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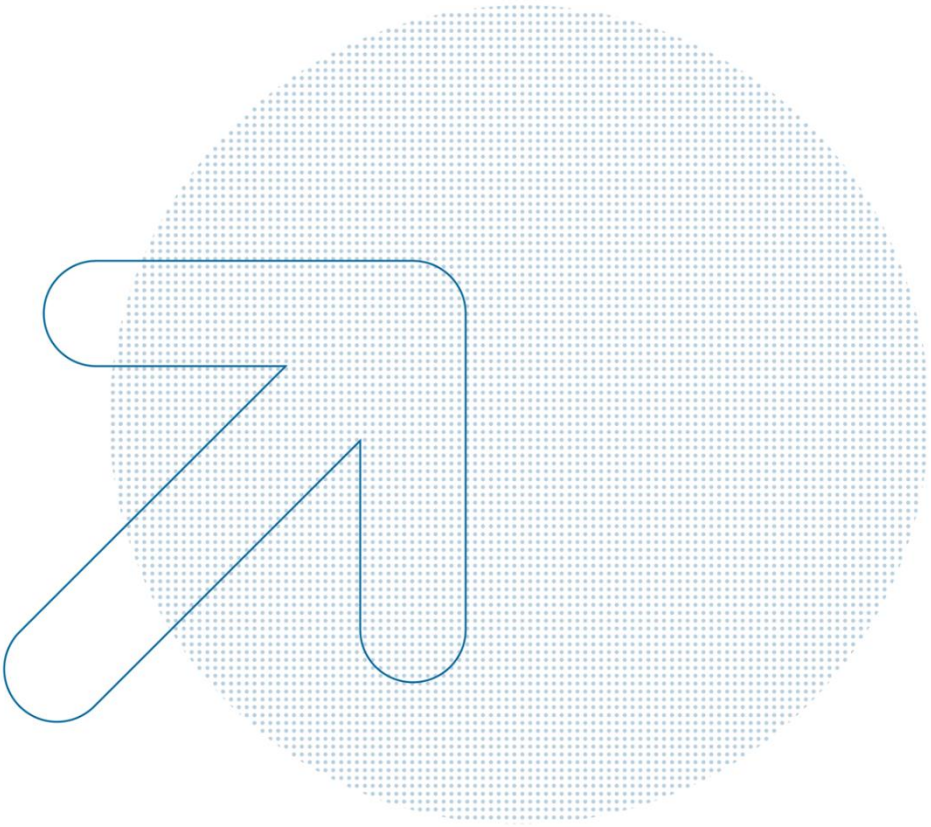
Study for the Norwegian Communications Authority (Nkom)



Market study on the Norwegian Data Economy (2403800)

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1 Executive Summary

The value of data is created by transforming it into actionable insights and services that enable innovation. The data economy relies on different stakeholders, including data suppliers, users and intermediaries, each of which plays a unique role in data flows and value creation. The non-rivalrous nature of data and its widespread accessibility make it an important asset in the context of digital transformation. Despite its non-rivalrous nature, exclusive access to data can provide a competitive advantage. In addition, large data platforms also have competitive advantages through data-driven feedback loops and network effects that enable more insights, thereby reaching even more customers and ultimately collecting even more data.

The Norwegian regulator Nkom commissioned WIK Consult to conduct this in-depth market study on the data economy in Norway in preparation for its task to guide the market with regard to the future implementation of the Data Act in Norway.

Current status of the Norwegian data economy

Norway has built a strong foundation for its data economy, characterised by a significant number of digitally engaged small and medium-sized enterprises (SMEs), a large number of companies offering ICT training, a high level of public acceptance of data sharing and the availability of many public datasets.

Norway's total data economy is estimated at 5.4% of GDP[1] in 2025, with direct impacts accounting for 17%. These are defined as revenues from the sale of data products and services. In addition, the indirect impacts account for a total of 44%. These are composed of forward indirect impacts of 23%, defined as economic growth generated by the use of data services and products, and backward indirect impacts of 21%, defined as revenues generated by the sale of necessary inputs to data suppliers. Finally, induced impacts account for 39%. These are economic activities stimulated by spending on higher or new wages. Compared to the EU, the importance of direct impacts is relatively low, while the importance of induced impacts is relatively high.

Several roles are identified in the data economy: infrastructure providers, data suppliers, data users and data intermediaries.

- The main **infrastructure providers** in Norway are Microsoft Azure, Amazon Web Services (AWS) and Google Cloud, with Microsoft having by far the strongest position. The country's cloud infrastructure has significant growth potential, with the most lucrative segment being software as a service. In addition, traditional telecom operators in Norway offer connectivity and data-related services based on partnerships with cloud provider AWS. Independent software vendors such as IBM, Cisco, Visma, Crayon, Cap Gemini and others offer data management and analytics solutions. Finally, system integrators such as Crayon and TietoEvry offer a combination of secure communications and cloud solutions.

[1] Gross Domestic Product

- On the **data supply** side, there are public and commercial data suppliers. In Norway, there is a large amount of public data with suppliers such as Statistics Norway (SSB), the Norwegian Mapping Authority (Kartverket) and the Norwegian Meteorological Institute (Meteorologisk Institutt). On the commercial data supply side, there are commercial entities such as Diskos National Data Repository (oil and gas sector) and Landbrukets dataflyt (agricultural industry). In the past, there has been a lack of understanding of the value of data, but interviewees noted that this has changed for the better due to the rise of AI, which has made people realise the importance of data.
- Commercial data sharing as a product or service is well developed in Norway, with 5.5% of companies focusing solely on it in 2023, significantly higher than the EU average (2.1%). However, the legitimate use of data remains a challenge; not only is there a lack of clarity about the forthcoming European regulation, but the existing sector-specific regulation sometimes prohibits the innovative re-use of data from the relevant sector.
- **Data users** can be defined as organisations that actively create, use, collect and analyse data in order to use insights to improve their business operations. According to the European Data Market Monitoring Tool, there were around 7,300 data users in Norway in 2023, which represented 2.4% of all companies and is only slightly higher than the EU average of 2.3%.
- The last group are **data intermediaries**, which facilitate the exchange of data between data providers and data users, usually by offering additional services for a fee. Data intermediaries can be divided into several categories; firstly, there are open data portal operators, websites set up by public administrations that publish data catalogues to support the discovery of public information (e.g. 'data.norge.no', which serves as a catalogue for government data). Then there are data space operators, which provide an environment of rules and standards for mediated data exchange in specific industries, such as oil & gas and maritime. Finally, there are data marketplace operators that provide data exchange, sometimes for a fee, such as Digital Norway's Data Factory and DNV's Veracity data platform.

Technologies of particular importance include AI, big data, machine learning and deep tech. Many companies use several of these technologies, with different emphasis depending on the solutions they offer. IoT seems to be an increasingly important source of data, as evidenced by the fact that the number of IoT connections in Norway will triple over the next four years.

Analysis of the Norwegian data economy

After taking stock of the current state of the data economy in Norway, it was compared with the well-developed data economies of Denmark, Sweden and the Netherlands. Detailed economic scenarios for the development of the data economy were also examined, as well as existing national data economy strategies and forthcoming European regulations.

A comparison with the benchmark countries revealed a number of similarities. All have developed mature data economies, built on a solid foundation of well-developed

infrastructure and digital literacy. However, there are also some differences; Norway has a slightly less prominent position in the data centre industry and a shortage of ICT professionals, which may hinder further growth. In addition, Sweden is currently the leader in IoT, although Norway is close behind and shows promising potential.

The Nordic countries generally have a much more advanced level of public data provision than the Netherlands. Denmark has the highest proportion of companies supplying or using data, while the Netherlands has the lowest. Sweden and Norway are similar in this respect. However, in terms of the value of the data economy as a percentage of GDP, the four countries have comparable shares, with Denmark showing a slight deficit, Sweden a slight advantage and Norway in the middle.

Three potential future scenarios for Norway's data economy based on IDC's data[2] have been analysed:

- The Baseline scenario, which assumes the steady continuation of current growth patterns, ongoing improvement in data innovation and the evolution of existing regulatory frameworks. This is anticipated to result in all components of the data economy growing healthily reaching 7.5% of GDP in 2030.
- The High Growth scenario envisions an accelerated expansion of the data market, driven by improved geopolitical conditions and the successful implementation of digital and data strategies. The growth in this scenario is 1.6 times higher compared to the Baseline scenario, reaching 8.6% of GDP in 2030.
- The Challenge scenario presents a less optimistic outlook in which the data market growths slower due to unfavourable geopolitical and macro-economic conditions and digital innovation progressing at a much slower pace. All growth rates in this scenario are noticeably lower, though still positive (0.3 times of the Baseline scenario), reaching 6.2% of GDP in 2030.

Which scenario applies to Norway depends on the geopolitical situation and whether certain macroeconomic conditions are met (a high level of data innovation, an open and transparent data governance model, and a broad distribution of the benefits of data innovation). We found that Norway is well positioned in terms of these macro-economic conditions. However, the further development of the data economy in Norway also depends very much on the geopolitical situation and how the market will be governed in the coming years, which we cannot predict.

Review of existing regulation and upcoming European regulation

Finally, the review of existing national data economy strategies and upcoming European regulations showed that Norway has a comprehensive data economy policy, supported by the recently published National Digitalisation Strategy 2024-2030. This strategy sets concrete digitalisation goals for Norway in 2030, and value creation through data sharing and AI is one of the priority areas where the government plans to increase its efforts. Norway's principles aim to strike a balance between openness and protection,

2 See European Commission (2024a).

ensuring data use that benefits society while protecting individual rights. In addition, Norway aims to facilitate cross-sector cooperation on standards and formats for data exchange to enable the digitalisation of entire value chains.

After reviewing the Data Act and the possible application of specific articles to the Norwegian context (see Annex 3 for more details), it appears that the Data Act complements existing national strategies for data sharing and/or the data economy in Norway in general.

In addition to giving consumers greater control over the data generated by their use of connected products, the Data Act also imposes obligations on providers of data processing services (cloud services) to ensure effective switching between providers. This will be achieved through transparency of migration processes, cost-based migration fees, data and application portability and interoperability. This could be relevant in the near future if more cloud customers in Norway want to use cloud services from more than one provider and/or if the cloud market position of certain providers is perceived to be too dominant. The interviews suggested that although companies can be cloud independent, in reality there is always some lock-in effect due to specific data formats or techniques used by each cloud service provider. Even when switching between cloud providers is possible, the customer still has to do the migration itself, which requires technical expertise and effort. Interoperability between cloud platforms can be achieved at the cloud level, but also through application design and open application programmable interfaces (APIs).

The forthcoming new law on data sharing (for public data) may overlap with the Data Act as it is cross-sectoral. In addition, existing detailed obligations, such as the Standard Licence for Open Government Data (NLOD), will need to be aligned with the forthcoming detailed obligations for data holders in the Data Act.

Policy recommendations

Several measures are proposed to take advantage of existing opportunities in Norway, such as supporting commercial data supply and developing Norwegian data analytics solutions. This can be done by reusing best practices from existing marketplaces and long-standing expertise from data spaces in the energy sector. Furthermore, by commercialising segment-specific solutions that are state of the art and can be resold globally.

At the same time, policy measures are recommended to improve identified weaknesses in the Norwegian data economy that prevent the exploitation of these opportunities. Relevant aspects include prioritising public datasets that can potentially be used by commercial data providers, while ensuring both quality and privacy. Furthermore, it is important to ensure the general availability of data sharing obligations in contracts with suppliers of IoT devices and the availability of skilled labour for all stakeholders in the data economy.

In addition, there are policies that support the avoidance of threats, such as accelerating the implementation of data analytics solutions and thereby supporting the

supply of data analytics solutions and related services, given the lower venture capital investment in AI in Norway compared to Sweden.

Last but not least, it is crucial to remove regulatory uncertainty for businesses. It is therefore recommended that guidelines be published to clarify what obligations and rights market participants can expect when the Data Act is implemented with regard to the sharing and use of data, including any issues of interpretation. These guidelines should also address the interplay between the different European regulations and/or existing sector-specific regulations.

Overall, we believe that with the right guidance and oversight, the Norwegian data economy has the potential to provide the expected support to the wider economy.

2 Introduction

Digital data is described as the new industrial revolution; our personal and business activities, research and more, all lead to data, which is collected and processed spurring new products and services, but also improvement in organizational procedures and scientific methodologies.[3] An interesting statement in this respect comes from a 2022 report for the Norwegian Ministry of Local Government and Regional Development which stated that "…the value that could be extracted from data in the future will be equal to the value extracted from oil."[4]

Datasets have become so large that we call them 'big data' and technologies like cloud computing and Artificial Intelligence (AI) enable us to handle and make use of these large datasets. Therefore, it is no surprise that the economic activities related to big data have grown significantly in the last years and are expected to continue to grow in the coming years.

Due to the economic impact of the so-called data economy, companies but also governments around the world have prioritized this topic. The European Commission therefore developed its 2020 strategy for data[5], the Digital Agenda for Europe[6] and the Digital Europe Programme[7] to boost Europe's economy in areas like supercomputing, AI, cybersecurity, digital skills and digital innovation in general. In this context several regulatory instruments have been released among others the Data Act and the Data Governance Act in 2023 and the AI Act in 2024.[8]

The Data Act, adopted by the European Union, becomes applicable on 12 September 2025 and forms the legal basis for data sharing, complementing the Data Governance Act which proposes voluntary data sharing mechanisms within the EU and is already applicable from September 2023 onward. The AI Act has been approved in May 2024 and ensures a responsible use of AI. It will gradually become applicable from November 2024 onwards until fully applicable in May 2027. See for more details on this regulation Chapter 5.3.

In this context, the Norwegian regulator Nkom has commissioned WIK Consult (WIK) to conduct an in-depth market study regarding the data economy in Norway as preparation for the task to guide the market in respect to the future implementation of the Data Act in Norway. Nkom is an agency under the Norwegian Ministry of Digitalisation and Public Governance (formerly under the Norwegian Ministry of Local Government and Regional Development).

3 See European Commission (2014a).
4 Investigation of the data economy in public sector on behalf of the Ministry of Local Government and Regional Development; Agenda Kaupang, 2022.
5 https://digital-strategy.ec.europa.eu/en/policies/strategy-data
6 https://www.europarl.europa.eu/factsheets/en/sheet/64/digital-agenda-for-europe
7 https://digital-strategy.ec.europa.eu/en/activities/digital-programme.
8 See European Commission (2014b).

2.1 Study objectives and methodology

The primary objectives of this study are to explore the current landscape of the Norwegian data economy, review possible future scenarios, benchmark the Norwegian data economy with other comparable economies, assess the impact of the Data Act and related legislation and derive policy recommendations aimed at fostering a healthy and competitive data economy in Norway.

For this report, both quantitative and qualitative data on the Norwegian data economy have been collected. Quantitative data was collected from publicly available sources, supplemented by proprietary commercial data from Statista. The focus was on publicly available data sources relevant to the Norwegian digital economy, with a special emphasis on the Norwegian data economy. An overview of these sources can be found in Annex 4.

Qualitative data has been collected from publicly available literature and in-depth interviews with key stakeholders in the Norwegian data economy. The literature reviewed includes academic publications, policy reports and news articles. A comprehensive list of relevant literature is provided in chapter 7.

The interviews were conducted from August to October 2024. The interviewees were carefully selected to ensure coverage of relevant market segments in Norway (e.g., energy, health), key technologies (e.g., IoT) and critical roles within the data economy (data suppliers, users, intermediaries and enabling technology providers). The interviews provided a means of cross-checking the trends, technologies and indicators identified through our data collection and literature review. In addition, the interviews helped to validate the scenarios for the development of the Norwegian data economy.

The report is structured as follows; Chapter 3 starts with an overview of the general concepts of the data economy explaining the different roles of stakeholders and possible business models. Chapter 4 summarises the current status of the Norwegian data economy including an overview per sector, relevant players and business models.

Based on the data collected, Chapter 5 describes the further analysis done; benchmarking Norway’s data economy with those from Denmark, Sweden and the Netherlands, reviewing the possible future scenarios for Norway’s data economy and lastly reviewing the existing national strategy for the data economy in Norway and the upcoming European regulation including the Data Act.

The concluding Chapter 6 reviews the current and potential issues for Norway and how a healthy development of Norway’s data economy can be ensured in the coming years.

3 Theoretical foundations of the data economy

The data economy refers to all economic activities involving data, which has shifted from being a by-product to a valuable product driving innovation and business optimization. It spans across industries, blending analogue and digital processes, and is marked by the increasing role of data in generating added value beyond traditional business methods.

This shift is particularly notable in digital services and internet-based companies, where data-driven feedback loops create market concentration, especially in large platforms like Google, Apple, and Amazon. With advancements in Artificial Intelligence (AI) and data processing, businesses are focusing on leveraging data for both direct value creation and optimisation across sectors.

3.1 Data and the value of data

Data, defined as information about the properties of units of analysis,[9] gains value through context and interpretation. Data consists of raw, unprocessed facts or figures without context, making it difficult to derive meaning or insights directly. In contrast, information is processed data that has been organized, contextualized, and interpreted to provide direct meaning.

Transforming data into usable information through data collection, management and analysis requires considerable effort and expertise, as data does not speak for itself.[10] The value of data is therefore not standardised, as it depends on diverse requirements and use cases.[11] Factors such as data quality (i.e., completeness, accuracy, timeliness) are important, while its economic value is derived from how it is utilised to generate insights and drive business decisions.[12]

Data is an intangible and non-rivalrous good, meaning its use by one party does not diminish its availability or utility to others. Data can be shared, re-used, and replicated indefinitely without being depleted, allowing multiple entities to derive value from the same dataset simultaneously.[13] This non-rivalry characteristic makes data uniquely positioned to drive innovation and economic growth across industries, as its potential for value creation is not limited by consumption.

The value of data in the digital economy hinges on the quality and quantity of actionable insights it provides. Most business models of online platforms leverage data for improved prediction accuracy, which enhances services or optimises targeted advertising. Common applications of big data include service personalisation, recommendation systems, and targeted ads, which increase a platform's value by

9 Kaase (2001).
10 Arnold et al. (2020).
11 Coyle et al. (2020).
12 cf. PwC (2019).
13 cf. Floridi (2010); Hildebrandt & Arnold (2016); Schepp & Wambach (2016).

refining user experiences and boosting engagement.[14] Within companies or even certain industry sectors, big data analysis, could be used for more efficient value chains, improved efficiency in production and development of new products and services.

The economic value of user data is in particular influenced by its breadth and depth. Breadth refers to the number of users from whom data is collected, depth refers to a wide range of unique data points (e.g., searches, purchases, or activities). The same principle applies when considering company data. As the number of users increases, the breadth grows, allowing for richer aggregate insights across many individuals. Depth on the other hand relates to the amount of data collected about a single user, giving a detailed picture of their behaviour or preferences. Depth is often enhanced by tracking users across multiple services or products, building a more comprehensive profile.[15] Timeliness of data is crucial as well, as outdated data may lose its relevance compared to current data.

Additionally, the value of data also depends on its uniqueness and the extent to which it can provide insights that are not easily replicated by competitors. Despite being a non-rivalrous resource, unique data insights can be a competitive advantage.

Market concentration tendencies driven by data often stem from positive feedback loops where improved services or targeted advertising generate more data, enhancing service quality and attracting additional users/customers.[16] This cycle leads to further data collection and optimization. The concept of data-driven network effects describes how these feedback loops can create competitive advantages. Despite data's non-rivalrous nature, its economic value is enhanced by factors like economies of scale, exclusive access, and data-induced switching costs, which can protect data-rich firms from competition and reinforce market dominance. However, the impact of data on market concentration depends on the nature of learning: user-specific improvements enhance individual experiences but don’t create network effects, whereas cross-user learning can lead to conventional network effects by benefiting from data across all users.[17]

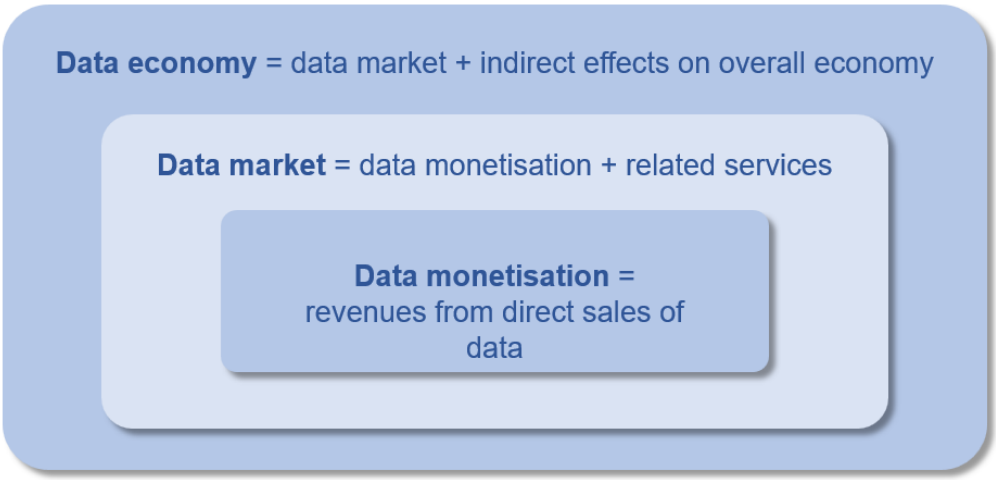
3.2 Definitions related to the “data economy"

The European Data Market study 2021-2023 defined the **data economy** as being the “*overall impacts of the data market on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies*”.[18] Thereby it is not only the marketplace where digital data is exchanged as “products” or combined with “services” as a result of the elaborations of raw data (the **data market**), but also covers the indirect effects of the data (e.g. improved efficiency) and also the induced economic

14 Steffen et al. (2021).
15 Krämer et al. (2020).
16 Arnold et al. (2020).
17 Sörries et al. (2022).
18 European Commission (2024a), p. 44.

