government will

- establish *Datafabrikken* (The Data Factory), which will contribute to more public sector information of high quality being reused for business development and innovation
- appoint a public committee for cohesive regulation of the reuse of public sector information

- map and evaluate the data economy in the public sector, including making recommendations on various organisational and funding models for data sharing and the reuse of open data
- further develop the National Resource Centre for Data Sharing in the Norwegian Digitalisation Agency to strengthen its offering of training, guidance, sharing of best practises and support with work on data sharing and the reuse of open data
- provide guidance to public and private entities on how to regulate access to data when entering into contracts, for example using standard contractual clauses
- further develop a framework for information management in the public sector based on user needs and experience gained from the work on *Datafabrikken* (The Data Factory) and the public-private sector development projects
- further develop data.norge.no with new services and functionality for providers and users of public sector information
- consider which areas it may be in the public interest to require that data from the business sector be made available, and examine whether requirements for data access in connection with awarding government licences might be a suitable policy instrument in this regard
- consider amending the Norwegian Government standard terms and conditions and developing specific contract templates to strengthen public agencies' rights to data that are collected in connection with deliverables
- draw up common principles for cooperating with the private sector on digitalisation with a view to further developing such cooperation
- release data on property from the Land Registry and Cadastre so that property data are available free of charge
- contribute to developing standards for collecting and making available real-time data, sensor data, etc. from the public sector for reuse
- develop a common methodology for measuring the benefits and effects of public sector information and rendering it visible, based on the work being carried out in the EU and OECD in this area
- further develop national infrastructure for geographical information to strengthen data sharing and use across the public and private sectors

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[24]   *Regulations on impact assessments*, sections 17 and 24

6 Skills and research for a data-driven economy

Having the right type and level of competence is vital for being able to share and create value using data as a resource. There will be a need for more candidates with specialist ICT education in order to meet the demand for skills in the labour market. In addition, those already active in the labour market must be given the possibility to develop their skills through courses and further education.

6.1 A demand for specialist ICT skills

The labour market must have access to specialists who can develop and use enabling technologies such as artificial intelligence, big data analytics, robotisation and the Internet of Things (IoT). There is a need for employees who can process, analyse and interpret data. According to the European Commission, the need for such specialists in EU-27 will increase from 5.7 million in 2018 to 10.9 million in 2025.[1] There is a need for employees who possess both digital skills and an in-depth understanding of their own industry or service area, and who are able to transform data into knowledge and insight.

By specialist ICT skills is meant education in ICT at bachelor's degree level or higher. This covers a range of educational programmes such as Master of Science in informatics and other programmes and disciplinary fields where ICT makes up an important component, such as health science and computers and law.

Report no. 14 (2019–2020) to the Storting *The skills reform: Lifelong learning* points out that Norway has been training too few technologists for some time. The Government has redressed this issue by creating new study places in ICT-related subjects. The Norwegian Committee on Skill Needs points out that ever since 2014 the Norwegian Labour and Welfare Administration's

business survey has reported on the lack of ICT specialists in Norway. It also reports that the labour market for this professional group is changing rapidly and that the need varies widely between sectors and regions.

According to a report prepared by Economics Norway in 2021, there were 56,000 employees with ICT education in the Norwegian labour market in 2019. The number of employees with ICT education has increased five times more than the number of employees generally in recent years. Economics Norway has used its business and skills model (*nærings- og kompetansemodell (SØNK)*) to project a realistic trend in the business structure and the labour market needs for formal skills up to 2030. According to these projections, the number of employees with ICT education will increase to almost 100,000 people in 2030. This represents an increase of 40,000 people compared with 2019.[2] There are two drivers behind the increase in the number of employees with ICT education: higher employment in ICT-related industries and a higher number of employees with ICT education in other industries. The latter effect is the most important, according to the survey.

Statistics Norway's survey on the use of ICT in the public sector from 2019 shows that three out of four public agencies have encountered difficulties in recruiting ICT specialists. This represents an increase from 2014, when around half reported the same problem. The corresponding figure for the municipalities was 36 per cent in 2019. The demand for these types of skills in the labour market is large, and a 2020 report from the Nordic Institute for Studies in Innovation, Research and Education reported that system developers and programmers are among the professions that showed strongest employment growth between 2005 and 2013.[3] In a survey of members in the Business Association of Norwegian Knowledge

[1] European Commission (2020): Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions *A European strategy for data* COM/2020/66 final

[2] Samfunnsøkonomisk analyse (2021): Samfunnsøkonomisk analyse (2021) [Norway's need for ICT competence today and in future]. Report commissioned by Abelia, ICT Norway, NITO, NITO, DigitalNorway, Tekna, Negotia and the Electrician and IT Workers Union. R1-2021
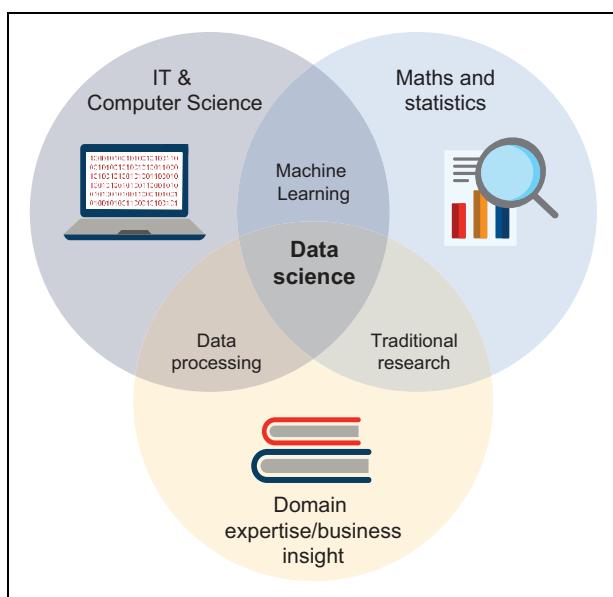
Figure 6.1 The relationship between data science and other disciplines

and Technology-Based Enterprises (Abelia), the skills areas showing the greatest need were found to be in programming and systems development, artificial intelligence/machine learning, data analytics and cyber security.[4]

Data science

Data science is an important skill in the data economy. Data science is an interdisciplinary field that involves extracting knowledge or insight from different data types and combining informatics, mathematics, statistics and data analytics with applications in other fields; see Figure 6.1. In the labour market the term 'data scientist' is used to describe people who develop models for analysing large datasets. Such models can, for example, be used in climate research, logistics, share trading, medical treatment or in developing games. Data science is a field that is undergoing strong growth and developing rapidly.

Cyber security

Competence in cyber security is also critical in a data-driven economy. Surveys from the Norwegian National Security Authority (NSM) show that

many agencies have considerable improvement potential in security awareness and security competence.[5] The Government has therefore developed a national strategy for cyber security competence.[6] The strategy mentions measures for high quality long-term research and sufficient national specialist competence as important areas. In addition, digital security will be included in ICT-related study programmes and be offered in continuing and further education courses.

6.1.1   The number of study places in ICT

Since 2015 the Government has given particular priority to ICT-related study programmes. Increased allocations to such programmes mean an increase of more than 2,150 students admitted to ICT-related studies in 2020 compared with 2014. This increase has happened gradually over several years. The overall effect in the form of graduated candidates has not yet taken effect, but in time this trend will increase the supply of candidates in Norway with high-level ICT skills.

At the same time as the rate of digitalisation and technological development has accelerated, new subjects and study programmes in ICT have been introduced in universities and university colleges. Since 2018, many of them have created their own study programmes in artificial intelligence and data science while the number of places in existing programmes have also increased. For example, more than 350 new study places dedicated to artificial intelligence, robotics and data science were planned from 2020 compared to 2017.

Despite the increase in capacity in recent years, applications to ICT programmes have increased by more than the increased number of study places. The number of applicants to ICT programmes in the Norwegian Universities and Colleges Admission Service for 2020 shows that there are many more qualified applicants than study places.

There is a need for more dialogue between the universities and university colleges and the labour market and society in order to achieve better alignment between educational programmes and labour market skills needs. In the spring of 2021, the Government launched a white paper on the

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[3]   NIFU (2020) *Arbeidsmarkedet for IKT-kandidater med høyere utdanning* [Employment market for ICT candidates with higher education]. NIFU report, 2020:15

[4]   Abelia (2020): *Teknologi- og kunnskapsbedriftenes kompetansebehov* [Competence needs of technology and knowledge companies]. Analysis, November 2020

[5]   Nasjonal sikkerhetsmyndighet (2017): *Helhetlig IKT-risikobilde 2017* [Overall ICT risk situation 2017]

[6]   Justis- og beredskapsdepartementet (2019): *Nasjonal strategi for digital sikkerhetsko* [National strategy for cyber security competence]

quality and labour market relevance in higher education.[7] The Government will facilitate broader dialogue and more systematic cooperation between universities, university colleges, state and local authorities and the private and voluntary sectors. A memorandum of understanding with Universities Norway, the social partners and the voluntary sector will contribute to this. The Government expects the universities and university colleges to facilitate employee mobility, for example in the form of dual positions between universities and university colleges and the rest of the labour market.

The Government has decided to produce a white paper on governance policies for public universities and university colleges. The white paper will discuss themes such as how the design of higher education should be governed to ensure sufficient capacity and skills for the regions and the future labour market.