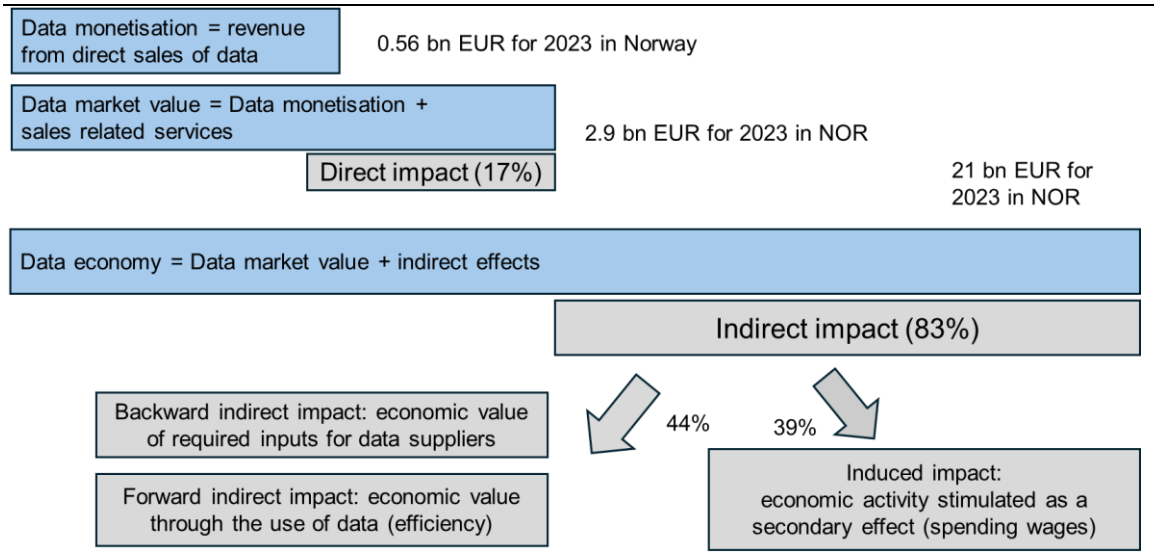
effects of additional income and spending by people working in the data economy.[19] The monetary value of the direct sales of data in the data market is called **data monetisation**. These definitions are reflected in below figures including as well absolute values for Norway's data economy in 2023.

Figure 1: Definitions used



Source: WIK Consult

Figure 2: Definitions used and their economic value for Norway



Source: WIK Consult based on European Commission (2024): European Data Market Study 2021-2023

19 European Commission (2024a), p. 41.

The data economy is not a sector that can be clearly distinguished from other (traditional) sectors. Data permeates practically all economic activities. Due to the fluidity of data, the data economy consists of numerous complex interactions between market players, including manufacturers, researchers, and infrastructure providers, making data accessible and usable.[20]

3.3 Roles in the data economy

The data market consists first of all out of the supply and demand sides: data suppliers and data users. Data suppliers are those entities that provide and offer raw, refined, or analysed data. (e.g. social media, e-commerce platforms, public entities, and companies). Data users refer to those entities interested in using datasets provided by data suppliers (e.g. retailers, financial institutions, and healthcare providers).

Data suppliers and users can exchange data directly on a bilateral basis without any mediation, mostly if they already have an existing business relation and/or trust one another. Data format and eventual fees are then agreed on a bilaterial basis. The other option is exchanging data via intermediaries which match demand and supply as shown in Figure 3.

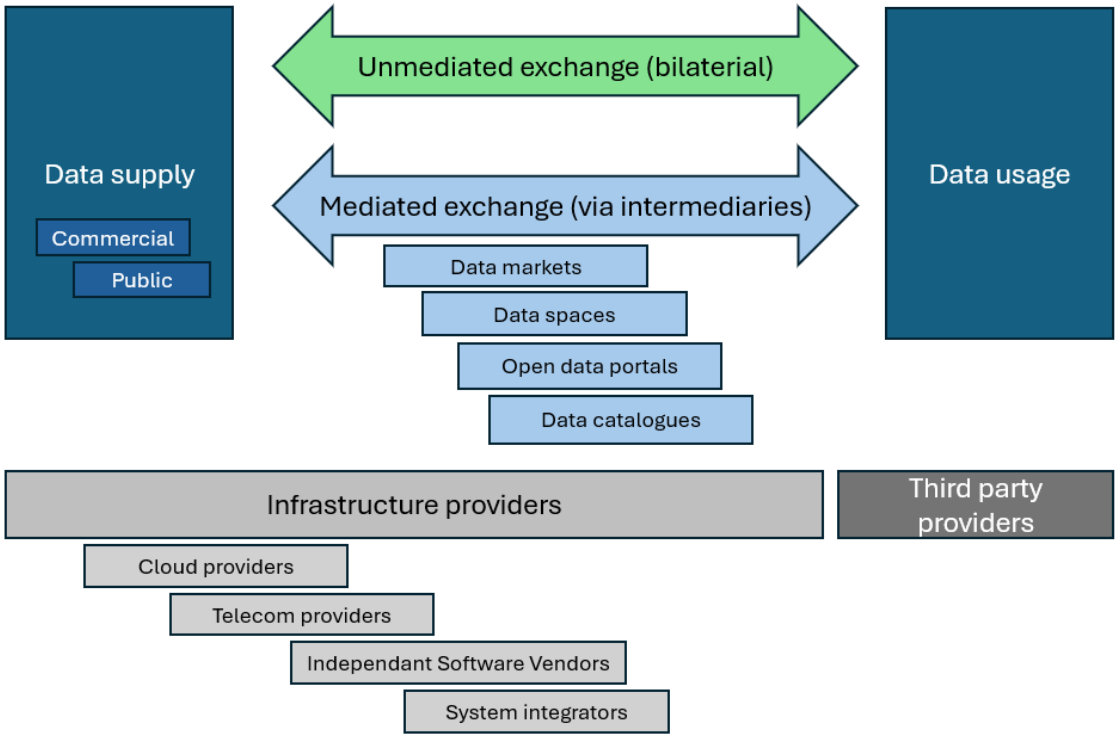
One of the options is via a marketplace for data, a so-called data market. Data suppliers can use this data market to offer their data sets in any format and data users use it to find the data they are looking for. After matching supply and demand, the platform receives a transaction for the matching and data supplier and user exchange the data and eventual fees. An online data market is established by a platform owner, which provides the technical functionalities required for an online data market like making the offered data from data suppliers visible for potential data users and facilitation of transactions. The platform owner can also have another role; fulfilling the operative and administrative part including marketing of the platform, but this role can also be done by a separate entity.

Figure 3 shows also the other options like data spaces, portals and catalogues, which will be discussed later. In addition, it shows the different entities involved in providing this mediation. First, there are providers of infrastructure components like cloud providers enabling the storage and processing of data. These cloud services are mostly categorised as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), which represent different, cumulative degrees of IT outsourcing. This ranges from outsourcing servers and/or storage (IaaS), to also the development platform (PaaS), to all of the above including the application (SaaS).

Furthermore, Figure 3 shows other providers of infrastructure services like telecom providers (connectivity), independent software vendors providing applications and systems integrators providing a mixture of connectivity and applications support. Lastly, there are third-party providers, who provide additional services for a fee either enhancing the data access or usage and/or enhance the data itself.

20 Arnold et al. (2020).

Figure 3: Data marketplace definition and actors



Source: WIK Consult

Then there is another group of actors in the data economy, called independent data intermediaries. These entities can also mediate between data providers and data users. To this category belong data spaces, providers of open data portals and data catalogues.

Data spaces resemble a data market in the sense that data users can search for data sets, but usually without the supporting transaction mechanism of a marketplace (and the commercial focus). Further differences with a data market are that a data space has standardised data formats and structures, hence enable data suppliers and users to more easily exchange and thereafter use the data. Lastly, data spaces have a so-called governance structure, which arranges who has access to which data. Hence, a data space lends itself for sharing more sensitive data (e.g. with business secrets) among a selected group of companies (who trust one another). The focus is therefore generally on providing a trusted and securely governed environment, rather than on the commercial aspect, although commercial data spaces do exist.

Data spaces can be private, but there are also those supported by the European Commission called common European data spaces. Their function is 'to bring together relevant data infrastructures and governance frameworks in order to facilitate data pooling and sharing.'[21]

21 https://digital-strategy.ec.europa.eu/en/policies/data-spaces

Open data portals are web-based tools mainly used by public authorities to enable access to open public data, interact with the data online and/or even visualise it. Data catalogues are online descriptions of available data sets, the data owner, the structure, quality and context. They enable users to discover and understand available data sources, before approaching then potential data suppliers and starting the process of exchanging the data.

Schweihoff et al. (2023)[22] made a comprehensive literature overview of the different types of data intermediaries and found that data intermediaries can have a variety of purposes, such as ensuring data quality, organising data-sharing transactions, but also as trusted entities. They distinguished five service types (which can overlap):

Table 1: Data intermediation service types

Service Type	Description
Transactions service	Enable the data & service exchange by bringing the actors together (match making), but also resolve conflicts and monitor transactions to increase trust.
Governance service	Regulate legal aspects of data sharing. So it is up to the intermediary to protect the data of the data suppliers.
Sovereignty service	Ensure compliance with policies and data ownership. Control of meta data, anonymisation and certification, data access control.
Technology service	Provide the infrastructure for sharing and storing data. Technical aspects such as standardised data formats and the sharing process.
Data service	Focuses on the data itself; aggregated data made available, data quality and data integrity. Complementary services are data analytics, data visualisation.

Source: WIK Consult based on Schweihoff et al (2023), Table 2, Page 7.

Thus, along the service types of Schweihoff et al (2023), the focus in data spaces is not only on the transaction service (matching demand and supply), but also on the governance service (legal aspects, protecting the data suppliers), technical aspect (standardisation of data formats) and partly on sovereignty (compliance with regulations). These data spaces can contain both open (public data) and non-open data sets. For the latter, participants can negotiate access with each other and consequently receive controlled access.

22 Schweihoff et al. (2023).

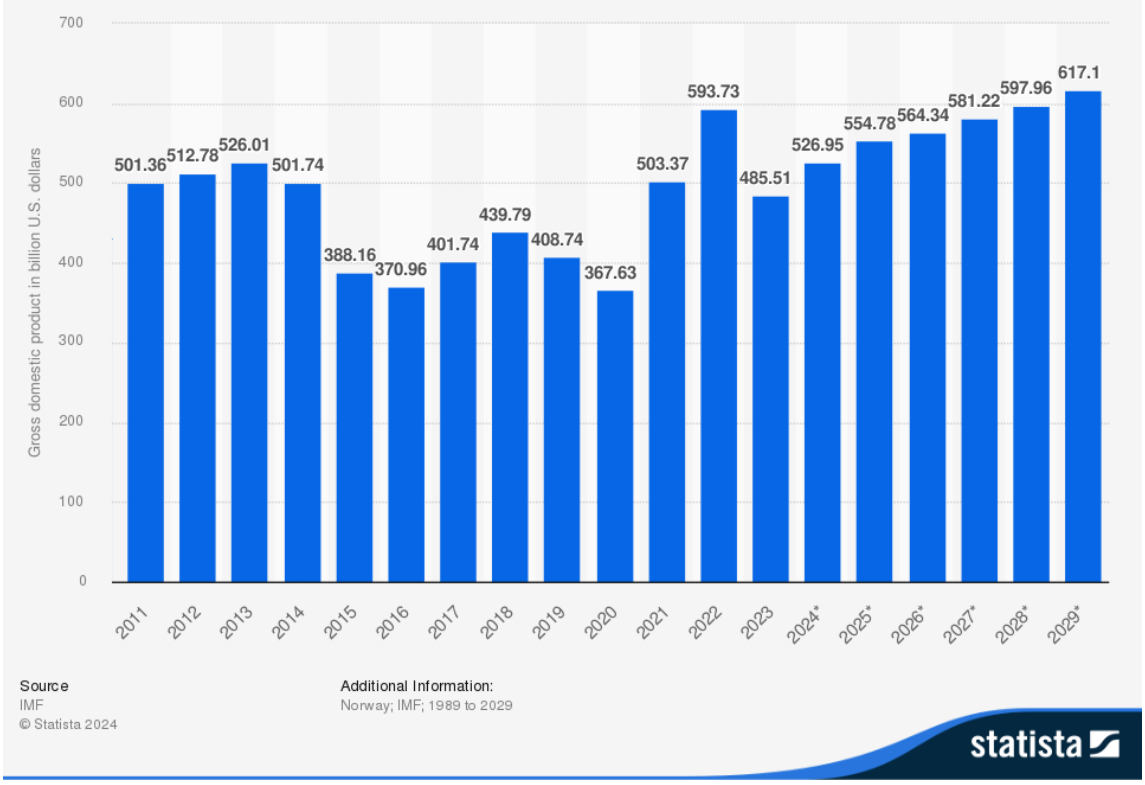
4 State of play for the Norwegian data economy

4.1 Norway's overall economy in relation to its data economy

Norway's economy is built on natural resources, shipping and hydropower.[23] Dominated by the oil and gas industry, the economy comprises a small domestic-oriented manufacturing sector, a few large international firms, and a high concentration of small and medium-sized enterprises (SMEs). Comparable to other Nordic countries, there is a large public sector and well-resourced universal welfare state.

Norway's overall economy is rather stable (see Figure 4). After a period of mostly decline between 2013 and 2020, ending with the lowest GDP value in 2020, which was also the year when the Corona crisis hit the economy, the Norwegian economy recovered quickly to pre-2013 levels in 2021. An upturn in 2022 was followed by a slight downturn in 2023. However, according to the IMF's World Economic Outlook, the Norwegian economy is expected to continue its recovery from this year onwards, reaching its highest level of GDP in 2029.

Figure 4: GDP development Norway



Source: IMF. (April 22, 2024). Norway: Gross domestic product (GDP) in current prices from 1989 to 2029 (in billion U.S. dollars) [Graph]. In Statista. Retrieved October 21, 2024, from https://www.statista.com/statistics/327319/gross-domestic-product-gdp-in-norway/

23 Dølvik & Steen (2018).

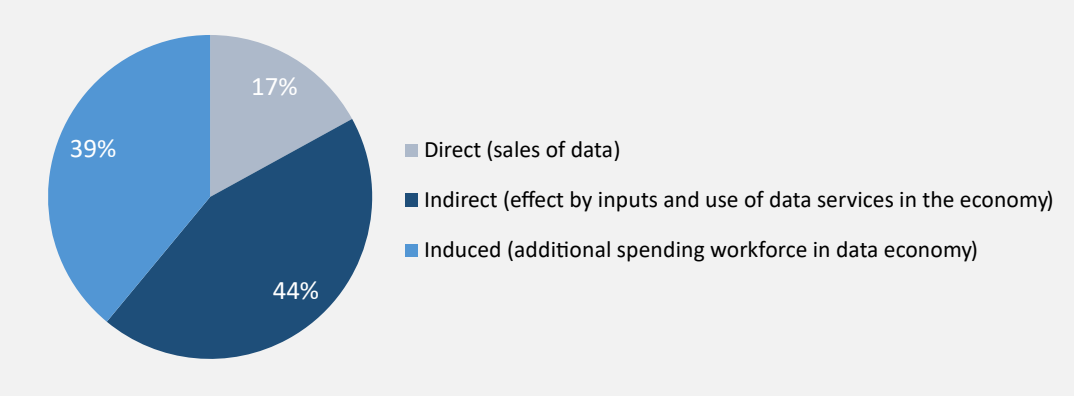
Norway's Gross Domestic Product (GDP) per capita in 2023 was estimated at USD $101,103, reflecting its high-income status and living standards.[24] High labour costs may encourage economic activity to shift into activities and sectors with a higher added value in Norway.[25]

International Data Corporation (IDC) estimated in 2023 that around 5.4% of Norway's GDP is derived from its data economy (around 21 billion €) and that this is expected to rise to at least 6.4% by 2030, at a maximum of 8.6%. In total, IDC, thus, expects the data economy in Norway to increase up to 32 billion Euro in 2030 in a conservative scenario. [26]

In its analysis IDC distinguishes between direct, indirect and induced effects. Direct effects are defined as the monetary value of data services sold. Indirect effects are related to the economic growth generated by a) the inputs to the data suppliers (backward indirect effect) and b) the use of data services by downstream industries, like increased efficiency and effectiveness (forward indirect effect). The remaining part is caused by so-called induced effects, as the data economy creates an additional workforce, and their related spending impacts the overall economy as well.

The 5.4% GDP contribution of the data economy in 2023 consists of 0.9% direct effects, 1.1% backward indirect effects, 1.3% forward indirect effects and 2.1% induced effects. The following figure expresses this GDP distribution of the Norwegian data economy in the different effect as percentages.

Figure 5: Distribution of GDP distribution in Norway in different effects- 2023



Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

Especially regarding the induced effects, Norway ranks 60% above the EU average (2.1% vs 1.3%). Also, in terms of forward indirect effects, Norway shows a 30% higher effect (1.3% vs. 1.0%). For the other two effects, the differences are less pronounced.

24 https://www.statista.com/study/89943/top-100-companies-norway/ and https://www.statista.com/study/48392/norway/
25 Dølvik & Steen (2018).
26 EU Data Market Report 23, Indicator 5.2. Data was given for the EEA countries Norway, Iceland and Liechtenstein. As the EEA GDP consists for 94% out of Norway's GDP, it is assumed that the EEA figures x 94% result in good figures for Norway. This approach is also used for IDC's other indicators.

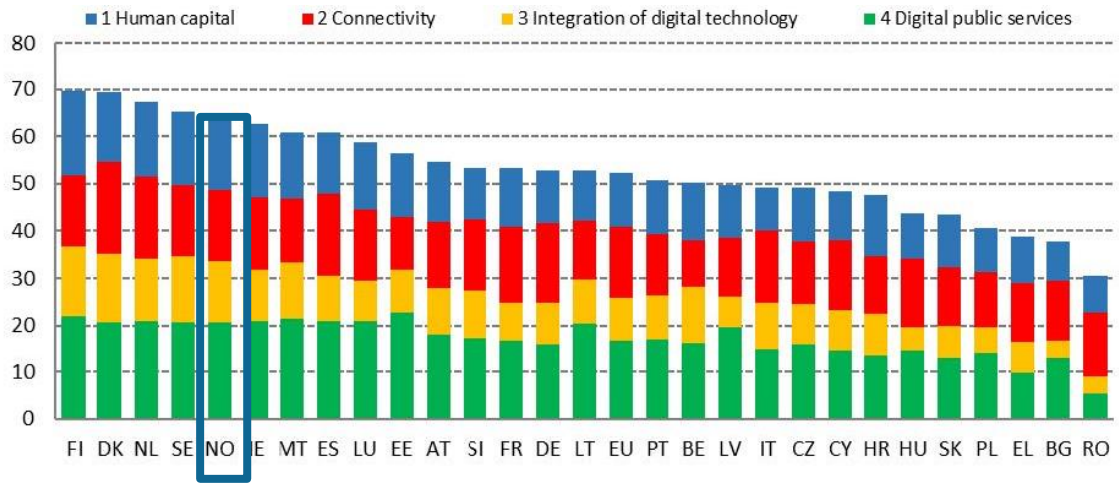
Norway's share of the data economy is expected to rise to 6.0% in 2025. The highest growth rate is expected for direct impacts.

4.2 Norway's characteristics relevant for the data economy

The European Commission's Digital Economy and Society Index (DESI) ranking evaluates member states according to their level in key digital policy areas like human capital, connectivity, integration of digital technology in society and the availability of digital public services, hence all enablers for a well-functioning data economy.

In 2022, Norway ranked fifth overall, directly behind Finland, Denmark, the Netherlands and Sweden indicating good prerequisites for the development of its data economy. [27] See Figure 6.

Figure 6: 2022 DESI ranking overall



Source: DESI report for Norway 2022, P. 3.

Norway's high ranking was due to:

- *Skilled human capital* with a significant above average level of digital skills and basic content creation skills of individuals and an above average % of enterprises providing ICT training.
- *Integration of digital technologies*; in Norway, there is an above average level of Small and Medium Enterprises (SMEs) which are digitally active in general and specifically regarding social media, cloud services and AI. Furthermore, Norwegian enterprises have a significantly higher usage of e-invoices and online sales; and

27 See DESI dashboard for the Digital Decade (2023 onwards) - Digital Decade DESI visualisation tool (europa.eu). The 2022 ranking is the latest available for Norway, as the DESI has been integrated into the State of the Digital Decade report since 2023 and there is no longer a separate country report for Norway.