6.1.2 Development of the data economy depends on interdisciplinarity

An interdisciplinary approach to research and education is important for understanding the consequences of the extensive changes and problems that a data-driven economy entails. Using data as a resource has a lot to do with developing services and business models in new ways. This raises whole new problems, particularly at the interfaces between law, technology, economy and the social sciences. Increased sharing and use of data involve taking a closer look at the ethical dilemmas that arise, what choices are made, and how these affect society in terms of sustainability, democratisation and trust in the population. The Expert Group on Private Sector Data Sharing has commented that many legal disciplines have fully adopted digitalisation perspectives, and sees the need for a more interdisciplinary approach to problems in the data economy.[8]

An introductory course in artificial intelligence for medical students and bioengineers has been established at the University of Bergen, where students learn how artificial intelligence can be used in clinical practice. In 2019 the Centre

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Box 6.1 Norwegian Committee on Skill Needs

In the spring of 2017, the Government appointed the Norwegian Committee on Skill Needs to obtain the best possible assessment of Norway's future skill needs. In its third report, the committee highlights three key trends that will come to shape the labour market and skill needs in the time ahead:
– technological development
– climate challenges
– demographic trends

The Government has decided to extend the tenure of the Norwegian Committee on Skill Needs until 2026 with an amended mandate and new organisation. One of the new duties in the committee's mandate is to offer advice on the design of the education sector. The mandate attaches importance to the fact that technology development, which is driven by increasing digitalisation, will create major needs for reform in the time ahead.

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for Computational and Data Science was established at the University of Oslo (UiO). Its starting point is that data science is far-reaching and in reality has significance for all disciplinary fields at UiO; see Box 6.5

On commission from the Ministry of Education and Research, the Norwegian Directorate for ICT and Joint Services in Higher Education and Research (UNIT) has developed a new digitalisation strategy for the higher education sector.[9] The purpose of the new digitalisation strategy is to set the course for further digitalisation of higher education and research in Norway. One of six strategic focus areas is value creation through sharing and reusing data. The strategy also reflects the growing need for interdisciplinarity, and considers among other things that vocationally adapted digital skills should be better incorporated into all disciplines.

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[7] Meld. St. 16 (2020–2021 *Utdanning for omstilling – Økt arbeidslivsrelevans i høyere utdanning* [Education for change – increased labour marked relevance in higher education]

[8] *Report on the expert group for data sharing in the business sector.* April 2020

[9] Ministry of Education and Research (2021): *Strategi for digital omstilling i universitets- og høyskolesektoren* [Strategy for digital transformation in higher education]
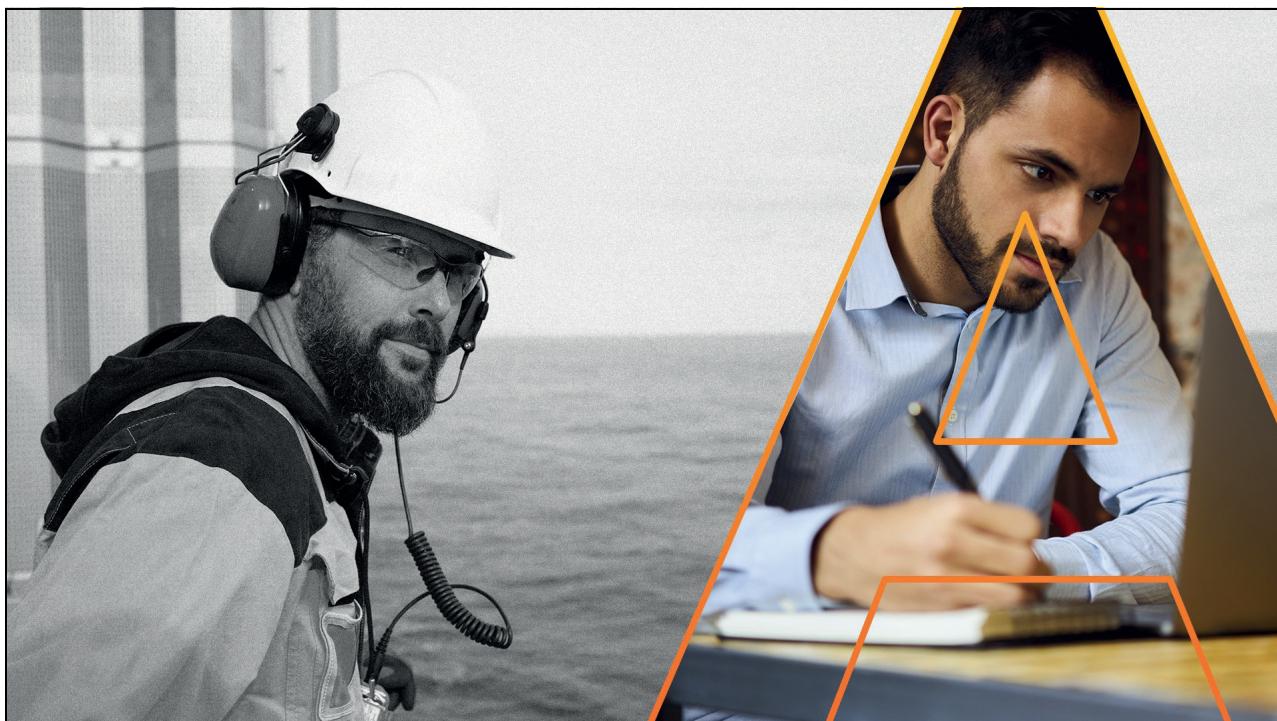
Figure 6.2 Industrial Digital Academy: courses in industrial data and digitalisation

Photo: Cognite

6.2   Opportunities for lifelong learning

The Norwegian Labour and Welfare Administration's Horizon Scan[10] shows that the pace of change in the labour market likely will accelerate, and the OECD estimates that every fourth job will undergo major changes.[11] There will be a need for more vocationally adapted digital skills and specialised digital skills in industries where employees traditionally have had other vocational backgrounds. For example, skills in fraud detection, data analytics, business development and computer science have gained importance in the financial services industry in recent years.

The Basic Agreements between employers and employees establishes that the costs for up-skilling and re-skilling that are necessary to meet the needs of the company must be borne by the company. The costs for further education or training that is not relevant for the company, for example if an employee wishes to change occupation, must generally be covered by the individual. It is up to the employer to decide what is relevant and necessary for the company.

However, society cannot expect businesses to carry full responsibility for covering the labour market's needs for new skills. Many small and medium-sized enterprises do not have the capacity to work systematically on up-skilling or re-skilling for their employees. In future, employees must expect to change jobs more often, and it is therefore natural that individuals gradually take on more responsibility for their own skills and career and not depend solely on their employers.

6.2.1   Flexible provision of courses and further education

In April 2020 the Government presented its white paper on skills reform.[12] The objective of the reform is that no one's skills become obsolete, and that the labour market needs and employee skills should be better aligned.

A flexible system is needed that can quickly respond to new skills needs. The Government has established schemes to support flexible programmes that can be combined with work and that are available throughout the country.

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[10] NAV (2019): *NAV's Horizon Scan 2019 – Developments, trends and consequences towards 2030.* Report 1-2019

[11] Nedelkoska, L. and Quintini, G. (2018): *Automation, skills use and training*, OECD Social, Employment and Migration Working Papers, No. 202, OECD Publishing, Paris

[12] Report no. 14 (2019–2020) to the Storting *The skills reform: Lifelong learning*

Between 2018 and 2020, a total of around NOK 185 million was allocated to schemes that make tertiary vocational education and higher education, including further education, available to people in work and for people who cannot move to an ordinary place of study. In 2021 up to NOK 132 million has been announced for flexible educational programmes.

In 2019 the Government created a new scheme under the Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education. Under this scheme, universities and university colleges can apply for subsidies to develop and operate flexible programmes to increase access to relevant educational programmes for people who cannot move to study. Priority was given to programmes focusing on sustainable transformation and environmentally friendly business development, technology and health.

The skills challenges differ throughout the country. Under the local government reform, the county municipalities were assigned an important role with respect to the labour market, tertiary vocational colleges, universities and university colleges to ensure better access to skills and relevant, qualified workforces in the regional labour markets.

As school owners for public tertiary vocational colleges and upper secondary education, the counties are particularly well placed to design the county's educational provision in a targeted manner. The tertiary vocational colleges are particularly able to quickly develop and offer short educational and training programmes in cooperation with the labour market. The county municipalities play a key role in developing higher vocational education, both as provider and administrator of tertiary vocational education, and in contributing to continuing and further education for local business and industry.

The Government has also established a scheme where universities, university colleges and tertiary vocational colleges can apply for funding to develop more flexible further education programmes in cooperation with the private sector. Digitalisation is given priority in this scheme because the scope of flexible further education programmes with relevance for digitalisation offered by Norwegian universities, university colleges and tertiary vocational colleges is small. The scheme is managed by Skills Norway.

In 2019 the Government and the social partners established a scheme with tripartite industry

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Box 6.2 Elements of AI

Elements of AI is a free online course in artificial intelligence. The course was developed in the spring of 2018 by the Finnish company Reaktor, its Norwegian sister company Feed and the University of Helsinki. The course is open to anyone interested in learning more about artificial intelligence, what it can and cannot be used for, and how to start using methods based on artificial intelligence. The course combines theory with practical exercises, and requires no specific prior knowledge. Elements of AI was launched in Norway by Feed in cooperation with the Norwegian University of Science and Technology in 2020. A follow-up course, Building AI, is now offered. Building AI offers participants deeper insight and teaches them how to build algorithms.

Source: Feed/Reaktor.

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programmes. The objective of the industry programmes is to contribute to skills development according to industry needs so that employees can handle changes and be better equipped for tomorrow's labour market. Ten industry programmes have been created so far.

In order to ensure high-quality and better integrated career guidance, the Storting has established by law that the county municipalities have a duty to provide career guidance to their citizens. A national digital career guidance service, karriereveiledning.no, has also been established. The karriereveiledning.no website offers information, reflection tools and professional career guidance via chat and telephone. In addition, the Government will consider a digital skills platform that will make it easier for those who need to find the right continuing or further education programme. The Government will also continue the work on making the Norwegian State Educational Loan Fund more flexible and better adapted to customers who take further education.

Some companies opt to cooperate with educational institutions on designing a more targeted skills development programme for their employees. For example, DNB bank has offered its employees opportunities to take further education in data science in order to meet the bank's need

for skills in this area.[13] DNB has also initiated cooperation with the Department of Informatics at the University of Oslo because they saw a need for more IT architects. Together they have developed a one-year programme at master's degree level that can be taken on a part-time basis over three years. The first cohort started in 2018. Equinor cooperates with the University of California, Berkeley on tailoring the Leading Digital Transformation programme for its managers. Several other companies and enterprises have entered into similar cooperation with educational institutions. Equinor also uses massive open online courses (MOOC) to develop its employees' skills.

6.2.2 Competence needs of small and medium-sized enterprises

Small and medium-sized enterprises (SMEs) make up a highly heterogeneous group, but one feature they all have in common is their often limited resources to develop new skills or buy services to meet their needs. SMEs need everything from standard guidance manuals and short courses to continuing and further education programmes at university and university college level, often developed in cooperation between the educational institutions and the private sector.

Many rural areas lack access to ICT skills. The region around Oslo has a structure of clusters and

industries that cover around 85 per cent of the employees in Norway with relevant ICT education. A survey conducted by the Nordic Institute for Studies in Innovation, Research and Education shows that two to three years after completing their education, 70 per cent of ICT candidates at master's degree level work in the Oslo region.[14] Mobility among master's degree graduates in ICT is 20 per cent higher than the average for master's degree graduates generally, and they are drawn towards the large cities, primarily Oslo.

Companies in the regions can make themselves more attractive to ICT students by cooperating with the universities and university colleges on creating practical placements for students. More cooperation with local labour markets during education can make it easier and more attractive for new graduates to seek jobs locally.

Better measures must be taken to allow the full breadth of the private sector to take advantage of decentralised continuing and further education courses in digital skills. To ensure that small companies also develop digital skills and tools, it will be important not just to develop offerings in courses and further education but also to encourage and facilitate good use of these offerings.

The Government has supported establishment of DigitalNorway. The centre plays an important role in building digital competence in the private sector, and works actively to enable small and

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[13] DNB (2018): *DNB utdanner egne Data Scientists* [DNB training its own data scientists]. News article on dnb.no, 29 June 2018

[14] NIFU (2020): *Arbeidsmarkedet for IKT-kandidater med høyere utdanning* [Employment market for ICT candidates with higher education]. NIFU report 2020:15

Boks 6.3 DigitalNorway

DigitalNorway is a non-profit initiative started in 2017 by 15 committed businesses with support from the public sector. Its objective is to speed up the digital transformation of Norwegian industry, especially in SMEs.

It is important to enable SMEs to participate in the data-driven economy. DigitalNorway will therefore promote large-scale collaborative projects involving data sharing in various industries. In alliance with the Norwegian Digitalisation Agency, DigitalNorway will have a key role in the Government's programme to establish a data factory.

As one of five Norwegian Digital Innovation Hubs (DIHs) under the EU's Horizon 2020 pro-

gramme, DigitalNorway is engaged in several EU projects and undertakes information activities related to research, technology and innovation, with a particular focus on SMEs.

DigitalNorway also delivers free online guides and training courses in various aspects of digitalisation, such as innovation, data use and digital marketing. The training courses range from short online sessions to more comprehensive further education programmes adapted to private sector needs. The courses are developed in cooperation with the universities.

Source: DigitalNorway.

medium-sized enterprises particularly to be able to participate in the data-driven economy. They offer free courses, guidance and further education programmes. They also arrange webinars, workshops and digital meeting places to facilitate experience exchange.

6.3 Research policy for increased knowledge of and for the data economy

Norway needs knowledge about what opportunities and challenges arise with the data economy, and how it affects Norwegian society. This creates a need for research in different fields such as ICT, law, economics and social sciences, as well as for a more interdisciplinary approach. For example, development in big data, data science and artificial intelligence will raise ethical and societal issues that should be researched. The Government's key research policy document is Report to the Storting no. 4 (2018–2019) *Long-term plan for research and higher education 2019–2028*. Enabling and industrial technologies, including ICT, is one of five long-term priorities in the plan.

A focus on basic technology research, artificial intelligence and data science is important for

keeping up with international trends and realising the Government's ambitions of renewal and restructuring. Civil protection, privacy and how technology affects society are important research areas that support this. For the data economy, research in areas including legal and economic issues will be important for moving the field of study forward.

6.3.1 ICT research and development

Between 2015 and 2019, a total of approximately NOK 1.3 billion was allocated via the Research Council of Norway to projects in artificial intelligence, robotics and information management (big data). These areas are extremely important for the data-driven economy. They are also the technology areas in ICT that grew most between 2015 and 2019; see Figure 6.3. Data protection, security and risk are other important ICT-related R&D areas in the data-driven economy. The enabling technologies are developed and applied in interaction with each other, and new technology areas are emerging at the interfaces between them. Considerable international attention is being paid to encouraging different technologies to merge and produce new knowledge, business development and innovation, and such technology conver-

Technology areas in the Norwegian Research Council

— AI, robotics, visualisation and digital content
— Software and services
- - - Next generation computing
- - - Components and systems

— Humans, society and technology
— Privacy, security and risk
- - - Communications technology and infrastructure
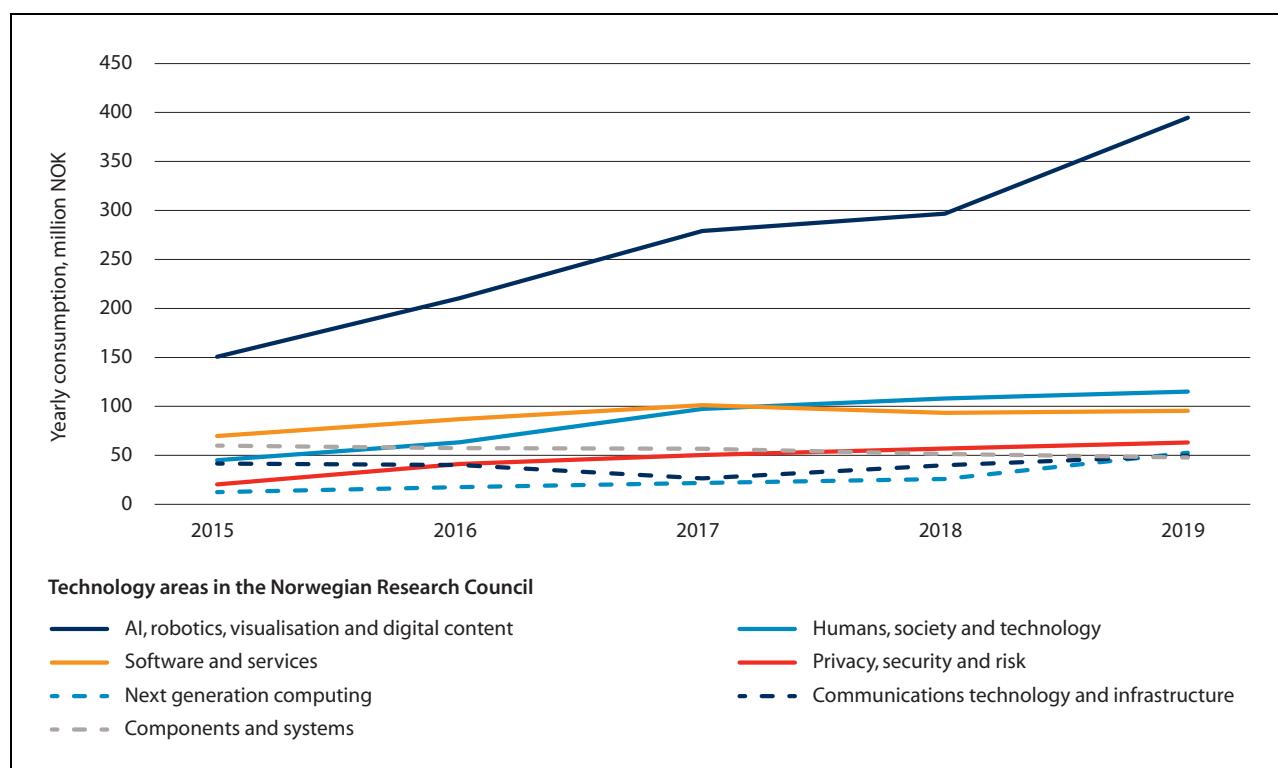
Figure 6.3 R&D expenditure for different technology areas in the Research Council of Norway

Source: Research Council of Norway

Box 6.4 Norwegian Research Center for AI Innovation (NorwAI)

The Centres for Research-based Innovation are the Research Council of Norway's scheme for building or strengthening Norwegian research communities in close cooperation with an innovative private sector. The purpose is to support long-term research that promotes innovation and competitiveness in the private sector.

The Norwegian Research Center for AI Innovation is a new research centre for artificial intelligence and big data led by the Norwegian University of Science and Technology (NTNU) and SINTEF Digital. The purpose of the centre is to develop ground-breaking theories, methods and technologies for efficient and responsible use of data-driven artificial intelligence in innovative, industrial solutions.

Among other things, NorwAI will work on: challenges associated with intelligent data platforms, analysis of large-scale sensor data, massive language models for Scandinavian languages, and the relation between physical and digital systems.

Source: Norwegian University of Science and Technology (NTNU)

Box 6.5 dScience – Centre for Computational and Data Science

Sustainable societal development is increasingly dependent on knowledge from data and the use of increasingly larger datasets. That is why the University of Oslo has established dScience – Centre for Computational and Data Science.

By gathering research communities across the institutes and disciplines, dScience will enhance the university's scientific profile and position Norway in the international arena. By conducting research in areas such as artificial intelligence, language technology, statistical methods, machine learning and deep learning, dScience will contribute to better, more efficient use of data in public administration and business development. This includes managing uncertainty and transforming knowledge and competence into economically sustainable jobs. As well as facilitating development and use of digital resources in research and business development, dScience will operate meeting places and develop partnerships between research communities in academia, and the private and public sector.

Source: Source: University of Oslo

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gence is high on the Research Council of Norway's agenda.

The size of allocations to basic research in ICT grew between 2016 and 2019. The Government wants this trend to continue, and ICT research will be strengthened in accordance with the escalation plan set out in the Long-term plan for research and higher education. The escalation plan is worth a total of NOK 800 million for the period 2019–2022, and in 2021 the Storting increased allocations to the Research Council of Norway by NOK 62.5 million for basic technology research with emphasis on ICT. Such initiatives in basic ICT research are necessary for building communities of research excellence that can form the foundation for the Government's goal of a technology-driven transformation and a digital green transformation. The long-term plan will be revised every four years.