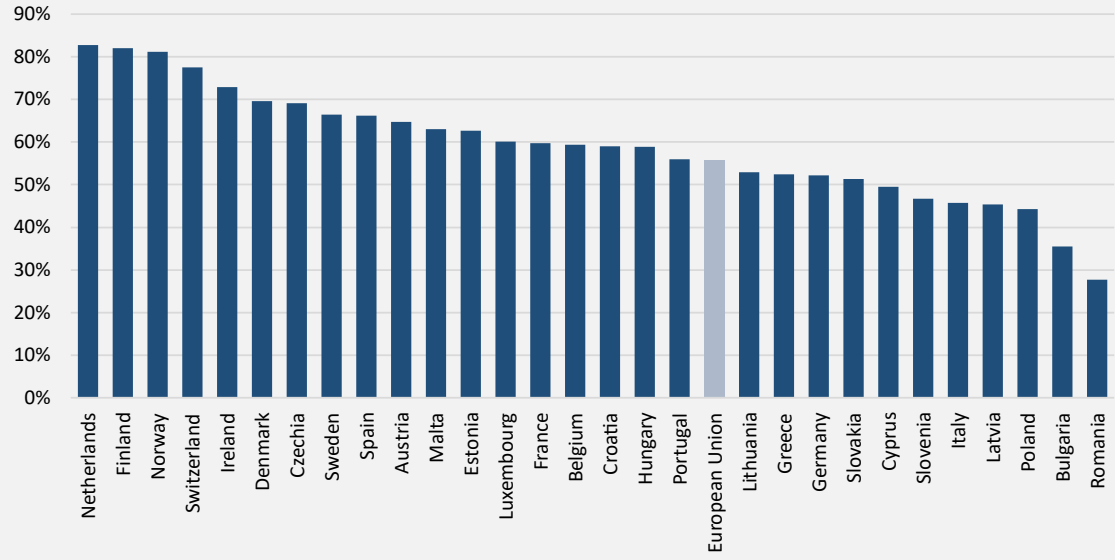
- *Availability of digital public services*; almost all public services are available digitally and used by almost all Norwegian internet users. In addition, most of the public data is open data, being available to everyone.

The only aspect ranked lower in Norway, compared to the EU average, was connectivity. This aspect looks at the overall take-up of (fast) broadband (fixed and mobile), the price index, the coverage with very high capacity (VHC) networks and FTTP and available 5G spectrum.

Despite having a significant above EU coverage of VHC networks, in 2021 the average uptake of 1 Gbps broadband connections was still lower than the EU average (2.7% for Norway versus 7.6% EU). The other lagging aspect was 5G coverage in populated areas in 2021 (24% for Norway versus 66% EU).[28] However, this aspect strongly improved as Nkom reported that in the first half of 2022, the 5G national coverage was close to 82%[29] (EU average 5G coverage is 50.6%[30]).

A Statista 2023 country report on Norway[31] confirmed the availability of digital skills in Norway once more as shown in Figure 7. The population in Norway has one of the highest digital skillsets in Europe (more than 80% have at least basic or above basic digital skills) with 65% of the population between 15 and 64 years old and 18% of people above 65 years old.

Figure 7: People with basic or above basic digital skills - 2023



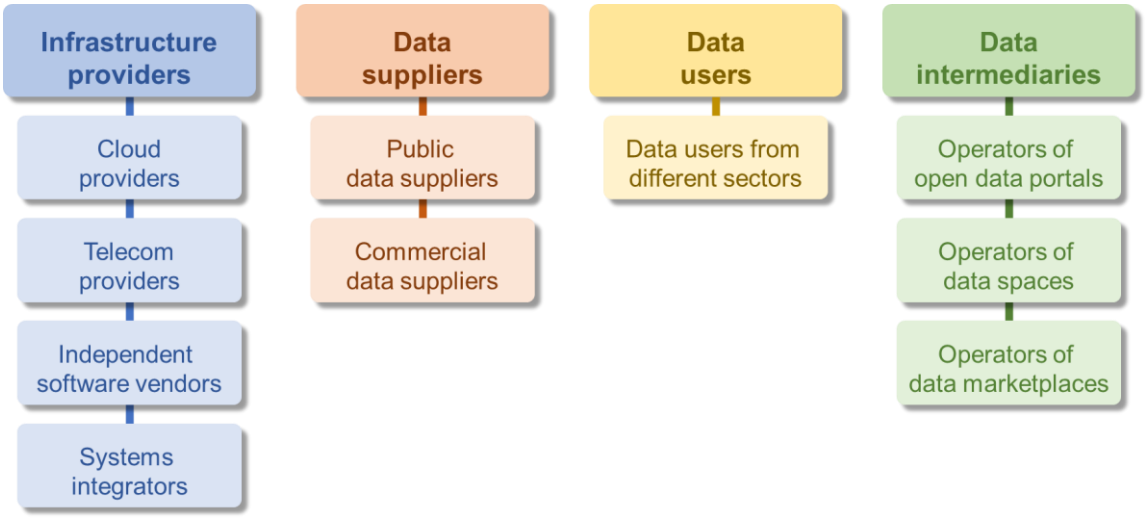
Source: WIK representation based on Eurostat, Digitalisation in Europe – 2024 edition. Retrieved November 07, 2024, from https://ec.europa.eu/eurostat/web/interactive-publications/digitalisation-2024#businesses-online

28 See DESI report 2022 for Norway, Page 5, 2 Connectivity. Based on 2021 data.
29 Nkom (2023).
30 European Commission (2024b): Denmark, Page 10,11.
31 Statista 2023 country report Norway – countries & regions / Eurostat, Digitalisation in Europe – 2024 edition - Eurostat (europa.eu).

4.3 Stakeholders and roles in the data economy in Norway

As described in the European Commission's report on the European data markets[32], several roles are identified in the data economy: from infrastructure providers, data suppliers, data users and data intermediaries. Following figure presents an overview of the possible subcategories of these roles, which will be discussed further in the following paragraphs.

Figure 8: Categorisation of different roles in the data economy



Source: WIK Consult

4.3.1 Infrastructure providers

Starting with the enabling infrastructure, we distinguish cloud- and infrastructure providers like telecommunications providers, independent software vendors and system integrators. All of them provide infrastructure services in combination with additional services focused on the storage, handling and processing / analysis of data.

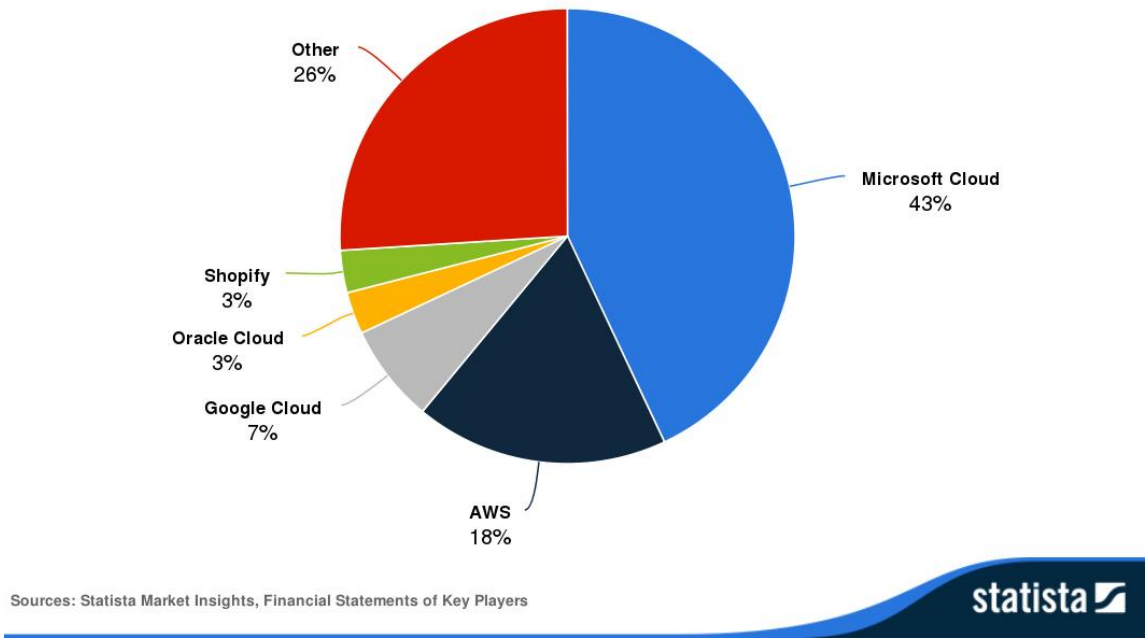
Cloud providers

As described in chapter 3, cloud services are categorized in different segments. Figure 10 below shows that in Norway the largest market share is for respectively SaaS and PaaS followed by IaaS. In addition, there is now also the outsourcing of the desktop (Desktop as a Service) and even the outsourcing of business processes (Business Process as a Service), but these segments represent still a small part of the cloud market.

32 Trusts Trusted Secure Data Sharing Space (2020); P. 24. Research and innovation program under grant agreement No 871481. Referred author for definition in report: Agahari et al. (2019); M. Spiekermann (2019).

The most important overall cloud- and infrastructure providers in Norway are Microsoft, Amazon Web Services (AWS) and Google Cloud Norway, which are present in all cloud market segments. In addition to their cloud services, these major players offer a wide range of (big) data management and analysis tools, including AI-based services. See the figure below for public cloud market shares in Norway.

Figure 9: Market shares public cloud providers in Norway - 2024



Source: Statista Market Insights. Public Cloud - Norway. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/public-cloud/norway?currency=USD&locale=en

From the interviews, several large ICT / solutions providers confirmed that Microsoft is their main cloud provider. However, many of them also noted that they are cloud agnostic, so they do offer their solution in combination with other cloud providers like Google, AWS and IBM but to a lesser extent. Interviewees noted that this is due to customer demand and historical reasons. Microsoft seems to adapt to Norwegian requirements and/or cooperate with Norwegian authorities better than its competitors. For example, Microsoft launched its data centres in Norway in 2019, which was the same time as the Norwegian data centre strategy was announced and the aspect of data residency within Norway became important.[33] The security and data sovereignty concepts have become even more relevant after recent geopolitical tensions due to the Ukraine war. Google announced in February of 2024 that they will invest €600 million to build a data centre in Norway as well, which should go live in 2026.[34]

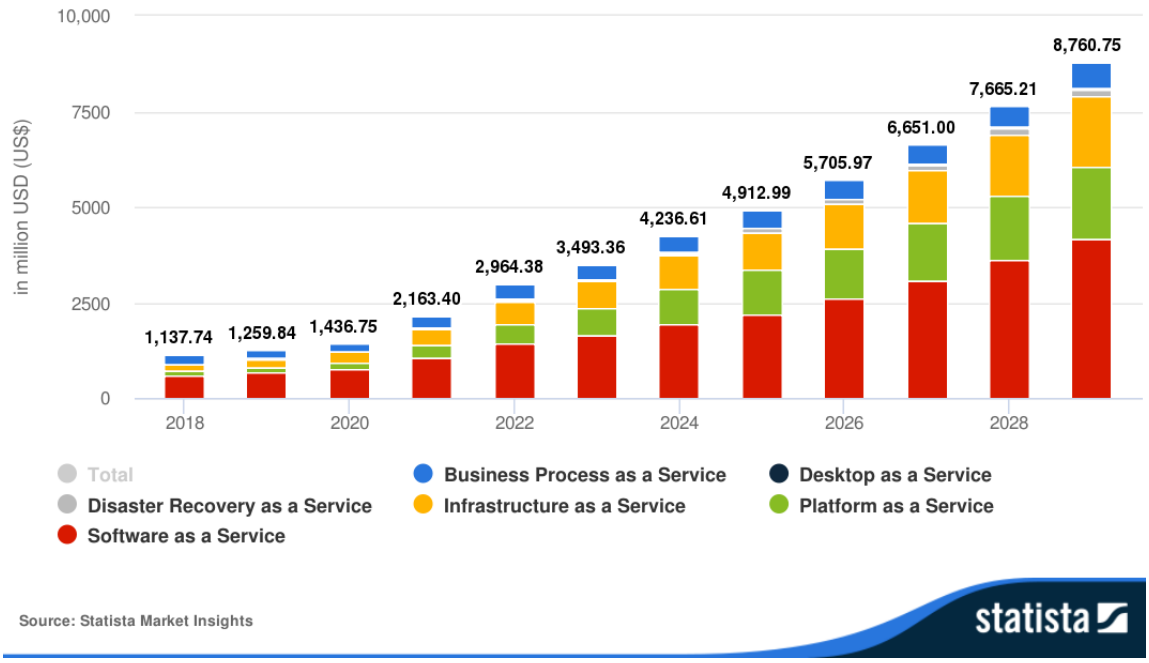
33 This relates to the concept of data sovereignty in which data is subject to the laws and governance structures of the nation where the data is collected.

34 Google breaks ground on Norway data center - DCD (datacenterdynamics.com)

However, while the larger ICT companies are able to support multiple cloud providers, the smaller data analytics companies interviewed stated that being able to provide their data analytics solution on multiple cloud platforms requires additional technical expertise, and therefore leads to higher costs. Hence for this reason, they focus on one cloud provider.

Figure 10 below shows the development of the different cloud segments in Norway. Currently, the largest cloud category is still SaaS, followed by PaaS with an almost similar share for IaaS. SaaS cloud services are expected to have the highest growth in Norway in the coming years due to their ease of use and scalability. This trend can be explained due to the high percentage of small and medium sized companies combined with an above average uptake of cloud services in Norway (71% of all companies with more than 10 employees in 2023[35]).

Figure 10: Public cloud revenue development in Norway 2017-2029



Source: Statista Market Insights. Public Cloud - Norway. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/public-cloud/norway?currency=USD&locale=en

From a data perspective, it is important to recognise that PaaS/SaaS customers still control the data, but that cloud providers store all the customer's data, provide all the data management and analysis tools and have access to the metadata across all customers using their applications (SaaS) and/or development platforms (PaaS).

One interviewee noted the trend towards so-called private SaaS, where not only the customer's data is separated (and hence more protected), but also the application it

35 OECD Data kitchen 2023. Indicator: Businesses purchasing cloud computing services.

uses. This has to be seen in the context of increased security levels especially for certain critical sectors such as nuclear energy and power grids.

Telecommunication providers

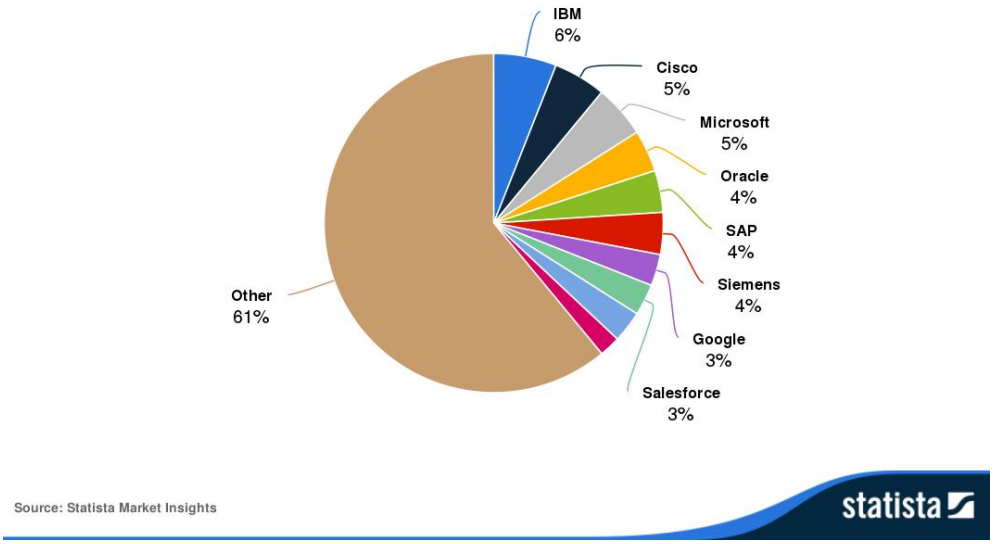
In addition to cloud providers, there are traditional telecommunication providers in Norway offering connectivity services as well as data related services; Telenor and Telia. Telenor is still a central player in the data market as it provides data analytics and other digital services together with IoT solutions on its mobile networks alongside its traditional telecom services.[36] Competitor Telia Norge also offers data and cloud-related services alongside its telecom services. Both Telenor and Telia have a partnership with cloud provider AWS.

Independent Software Vendors

The third category of enabling infrastructure are the so-called independent software vendors (ISVs) who offer solutions for data management and data analytics. They can either specialise on data analytics or offer these in combination with applications for Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), application development platforms (e.g. MS Azure), productivity software or software related to system infrastructure (e.g. Cisco) and/or consultancy.

Figure 11 illustrates that the most important ISVs in Norway are IBM Norge (6% market share), Microsoft Norge (5%), and Cisco (5%), but there are also players such as Visma, Crayon, Cap Gemini and many other smaller niche players.[37]

Figure 11: Market share ISV in Norway 2024 (ERP/Productivity/Appl dev/Sys infra)



Source: Statista Market Insights. Software - Norway. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/software/norway?currency=USD&locale=en

36 See Telenor investing in data capture and analysis capacity for a smarter society
37 Statista 2024 Insights in the software market in Norway.

Microsoft Norge offers data management and analysis services together with its cloud and data (Azure) solutions. SAP offers ERP solutions, Salesforce CRM solutions which both include data analytics and business intelligence solutions. Lastly, there are the consultancy firms Cap Gemini and Accenture, which have expanded their management consulting services to include data analysis services, as these provide important outputs for management.

A number of stakeholders in this category have been interviewed, namely independent software vendors (ISVs) whose applications generate value for their customers by extracting data from industrial IoT. This data is collected by the assets used and/or owned by the customers of the ISVs in question. It should be noted that these ISVs are not the owners of the data in question; rather, they assist their customers in the standardisation of disparate input data and the subsequent data analytics and visualisation. However as discussed later, they can be so called data holders, which have several obligations under the data act to make the collected data available to data users and/or not to share with third parties (other than for the purpose of providing their service).

A high degree of market concentration does not appear to be evident, although this may be the case in specific market segments or market niches.

Systems Integrators

This group of companies comes mostly from the ICT side offering a combination of secure communication services and/or cloud services and applications. There is an overlap with later discussed intermediaries, as these companies can also mediate between data suppliers and demand. Examples are:

- **Crayon**, a global IT company specialised on application and IT, which also supports companies with the exchange of data and the management thereof.
- **TietoEvry**, a large Nordic IT service provider, which also offers data platforms and services, supporting companies with the collection, sharing and analysis of data; and
- **Norsk Helsenett**, which offers secure communications and data services for the Norwegian health sector. They enable the secure exchange of patient data between different health organisations.

4.3.2 Data suppliers

Data suppliers can be defined as organisations whose core business is the production and delivery of digital data-related products, services, and technologies, as well as data itself.[38] We distinguish between public and commercial data suppliers.

Public data suppliers

The public sector in Norway plays an important role when it comes to data supply. Norway started quite early in making its public sector data publicly available for re-use.

38 Definition from 2023 EU Data Market Study.

In 2016, a white paper was published to present the Government's policy on how to exploit ICT in the best interest of the Norwegian society including initiatives for what was called the 'sharing economy'. Amendments were proposed to the Freedom of Information act to enable re-use of public sector data and action plans were prepared to make data related to culture, geodata, transport data and research data available.[39] The follow-up in 2017 was the publication of Norway's guidelines for making public sector data publicly available.[40]

The main objective of the 2017 guidelines was that businesses, researchers, civil society and the public sector themselves can make use of information managed by the public sector – for value creation, increased efficiency and increased openness and transparency. The guidelines include that confidential data relating to personal matters and business secrets will not be made available, that data must be free of charge (with some exceptions)[41] and that data must be made available without the user having to apply for permission or register. In 2019, the Norwegian digitalisation strategy for the public sector reinforced this by supporting the digital transformation of the public sector including the sharing and re-using of more public sector data.[42] On 26 September 2024, this strategy was replaced by the National Digitalisation Strategy 2024-2030 by the Norwegian Ministry of Digitalisation and Public Governance.[43] This strategy contains concrete targets for where Norway should be in 2030 in terms of digitalization.

Multiple interviewees confirmed that there is a vast amount of public data available in Norway and a unique 'culture' of allowing the sharing of data by public entities like income, utilities consumption, companies' financial statements and much more.