6.3.2 Participation in the Horizon Europe research programme

The world's leading research environments in ICT are in the United States, China and the EU. International cooperation with good research communities on all continents is important for being at the frontier of research and building research-based knowledge and competence nationally, as well as for being perceived as attractive partners in international projects.

A key component in Norway's research policy is participation in the EU Framework Programme for research and innovation. The EU's ninth framework programme for research and innovation, Horizon Europe, commenced on 1 January 2021 with a proposed budget totalling EUR 94 billion. Norwegian entities can apply for funding on equal terms with companies, public agencies and research institutions in EU member states. An important change from the previous framework

programme for research, Horizon 2020, is the introduction of mission-oriented research and innovation, where 'missions' must be ambitious research and innovation initiatives to solve specific major societal challenges. Combined with participation in the Digital Europe Programme (DIGITAL), participation in Horizon Europe will give Norway a solid competence boost in important areas. Artificial intelligence plays a key role in the programme. The focus on innovation will also be stronger than in Horizon 2020.

6.4 The Government will

The Government will

- present a white paper to the Storting on governance policies for public universities and university colleges, with expectations that universities and university colleges design their study programmes according to student demands and labour market needs
- present a new digitalisation strategy for the higher education sector in the spring of 2021
- strengthen basic ICT research through the Research Council of Norway
- encourage public and private entities to have employees take the online course Elements of AI, which is now available in Norwegian

7 Fair, ethical and responsible use of data

The Government will facilitate a responsible data economy in Norway and work to ensure that data are used in fair, ethical and responsible ways. Security and privacy must be safeguarded. Consumers' rights shall be protected and there should be fair competition rules for Norwegian and international businesses. While better use of data can lead to services being personalised and tailored to individuals, the work on preventing discrimination, manipulation and misuse of information will be particularly important. Transparency, equal treatment and legal certainty are important democratic principles and must also apply in the data economy.

7.1 Fair competition in the data economy

Many of the biggest companies in the data economy depend first and foremost on all the information users and customer leave behind when visiting websites, searching for information, downloading and using mobile apps or shopping online. People's everyday use of technology generates large amounts of personal data, and enterprises with business models that are based on refining, exchanging and using such information are dependent on consumers' trust.

7.1.1 The dominance of the big technology companies

The world's biggest technology companies, measured by market value and market shares, are leading the way in technology development and the data-driven economy. There are currently five big technology companies dominating the global market: Alphabet (Google's parent company), Facebook, Apple, Microsoft and Amazon. Large Chinese technology companies have also entered the global market, such as the internet company Alibaba, the social network TikTok, and Huawei, which delivers technology and equipment for telecommunications, mobile phones, etc. These businesses are fierce competitors in areas such as

smartphones, operative systems, analytics technology and cloud computing services. Other areas are dominated by individual companies, such as Facebook in social media.

The competition from the big international platform companies primarily affects the service industries, such as banking, finance, insurance and the media, but no one industry is safe. The market dominance of the big technology companies challenges the ground rules and exposes Norwegian business and industry to fierce competition. Competition can be positive and lead to a high pace of innovation and low prices, but that is contingent on fair competition on as equal terms as possible. Network effects and tax issues are factors that challenge this.

The prohibition provisions in the Competition Act are worded in such a way as to render them applicable in new, emerging technologies, industries and markets. Nonetheless, there is reason to question whether the specific issues of competition law that can arise in a data-driven economy can be adequately resolved with today's legislation. This is part of the reason why the European Commission is currently formulating competition rules that can effectively address new technology and new markets. The allocation letter to the Norwegian Competition Authority for 2021 specifies that the authority must continually assess whether it has the necessary enforcement tools to deal with a digital economy. In this connection, the Norwegian Competition Authority will follow up processes in regulatory development in both the EU and the OECD.

Network effects

Some markets are characterised by economies of scale and what are known as network effects. A network effect is when the benefit derived by one user of a product or service depends on how many other users use the same product or service. Telephony is a good example: who would be interested in buying the world's only telephone? The value of telephony is dependent on how many others have a telephone. In a network effect, the
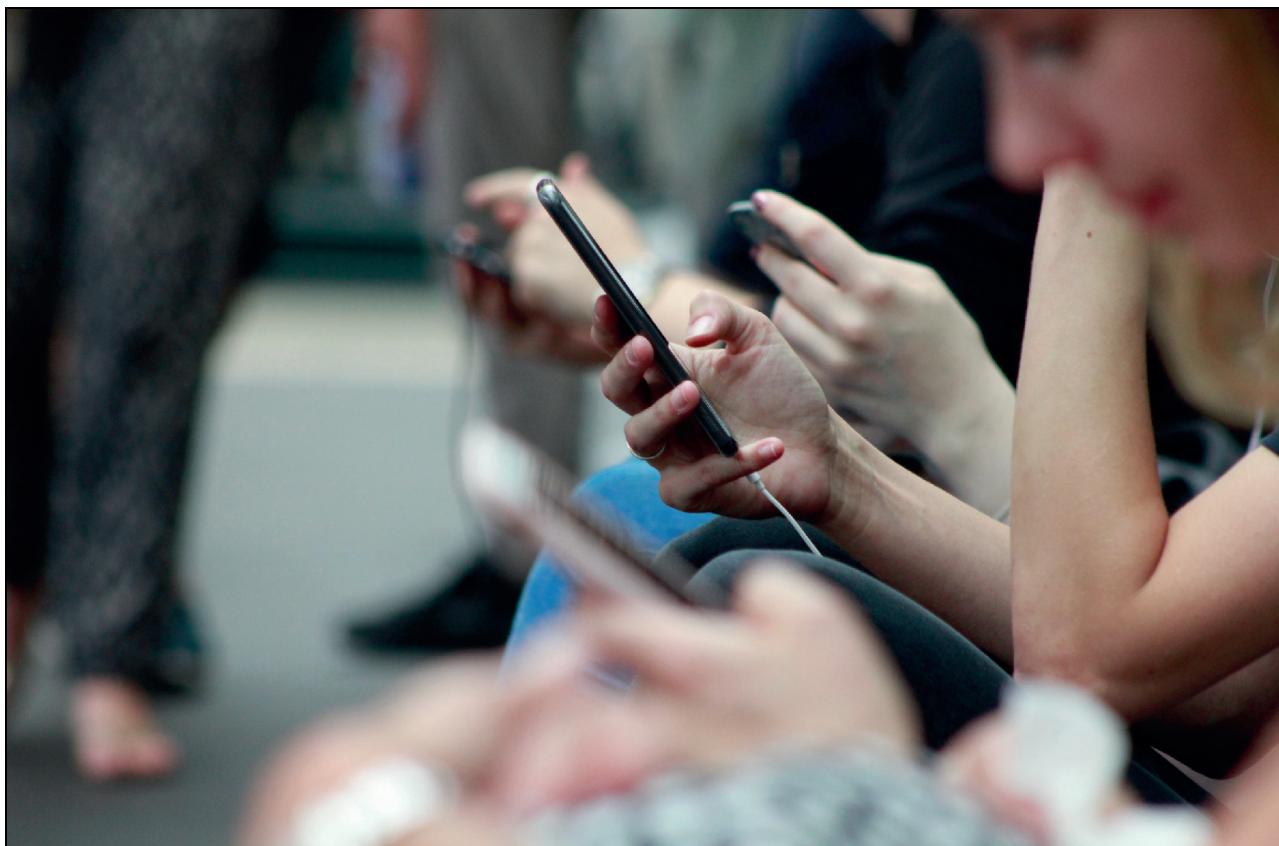
Figure 7.1 Use of social media

Photo: Robin Worrall on Unsplash

market will often 'take off' once a given number of users is reached, creating a self-reinforcing demand that generates a large number of users.

Social media are another example. There is no fun in being on a social medium where no one else is. In 2009 'Nettby' was Norway's most popular online community. Nettby was closed down in December 2010 because all its users moved to other online communities, predominantly Facebook. This illustrates another aspect of network effect: if the cost to the user for switching to alternative services is low, 'all' the customers may switch when a new and seemingly more attractive service emerges. The providers will therefore try to create mechanisms that make it less attractive to their users to switch services. This may be the case if they find the transaction costs of switching too expensive.

Moreover, new businesses find it difficult to establish themselves in a market in which one or more dominant actors are already operating. A typical characteristic of digital services is that once a service is fully developed and established, the cost of serving one additional customer (the marginal cost) is extremely how, practically zero.

This means that the service can be scaled up at a very low cost. The challenge for intruders in markets like these is to create a critical mass of services and users. Because establishment costs are high, the cost of each new customer during the establishment phase is extremely high.

The competition authorities serve to counteract network effects, attempting to restrict monopolies and thus ensure competition in the market. A relevant example is the requirements that were imposed by US authorities, and subsequently by the European Commission, on Microsoft to publish APIs for the Windows platform so that desktop programmes from other providers can open and process files such as Word documents. The Norwegian Consumer Council later took the lead to force Apple to remove its copy protection system (also known as digital rights management (DRM) software) which at the time allowed music purchased from Apple to only be played on Apple devices.

Apple and Google – through App Store and Google Play Store – have been criticised for exploiting their market dominance by making it difficult for competitors and for giving preferential

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Data as a resource

treatment to their own products. For example, these companies have a payment model that requires other companies to pay a considerable share of their revenues to Apple and Goole for distributing their apps on the platforms. This generates higher distribution costs for Apple's and Google's competitors, as there are few alternatives for reaching consumers.

7.1.2 The Digital Services Act and the Digital Markets Act

In recent years the European Commission has been following the digital platform economy and platform companies such as Facebook, Amazon and Google. In December 2020 the European Commission published the *Digital Services Act* and the *Digital Markets Act*. These legislative initiatives have two main goals: to create a safer digital space in which the fundamental rights of all users of digital services are protected and to establish a level playing field to foster innovation, growth and competitiveness, both in the EU/EEA and globally.