This data is made available (mostly for free[44]) to support other industries in Norway while still respecting data privacy. This is achieved via the standard license for open government data (NLOD) developed by the Ministry of Local Government and Regional Development in Norway. This license supports all data owners in the public sector by creating a clear legal basis for the data owner explaining its key rights and obligations under the Norwegian law. It also tackles practical matters such as copyright, personal data, exemptions of rights of use of the public data and liability.[45]

For example, as of 2020, 100% of Norway's national health datasets have been shared.[46] Norway has also created an open data portal[47] (data.norge.no) for this public data, which functions as a catalogue. The portal itself does not contain data; once potential data users have found interesting data sources in the online catalogue, they can request that data from the relevant authority. This governmental portal currently

39 Norwegian Ministry of Local Government and Modernisation (2016), Para 8.2.
40 See Guidelines for making public sector data available - regjeringen.no
41 See Freedom of Information Act (Section 8) and the Regulations (Section 4) that allow you to charge for data.
42 See digitaliseringsstategien.docx (live.com)
43 The digital Norway of the future: National Digitalisation Strategy 2024–2030. See: European Commission (2023).
44 Apart from certain commercial geospatial data.
45 See Norwegian Licence for Open Government Data (NLOD) 2.0 (norge.no)
46 OECD (2024).
47 https://data.norge.no/nb

administers around 8,000 data sets. The following (non-exhaustive) list shows the major public entities making their data available:

- *Statistics Norway (SSB):* providing comprehensive data on population, economy, education, labour market, health and more.
- *Kartverket* (Norwegian Mapping Authority): the national provider of geospatial data, maintaining the country's topographic maps, geographic information systems (GIS) and land registry.
- *Meteorologisk Institutt* (Norwegian meteorological Institute): providing real-time and historic weather data, climate and oceanographic data.
- *Bronnoysund Register Centre:* managing the national registry of business data in Norway including financial statements, ownership and other business-related data.
- *Norwegian Centre for Research Data* (NSD): providing access to a wide range of research data especially in social sciences.
- *Norwegian Institute for Air Research* (NILU): focusing on environmental research and providing data on pollution, climate change and other environmental aspects.
- *Fiskeridirektoratet* (Norwegian Directorate for Fisheries): providing data related to the fishing industry, including stock assessments, catch statistics and marine ecosystem data.
- *Norwegian Water Resources and Energy Directorate* (NVE): providing data on water resources, hydropower production, and other energy-related information.

The advanced state of sharing public data in Norway is also confirmed in the 2023 OECD's OURdata index, covering the period 2020-2021.[48] The data further shows that in Norway 63% of its high value datasets are available against an OECD average of 47%.[49] Furthermore, Norway ranks third from 26 EU countries in the category 'Data accessibility' (0.89, OECD average 0.59) due to high scores in the sub-categories 'Content of policy on free and open access to data' (0.92), 'Implementation' (0.91) and 'Stakeholder engagement for data quality and completeness' (0.83). However, the report also indicates that Norway could improve its data availability by consulting more often with the demand side of the market, hence the businesses, academia and others to identify data needs.

However, making all this data available has a price. A 2022 report on behalf of the Norwegian Ministry of Local Government and Regional Development on the data economy in the public sector stated that "…making data available for reuse can be costly for public sector organizations. Therefore, the public sector will face a dilemma between providing high quality data and the need for predictable funding for this type of activity."[50] Due to the EU Open Data Directive[51] public data in general should be free of charge and therefore, utilizing fees to cover for the additional costs is not possible (or

48 OECD (2023).
49 OECD (2023). Sub-pillar 'Availability of high value datasets'.
50 Investigation of the data economy in public sector on behalf of the Ministry of Local Government and Regional Development, Agenda Kaupang, (2022).
51 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). See Directive - 2019/1024 - EN - psi directive - EUR-Lex (europa.eu)

only exceptional circumstances). Hence, the report concluded that there should be a clearer prioritization by the government of which datasets in the public sector should be shared, as it is costly and resource-intensive to improve the quality of data and make it available in a useful way.

This was confirmed by some of the interviewees, which noted that public entities struggle with making the right data available and/or in the right quality or format as they have no insights in the usage of this data. One interviewee in fact resolves this issue for its customers by screening the available public data, checking the quality and putting it in the right data format and making it available against a fee on their own data space and data catalogue. This activity would fit into the next category of commercial data supplier.

Commercial data suppliers

Commercial data suppliers share and supply data for a fee, but also develop new business models, establish partnerships with other companies and support innovation.[52] Data can be sold between commercial companies although some data is also shared for free.[53] These appear to be sector-specific and examples include among others the Diskos National Data Repository, which is important for the oil and gas sector, the Maritime Data Space, Landbrukets dataflyt, which is used by the agricultural industry, and Elhub, which is used to share metering data.[54]

In the beginning of data sharing in Norway (around 2018), the most relevant obstacles were technical issues, such as missing interoperability or infrastructure costs, and legal issues, such as uncertainty about the lawful use of the data and monitoring issues related to the missing ability to track data usage.[55] In 2021, commercial data sharing was still limited to internal company operations or a limited number of trusted external parties, which resulted in a data sharing ecosystem with low maturity in Norway. There was also a lack of understanding of the potential value of the data and a lack of knowledge and trust.[56] Interviewed Norwegian stakeholders in 2024 noted that this has changed for the better due to the rise of AI, which made companies realise the value of data. However, interviewees noted that there are still uncertainties regarding the lawful use of shared data, especially where there are sector specific laws like water regulation, which may prohibit the innovative re-use of data for other purposes than the original intended purpose.

The total number of commercial data suppliers[57] in Norway in 2023 was around 6,500, which is 5.5% of the total number of enterprises in Norway.[58] This is well above the EU average of 2.1% and seeing an upward trend possibly reaching 6.7% in 2030. However,

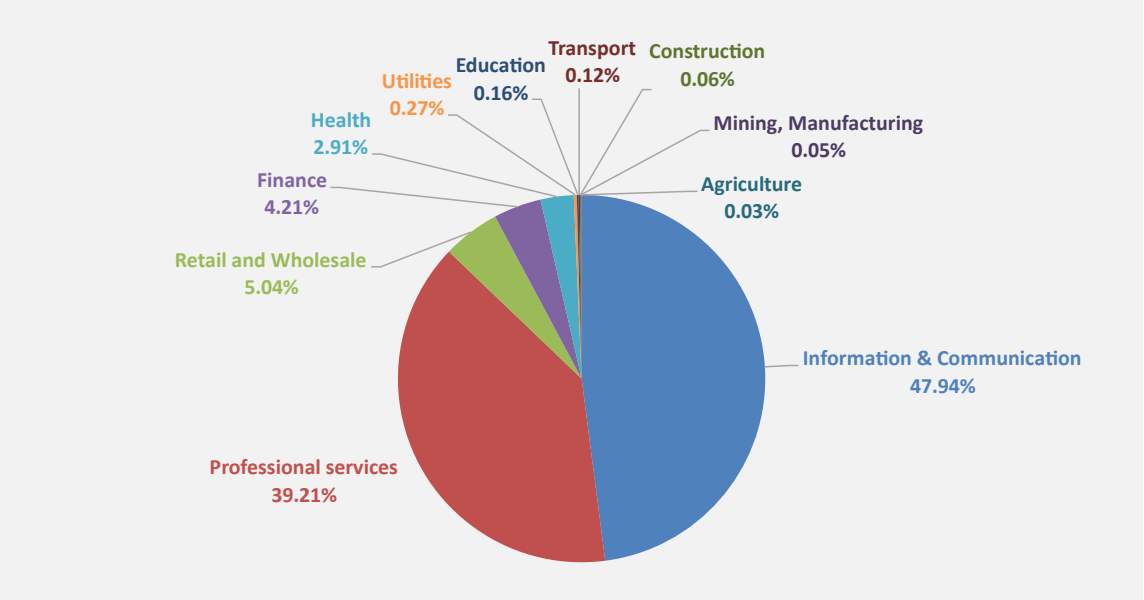
52 European Commission (2018).
53 Data as a resource, Norwegian Ministry of Local Government and Modernisation (2022).
54 Data as a resource, Norwegian Ministry of Local Government and Modernisation (2022).
55 European Commission (2018).
56 Nordic Innovation (2021).
57 Companies whose primary focus is the creation and delivery of products, services and technologies related to digital data.
58 European Data Market Monitoring Tool, IDC 2023. For classifications A, C, D, E, G, H, J, K, M, P and Q.

these figures also show that Norway is still far behind countries with the highest shares like the United Kingdom (17.8%) and Estonia (13.3%).

The revenues of data-related products and services of commercial data suppliers in Norway amounted to around 3 billion Euros in 2023, accounting for 0.78% of their turnover; the revenue is possibly increasing to around 3.5 billion Euros in 2025 and 5.1 billion Euros in 2030.[59]

In order to better understand the relationship between industry sector and the degree of commercial data suppliers, it is helpful to look at the distribution of data suppliers in the EU by industry sector in the figure below.

Figure 12: Distribution of commercial data suppliers by industry segment- EU wide 2023



Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

Three groups of sectors can be distinguished; first the dominating ICT and Professional Services[60] sectors with 48% and 39% respectively, then the second group follows at some distance with shares between 3 and 5% (Retail & Wholesale, Finance and Health) and thereafter the more traditional sectors like Agriculture, Mining, Construction, Transport, Utilities, Education with shares between 0.03 and 0.3%, which is a factor 10 to 100 lower than the second group.

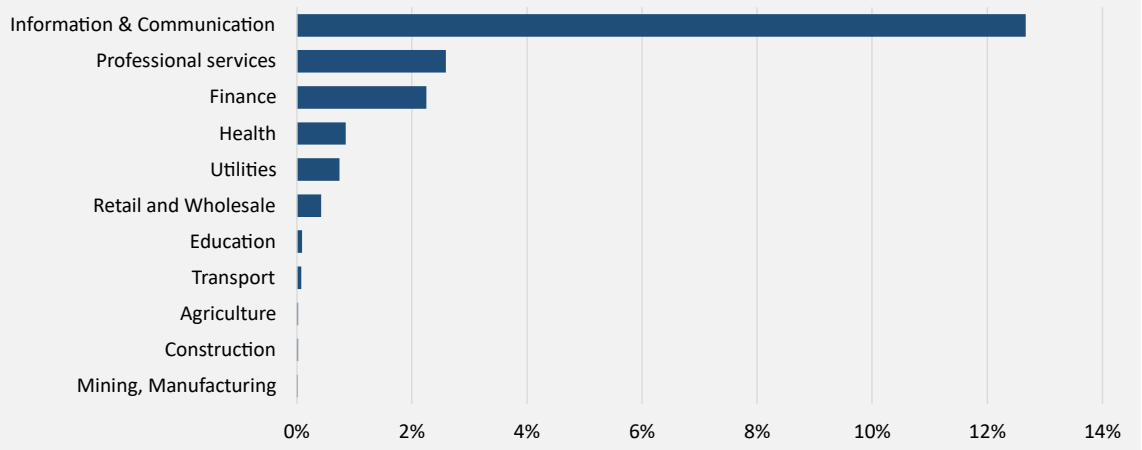
While these figures show the existing correlation between sectoral affiliation and the percentage of enterprises in the sector acting as data suppliers, the relative share of companies in these sectors in the economy as a whole also plays a role. As can be

59 OECD (2024).
60 Described as 'consulting, legal and tax, advertising, engineering, staffing services, software and IT services, real estate, etc.'. See European Data Market Study 2021–2023, D1 Inception report of 22nd of April 2021.

seen below in Figure 13, the ICT sector has by far the highest percentage of companies acting as data suppliers (12.7%). For the other sectors, this is significantly lower.

Assuming that Norwegian companies operating in the ICT, Professional services, Finance and Health sectors also share data to the same degree as companies in Europe, these sectors are also likely to account for the majority of data providers in Norway. This is very likely due to the data-intensive character of these sectors. However, there is no data available to validate this assumption.

Figure 13: Data suppliers as % of total companies per segment – EU wide 2023



Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

4.3.3 Data users

Data users can be defined as organisations that actively create, use, collect and analyse digital data in order to use insights to enhance their business operations.[61] There are many reasons for using data. A 2018 study noted increasing innovation, understanding customers better, optimising operations and increasing productivity, improving quality, increasing safety, better managing risk and reducing emissions as potential reasons.[62] The 2023 EU Market study added continuous monitoring and tracking in real time and predicting future outcomes with little or imperfect information to this list.[63] All of these aspects can increase a company's competitiveness and growth.

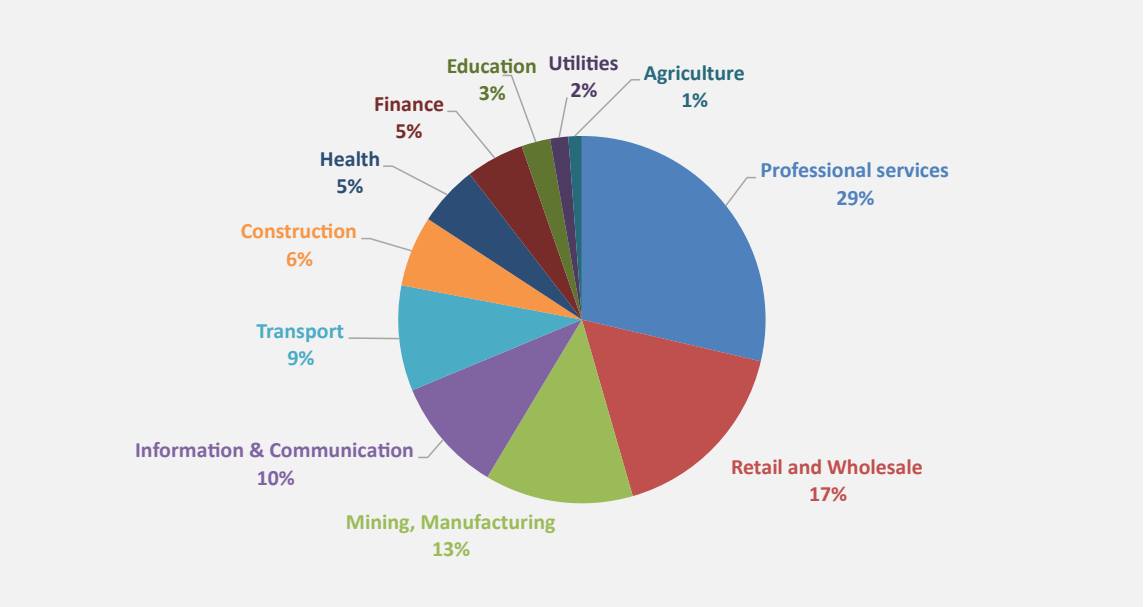
The data from the European Data Market Monitoring Tool from 2023 shows that in 2023 there were around 7,300 data users in Norway, which corresponds to 2.4% of all companies.[64] This is only slightly higher than the EU average of 2.3%. Norway's share is expected to increase slightly to 2.6% in 2030. The two countries with the highest

61 See European Commission (2024a).
62 European Commission (2018); Norwegian Ministry of Local Government and Modernisation (2022); Investigation of the data economy in public sector on behalf of the Ministry of Local Government and Regional Development, Agenda Kaupang, 2022.
63 European Commission (2024a) [Several reports including facts and figures, policy, use cases].
64 European Data Market Monitoring Tool, IDC 2023.

shares, the United Kingdom and Luxembourg, have reached shares of 7.5% and 5.5% respectively, showing the potential for Norway.

The figure below shows that data users in the EU are more diversified in terms of segments than data providers, with the two largest sectors accounting for only 46% of the total share of data users, less than the total share of the ICT sector alone for data suppliers.

Figure 14: Distribution of data users by industry segment – EU wide 2023

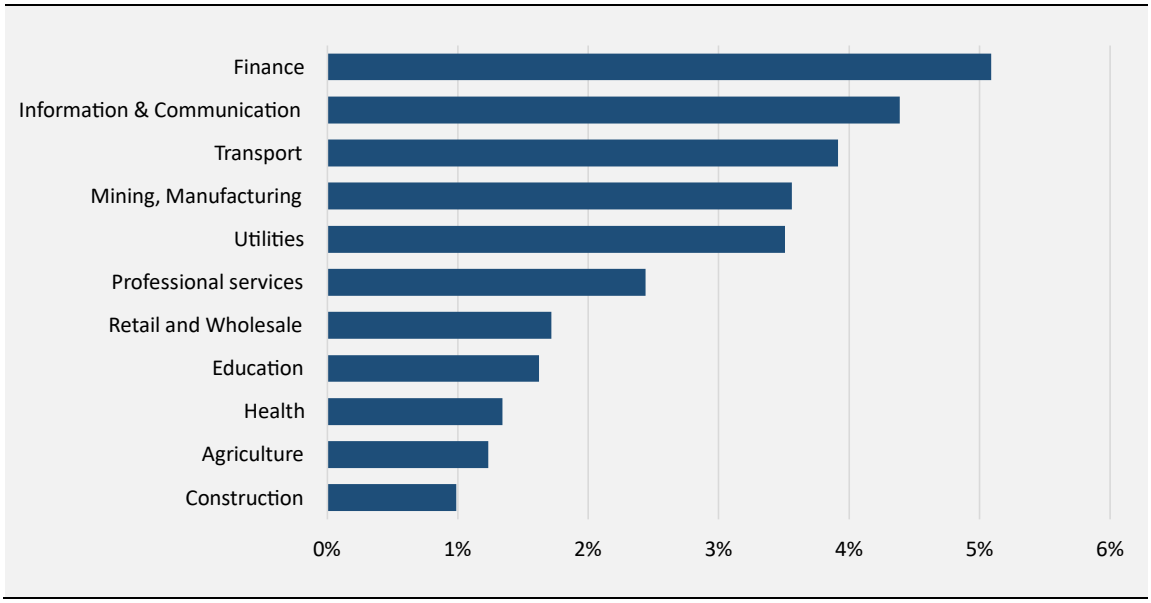


Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

Furthermore, accounting for a high share of data suppliers (as shown in Figure 13) does not necessarily lead to having a high share of data users (as shown in Figure 14). For example, Professional services accounts for the highest share of data users (29%), but in terms of data supplier it comes second after ICT with 39%. More clearly is the much lower share of the ICT segment, which was the main contributor in terms of data supply (48%) but accounts for only 10% of data users. Professional services and ICT are the two segments in which an EU company is more likely to be a data supplier than a data user; the opposite is true for the other segments. In particular, Mining and Manufacturing (20 times less), Agriculture (52 times less), Transport (51 times less) and Construction (47 times less) are much more active as data users than as data suppliers, mainly due to their low share of data suppliers.

A possible reason could be that companies in these sectors have less incentives to share the data while they are exploiting the value from this data themselves. It should also be noted that these shares focus on companies that use data intensively, and in some sectors, the number of companies that use data marginally may be proportionately higher, for example in Finance and ICT sectors as shown in Figure 15 below.

Figure 15: Data users as % of total companies per industry segment- EU wide 2023



Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

4.3.4 Data intermediaries

Data intermediaries are facilitating actors mediating between data suppliers and data users. In most cases, they provide additional services for a fee either enhancing the data access or usage via data platforms or data spaces and/or enhance the data itself.

The Norwegian market for data intermediaries appears to be relatively fragmented. This seems to be due to the different nature of the intermediary services, but also to the different additional services offered, such as cloud solutions, IT consulting and data analysis. From the interviews it appears that there is no dominant intermediary overall, but the situation varies from sector to sector.

We have categorised the intermediaries in Norway, considering the possible types of services as described above:

- Operators of open data portals & catalogues
- Operators of data spaces
- Operators of data marketplaces

<u>Operators of open data portals</u>

Open data portals are public websites set up by public administration entities that publish data catalogues to support the discovery of public information to facilitate reuse and distribution. In Norway, there are several of these portals, due to Norway's approach of making as much public data available as possible for the greater good of supporting the economy and increasing innovation.

An important portal is 'data.norge.no'[65], which serves as a catalogue for all accessible government data. Examples of listed information are described in chapter 4.3.2. Other examples are websites from the Norwegian Offshore Directorate displaying public data about petroleum activities and related marine information[66], or the Norwegian Coastal Administration making its global ship tracking data on vessels available.[67]

These portals have the function of 'match maker' between data supply and demand, i.e. the transaction service type. However, there is not much information on whether conflict resolution and monitoring of transactions to increase trust in these open data portals has been done in Norway. The technical service of standardising the information in certain data formats and the process are not covered; each data supplier can deliver the data in a different format (and delivery manner) to the data user.

A governance aspect is the earlier mentioned standard license for open government data (NLOD) as it creates a clear legal basis for the data owner explaining its key rights and obligations under the Norwegian law. This should be checked and if needed synchronised with the legal basis in the Data Act for the data holder.[68]

An interviewee noted that researchers struggle with the regulatory uncertainty related to public data as there are restrictions from old sector specific legislation on how to use the data. This restricts the innovative use of available data by creating an atmosphere where researchers are (too) careful not to violate any law.

Operators of data spaces

The EU Commission is funding data space initiatives which address the needs of a particular sector such as agriculture or health and making these available across Europe, hence the name common EU Data Spaces. One example is the European Health Data Space.[69]

In addition to the general EU Data Spaces, there are industry specific data spaces in Norway such as for the Oil & Gas industry and Maritime sector. A 2021 white paper by the Norwegian Ministry of local government and Modernisation gave additional insights via expert groups in existing data spaces in different industries:[70]

- **Diskos National Data Repository**; a national database containing information for the oil and gas industry containing seismic, well and production data. It was established in 1995 by the Norwegian Petroleum Directorate and oil companies operating in Norway. 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-

65 https://data.norge.no/
66 https://www.sodir.no/en/about-us/open-data/
67 https://www.barentswatch.no/en/articles/open-data-via-barentswatch/
68 See Norwegian Licence for Open Government Data (NLOD) 2.0 (norge.no)
69 https://health.ec.europa.eu/ehealth-digital-health-and-care/european-health-data-space_en For other EU data spaces, see Common European Data Spaces | Shaping Europe's digital future (europa.eu)
70 Norwegian Ministry of Local Government and Modernisation (2022).

confidential data. The Diskos platform also allows companies to exchange or trade data.

- **OMNIA Platform** belonging to oil & gas company Equinor and containing well data.
- **Maritime Data Space** being a 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.
- **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.
- **Landbrukets dataflyt** (Agricultural Data Flow) is a platform handling the operative coordination of measures under OPS Landbruk[71]. 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).
- **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.
- **Elhub** was established in 2019 by the Norwegian Water Resources and the Energy Directorate (NVE) in cooperation with Statnett and the energy industry. Elhub is a central system for receiving, processing and distributing metering values in Norway.
- **DIGIN**, a public-private sector development for digitalising the energy industry established by Energy Norway and the industry. DIGIN will form a basis for more efficient data exchange.
- **Miljøstatus, Mareano and Artskart** are data sharing platforms for large amounts of environmental data managed by the Norwegian Environment Agency. They mainly offer aggregated information, and the datasets are partly accessible via open APIs and with licences that permit reuse.
- **InSAR Norway** provides the world's most advanced nationwide mapping service for monitoring subsidence with unique free 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 service is provided to the construction industry, insurance companies and municipalities.
- **Kunnskapsbanken** (Knowledge Bank), a technical solution, launched in 2020 by the Directorate for Civil Protection and Emergency Planning (DSB), that makes information and datasets on risk and vulnerability easily available.

In addition, **Finans Norge**, functions as the data intermediary of the Norwegian finance sector operating a platform for the exchange of financial data between banks and other

71 See Mountain and Inland Strategy - regjeringen.no. This is a comprehensive government strategy to develop and optimise the agriculture value chain in Norway (e.g. the food, drink and timber industry).

financial service providers. This seems to cover both the transaction service and the governance service type due to the sensitive nature of financial data.

Our analysis shows that data sharing in Norway is more advanced in certain sectors than in others (oil & gas, energy, finance). This most likely depends on the level of maturity of a sector within the data economy, the available financial means, the commercial potential of sharing and selling and whether this exceeds the commercial potential of keeping the data exclusive. The number of service types offered differ as well between data spaces; from standardising the format, to giving secure access (governance) and even monitoring the quality of the data and or offering a trading platform. The Diskos National Data Repository seems to be a good example of a data space covering almost all service types.

Operators of data marketplaces

In Norway, international cloud providers like Microsoft, Google and AWS offer their (international) data exchange platforms in combination with their cloud and data analytics services. AWS Data Exchange offers data users a platform to support data hosting, entitlements and delivery of data files, data APIs and third-party data sets[72]. Google recently announced the general availability of Analytics Hub, which is a managed service enabling organizations to securely exchange data and use analytics tools.[73] Microsoft offers its Azure Marketplace, which is focused on the facilitation of the exchange and selling of applications, but these can include data as well.

In addition, there are long-standing examples in Norway of industry specific marketplaces where data can be exchanged for a fee, but also traded for free:

- **Data Factory** by Digital Norway[74] functions as a platform to enable the secure and efficient exchange of data between companies with the aim to stimulate innovation and value creation. These data factories were announced by the Norwegian Ministry of Local Government and Modernisation in 2021, but according to interviewees funding stopped recently. The intention was to create common platforms for public but also private entities, giving especially small and medium-sized companies and start-ups easier access to high-quality data, advanced analytics technology and to advisory services. [75]
- **Veracity data platform** by DNV's which covers the Maritime, Oil & Gas and Energy sector, among others, and currently has more than 50,000 vessels connected and 300,000 users. Norwegian company Equinor produces a huge amount of data coming from sources like sensors on drilling equipment and fibre-optic cables for information sharing. They use data types like drilling data, operational data, subsurface data or supplier data. Due to this, they can improve production processes, facilitate co-operation between the company and suppliers,

72 See https://aws.amazon.com/data-exchange/
73 See Analytics Hub data exchange is now generally available | Google Cloud Blog
74 Established in 2017 by the largest companies in Norway with public support to support the use of digital technologies among Norwegian companies, especially SMEs. See About Digital Norway - Digital Norway
75 Norwegian Ministry of Local Government and Modernisation (2022).

get information about potential needs for repair, increase the probability of finding oil and increase their productivity. [76]

- **Kognifai and Vessel Insights** from Kongsberg Digital; data platforms for the Maritime sector containing beside data also analytical tools that can be used by the customer.

Overall, interviewees noted that the market for data intermediaries in Norway is not concentrated yet and that there are many medium sized companies with different target groups. The role of data intermediaries is to enable the extraction of insights from existing data and/or additional data gathered via IoT and devices. Their role is further to translate the different formats of data input into a common format. This enables their customers to easily import different data sources into their own IT systems, for example to use their data analysis tools to optimise value chains and work more efficiently. Interviewed intermediaries focus on specific use cases of their customers and are therefore most of the time active in a specific market niche.

Another interviewee has a complete department focused on using public data, enriching it, putting it into a standardised format and reselling it on its own data space with catalogue. One regulatory aspect hindering them (and their customers in using all data) are sector-specific laws, which forbid the use of certain data for purposes other than those originally intended. This hinders innovative ways of re-using public data.

4.4 Relevant industry & service sectors in the Norwegian data economy

The commercialisation of data-by-data suppliers and intermediaries in Norway, either by selling datasets themselves or incorporated with data-driven services, is estimated by the 2023 EU Data Market Study to generate around 818 million Euro in 2025. To put this number in perspective, this is only 17% of the total estimated value of the overall data economy in Norway as shown before. The remaining monetary effect (83%) is a consequence of the indirect effect of sharing the data in the economy and due to additional spending of those employed in the data economy, so, there is a multiplier effect of more than 5 times. The value of data monetisation in Norway is expected to grow significantly (11.8% per year) to 1,426 million Euro by 2030.[77]

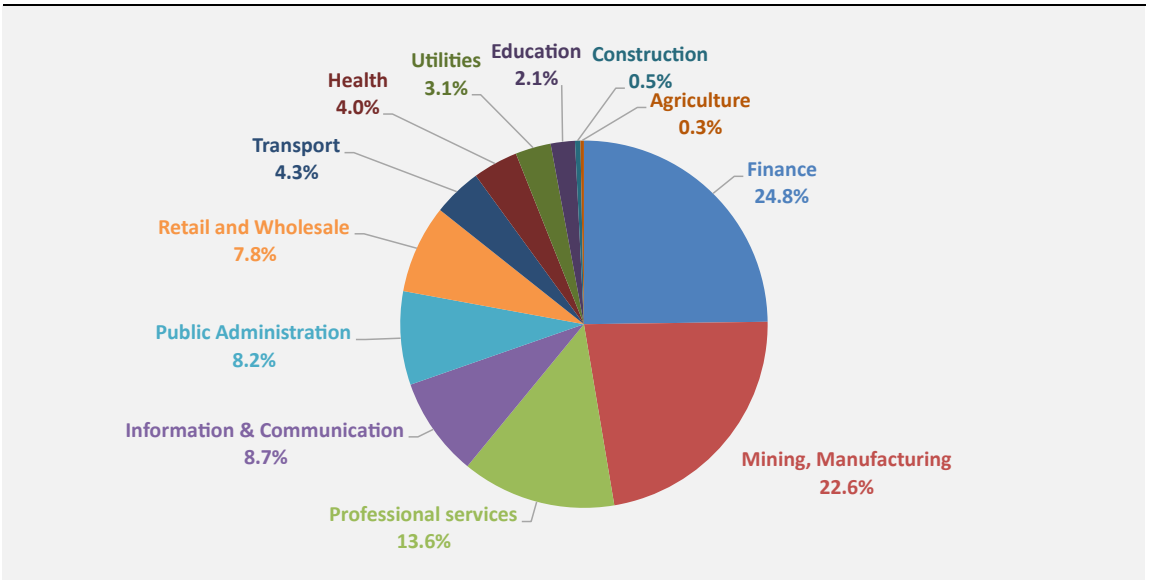
An important question is which industry segments contribute to the Norwegian data economy and which segments could contribute more with the right support. We have looked at several indicators: Norway-specific information on the segments in which companies using data technology are active in, as well as European data on the distribution of data monetisation and the overall data economy per industry, which can serve as an indicator of the potential in Norway.

76 See Veracity – a secure platform for efficient industry collaboration (dnv.com)
77 Based on data from the European Data Market Monitoring Tool, IDC 2023.

4.4.1 Share of EU data monetisation and data economy per sector

Two important indicators for the Norwegian data economy are the data monetisation and overall data economy at EU level and which segments contribute to these. This information can be used to **prioritise** where to support and drive **commercial** data sharing in Norway. As can be seen in Figure 16, the segments Finance, Mining and Manufacturing and Professional services are the main sources of data monetisation, although Professional services make up considerably less than the other two. However, it should be noted that, according to IDC, the estimate of data monetisation is only preliminary, as this part of the data economy is still opaque, and the estimates are based on survey responses.

Figure 16: Share of data monetisation by industry - EU wide 2023



Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult.

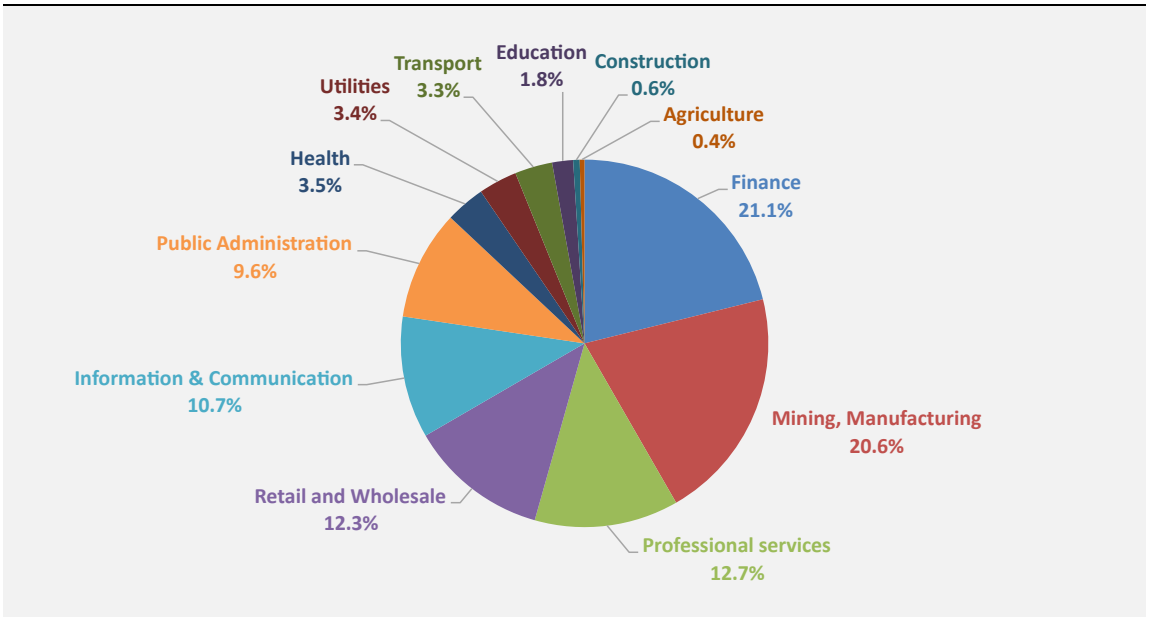
As data monetisation is only part of the overall picture of the data economy, it is important to look at the European data on the distribution of the data economy by sector.

As can be seen in Figure 17, at EU level, the data economy is heavily fuelled by the **Finance, Mining and Manufacturing, Professional services, Retail and Wholesale, ICT and the Public administration** sectors (together 88%).

It is noteworthy that the proportion of shares attributed to the data monetisation segment is largely consistent with its share of the data economy as a whole. Therefore, it can be concluded that the segments in which a significant volume of data is sold are also those in which data is exchanged extensively as a product or service. Furthermore, these segments contribute to the indirect effects in a similar manner. IDC provides an explanation for this phenomenon, noting that industries operating within the data market have established structures for the collection and utilisation of data, thereby reducing the necessity for additional steps such as data sale. This observation may be

interpreted as an argument in favour of providing support to commercial entities seeking to monetise data within segments that are not yet fully developed but demonstrate potential for value creation, given that the associated burdens are likely to be greater.

Figure 17: Distribution of data economy value by industry EU wide 2023

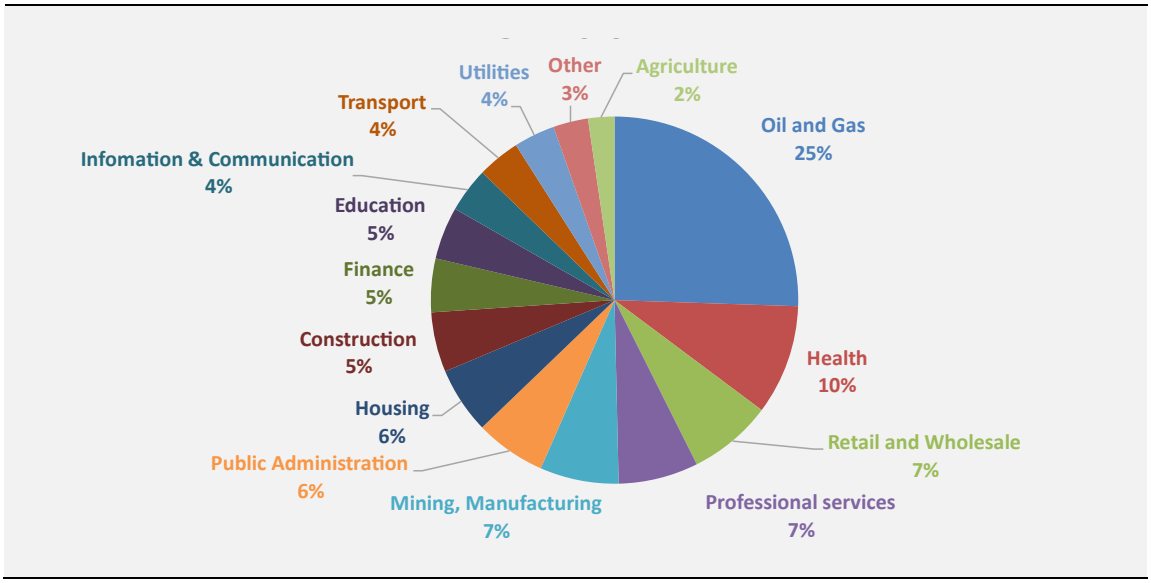


Source: European Data Market Monitoring Tool, IDC 2023, representation by WIK Consult. Calculated as: absolute value data economy divided by total value data economy in Norway.

4.4.2 Current GDP contribution to the general Norwegian economy per sector

An additional perspective on the potential of the data economy in Norway is to examine the country's current economic importance, specifically its contribution to GDP and any notable differences from the European average. In Norway, in addition to the oil and gas industry, the health, retail and wholesale, professional services, and mining and manufacturing sectors contribute significantly to GDP. In general, a diverse range of sectors play a substantial role in Norway's GDP.

Figure 18: GDP distribution over segments in Norway, 2023



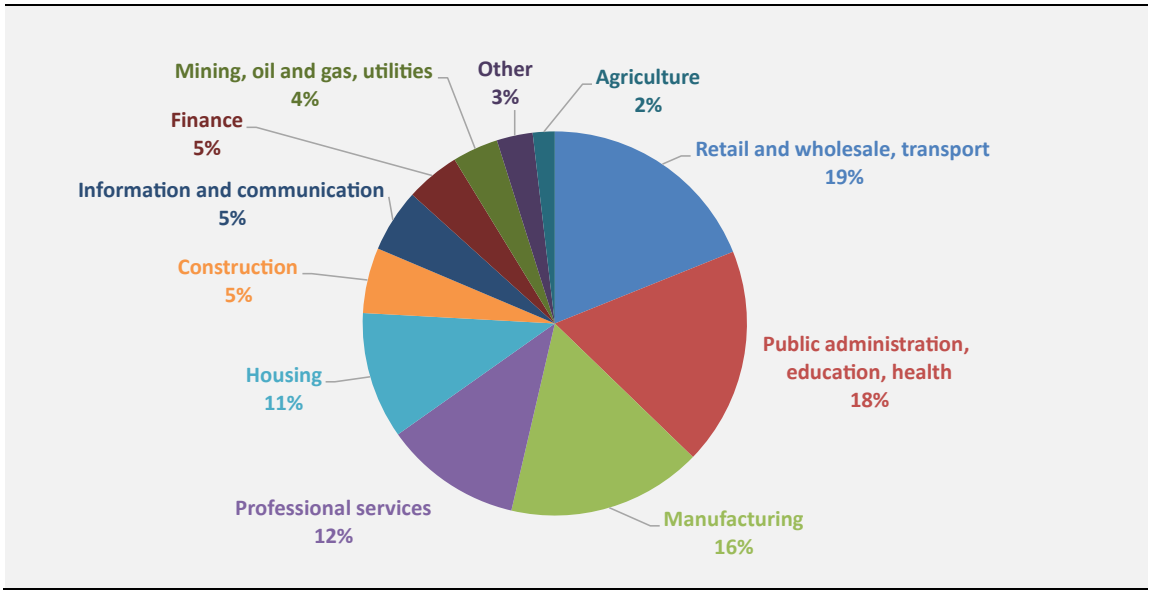
Source: aggregated data from Statistics Norway by WIK Consult – 2024. Segments are based on statistical classification of economic activities in the European Community (NACE).

Comparing Norwegian GDP figures per industry segment with available EU figures shows that the most obvious difference is the higher importance of Oil and Gas in Norway (25% versus 4%). However, this distorts the picture for the other sectors in Norway as their relative share becomes lower compared to the EU shares. Therefore, for the comparison of the other segments, we assumed that the Norwegian Oil & Gas sector would be at an average EU level (5%).[78] This would imply that the relative shares of all other sectors increase by 25%, as illustrated in Table 2.[79]

78 The mining and utilities segments are also included in the Oil & Gas EU figures, which would lower the EU GDP contribution even more and would require even more increasing the weight of other sectors in Norway. However, the figures for the Norwegian Mining sector are combined with Manufacturing, which would require further assumptions. The applied increase of relative share can therefore be considered as a conservative estimation.

79 Reducing the relative share of the oil & gas segment from 25% to 5% implies that the overall GDP is also reduced by 20%. As other segments' objective value remains the same, their relative share increases from for example (10/100=10%) to (10/80= 12,5%), so an increase of ((12,5-10)/10) =25%.

Figure 19: GDP distribution over segments in Europe, 2023



Source: Eurostat, representation by WIK Consult.

Table 2: Estimated contribution to Norwegian GDP with average Oil & Gas sector

Industry segment	Contribution to EU data economy (%)	GDP contribution at EU level (%)-b	Normalised GDP contribution in Norway (%, +25%)-a	Difference in % points (a-b)
Retail, Wholesale and Transport	12	19	13.7	-5.3
Public Adm., Education and Health	15	18	26.2	+8.2
Manufacturing	21 (incl. Mining)	16	8.5*	-7.5
Professional Services	13	12	8.75	-3.25
Housing	n.a.	11	7.5	-3.5
Construction	1	5	6.25	+1.25
Finance	21	5	6.25	+1.25
ICT	11	5	5	-

*Segment includes Mining for Norway (0.2%), so Manufacturing is 6.8% with the 25% uplift becomes 8.5%. For some sectors EU data is only available at aggregated level, hence Norwegian GDP data was aggregated for comparison as well.

After normalising the size of the Oil and Gas sector to the EU average, it becomes evident that, in Norway, the following segments exceed the European average in terms of relative GDP contribution: 'Public administration, education and health' and 'finance'. It is therefore recommended that, in addition to the Oil & Gas segment, these other segments should be the focus of attention with regard to the potential for the data economy to provide further support, if this has not already been addressed.

Furthermore, there are sectors that are underrepresented in Norway in terms of GDP contribution yet are of significance for the data economy at the EU level, namely manufacturing, professional services and retail, wholesale and transport. It would be reasonable to evaluate whether data sharing could be employed to provide support in this regard. However, a comparison of the percentage contribution of the various sectors to GDP between Norway and the EU does not differentiate between a sector

that is underdeveloped and those that are well developed. Consequently, further analysis should be conducted, considering the current state of the sectors and the potential for data utilisation.

4.4.3 Usage of data technologies by key companies per sector in Norway

A last indicator of sector relevance for the Norwegian data economy is generated by looking at venture capital platforms such as Dealroom[80]. They indicate in which markets key companies, active in data technologies, operate and therefore could provide an indication into which sector is most promising for using data technologies.

The EU Data landscape report of 2023[81] used the (European) Dealroom database as well to see in which industry segments the key data companies with more than 100 million € revenue in 2023 were active across Europe. These industry segments might be subsegments of previously mentioned sectors (e.g. ERP is part of the ICT segment and Marketing of Professional Services). The following table shows the results of the study.

Table 3: Industry segment focus of key data companies in Europe

Industry (market)	Number of data companies	Percent of companies
Enterprise Software	1417	34.6%
Health	555	13.6%
Marketing	540	13.2%
Fintech	403	9.9%
Transportation	240	5.9%
Energy	233	5.7%
Media	220	5.4%
Security	172	4.2%
Food	155	3.8%
Education	150	3.7%
Real Estate	141	3.4%
Jobs Recruitment	120	2.9%
Robotics	106	2.6%
Telecom	92	2.2%
Travel	79	1.9%

Source: EU Data Market Study 2021-2023, Table 1.