Digital Services Act (DSA) can be viewed as a revision of the *e-Commerce Directive*. Since the *e-Commerce Directive* was adopted in 2000, the digital landscape has changed significantly with the emergence of new digital platforms. The DSA should improve the possibility to remove illegal content online and better protect users' fundamental rights, including freedom of expression. The DSA should provide better public supervision of digital platforms, particularly platforms reaching more than 10 per cent of EU citizens.

More specifically, this means the possibility to flag and trace sellers of illegal goods, services or content online; better protection for users; algorithmic transparency, for example in services that come with recommendations; greater responsibility for the dominant platforms to prevent misuse of their services through risk management and internal control; access for researchers to key data from the very large platforms so that they can scrutinise how online risks evolve; and an oversight structure to address the complexity of the online space.

The aim of the *Digital Markets Act* (DMA) is to regulate and limit the market power of certain large platforms that control the online market to a large degree. In practice this means the companies collectively known as GAFAM: Google, Amazon, Facebook, Apple and Microsoft. This initiative entails prospective regulation (known as ex ante regulation) of large platforms. This means

that obligations and requirements are imposed on these platforms without evidence of negative effects on competition. The European Commission is also expected to propose a new 'competition toolbox'; this is, new tools that can be used on a case-by-case basis where competition problems arise. This may also include assessments to identify market failures in digital markets.

Norway supports the EU initiative to develop a new regulatory framework for digital platforms. In its response to the EU in connection with the consultation of DSA and DMA, Norway stresses the importance that the new framework does not lead to an excessive regulatory burden that disproportionately impacts European small and medium-sized enterprises. It also deems it important that necessary considerations concerning security and crime be considered. It is also Norway's position that no obligations for digital platforms ought to be imposed that may result in content from editorial media being censored in ways that negatively impact freedom of expression. Furthermore, Norway recommends stronger protection of consumer rights on digital platforms and stresses the need for universal design.

7.1.3 Taxation of multinational companies

Another aspect of importance to the competition situation is taxation. If multinational companies can achieve lower tax rates than domestic companies by exploiting weaknesses in national and international regulations, this will have a negative impact on the competitive situation for Norwegian companies. The combination of globalisation and digitalisation has enabled business models that challenge national and international tax regulations. This makes it possible for multinational companies to reduce their tax liabilities through tax planning and to distribute their tax revenues between countries.

Between 2013 and 2015 the OECD and the G20 countries conducted a joint project called Base Erosion of Profit Shifting (BEPS). It was launched to address weaknesses in national and international tax regimes that create opportunities for multinational enterprises to, among other things, shift taxable profits from group companies in countries with high tax rates to group companies in countries with low or no tax. Over time, such profit shifting can make it difficult to retain tax revenues and can have negative competition effects for domestic businesses. This type of activity is associated with many industries and is not exclusively linked to digitalisation. Through the

BEPS project consensus was reached on a number of initiatives to counteract profit shifting and tax base erosion.

Digitalisation of the economy is exacerbating challenges in the taxation of multinational enterprises and is creating new challenges beyond profit shifting alone.[1] Under current international tax rules, physical presence is a key criterion for taxation, but digitalisation and new business models have created opportunities for multinational enterprises to have a market presence without a physical presence (properties or employees). This puts pressure on international rules regulating which countries can impose tax on these enterprises' revenues.

Work is currently being conducted in the OECD/G20 Inclusive Framework, a collaborative body comprising more than 140 countries, including Norway, to find a collective, consensus-based solution for a more effective and fair tax system in an increasingly digitalised economy. The Inclusive Framework is working on a two-pillar approach:[2]

Pillar 1: Allocation of taxing rights to business profits between countries

This pillar will establish new rules on where tax should be paid ("nexus" rules) and a fundamentally new way of sharing taxing rights between countries. The aim is to ensure that digitally-intensive or consumer-facing MNEs pay taxes where they conduct sustained and significant business, even when they do not have a physical presence.

Pillar 2: Profit shifting and tax base erosion

This is a continuation of the BEPS project. The aim is to introduce a global minimum tax that would help countries around the world address remaining issues linked to Base Erosion and Profit Shifting by large multinational enterprises. Another aim is to counteract harmful tax competition between countries and a 'race to the bottom' on corporation tax.

Some European countries have argued that the EU ought to put in place a common European proposal for fairer taxation of digital services. In a joint statement on 14 October 2020, the G20 finance ministers expressed their continued support of the Inclusive Framework process. They support the call for continued efforts to reach a global and consensus-based solution. The Government will keep the Storting informed of developments in, and the outcome of, the negotiations process and will present proposals of whatever amendments to laws and international agreements would be necessary for the initiatives to be implemented.

7.2 Fair, ethical and responsible use of data

Use of data can help make services more personalised and better adapted to individuals. Many will find this a positive development. Nonetheless, the data economy has some negative aspects in the form of echo chambers, manipulation of information and misuse of personal data. The Government wants to promote a culture where business and industry see the value in developing ethically sound solutions, products and services.

7.2.1 Risk of manipulation, echo chambers and discrimination

Data analytics can reveal whether people are impulsive or cautious, whether they like to be the first to buy new products or whether they react best to hearing that an item is almost sold out.[3] Knowledge of individuals' personality traits makes it possible to adapt advertising aimed at individuals or consumer groups in ways that make it seem relevant and useful, but advertisers can also exploit consumers' vulnerability by personalising advertising at points in time when individuals are most likely to be receptive. Such marketing not only challenges privacy and consumer protection; it raises broader ethical questions about the individual's right to self-determination.

Risk of manipulation based on a combination of data analytics and behavioural psychology is not confined to advertising; analysis of personal data has also been used to manipulate individuals to adopt a specific political view. Cambridge Analytica's use of personal data in various election campaigns, collected from Facebook, is an example of this. Without users' consent or knowledge, analyses and profiles were developed to target individuals with political messages. This case

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[1]   OECD (2015): *Addressing the Tax Challenges of the Digital Economy,* Action 1 – 2015 Final Report, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris

[2]   Updated information from the project can be found at www.oecd.org/tax/beps/

[3]   Datatilsynet (2015): *The great data race. Report on how commercial use of personal data is challenging privacy.* November 2015

shows that information that is obtained for one purpose can be exploited in new and unpredictable ways. The use of personal data to influence democratic elections blurs the line between privacy and consumer protection and fundamental civil rights, and can pose a threat to democracy.[4]

Business models that are based on personalised digital services can also impact the conditions for public discourse. Digital echo chambers are created when individuals are exposed to a disproportionate amount of views that reinforce their own. This has created favourable conditions for phenomena such as 'fake news' and 'alternative facts'. Over time, this can undermine trust in the mainstream media. Echo chambers can also stifle open discourse, which is a key prerequisite for a free and democratic society.

The risk of discrimination and misguided conclusions

The use of profiling based on algorithms and artificial intelligence can produce better, more personalised services, but it can also increase the risk of unlawful differential treatment. When services are more personalised, consumers risk being subjected to price discrimination. Algorithmic advertising systems can also be designed so that, for example, advertisements for housing rentals and job vacancies are only shown to certain groups of people. This means that others are essentially excluded and potentially subjected to discrimination.

Enterprises that process personal data are obliged to ensure that the information is correct. This proves particularly challenging when analyses are based on data obtained from multiple sources. A flawed factual basis can in many contexts have negative consequences for individuals. Any errors in the datasets included in an analysis can lead to incorrect decisions. While the data may be correct seen in isolation, they can produce unfair and discriminatory results if, for example, an algorithm contains historical biases.

7.2.2 Ethics by design and ethical risk assessment

Requirements for risk assessments and privacy by design are laid down in the *General Data Protection Regulation* (GDPR). Privacy by design is a key requirement in GDPR, and means that consideration must be given to privacy in all phases of development of a system or solution. When sharing and using data for new purposes, the same consideration should be given to ethics by design and ethical risk assessments. Artificial intelligence is a central component of the data economy. For example, when using artificial intelligence, it is important to assess whether an algorithm could lead to discrimination and then implement measures to reduce that risk. Ethical assessments may also cover potential consequences for the environment and whether a system contributes to achieving the UN Sustainable Development Goals.

In the *National strategy for artificial intelligence* (2020), the Government promotes seven principles for responsible development of artificial intelligence:

1. Solutions based on artificial intelligence must respect human autonomy and control.
2. Systems based on artificial intelligence must be safe and technically robust.
3. Artificial intelligence must take privacy into account.
4. Decisions made by systems built on artificial intelligence must be traceable, explainable and transparent.
5. The systems must facilitate inclusion, diversity and equal treatment.
6. Artificial intelligence must be developed with consideration for society and the environment, and must have no adverse effects on institutions, democracy or society at large.
7. Mechanisms must be introduced to ensure accountability for solutions based on artificial intelligence and for their outcomes, both before and after solutions are implemented.

7.3 Privacy challenges in the data economy

Personal data represent an important resource, and if used correctly can benefit both individuals and society. At the same time, privacy is a human right that his protected by the *European Convention on Human Rights* and the *Constitution of the Kingdom of Norway*. It is important that use of personal data take place within the confines of the law and of what is ethically defensible. Another prerequisite is to create trust so that individuals are willing to share information about themselves.

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[4] Forbrukerrådet (2020): *Out of Control. How consumers are exploited by the online advertising industry – and what we are doing to make it stop*

Overlap between data protection and consumer protection in the data economy

There is considerable overlap between data protection and consumer protection in the data economy. Data protection is challenged by data-driven business models by which consumers are offered products and services in return for disclosing personal data. Consumers are often unaware of how this information is used. Without this knowledge, consumers are not fully able to influence how their personal data are used or to take on the role of critical consumers in the data economy.

It is possible to protect consumers' interests and still allow the private sector to create value from new technologies and data. The Government sees a need to strengthen the position of consumers and strike a better balance between businesses and consumers in the digital economy.