Mimicking a similar approach specifically for Norway, using the online Dealroom database and selecting relevant technologies for the data economy as filters (e.g. AI, big data, IoT, machine learning, sensor tech, 3D, blockchain, VR/AR, connected devices) and narrowing down the results to companies headquartered in Norway and of significant size, an overview of key companies for Norway was created (see Annex 5). The number of these companies in the different segments is thereafter used as

80 https://norway.dealroom.co/
81 European Commission (2023), European Data Market Study 2021-2023, Deliverable 4.3 – EU Data Landscape, SMART 2016/0063, December 2023. Paragraph 2.3.

indicator which segments play a relevant role in the data economy: Energy (25), Health (23), Enterprise software (22), Robotics (19), Transportation (17), Semiconductors (14) and Fintech (12) stand out.[82]

A comparison of the EU ranking with the Norwegian ranking reveals that the Energy sector occupies the top position in Norway, while Robotics also demonstrates a high level of performance, indicating that Norway is a leading nation in this field. The remaining sectors appear to exhibit a comparable ranking, with only Fintech exhibiting a somewhat lower ranking in Norway relative to the EU.

4.4.4 Overall assessment of sector relevance

There is only European information available on the sector-specific contribution to the monetisation of data and data economy; hence we will use this data to draw conclusions for potential sectors of interest of Norway. For the EU, as mentioned before, the data economy is heavily fuelled by the Finance, Mining and Manufacturing, Professional services, Retail and Wholesale, ICT and the Public administration sectors (together 88%).

A review of the available indicators for Norway, including GDP contribution, the focus of venture capital flows in data technologies and input from interviews, suggests that different sectors are of importance. It can be reasonably deduced that the sectors of oil and gas and energy in general, health and finance warrant further investigation. Furthermore, two subsegments merit particular attention, as they exhibited greater significance than the remainder of the segment: enterprise software and robotics in ICT.

As pointed out earlier, there are also sectors that appear to be underrepresented in Norway's GDP compared to the EU: Manufacturing, Professional services and Retail, Wholesale and Transport. This may also be related to a different industry focus, development phase and a strong position of the remaining sectors. However, if this is not the case, the question then becomes how data sharing can be used to support these sectors.

The following sector information has been derived from the interviews and provides additional insight into the significant sectors in Norway and their role in the data economy.

Energy sector including Oil & Gas

An interviewed data analytics company in Norway noted that the Oil sector was early in utilizing and sharing data. They started since 2017. Use cases concern value chain optimization and especially the shipping / logistic component, but also the production of sustainability reports based on data analytics and the use of robotics in hazardous environments such as oil refining.

82 See Dealroom.co.

Public sector

Despite the availability of large amount of high-quality public data, interviewees noted that data sharing is more complex than originally anticipated. In addition, there is concern on the detailed insights which can be derived from this data, which feeds into the debate about how much data should be made publicly available and is sometimes used by organisations as a reason not to share their public data.

Interviewees also noted that there is more cooperation required between the public sector and private entities to find out which data should be shared (and maintained). Another aspect is that public sector companies are building their own architecture and data infrastructure, which results in high costs for Norway.

Finance sector

Interviewees noted that access to data is highly relevant for the Banking and Finance sector to optimise the whole value chain. The Finance sector has been active for a long time in data utilization but is now starting to share its data as well. Data analytics in this sector can significantly improve customer insight, engagement and experience, improve Relevant technologies for the data economy in Norway

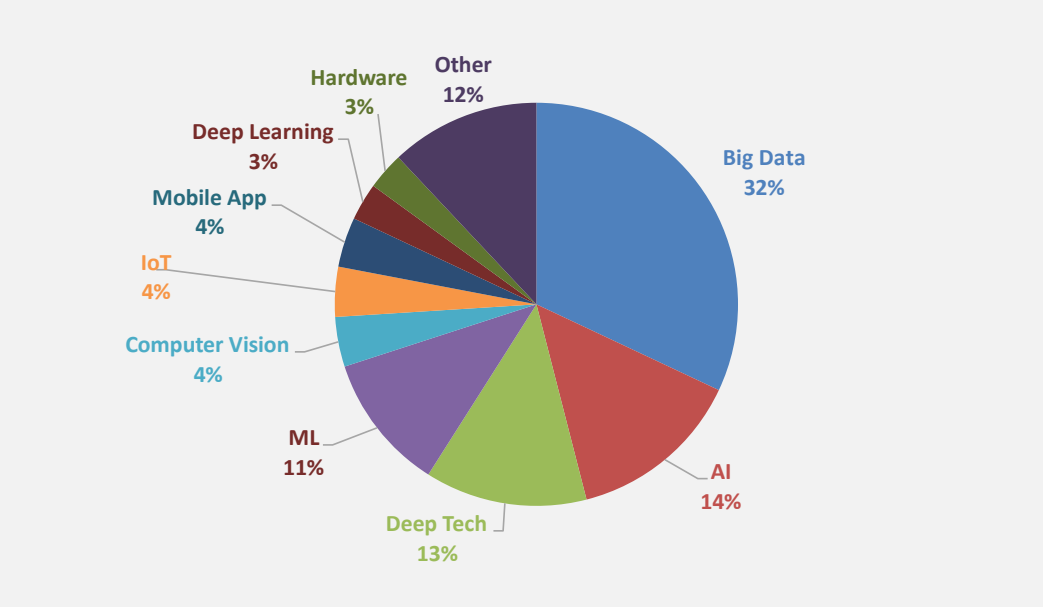
In the following sections, we look at the technologies used by start-ups and scale-ups in the European data economy, thereafter at the role of AI and the investments made in Europe and in the different Nordic countries and lastly, we highlight the role of IoT devices and Norway's high ranking therein.

4.4.5 Used technologies

According to an EU-wide analysis of start-ups and scale-ups in the data economy in 2023, the following relevant technologies have been observed in the start-ups and scale-ups of data companies across Europe.[83]

83 European Commission (2023), European Data Market Study 2021-2023, Deliverable 4.3 – EU Data Landscape, SMART 2016/0063, December 2023.

Figure 20: Observed data technologies in European start-ups and scale-ups- 2023



Source: EU Data Market Study 2021-2023, based on Dealroom database.

Big Data refers to the mass of digital data produced by companies and individuals whose characteristics (large volume, different forms, speed of processing) require increasingly sophisticated computer storage and analysis tools.

Deep Tech '.does not refer to the innovation itself, but to a category of startup companies that develop new products based on scientific discovery or meaningful engineering innovation...'[84] Applied technologies such as biotechnology, robotics, advanced materials, space technology and quantum computing fit into this category.

Machine Learning (ML) is a subfield of **AI** in which algorithms learn from data and generalise this to unseen data and thus can perform tasks without explicit instruction.

Deep Learning is a subset of ML based on neural networks inspired by biological neuroscience, where "deep" refers to the use of multiple layers of neurons (ranging from three to several hundred or thousands).

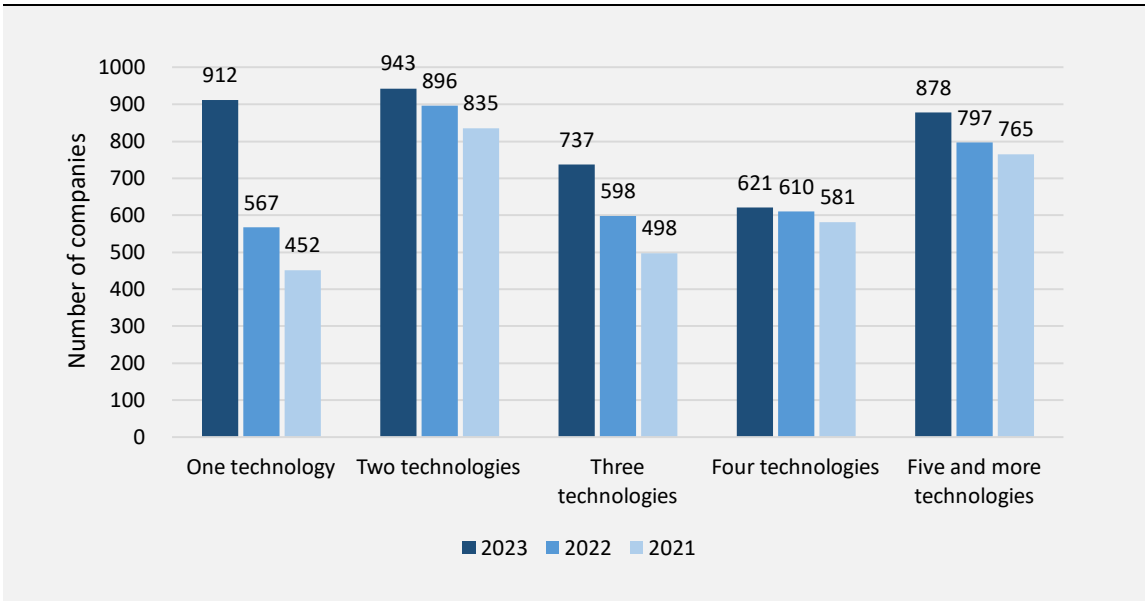
Computer Vision is a technology further enabled by AI that analyses digital images of the real world to produce numerical or symbolic information, e.g. in the form of decisions.[85]

Internet of Things (IoT) describes the entire system of connected devices and sensors that exchange data over the internet or other communication networks. IoT plays an important part in the ever-growing amount of available data that can be analysed, traditionally in the production process or logistics, but also increasingly in other segments such as maritime.

84 See Deep tech - Wikipedia
85 See Machine learning - Wikipedia and Computer vision - Wikipedia and Deep learning - Wikipedia

Furthermore, the EU Data landscape report observed that the majority of companies in the data economy use two or more technologies, as shown below.

Figure 21: Number of data technologies used by EU start- and scale-ups-2023



Source: EU Data Market study 2021-2023, based on Dealroom database.

Related to Figure 21, the same report also indicates that, on average, (data) companies included in the EU database use **3.4 different data technologies**. This is also confirmed by the interviews; multiple stakeholders in Norway stated that it is a mix of all technologies (AI, robotics, data analytics), but everyone has a different focus depending on the solution they provide.

4.4.6 The role of AI in Europe and in Norway

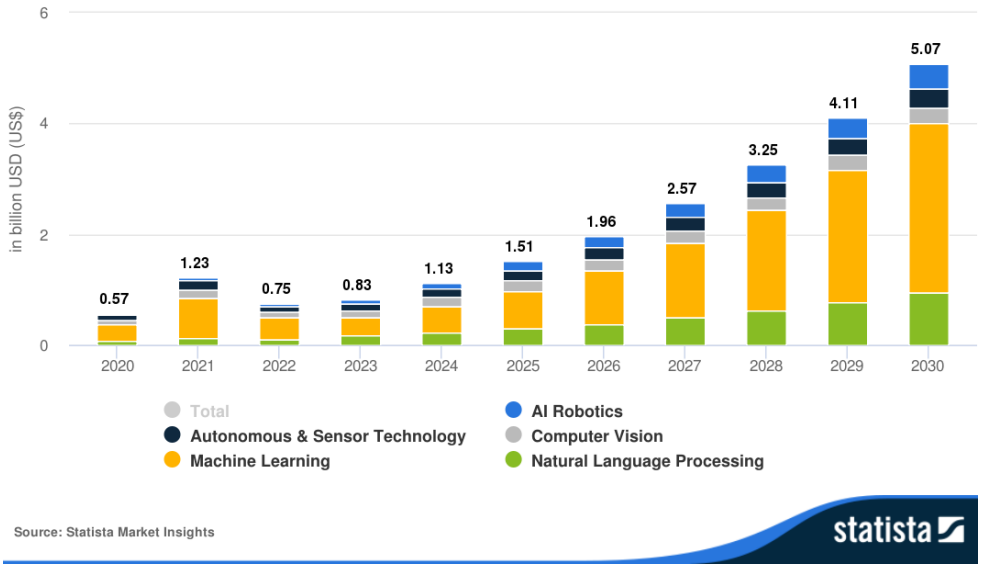
Interviewees remarked that the use of AI has driven the increased awareness of the importance of data within companies (which was lacking in previous years) and of data sharing in general. Furthermore, AI enables many other data technologies, such as Machine and Deep Learning and Computer Vision, so any further discussion of investment in AI will include all of these areas.

Since 2021, the number of key data companies in Europe using AI increased annually by 19% (from 39 companies in 2021 to 55 in 2023). Similarly, the key companies using machine learning algorithms grew annually by 18.6% (from 32 companies in 2021 to 45 in 2023). When it comes to deep tech the annual growth is much smaller – only 2.35%, reaching just 44 key companies in 2023 compared to 42 in 2021.[86]

86 EU data landscape report (2023).

According to Statista, the market for AI in Norway is expected to develop especially in the areas of ML and to a lesser extent in Natural Language processing and AI Robotics. See Figure 22.

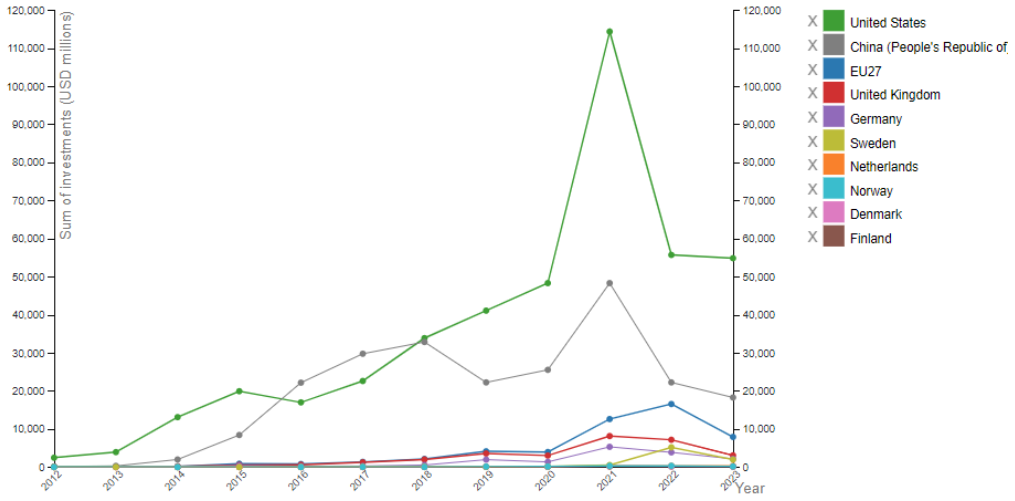
Figure 22: Artificial Intelligence – Market size in Norway (billion USD) 2020-2030



Source: Statista Market Insights. Most recent update: Mar 2024. Artificial Intelligence - Norway. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/artificial-intelligence/norway?currency=USD&locale=en

The usage of AI goes hand in hand with related investments. Figure 23 shows the worldwide venture capital investments in respect to AI technology.

Figure 23: Venture Capital investment in AI by country 2012-2023



Source: OECD.AI (2024), visualisations powered by JSI using data from Preqin, www.oecd.ai

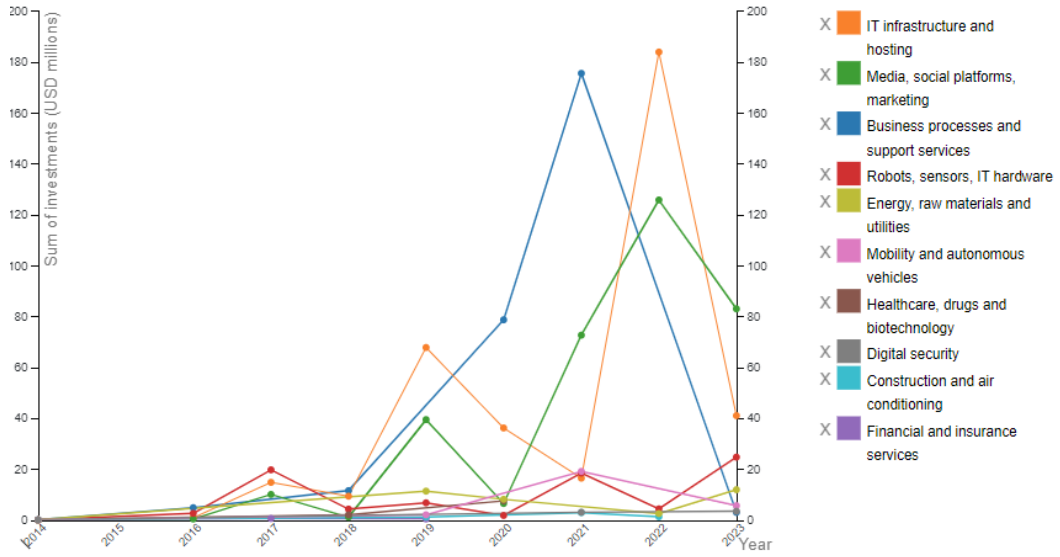
Overall, there is a strong increase in investment in most countries until 2021, and then a decrease or stabilisation of investment. Globally, the US and China have the highest levels of venture capital investment in AI in their markets. Investments in the EU are around 50% of those in China and around 15% of those in the US.

Zooming in on Europe, the following groups can be categorised according to the level of investment in AI:

- UK (around 3 billion USD yearly).
- Germany, France, Sweden (around 2 billion USD yearly each).
- Spain and the Netherlands (between 300-400 million USD yearly each).
- Norway, Ireland and Denmark (around 200 million USD yearly each); and
- Remaining countries like Finland, Austria, Belgium (around 100 million USD yearly each).

Figure 24 zooms further in on Norway's AI investments by market segment and shows striking fluctuations in the three segments that have seen the most investment since 2018: IT infrastructure, Business processes and support services and Media, social platforms & marketing. A steadier investment is observed for Robots, sensors, IT hardware, Energy, raw material and utilities and Mobility and autonomous vehicles.

Figure 24: Venture Capital investment in AI in Norway 2014-2023



Source: OECD.AI (2024), visualisations powered by JSI using data from Preqin, www.oecd.ai

In addition, OECD data from 2023 shows that the following data start-ups in Norway have received the highest amount of venture capital towards AI.[87]

87 See Live data from OECD.AI - OECD.AI and https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data&selectedVisualization=top-data-start-ups-per-country-and-industry

Table 4: Top AI start-ups per segment in Norway

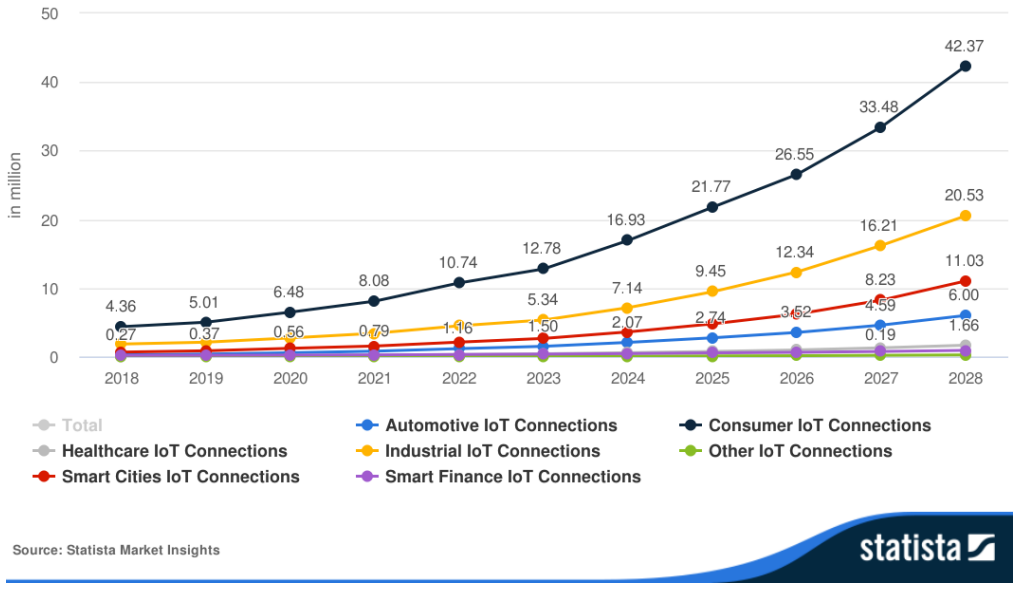
Company	#deals	Total raised (mln USD)	Country
1X Technologies AS	4	40	Norway / Robots, sensors, IT hardware
eSmart Systems AS	4	98	Norway / IT infrastructure and hosting
Tibber AS	7	147	Norway / IT infrastructure and hosting
Ardoq AS	4	160	Norway / Media, social platforms, marketing
Cognite AS	2	225	Norway / Business processes and support services

Source: https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data&selectedVisualization=top-ai-start-ups-per-country-and-industry

4.4.7 The role of IoT

An important role in the application of AI in Norway could be the amount of data derived from connected devices in the IoT ecosystem. As shown in Figure 25, according to Statista's forecasting, the number of IoT connections in Norway is expected to increase by 300% in the next four years (from around 27 in 2024 to 82 million devices in 2028).

Figure 25: Number of IoT connections in Norway (millions) 2018-2028



Source: Statista Market Insights. Internet of Things - Norway. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/internet-of-things/norway?currency=USD&locale=en

The expectation of Statista is that Consumer IoT, followed by Industrial IoT, have the highest absolute numbers in the coming years. The highest growth is expected in Smart Cities IoT, with 550% over the next four years.