In 2019 the EU adopted a directive aimed at modernising consumer rights in light of the digital transformation: The *Better Enforcement and Modernisation Directive*.[5] The new directive imposes more stringent information requirements on providers of digital services, search engines and online marketplaces. The directive strengthens consumer rights in agreements where the consumer pays for services in the form of personal data, and sets stricter sanctions. A violation that affects consumers in multiple member states may result in a maximum fine of at least four per cent of the trader's annual turnover in the member states concerned. The Ministry of Children and Families is currently working on incorporating the directive into Norwegian law.

The EU has also adopted a directive with the purpose of harmonising the rules on delivering digital services to consumers.[6] The directive applies not only where the method of payment is money, but also where the consumer provides personal data, unless the personal data is processed exclusively to supply the digital service or to meet legal requirements. In December 2020 the Ministry of Justice and Public Security distributed draft legislation for implementing the *Digital Services Act* for consultation.

The Government will present a national strategy for a safe digital childhood. The aim of the strategy is to develop a cohesive policy for children's digital lives. The strategy will discuss the positive aspects and the risks of children's use of online resources. Important topics will be consumer rights, data protection, cyber security, online marketing, digital safety for children, digital skills and e-commerce. The Norwegian Media Authority will be responsible for the practical coordination of the work.

7.3.1 Complicated end user agreements and privacy statements

In the data economy, personal data are often shared and used for secondary purposes. Such processing can challenge the principle of purpose limitation. The principle states that the purpose for processing personal data must be clearly stated and established when the data is collected. This is fundamental to ensuring that individuals have control of their data and can give informed consent to data processing. In accordance with the principle, personal data may not be used for new purposes that are incompatible with the initial purpose unless this is based on consent or statutory provision.[7][8]

Consent from individuals to process their personal data can allow development of innovative products and services and facilitate more personalised digital solutions. Consent must be freely given, specific, informed, and be given by a clear affirmative act.[9] These requirements are intended to ensure that individuals receive good information about how their personal data will be processed and can exercise control over their use. In practice, it can be difficult to understand the terms and conditions for the use of apps and digital services, making it almost impossible for individuals to have real control and influence over what personal data are collected and how they are used. According to the GDPR, the privacy statement must be clearly separated from other terms of use, and the information must be given in language that is clear, plain and easy to understand.

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[5] *Directive (EU) 2019/2161*

[6] Directive EU 2019/770. The directive was negotiated as part of a 'package' together with the new Directive (EU) 2019/771 on the sale of goods to consumers

[7] *General Data Protection Regulation*, Article 6(4) lists factors that must be taken into account when ascertaining whether or not the new purpose is compatible. Compatible reuse is generally permitted

[8] *General Data Protection Regulation*, Article 6(4); cf. Article 23(1) and Prop. 56 LS (2017–2018). If the basis for processing is laid down by law, the use must be a necessary and proportionate measure in a democratic society to safeguard specific important interests

[9] *General Data Protection Regulation*, Articles 4 and 7. Consent must be given more explicitly in some cases such as when it applies to special categories of personal data. The directive provides specific rules governing children's consent in relation to digital services

In practice, however, these statements are often long, complicated, detailed and full of legal and technical terms that are extremely difficult for individuals to interpret.

The companies that collect data will often have a far more detailed understanding of the data collection and how the data are used than the individual consumers. This phenomenon is known as *information asymmetry*. Enterprises that use advanced methods of data collection and profiling could achieve a competitive advantage. Consumers' lack of understanding means that they often have no real possibility to assess privacy in products and services and reject those who use invasive methods. Such information asymmetry can hamper development of balanced solutions and prevent privacy-friendly solutions from becoming a competitive advantage.

Trading of personal data in the digital advertising market

Trading of personal data in the digital advertising market, combined with new technology that enables analysis of large datasets, has changed the way in which advertisers reach consumers. Personalised marketing has far more impact and accuracy than conventional marketing techniques. Although personalised advertising is often advantageous for consumers, the information can also be used to manipulate individuals into buying products they otherwise would not have bought. Data are used to analyse and identify people's vulnerabilities and personality traits.

In January 2020 the Norwegian Consumer Council presented a report entitled *Out of control*. It describes how large amounts of personal data collected via various apps are resold. A digital twin is created of individual consumers, making it possible to follow them across services and platforms. This information gives commercial interests a detailed picture of individual consumers, such as information about their activities, preferences, purchases and health. These digital twins are sold on digital advertising exchanges where advertisers submit bids indicating how much they are willing to pay to have their advertisement shown to consumers with a certain profile. The type of profile considered attractive depends on what is being sold. The resale of personal data is often regulated in long and complicated terms of use. To make an informed consent, consumers will often have to read and understand terms of use not only of the party they enter into an agreement with, but also of third-party service provid-

ers. This makes it almost impossible for regular consumers to know who receives the data and how they are used.

7.3.2   Individual control over personal data

A fundamental privacy principle is the idea that individuals should have as much control as possible over their personal data. Because real control requires individuals to have knowledge of how their personal data are and will be used, entities that process personal data are obliged to provide this information in an intelligible and accessible form.

The right to data portability

One way in which individuals can exercise control over their own data is by requesting to receive them from the service provider. This is known as the right to data portability. This right applies when an individual, typically a consumer, has provided data based on consent or an agreement. Data portability means that individuals can obtain information about themselves in a commonly used and machine-readable format. The intention is that the user should be able to reuse the data across different systems and services.

This right strengthens not only privacy, but also consumer power. When consumers can transfer their personal data to a provider offering the best terms, this may encourage competition in providing privacy-friendly and secure solutions.

The European Commission has conducted an evaluation of the GDPR.[10] The evaluation shows that the potential of the right to data portability is still not fully realised. One reason for this is the lack of standards enabling the provision of data in a machine-readable format. The Commission will explore practical means to facilitate increased use of the right to portability. Tools for managing user consent, standardised formats and interfaces may contribute to resolving this challenge.

Access strengthens individuals' control over their personal data

The Government will consider establishing a solution where citizens can have access to their personal data in multiple public-sector systems via a

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[10] Communication from the Commission to the European Parliament and the Council. *Data protection as a pillar of citizens' empowerment and the EU's approach to the digital transition – two years of application of the General Data Protection Regulation.* COM/2020/264 final

common login system. The possibility to integrate selected enterprises from the private sector into such a system will also be considered. Such a system would make it easier for individuals to obtain a more meaningful overview of how their personal data are used. If possible, the solution should also make it possible to manage how the data are used, including giving or refusing consent to sharing them.

7.3.3 Enhancing knowledge by providing guidance on the data protection rules

The GDPR is an important instrument for promoting data sharing in a secure and responsible manner and for creating trust. Reports indicate that companies spend many resources on understanding and interpreting the provisions in the GDPR.[11] The perception of the regulation as complicated and the fear of making mistakes and breaching the rules may therefore create unnecessary barriers for companies wishing to try out new ideas through data-driven innovation.

The Government sees a need to enhance knowledge about the data protection rules in the public and private sectors and in the population in general. Sound knowledge of the rules is a prerequisite for ensuring that those who process personal data fulfil their obligations and that individuals can exercise their rights.

The Norwegian Data Protection Authority and the Consumer Authority provide guidance to individuals, businesses and public bodies. For example, these authorities answer specific questions, publish guidance material and give lectures. In 2020 the Norwegian Data Protection Authority and the Consumer Authority published a guide entitled *Digital services and consumer data*, targeting developers, marketers and digital service providers.

It is important that the scope for action in the GDPR is used in ways that do not create unnecessary barriers to innovation. A sound understanding of the rules is a prerequisite for creating innovative and balanced solutions that safeguard privacy. The Government wants to contribute to the development of these types of solutions. Consequently, an important measure in the *National strategy for artificial intelligence* was to establish a regulatory sandbox for data protection and artifi-

cial intelligence. The sandbox was launched in 2020.

The overarching objective of the regulatory sandbox is to stimulate innovation of ethical and responsible artificial intelligence. The Norwegian Data Protection Authority will provide free and professional guidance to selected projects under the sandbox framework. The projects that are included in the sandbox must be innovative, which means that there will be uncertainty around how the data protection rules will be complied with. Together with the participating organisations, the Norwegian Data Protection Authority will identify regulatory issues that are challenging, and work towards sound, well-balanced solutions that safeguard privacy. The regulatory sandbox will fulfil several objectives:

– The participating organisations will gain a better understanding of the regulatory requirements and thereby reduce the time from development and testing to rollout of artificial intelligence solutions in the market.
– Solutions that are rolled out after being developed in the sandbox can set examples for other organisations seeking to develop similar solutions.
– The Norwegian Data Protection Authority will gain a better understanding of new technological solutions and be able to identify potential risks and problems more easily at an early stage. This will enable the timely production of relevant guidance to clarify how the rules should be applied.
– The Norwegian Data Protection Authority and the industries can identify sectors with a need for industry standards.
– Individuals and society will benefit from new and innovative solutions being developed within responsible parameters.

7.3.4 Use of anonymous, de-identified and synthetic data

It is possible to leverage the potential of personal data without compromising privacy by using anonymised or de-identified data. Statistics Norway's microdata.no platform is an example of this.

Use of *anonymous data* offers numerous possibilities for developing innovative products and services. Anonymous data are not personal data because the information cannot identify individuals. Anonymisation entails rendering it impossible to re-establish the link between the data and the specific individual, taking account of all the means reasonably likely to be used to identify the individ-

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[11] Communication from the Commission to the European Parliament and the Council. *Data protection as a pillar of citizens' empowerment and the EU's approach to the digital transition – two years of application of the General Data Protection Regulation.* COM/2020/264 final
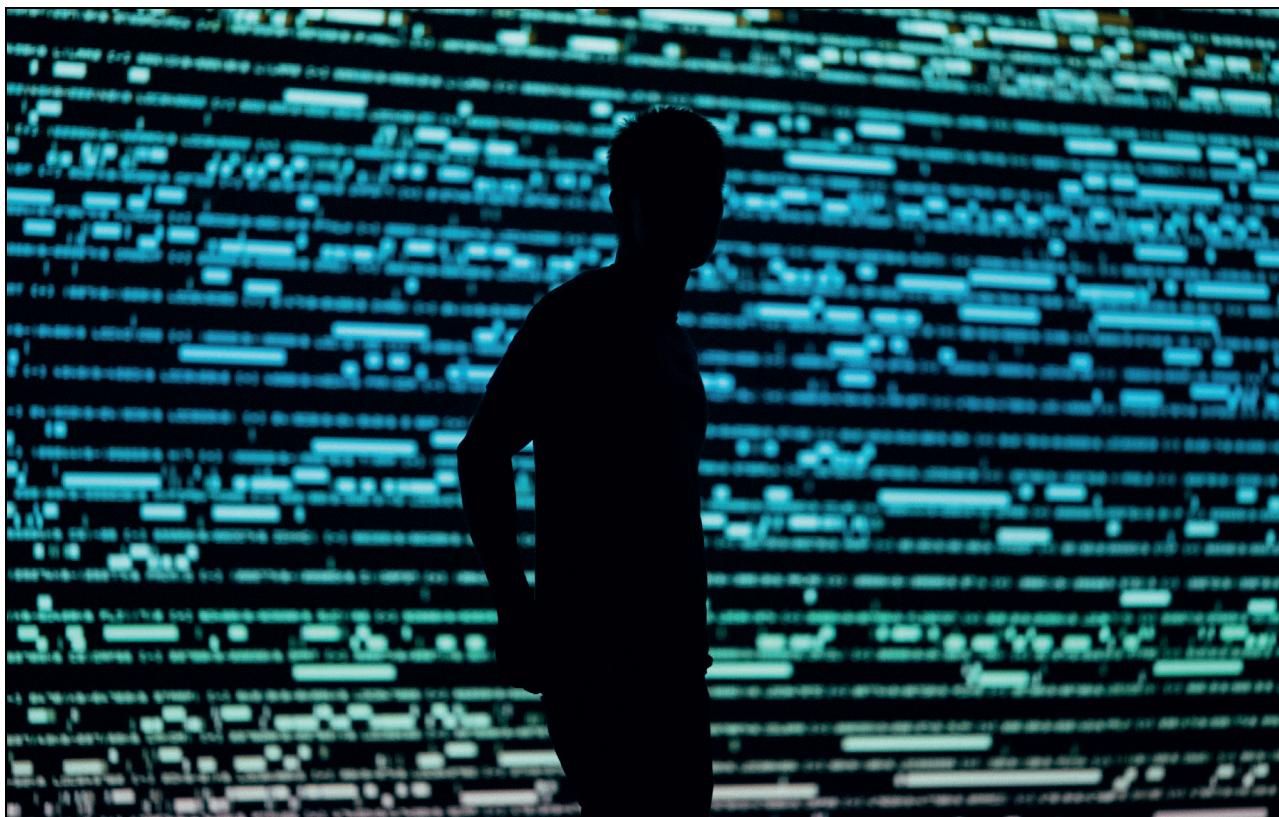
Figure 7.2 Anonymous data

Photo: Chris Yang on Unsplash

ual concerned. The data protection rules therefore do not apply because such information does not relate to identifiable individuals. Anonymous data can therefore be shared and used for new purposes.

Clarifying whether a dataset contains personal data, and the anonymisation process itself, can prove resource-intensive. That said, the benefits to be derived from anonymisation can more than outweigh the costs.

If anonymisation proves unsuitable or too demanding, *de-identification* may be a better option. De-identification entails the removal of all uniquely identifiable characteristics from the data. This can be useful and necessary for safeguarding personal data protection, but does *not* mean that the data are rendered anonymous. Use of de-identified data must therefore always comply with the personal data protection rules. *Pseudonymisation* is a form of de-identification where directly identifiable parameters (such as names) are replaced with pseudonyms, such as serial numbers. It must be impossible for such information to be attributed to a specific person without the use of additional information.

Risk of re-identification

Re-identification occurs when individuals are identified based on de-identified or apparently anonymous data, often as a result of integrating data from multiple sources. Extensive access to data, combined with better and cheaper analytics technology, has increased the risk of such re-identification. The risk can be reduced by allowing only anonymous data to be used in analyses. However, it is not always easy to assess whether a dataset has been anonymised or only de-identified. It can also be difficult to assess whether connecting it with other datasets that are currently available or that will be available in future may lead to re-identification.

In order to safeguard trust and security, it is important to minimise the risk of re-identification. Enterprises must undertake thorough risk assessments when anonymising personal data and when integrating them with other datasets. Should the data prove to be identifiable, they must be processed in compliance with the provisions in the GDPR.

Box 7.1 Smartphone location tracking

Some data types, such as location data, are more difficult to anonymise than others. A person's movements are often so unique that they can prove highly revealing. In the spring of 2020, the Norwegian Broadcasting Corporation (NRK) published a number of articles about the buying and selling of location data collected from free apps. After paying NOK 35,000, NRK bought what were apparently anonymised location data on more than 140,000 unique smartphones and tablets belonging to Norwegian citizens from the British company Tamoco. All the coordinates were linked to a date, a time and a specific device, and showed the exact location of a given device at a specific point in time. Using simple methods, NRK managed to identify several individuals and track their movements over time. The location data revealed where they lived and worked as well as information on stays in hospitals and crisis centres. Among the individuals NRK managed to identify were a member of parliament and key figures in the Norwegian Armed Forces.

Source: Furuly, Trude et al. (2020): *Avslørt av mobilen* [Exposed by the mobile]. Published on nrk.no on 9 May 2020

Synthetic data

An alternative to using de-identified or anonymised data is to use *synthetic data*. A synthetic dataset has the same properties as a real-world dataset. Because the data do not pertain to real-life people, they do not involve personal data. Synthetic data have many applications and are often used as test data in system development projects where the alternative would be to test systems using real-world data. Since they contain no personal data, such datasets can also be made publicly available for purposes such as research and development.

7.3.5 Privacy as a competitive advantage

The Norwegian Data Protection Authority regularly undertakes a large-scale survey on privacy trends in Norway. The privacy survey for 2019–2020 reveals scepticism among respondents towards data-driven business models. Around half of respondents say they feel uncertain about whether smart house technology safeguards privacy. Three out of four respondents are negative to the use of personal data to personalise advertisements.[12]

Extensive commercial use of personal data could lead to a loss of trust in businesses and growing reluctance to buy digital products and services. The Norwegian Data Protection Authority's survey shows that more than 50 per cent of respondents have declined to use a service because they were unsure of how personal data were handled.

On the other hand, trust in businesses is enhanced if consumers feel confident that privacy

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[12] Datatilsynet (2020): *Personvernundersøkelsen 2019/2020* [The Privacy Survey]

Box 7.2 Generation of synthetic test data for the National Registry

The Norwegian Tax Administration has established a solution in which machine learning is used to generate rich synthetic test data in a dedicated test environment for the National Registry. The synthetic National Registry offers synthetic test subjects and simulates events. The objective is to allow enterprises that use information from the National Registry to test their integrations without using authentic personal data in the tests. These organisations include companies developing software for the public sector.

The synthetic data are available to anyone wishing to test integration with the National Registry or that need National Registry data for test purposes.

Source: The Norwegian Tax Administration

and information security are safeguarded, and that the data are processed within responsible parameters. Trust and privacy can thus represent a competitive advantage for companies that can show that they process data in a lawful, responsible and ethical manner.

Code of conduct for processing personal data

One of the challenges in the GDPR is the discretionary nature of its provisions, whereas many organisations, particularly small and medium-sized enterprises, need concrete and industry-specific guidelines. Codes of conduct (also known as industry standards) are intended to remedy this, and help organisations find clear answers to practical questions. The GDPR leaves it up to the industries themselves to develop codes of conduct for processing personal data and to have these approved either by the Norwegian Data Protection Authority in the case of national standards, or at EU level. The codes do not need to be exhaustive; they can be thematically delimited.

The Government finds it encouraging to see that industries are preparing codes of conduct for processing personal data. If companies within a sector agree to use the same privacy standards, this can contribute to reducing competition bias. At the same time, establishment and use of codes of conduct will lead to greater transparency and stronger privacy protection in the industries concerned. The fact that businesses show that they comply with a code of conduct approved by the Norwegian Data Protection Authority will also reassure consumers when selecting products and services that safeguard privacy.

Data protection certification mechanism

Pursuant to the GDPR, products and services can be certified according to specific criteria and be issued with a data protection seal or trustmark. A data protection seal would make it easier for consumers to assess whether privacy is safeguarded and whether the provider is trustworthy. This strengthens consumer power and can help make data protection a competitive advantage. Certification would be carried out either nationally or within the EEA, the latter of which may result in a common European data protection seal. The Norwegian Data Protection Authority is working on establishing a certification mechanism for Norway.

7.3.6 Enforcement and cooperation on data protection across Europe

The GDPR seeks to harmonise laws across the EEA. Citizens in all the member states will be assured the same strong data protection while businesses must comply with the same rules and administrative systems. This means there will be limited scope to establish separate data protection regulations for Norway. The most important work in following up the directive is therefore to ensure effective enforcement and interpretation of the rules.

Cooperation within the European Data Protection Board will be critical to achieving a common European understanding of the GDPR. One of the board's main tasks is to provide guidance on how the GDPR should be interpreted and applied. Participation in the work on common European data protection issues offers possibilities to influence how the rules are interpreted. The Norwegian Data Protection Authority has therefore decided to actively contribute to the board's work and has assumed leading roles in a number of large projects.

The GDPR lets the data protection authorities in the EEA member states impose administrative fines when the rules are infringed. Fines of up to EUR 20 million can be imposed, or – in the case of companies – four per cent of their worldwide revenue from the preceding financial year. The Norwegian Data Protection Authority also has alternative enforcement mechanisms, such as the authority to prohibit the unlawful processing of personal data and to impose coercive fines for non-compliance with orders. These mechanisms have strong potential to ensure regulatory compliance.