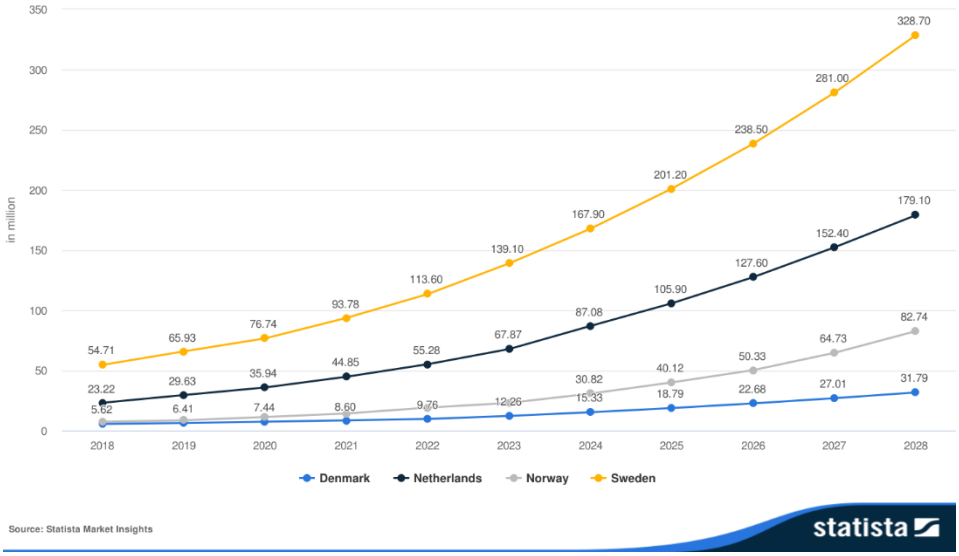
This is also confirmed by Nkom's annual report of 2023, which noted that there was an increase of 30% in active SIM cards from 2021 to 2022. With the rollout of 5G well

underway, this can probably increase the number of IoT devices even more in the coming years. [88] Also the Nordic-Baltic report indicates a strong growth of IoT devices in the last years leading to Norway having the highest number of IoT devices per capita in 2023 (0,74) versus 0,66 for Sweden, 9,4 for Denmark and 0,32 for Finland.[89]

According to Eurostat, more than 24% of consumers in Norway use IoT devices, which is the highest in Europe, directly followed by the Netherlands, Sweden and Denmark with slightly lower rates (23, 18 and 17%).[90] On the other hand, looking at IoT usage by businesses, Norway (20%) is well behind the Netherlands and Denmark with respectively 24% and 40%.[91]

Figure 26 shows the absolute number of IoT devices in the market and the predicted development until 2028, with Sweden and the Netherlands clearly leading the way, followed by Norway in third place.[92]

Figure 26: Number of IoT connections in Sweden, Denmark, Norway and the Netherlands (millions) 2018-2028



Source: Statista Market Insights. Internet of Things - Norway, Denmark, Sweden, Netherlands. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/internet-of-things/custom?currency=USD&locale=en&token=j4VNyo4Vi3SUZz37uRwfrlUbe1VeHpNHNjMtMx8GahT57VuVk8pe9LiJPw547AhyLW9q-DTiyepcM0-p0NClqaWXKw0L9_LkXaJubsjaP5wvJw9J6ewBZxw%3D

88 Nkom (2023), para 2.2.6.

89 https://statistik.pts.se/en/telecom-and-broadband/nordic-baltic-telecom-market/graphs/1-mobile-services/1-5-m2m-subscriptions/

90 Eurostat. (2024). Internet of Things - use. https://ec.europa.eu/eurostat/databrowser/view/isoc_iiot_use/default/bar?lang=en&category=degurb.degurb_isoc.du_isoc_i.du_isoc_iw

91 Statista 2021.

92 Statista 2024.

5 Analysis of the Norwegian data economy

After taking stock of the current state of the data economy in Norway, it was compared with the well-developed data economies of Denmark, Sweden and the Netherlands. Detailed economic scenarios for the development of the data economy were also examined, as well as existing national strategies for the data economy and forthcoming European regulations. These topics will be described in detail in the next paragraphs.

5.1 Benchmarking the Norwegian data economy

This section summarises the results of benchmarking the data economy in Norway to comparable countries in Scandinavia and Western Europe. Based on available indicators for the data economy, we have compared three countries with Norway, which have an advanced infrastructure and a well performing data economy in place.[93]

The details of the benchmarking review can be found in Annex 1

5.1.1 Selection of comparable countries

The countries selected for the benchmark are **Sweden**, **Denmark** and the **Netherlands**. The selection is based on a number of factors, including similarities with Norway and digital progressiveness. This makes it possible to compare different strategies implemented in similar environments and also to learn from others what might be essential for a successful data economy. The selected benchmark countries share similar characteristics with Norway, such as a focus on renewable energy, strong digital infrastructures and a supportive regulatory environment for the growth of the data economy. The fact that the benchmark countries are ranked 2nd-4th in the European DESI 2022 ranking, where Norway is ranked 5th, underlines the similarity with Norway, but also their digital progressiveness.

Sweden has a strong digital infrastructure, significant investment in data centres and a robust policy framework supporting digital innovation and the growth of the data economy. Like Norway, Sweden leverages renewable energy sources to power its data centres. In general, Sweden has a well-developed digital infrastructure and is a close competitor to Norway.

Denmark has high levels of digitalization, supported by substantial investments in digital infrastructure and data centres. Denmark's focus on data sharing and open data policies aligns with Norway's strategies to enhance data accessibility and innovation.

The Netherlands has a well-developed data economy with a strong emphasis on data-driven innovation, supported by very good digital infrastructure and significant investments in data centres. The country's policies promote data sharing and accessibility, aligning closely with Norway's objectives for the data economy. It is a non-

93 According to the annual Digital Economy and Society Index (DESI) reports from the European Commission

Nordic country with a high position in the EU data economy, which also provides a geographically broader picture.

5.1.2 Conclusion of benchmarking

Overall, all the countries analysed have well-developed data economies, built on a solid foundation of well-developed infrastructure and skills. However, some differences and specific challenges and advantages can be identified.

Sweden is doing well overall, looking at its high value of the data economy but also regarding its environment promoting innovation supported by much venture capital. It also scores well in terms of infrastructure and technologies such as cloud and IoT. However, it is a bit behind in terms of the use of AI and big data. But the high level of investment in this area could help to change this in the future. It provides a good basis for future developments.

In the Netherlands, the supply and use of data by businesses is not as widespread as in the other countries, and access to public data is not as sophisticated. However, Dutch companies that use data contribute a lot to GDP (probably due to the large financial sector), so overall the Netherlands is not lagging in this respect. It could, however, increase the spread of companies that supply and use data, thereby increasing the value of its data economy. The same could be said about the use of cloud computing since it is somewhat lower than in the other countries and could provide an increase to the value of the data economy (due to its higher-performant use of IT technologies). The use of data could also be boosted by making more public data available. The Netherlands has untapped potential that could be unleashed with the right policies.

Denmark shows the opposite picture to the Netherlands: The supply and use of data by enterprises is widespread, but its contribution to GDP is less pronounced, so that Denmark has the lowest contribution of the data economy to GDP. In many respects, Denmark is in the middle of the benchmark countries. However, it scores well in the use of AI. Overall, Denmark is doing well but could probably do even better in certain areas to realise its full potential.

Norway's data infrastructure shows widespread use of the cloud compared to the benchmark countries, but the data centre industry could be strengthened further. Norway could benefit from increasing the number of ICT specialists, increasing R&D and improving access to venture capital. This could increase Norway's innovation power, which could also boost the use of big data or AI, where the country is somewhat behind. As the direct effects of the data economy and data monetisation are the lowest in Norway, this implies that selling data as a commercial service is not as developed as in the other countries. However, Norway benefits strongly from the effects of the data market through induced effects, which means that a relatively high multiplication factor is associated with the data market. Overall, Norway is in a good position, but there is still considerable potential.

5.2 The evolution of the Norwegian data economy

This section summarises the review of possible economic scenarios for the data economy in Norway. The underlying details can be found in Annex 2.

The scenario-based approach is used to extrapolate the evolution of the Norwegian data economy under varying assumptions. To this end, we first identified established methodological approaches for estimating the value of data and the impact and value of the data economy in the related literature.[94]

Thereafter, the approach for the scenario analysis used in the European Data Market study by IDC[95] was reviewed and compared with the theoretical approaches identified to gain a better understanding of its merits and possible shortcomings. Thereafter, IDC assumptions in constructing their EU-wide model were reviewed. These assumptions were finetuned later, where possible, to Norway. This finetuning is done using a mixture of qualitative and quantitative methods in order to assess the likely direction of deviation of IDC's figures for Norway. This review will also highlight some threats and/or opportunities that Norway may face and explain the effects of certain contingencies.

Our assumptions (e.g. on trends, impacts, etc.) were cross-checked with data from our stakeholder interviews. This allowed us to validate the assumptions used, gather missing information and identify potentially relevant trends for scenario development and analysis that could not otherwise be captured.

5.2.1 Methodological approaches

The literature was screened for established methodologies to capture, for example, the impact and value of the data economy. Based on the desk research, we identify the following methodological approaches for estimating the value of data:[96]

- **Market-based** approaches using market prices of similar products on the market to estimate the value of data. However, as the value of data of the same volume and even of the same content can vary enormously depending, for example, on the context in which the data is used, a reliable price using the market price of other data is not feasible in most cases. Furthermore, many types of data are not sold on a market.
- **Cost-based** approaches take into account the cost of producing the information derived from the data in order to estimate the value of the data, assuming that everyone would only pay as much or even less than the benefits they expect to derive from it. The cost-based approach involves, among other things, assessing which professions spend what proportion of their working time collecting, storing, maintaining and analysing the data and what other costs are associated with these activities.

94 Mitchell et al. (2021); Goodridge et al. (2021); Calderón & Rassier (2022).
95 European Commission (2024a) [Several reports including facts and figures, policy, use cases.].
96 Mitchell et al. (2021); Goodridge et al. (2021); Calderón & Rassier (2022).

- **Income-based** approaches estimating upcoming cash flows based on the data usage. However, these are difficult estimates to make.

All three approaches therefore face challenges. The most commonly used approach today is the cost-based approach, as its challenges are the easiest to work with. IDC also has used this approach to estimate the data market, enriched with macroeconomic data, interview input and qualitative data. Since we can separate IDC's EEA data into Norway and the rest of the EEA countries with sufficient precision (based on GDP contribution), and since IDC uses an estimation methodology that has been refined over the years, which means that effort and expertise have been put into avoiding the pitfalls associated with the cost-based approach, we have chosen to use IDC's data as the basis for any quantitative statements, which have been subsequently enriched with Norway-specific inputs. This approach allows us to draw a comprehensive picture of several elements of the Norwegian data economy.

5.2.2 Scenario development and analysis

In creating the scenarios, IDC has selected the most relevant factors for the scenarios by assessing a) the level of impact on the development of the data market and b) the level of uncertainty over the next five years. The higher the impact and uncertainty, the more relevant these factors are for the future. In addition, IDC used workshops to discuss the various assumptions underlying the scenarios. These factors are grouped into macroeconomic factors, policy/regulatory conditions, data market dynamics and global megatrends affecting all technology markets. The details of the different assumptions for each factor are described and, where necessary, changed for Norway.

IDC defined the scenarios as follows:

- **Baseline scenario**, with the main assumptions based on the continuation of current growth trends and the evolution of current framework conditions.
- **High Growth scenario**, whereby the data market enters a faster growth trajectory thanks to more favourable framework conditions.
- **Challenge scenario**, whereby the data market grows more slowly than in the Baseline scenario because of less favourable framework conditions and a less positive macroeconomic context.

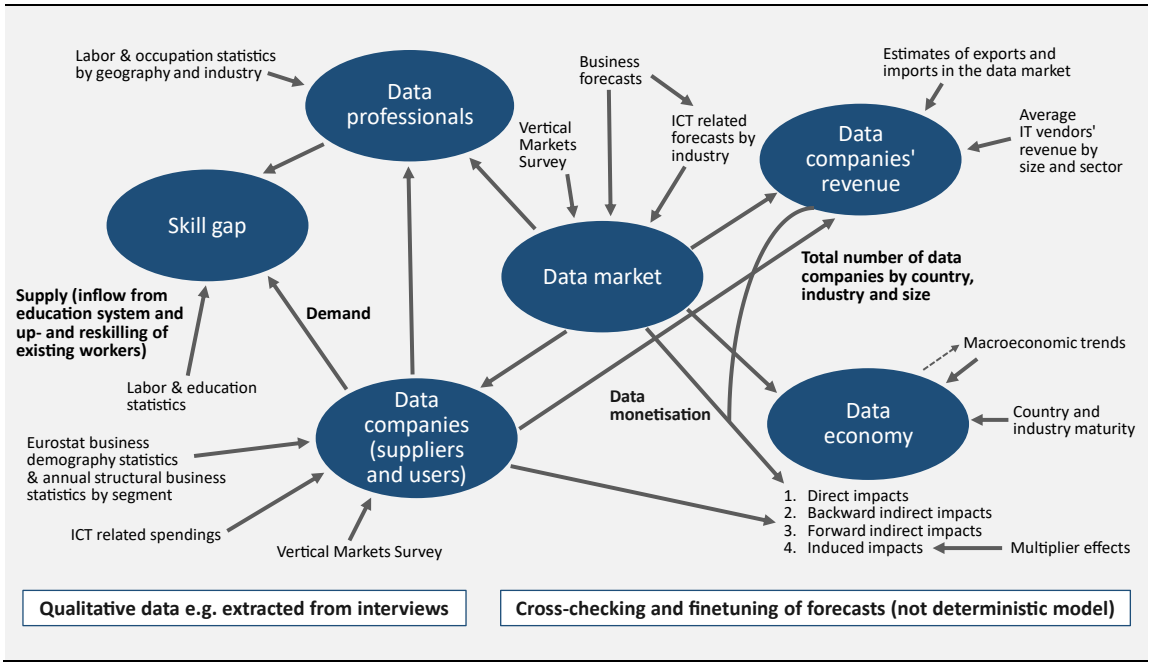
Table 5: IDC scenarios and main parameters in the 2023 EU Data Market Study

Scenario / Characteristic	Challenge scenario	Baseline scenario	High growth scenario
Data innovation	Low level	Healthy growth	High level
Concentration of power	A moderate level due to digital markets fragmentation	Moderate by data providers	Low data power concentration
Data governance model	Unclear	Protecting personal data rights	Open and transparent
Distribution of data innovation benefits in the society	Uneven	Uneven but rather wide	Wide

Based on 'Definition and analysis of the EU and worldwide data market trends and industrial needs for growth'.[97]

An overview of the general structure of IDC's model, on which the resulting data for the scenarios are based, and the relationship between the different indicators is shown in the figure below. A version of the main structure of this model is also used to assess IDC's figures in a directional way when adjusting the scenario assumptions for Norway. In doing so, the trickle-down effects of one variable, such as ICT expenditure, on other variables are also taken into account in the Norway-specific assessments. Overall, sufficient ICT spendings, higher value of data and data-related products sold, and widespread use of data appear to be main parameters.

Figure 27: Overview over IDC's model



Source: WIK Consult's representation based on the descriptions in IDC's Data Market reports.

97 Trusts Trusted Secure Data Sharing Space (2021).

5.2.3 Conclusion of scenario analysis

After review of the scenario analysis used in the European Data Market study by IDC, it appeared that IDC used the cost-based approach to estimate the data economy for the EEA countries (Norway, Iceland and Liechtenstein), enriched with macroeconomic data, interview input and qualitative data.

The main parameters of the scenarios are level of data innovation, data governance model and distribution of data innovation benefits in the society. The reviewed main parameters for the econometric model of IDC are sufficient ICT spendings, higher value of data and data-related products sold, and widespread use of data.

From reviewing the Baseline, High Growth and Challenge scenario for the EEA countries (of which 94% applies to Norway based on GDP weight), we conclude that these align to a high degree to the findings in our study on the Norwegian data economy:

- The Baseline scenario foresees a gradual development of the data ecosystem in Europe based on the European Data Spaces and doing so in a sustainable manner.
- The High Growth scenario depends on improved geopolitical conditions and swift implementation of European data strategies resulting in significant investments in among other data technologies.
- The Challenge scenario is triggered by unfavourable geopolitical and macro-economic conditions together with delayed and/or inadequate implementations of data strategies in Europe, leading to significantly decreased investments in digital technologies.

The following table displays the different estimations per scenario for several aspects of the data economy in Norway.

Table 6: Comparison of main economic parameters per scenario

Scenarios	Challenge	Baseline	High growth
ICT spendings, CAGR 2025 - 2030	2.5 %	4.8 %	7.0 %
Number of data suppliers, CAGR 2025-2030	2.4 %	3.9 %	5.8 %
Number of data users, CAGR 2025-2030	3.9 %	8.0 %	12.4 %
Number of data suppliers as share of total companies, 2030	6.6 %	6.7 %	6.7 %
Number of data users as share of total companies, 2030	3.8 %	3.6% %	3.3 %
Value of data monetisation, CAGR 2025 -2030	4.1 %	11.8 %	15.1 %
Value data market, CAGR 2025-2030	0.5 %	5.7 %	11.8 %
Value overall data economy, CAGR 2025-230	1.7 %	6.1 %	10.0 %
Data economy as share of Norwegian GDP 2030	6.2 %	7.5 %	8.6 %

Source: WIK Consult, based on EU Data Market study 2021-2023.

Which scenario will apply for Norway depends on the geopolitical situation and macro-economic conditions (high level of data innovation, an open and transparent data governance model, and a broad distribution of the benefits of data innovation). We observed that Norway is well positioned in respect to the macro-economic conditions, and this is considered in the scenarios. However, the further development of the data economy in Norway also very much depends on the geopolitical situation and how the market is guided in the coming years, which we cannot predict.

5.3 Review of existing national strategy and upcoming regulation

Until September 2024, the Digital Agenda for Norway by the Norwegian Ministry of Local Government (2016) was at the centre of Norway's digital policy landscape.[98] On 26 September 2024, the strategy was replaced by the National Digitalisation Strategy 2024-2030 by the Norwegian Ministry of Digitalisation and Public Governance.[99]

National Digitalisation Strategy 2024-2030

This strategy contains concrete targets for where Norway should be in 2030 in terms of digitalization. The value creation by data sharing and AI is one of its priority areas, in which the government plans to step up its efforts.

One key goal is to become a leader in creating value with data and data-driven research and innovation, thus focusing on the demand side of the data economy. The importance of public data in Norway, which is highly valuable to the society and the public sector is emphasized in this context. To support this goal, the government will establish a national prioritization council for data sharing, bringing together key stakeholders to identify and advise the government on prioritizing national data with the greatest value.

Norway's National Digitalisation Strategy emphasizes the creation of synergies between Norwegian and European digitization policy. The strategy noted the relevance of monitoring regulatory developments in the EU and quickly implement adopted EEA-relevant EU regulations, so that Norwegian businesses will have the same competitive conditions as the rest of Europe.

Furthermore, the National Digitalisation Strategy includes the principle of “once only”, which means capturing data one time and thereafter making available across entities. This concept was developed in the Digital Strategy for Public Sector 2019-2025 emphasizing that data reuse within the public sector is paramount. This concept means that the public sector should share data whenever possible and protect it when necessary, making as much data as possible openly available for reuse to develop new services and create value in the business sector.[100]

98 Norwegian Ministry of Local Government and Modernisation (2016).
99 The digital Norway of the future: National Digitalisation Strategy 2024–2030. See: European Commission (2023).
100 Ministry of Local Government and Modernisation (2019).

In Meld. St. 22 (2020-2021), an important white paper of the Ministry of Digitalisation and Public Governance, Norway outlines its policy for value creation using data as a strategic resource. Key objectives include promoting greater data sharing within the private sector and between private and public entities. Enhanced data use in the private sector is seen as essential for fostering innovation, supporting new business models, and strengthening the competitiveness of Norwegian industries domestically and internationally. As part of the white paper, the Norwegian government establishes four key principles for the use and sharing of data:

- First, data should be open whenever possible, but protected when necessary.
- Second, data should be accessible, searchable, usable, and comparable with other datasets.
- Third, data must be shared and utilized in ways that generate value for businesses, the public sector, and society as a whole; and
- Finally, data should be shared and used in ways that respect fundamental rights and freedoms, preserving Norwegian societal values.

These principles are intended to balance openness with protection, ensuring data use that benefits society while protecting individual rights.[101] The Norwegian Research Centre for Sharing of Data, which opened in 2020, publishes guidance material on data sharing and acts as an advisor when challenges related to data sharing arise.[102]

According to Norway's National Digitalisation Strategy, the country aims to have 80 % of public sector organisations to adopt AI by 2025, with a full adoption rate targeted by 2030. The government will also implement the AI Act into Norwegian law. It primarily serves as a product liability law, ensuring that AI products and systems are safe to use by classifying them according to the risks they pose to society and individuals.

While most current AI systems are not regulated under this law, EU member states are required to establish administrative and supervisory structures to enforce it. Although many existing AI systems are not considered high-risk, future developments may fall into high-risk categories, making the regulation a central framework for AI development in Norway. In this way, the Norwegian government will also establish a national supervisory and management structure for AI.[103]

For example, the Norwegian Agency for Public and Financial Management (DFØ) proposes Nkom to be designated as the national market surveillance authority and become the “single point of contact” for regulatory matters in Norway, as Nkom already has extensive expertise in several of the areas highlighted in Article 70(4) of the AI Act.[104] Nkom would then be responsible for:

- Providing advice, guidance, and information to AI suppliers, users, and the general public.