Cases of cross-border protection of personal data

Cases of cross-border protection of personal data are cases where an organisation's processing of personal data affects individuals in more than one EEA member state or where processing takes place because the organisation is established in multiple EEA member states. Since data protection challenges in the data economy exist in an international context, it is particularly important that infringements of the rules in such cases be sanctioned.

Processing of cross-border cases are led by the data protection authority in the member state in which the company has its main establishment. This is known as the one-stop-shop mechanism.

This mechanism is important for ensuring a harmonised interpretation of the rules, and is practical because organisations and citizens only need to deal with a single data protection authority inside the EEA.

A number of cross-border cases have been decided through this collaborative mechanism since the GDPR entered into force. However, the European Commission's evaluation of the GDPR shows that enforcement in such cases has its challenges.[13] Processing takes time due to multiple data protection authorities being involved, and because of the often complicated and comprehensive nature of the cases.

Several of the large international IT companies, such as Facebook, Google and Twitter, have their head offices in Ireland. Ireland's Data Protection Commission is therefore currently the lead authority for several important cross-border cases, and its decisions may significantly influence how the rules are interpreted. Despite the Irish Data Protection Commission being one of the supervisory authorities with the largest staff increases after the GDPR was introduced, there are problems with heavy workloads and long processing times.

The European Commission's evaluation also shows that the supervisory authorities have not yet made full use of the cooperation mechanisms provided by the GDPR, such as joint operations and enforcement actions. The Commission reports that it will continue to foster more efficient and harmonised handling of cross-border cases.

7.4 Cyber security

Good digital security is fundamental to the digital economy and the data economy. Society is becoming increasingly vulnerable to cyberthreats, and the more data collected, stored and processed, the greater the exposure to vulnerabilities.

In January 2019 the Government published the *National Cyber Security Strategy for Norway* and a national strategy for cyber security competence (*Nasjonal strategi for digital sikkerhetskompetanse*). Norwegian companies' ability to digitalise in a secure and trustworthy manner and be

able to protect themselves against cyber security incidents are important strategic goals.

7.4.1 An increasingly complex risk situation

Data that are managed by public and private enterprises represent immense value. At the same time, the digital value chain and the composition of the organisations involved are complex, and often include both domestic and foreign entities. It is impossible to have oversight of every potential security challenge, so sound competence in cyber security is needed to ensure that new developments can be monitored and that any measures implemented are adapted to the risk situation.

According to the Norwegian National Security Authority (NSM), state-sponsored intelligence and criminals constitute the greatest cyberthreats to Norway. NSM is observing a steady stream of cyberattacks on Norwegian targets, including on organisations that perform critical societal functions.[14]

7.4.2 Information security and data sharing

Information security includes ensuring the confidentiality, integrity and availability of information that is processed and exchanged digitally.

Some data will need to be protected and kept secret. Datasets containing such information cannot be made openly available, and must only be shared subject to agreement and when both parties are sure that they have a legal basis to exchange and use the information. Transmissions of data must be appropriately secured, and the recipient must safeguard confidentiality. Encryption may be an appropriate measure to ensure this.

Integrity assurance is always important, also when sharing data. Procedures and systems must be established for data exchange that ensure that the information received is the same as the information transmitted, and that no changes occurred – either deliberate or due to error – during transmission. When no adequate procedures and systems are in place to ensure integrity during transmission, this must be clearly communicated to the recipient.

Availability has to do with having access to data when they are needed. If an organisation needs to use data in order to deliver a service or perform a task, the type of information must be

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[13] Communication from the Commission to the European Parliament and the Council. *Data protection as a pillar of citizens' empowerment and the EU's approach to the digital transition – two years of application of the General Data Protection Regulation.* COM/2020/264 final

[14] NSM (2020): *Helhetlig digitalt risikobilde 2020* [Overall digital risk situation].

identified, as well as any need for protecting confidentiality, integrity and availability.

Considerations of confidentiality, integrity and availability must often be weighed against each other. For example, high-level confidentiality may render data less readily available, in which case an assessment must be made of what is more important in specific situations.

7.5 Enforcement and supervision

The Government wants to have an effective system for supervision that is adapted to societal challenges and to needs in data protection, competition policy and consumer protection.

The Norwegian Data Protection Authority's budget has been significantly increased in recent years. This is because the authority was assigned new tasks when the GDPR was incorporated into Norwegian law in the summer of 2018. The budget increase is particularly intended to make the authority well equipped to participate in EU cooperation on the protection of personal data.

The Government's objective is to strengthen supervision of and guidance on consumer protection rules in the digital economy. The budget allocations for the Consumer Authority were therefore increased in 2019 and 2020. This shall also contribute to the strengthening of the Consumer Authority's international activities, including coordination of cross-border supervisory activities.

Competition in a digital economy will be one of the Norwegian Competition Authority's focus areas moving forward.[15] The Norwegian Competition Authority will make it easier for digitalisation to contribute to increased competition and thereby to efficient use of public resources. The Norwegian Competition Authority will also assess the possibilities created by digitalisation to detect competition law offences and improve the efficiency of investigative methods.

Cooperation between supervisory authorities in Norway

The data economy raises issues that cut across various sectoral legislation, particularly data protection, consumer protection and competition legislation. It is therefore important that the relevant supervisory authorities cooperate and exchange

knowledge and information, and participate in relevant national and international fora. The Norwegian Data Protection Authority and the Consumer Authority have established good cooperation on consumer and data protection issues in recent years. It will be important to reinforce this cooperation moving forward.

In the European context, the European Data Protection Supervisor has established the Digital Clearinghouse initiative, where supervisory authorities for data protection, consumer protection and competition discuss how different regulatory regimes can be viewed in relation to each other to ensure the functioning of the digital economy. In a white paper to the Storting on consumer policy, the Government announced that it will create a similar cooperation forum at national level: Digital Clearing House Norway.[16] The Consumer Authority has been charged with establishing the forum. The purpose is, among other things, to achieve more effective enforcement, avoid duplication of efforts and ensure a cohesive approach.

7.6 The Government will

The Government will

- encourage the creation and adoption of mechanisms for data protection certification
- encourage development and use of codes of conduct (industry standards) for data protection
- consider creating regulatory sandboxes in areas that are relevant for development of the data economy and data-driven innovation
- evaluate the possibility of establishing a digital solution that comprise multiple data controllers, where citizen can have access to and possibly administer the use of their personal data, including giving consent to sharing
- encourage public and private enterprises to develop solutions that simplify individuals' access to information on and control over how their personal data are processed and, where applicable, shared
- enhance knowledge about data protection rules among consumers and businesses
- establish a national cooperation forum to strengthen supervision of the digital activities, modelled on the EU's Digital Clearinghouse

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[15] Nærings- og fiskeridepartementet (2020): *Konkurransetilsynet (KT) – Tildelingsbrev* [Norwegian Competition Authority – Allocation letter]

[16] Meld. St. 25 (2018–2019) *Framtidas forbrukar – grøn, smart og digital* [The consumer of the future – green, smart and digital]

8 Economic and administrative consequences

This white paper outlines the main measures the Government believes should be taken towards further development of the data economy in Norway. Better use of data as a resource in the public and private sectors will contribute to increased value creation, new economically sustainable jobs and a more efficient public sector. The Government's policy will also promote a balanced data economy in line with Norwegian social values and that respects the fundamental rights and freedoms of the individual. To preserve trust in Norwegian society, development must take place in a sustainable, safe and responsible manner. The value of data should benefit the private sector, the public sector and society, and data should be used and shared in ways that ensure user-friendly and safe digital products and services to citizens.

The measures in the white paper that have budgetary consequences have already been followed up in the respective ministries' budget proposal for 2021. In the budget proposal for the Ministry of Local Government for 2021, NOK 16 million was allocated to development of the Data Factory. The DIGITAL programme has a proposed budget of EUR 7.17 billion (in 2021 prices). Norway's total contribution to DIGITAL is estimated at EUR 180 million (in 2021 prices), which is equivalent to approximately NOK 1.9 billion.

The following measures will be covered by the Ministry of Local Government and Modernisation's budget allocation for 2021: appoint a public committee for cohesive regulation of the reuse of public sector information (data); appoint an interdisciplinary expert group on private sector data sharing that can develop guidelines on responsibility, ownership and usage rights in connection with sharing these types of data; and map and evaluate the data economy in the public sector, including making recommendations on organisa-tional and financing models for sharing data from the public sector for reuse.

The principles for sharing and using data derive from currently applicable requirements and political guidelines in the EU, the OECD and in Norway, and thus will not have major administrative or organisational consequences. The expectations and requirements that can be inferred from the principles already apply for public agencies, while the principles are to be regarded as voluntary and recommended best practice in the private sector. The principles will therefore not create unreasonable burdens on municipalities or businesses. Nonetheless, many businesses must adjust their activities if they are to succeed in the data-driven economy.

Measures that have implications for the municipal sector will be discussed with the Norwegian Association of Local and Regional Authorities (KS) in accordance with the principles for coordination of digital policy in central and local government.

Under the World Trade Organization (WTO) treaty, the General Agreement on Trade in Services (GATS), Norway is obliged to be open to other WTO members' service providers. Under GATS, equal treatment in the Norwegian service market therefore applies between Norwegian and foreign service providers. Measures that are implemented in Norway to fulfil EEA obligations will be exempt from GATS. The measures in this white paper will not have consequences for Norway's WTO obligations.

Norway has a responsibility to contribute towards reaching the UN Sustainable Development Goals by 2030. Digitalisation, technology and data-driven innovation are important means to manage many of our present and future societal challenges. This white paper will therefore contribute directly and indirectly to Norway achieving the goals.

94 **Meld. St. 22 (2020–2021) Report to the Storting (white paper)** 2020–2021

Data as a resource

Ministry of Local Government and Modernisation

r e c o m m e n d s :

that the recommendation from the Ministry of Local Government and Modernisation of 26 March 2021 on Data as a resource: Data-driven economy and innovation be presented to the Storting.

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