101 Norwegian Ministry of Local Government and Modernisation (2022).
102 Nordic Innovation (2022a).
103 The digital Norway of the future: National Digitalisation Strategy 2024–2030. See: European Commission (2023).
104 Norwegian Agency for Public and Financial Management (DFØ) (2024).

- Coordinating, guiding, and assisting other market surveillance authorities.
- Acting as the primary contact with the EU and participating in various EU bodies and processes.

Besides the existing national centre for artificial intelligence, which consists of eight Norwegian companies,[105] Norway will create research centres for the development and use of AI in the society. It will also guide work for the responsible development and use of AI including through regulatory sandboxes. These sandboxes provide a controlled testing environment for new products, technologies and services with regulatory oversight.[106]

The Norwegian Agency for Public and Financial Management (DFØ) proposes that the national regulatory sandbox should be established and operated as a joint project between the Norwegian Communications Authority, the Norwegian Data Protection Authority, and the Norwegian Digitalisation Agency. This approach will promote coordinated and consistent information, advice, and guidance on the AI Act and support mutual capacity building.[107] It will complement the sandbox for responsible AI by the data protection authority, which stimulates the development of responsible AI.

As the use of AI raises several ethical questions, the 2020 National Strategy for Artificial Intelligence defined seven principles for the ethical and responsible development of AI that are also referred to in the new Digitalisation Strategy.[108] In summary, the principles emphasize respecting individuals' autonomy and privacy, developing systems that are secure and technically robust, ensuring that algorithms and models are transparent and verifiable, and promoting AI solutions that foster inclusion, diversity, and equal treatment.

In general, the strategy serves as a framework for private and public seeking to develop and use AI. The strategy specifies what is meant by AI and identifies key areas where it will be important for Norway to seize the opportunities that AI presents. As AI is constantly evolving, the strategy is designed to be open ended. However, it has not been updated with the publication of the new digital strategy.

For many companies, external cloud solutions are essential to fully leverage AI's potential. In response, the Ministry of Local Government and Regional Development in Norway introduced a Data Centre Strategy in 2018 and revised it in 2021.[109] The goal of the strategy is to ensure that Norway is an attractive country to build data centres. The Norwegian government is committed to make the process of establishing a data centre as smooth as possible.

105 Cf. https://www.nemonoor.no/ (30.10.2024).
106 The digital Norway of the future: National Digitalisation Strategy 2024–2030. See: See: European Commission (2023).
107 Norwegian Agency for Public and Financial Management (DFØ) (2024).
108 Norwegian Ministry of Local Government and Modernisation (2020).
109 Norwegian Ministry of Local Government and Modernisation (2021).

Norway's policy for Open Access to Research Data

In addition, in 2014, the Research Council of Norway has established a policy for open access to research data, which was updated in 2017.[110] This policy adheres to an open-by-default approach for accessing research data, requiring that such data be accessible, discoverable, and reusable. In general, these guidelines encompass all data generated within projects funded by the Research Council. A year later, in 2018, the Ministry of Education and Research published the National Strategy on Access to and Sharing of Research Data, which sets out similar principles and guidelines for publicly funded research data as well.[111]

European regulation

The EU is already focusing on the demand side of the data economy through the Directive of High-value Datasets.[112] This directive identifies six categories of datasets with the potential to deliver high socio-economic benefits: geospatial, earth observation and environment, meteorological, statistical, enterprise and enterprise ownership, and mobility. Public sector organizations will have to make those high-value datasets available free of charge, in a machine-readable format, via Application Programming Interfaces (APIs) and, where relevant, as bulk downloads. On 9 June 2024, the EU regulation came into effect.[113] Norway has declared that it will publish its geospatial data according to the EU specifications for high-value datasets.[114]

Harmonized standards are of particular interest for efficiently combining different data sets, which is crucial when optimizing value chains. The Norwegian government will facilitate collaboration across sectors on standards and formats for data exchange to enable the digitalization of entire value chains. An interviewed software company said that regulators such as Nkom could drive standardization, for example by requiring reporting on this topic. Further, as data areas in Meld. St. 22 (2020-2021) align closely with the EU's priorities; it is likely that the government will actively support Norwegian stakeholders in leveraging opportunities offered by the EU's pan-European data efforts (European Data Spaces).[115]

The Data Act (Articles 1 to 11) empowers consumers with greater control over data generated by their use of connected products, and facilitates the access to, use and portability of this data. It contains several articles which might have relevance for Norway such as ensuring that data collected by providers of IoT is being shared and certain exemptions of obligations for data holders for SME.

Furthermore, the Data Act contains articles (23 to 32) with obligations on providers of data processing services and rights for users of these services to ensure effective

110 The Research Council of Norway's Policy for Open Access to Research Data (2017).
111 Norwegian Ministry of Education and Research (2018).
112 Commission Implementing Regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use. See: https://eur-lex.europa.eu/eli/reg_impl/2023/138/oj
113 Ibid.
114 European Commission (2023).
115 The digital Norway of the future: National Digitalisation Strategy 2024–2030. See: European Commission (2023).

switching between providers. This is enabled via transparency on migration procedures, cost-based migration charges, functional equivalence for IaaS services and data and application portability and interoperability for PaaS and SaaS. This could be relevant in the near future if more cloud customers in Norway want to use hybrid cloud solutions and/or the cloud market position of certain providers is deemed too dominant.

From the interviews there were indications that although companies can be cloud independent, but in reality, there is always a certain lock-in due to specific data format or techniques used by each cloud service provider as these require specific expertise, hence costs and effort. Even when switching between cloud providers is enabled, the customer still has to do the migration themselves requiring technical expertise and effort. Interoperability between cloud platforms can be realised at the cloud level, but also through application design and open Application Programmable Interfaces (APIs). At the application level, this can be realised faster but costs more effort for the application developer and creates also a lock-in for customers.

After reviewing the Data Act and the possible application of specific articles on the Norwegian circumstances (see Annex 3 for more details), it seems that the Data Act complements existing national strategies for data sharing and/or the data economy in Norway in general. The forthcoming new law on data sharing (for public data) may overlap with the Data Act as it is cross-sectoral. In addition, existing detailed obligations, such as the Standard Licence for Open Government Data (NLOD), would need to be aligned with the forthcoming detailed obligations for data holders in the Data Act.

Ongoing implementation of European regulation

The Ministry of Digitalisation and Public Administration is preparing the implementation of the Data Governance Act and the Open Data Directive — a recast of the Reuse Directive 2003/98/EC, which is currently implemented in Norwegian law through the Freedom of Information Act. A government-appointed committee has recommended more comprehensive regulation of the reuse of public data. The committee presented its formal report, NOU 2024:14, *"By Law, Data Must Be Shared: New Legislation on Public Data Reuse,"* on 26 June 2024.[116] The report includes proposals for a new data sharing law and a new data governance law. The consultation on the report will be open until 9 December 2024.[117]

In general, as a country in the European Economic Area (EEA), Norway adopts most EU legislations, but the implementation process takes some time. An interviewed software company, IT-Infrastructure provider, and IT-platform provider stated that while the regulation is being implemented in EU member states there is a period of uncertainty in the Norwegian market. This is where regulators could add value by clearly communicating to the market what rules to expect and providing guidance on how to comply with them.

116 NOU (2024).
117 Consultation - NOU 2024:14 With law, data must be shared. See: https://www.regjeringen.no/no/dokumenter/horing-nou-202414-med-lov-skal-data-deles/id3053841/?expand=horingsbrev

6 Conclusions & policy recommendations

This section is based on the results and insights from previous chapters. First, the strengths and weaknesses of the current data economy in Norway are formulated, followed by the possible opportunities and threats, which are derived from technological and/or market situations. These can be based on factual data, but also on qualitative judgements either from interviews or from authors when comparing Norway versus the benchmark countries and/or European data.

Finally, the strengths and weaknesses are linked with opportunities and threats to derive possible actions which flow into policy recommendations.

As described in below figure, this so-called Strength, Weaknesses, Opportunities and Threat (SWOT) analysis combines strengths and weaknesses with opportunities and threats leading to certain actions with certain priorities. For example, if a current strength can be combined with a market opportunity, this is likely to bring significant benefits in the near future. On the other hand, the combination of a current weakness with a market threat will not bring immediate benefits but will most likely need to be addressed to avoid problems in the near future. We do not intend to define a policy to address all of these actions, but they will point in a certain direction, as shown in the table below.

Table 7: SWOT analysis

	(Market) opportunity	(Market) threat
Strength of data economy	Combinations indicate which strengths can be used to benefit from market opportunities. Policy initiatives in these areas will most likely bring significant benefits in the near future.	Combinations will indicate how to use strengths to defend against threats. Policy initiatives in these areas prevent certain issues in the near future
Weakness of data economy	Combinations indicate in which areas Norway's data economy should improve in order to benefit from the market opportunities. Policy initiatives in these areas will only bring benefits in the longer term as the current weakness needs to be transformed into a strength.	Combinations require direct actions as it will take time to improve a weakness and at the same time there is an ongoing threat from the market.

Source: WIK.

6.1 Strengths and weaknesses of the Norwegian data economy

The strengths and weaknesses are categorised in logical blocks: country characteristics, data supply, data usage, (market) segments and technology. If no opportunities or threats are identified for a particular category, there is an 'average' situation in Norway. Described opportunities and threats reflect significant deviations from the average situation/expectation.

Country characteristics - Strengths

- Norway has a high integration of digital technologies in Small and Medium Enterprises (SMEs). They are in general digitally active and specifically regarding social media, cloud services and AI usage.
- The population in Norway has one of the highest digital skillsets in Europe; more than 80% have at least basic or above basic digital skills.
- Norwegian consumers have trust in authorities, which has led to the sharing of sensitive personal information while still respecting data privacy and to well-integrated systems between publicly owned institutions like municipalities and hospitals.
- The induced effect of sharing data (additional contribution to GDP via salaries etc.) in Norway is 60% higher than the EU average (2.1% vs 1.3%). The forward indirect effects (use of services by downstream industries, e.g. to improve efficiency) are also 30% higher in Norway than in Europe (1.3% vs. 1.0%).

Data supply - Strengths

- There is a vast amount of public data available in Norway and a unique 'culture' of allowing the sharing of data by public entities. This concerns income, health records, utilities consumption, companies' financial statements and much more. This data is made available (mostly for free) to support other industries in Norway while still respecting data privacy.
- In 2023, the total number of commercial data suppliers in Norway expressed as % of all companies was well above the EU average (5.5% vs 2.1%) with an upward trend possibly reaching 6.0% in 2025.
- The economically important sector of Oil & Gas has a long history of (restricted) data sharing among industry participants, with well-developed data spaces.
- Norway is frontrunner as well in the energy sector, which ranks high in sustainability. One important aspect here is the reporting on sustainability, which requires data analytics of the whole value chain, which is progressed in Norway as well.

Data supply - Weaknesses

- Public entities seem to struggle with making the right data available for the private sector (Interviewees).

Data usage - Weaknesses

- In general for the Nordics, it was noted that despite the long process of collecting and analysing the data for many companies, the challenge lies in shifting pilots into large scale usage.

Technology - Strengths

- Norway ranks first in the number of Consumer IoT connections in Europe, and also the industrial usage is significant.[118] Most important segments in absolute numbers are Consumer IoT, followed by Industrial IoT, but the highest growth is in segment number three, Smart cities IoT, which will grow by 550% in the coming four years.

Technology - Weaknesses

- Considering AI investments expressed as % of GDP, Norway is in the same league as most Nordic countries. However far behind Sweden, which has an up to 7 x higher level as EU countries including the Nordics.

6.2 Opportunities and threats for the Norwegian data economy

Also here, if no opportunities or threats are identified for a particular category, there is an 'average' situation in Norway. Described opportunities and threats reflect significant deviations from the average situation/expectation.

Country characteristics - Threats

- Implementing real use cases for IoT-customers requires pilots with long duration (6-18 months) to showcase the benefits as customers have been disappointed with digitalisation projects in the past and hence upfront costs for companies with no immediate revenues. This can be problematic for start-ups.
- The combination of a general conservative nature in the market (less venture capital) with lagging digitalization in certain sectors, creates a difficult climate for start-ups in the data economy.

Data supply - Opportunities

- The total number of commercial data suppliers in Norway in 2023 was around 6,500, which is 5.5% of the total number of enterprises in Norway.[119] This is well above the EU average of 2.1% and seeing an upward trend possibly reaching 6.0% in 2025. However, these figures also showed that Norway is still far behind highest scoring countries like the United Kingdom (17.8%) and Estonia (13.3%).
- Data monetisation in Norway is on average lower than in the other benchmark countries, so the market has still potential to grow further in the future (1.2% of GDP versus at least 2% in other benchmark countries). IDC also noted this and considered that the Norwegian market could catch up in 2030.

118 Statista 2024.
119 European Data Market Monitoring Tool, IDC 2023. For classifications A, C, D, E, G, H, J, K, M, P and Q.

Data supply - Threats

- Possible cybersecurity issues could alter the public opinion on sharing of their data, which contribute currently to a strength and several opportunities for Norway. This is relevant for example for public health data sets.
- Longer time to market; In case the development of advanced data analytics solutions and usable data sets take longer in Norway, Norway can lose its competitive advantage.
- Application developers seem to be required to attract skilled (AI) workforce from abroad, hence Norwegian companies need to build more competences in these areas (Interviewee).
- Data sharing in certain developing market segments like robotics and IoT holds a risk for Norwegian start-ups as this data is integral part of the product development. Especially if large international companies (with larger budget) are also entering this market. So fast implementation of these innovative technologies is important and regulatory unclarity or uncertainty should be removed as it delays.
- Suppliers of heavy assets/equipment (which in modern versions collect data themselves on their operation) might be reluctant to share the data collected by their products with the customers using them (unless negotiated by contracts).

Data usage - Opportunities

- 2.4% of the total companies in Norway are data users, which is only slightly higher than the EU average of 2.3%. However, the two highest scoring countries, the United Kingdom and Luxembourg, have reached shares of 7.5% and 5.5% respectively, showing the remaining potential for Norway. However, one should consider the different market structure with more SME in Norway, which decreases the %.
- As labour costs are comparably high in Norway, there is an opportunity to increase efficiency and output by increased data usage/analytics and/or reduced labour input by robotics.

Data usage - Threats

- There is a certain degree of regulatory uncertainty on how the EU regulations on data economy will be implemented (and interpreted) in Norway. This will hinder especially smaller entities (public and private) without legal expertise available, which are disproportionally present in Norway.
- Traditional sector regulation might hinder the innovative re-use of shared data. The threat here is that companies are afraid of using data in creative ways as this might not be allowed.
- An interpretation aspect of the upcoming Data Act in Norway is whether or not an (IoT) company is seen as having a physical infrastructure, which implies that it has obligations regarding integration, APIs and the enabling of data porting by competitors for this infrastructure. This interpretation would jeopardize

competitive advantages as competitors would then be enabled to develop a similar product more easily (Interviewee).

- Stricter EU regulation on AI and GDPR (and in the near future in Norway most likely as well), may place Norwegian companies at a competitive disadvantage versus US competitors, who face fewer regulatory constraints. An example is the use of (sensitive) visual context input of robotics in homes for AI based instruction learning.
- Norwegian companies should have competent IT/Data Analytics staff to drive data usage.

Technologies - Opportunities

- Data sharing in the Norwegian Health industry has huge potential due to the large amount of personal data available, but anonymisation will become important to ensure data privacy as modern techniques enable combination of data. Furthermore, it was noted that this sector will become more crucial in Norway due to the increasing share of older people. AI and new technologies could be used to improve productivity in the public health sector.
- Considering different factors, the following sectors show a disproportional high potential to contribute to the data economy in Norway and therefore deserve regulatory focus: 'Public administration, Education and Health' considering the vast amount of data available and considering the commercial potential in the health sector. 'Finance' due to the data intensive nature of the business and the 'oil & gas' sector due to their inherent value chain, available budget and long-term experience with data sharing.
- Data analytic solutions combined with IoT/Robotics can not only improve processes, but also replace repetitive and/or dangerous tasks. This can be disproportionally relevant for Norway as certain tasks in the oil & gas and maritime industry may qualify in this regard.
- As Norway is leading developments in certain sectors for Europe, such as carbon capture, sustainability in general, power supply but also public services, the specific data analytics solutions which are being developed, are also state-of-the-art. These applications and related expertise can then be sold and re-used outside Norway and contribute to the Norwegian economy.

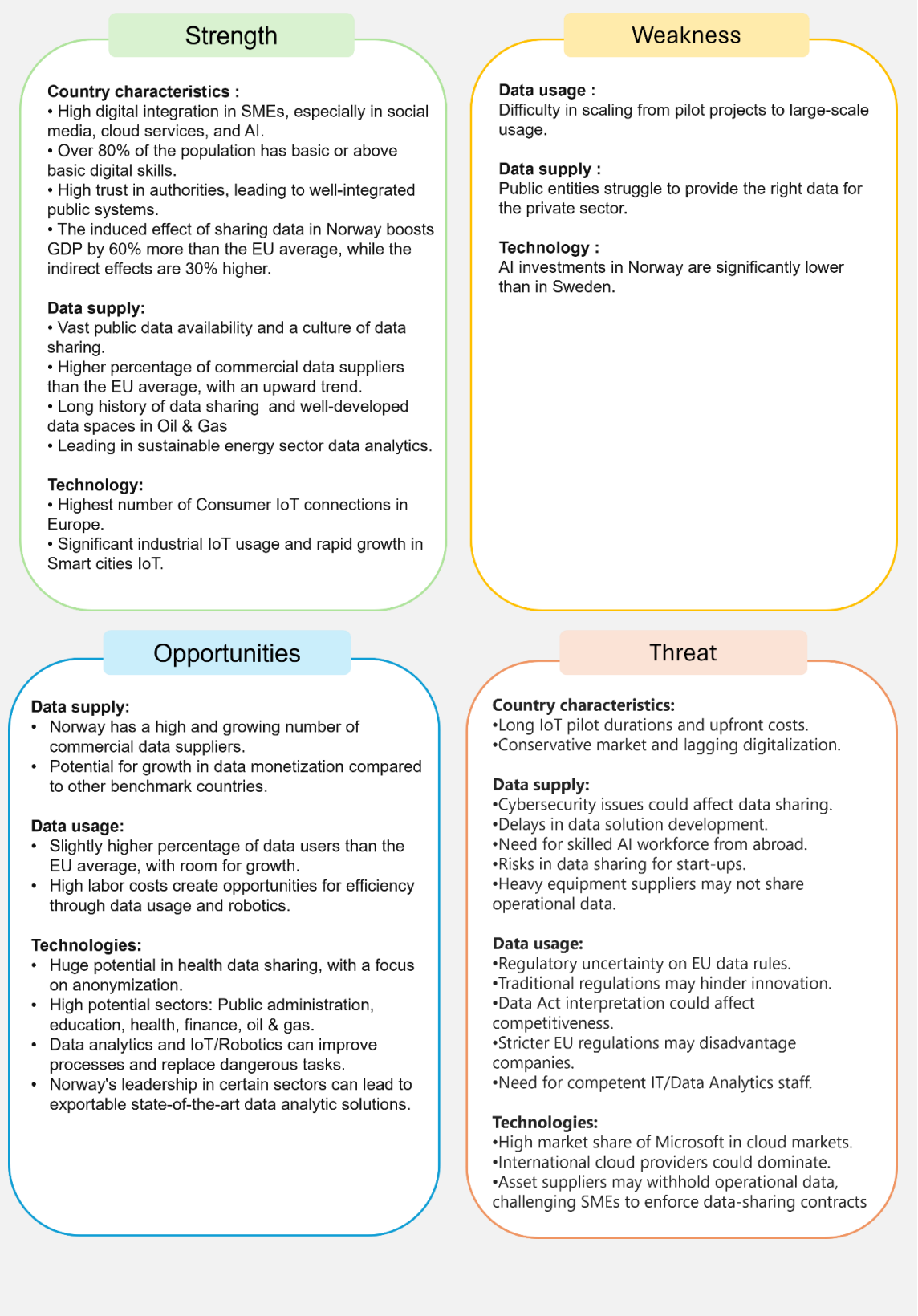
Technologies - Threats

- There is a significant higher market share for Microsoft in the underlying cloud markets of the Norwegian data economy. Despite multiple providers being available, interviewed smaller data analytics companies indicated that being able to provide their solution on multiple cloud platforms requires additional technical expertise, hence costs, so for practical reasons they seem to focus on one cloud provider. Not a direct threat but an aspect for monitoring as it may be reinforcing due to the high growth potential of the SaaS market in Norway due to higher %

of SME (which require the scalability of SaaS), but also due to high acceptance of cloud-based services in companies.

- International cloud providers like Microsoft, Google and AWS could use their position in the infrastructure market to establish their position as well for (international) data exchange platforms. Perhaps better to have national data exchange platforms and/or national data spaces.
- Suppliers of certain assets (which produce data like machines) traditionally keep the data their asset is producing while in use with their clients. Customers start to realise the value of this data and request to receive this data as well. Has to be contractually agreed, unknown whether SME is able to enforce these contracts.

Figure 28: Overview of strengths, weaknesses, opportunities and threats for the Norwegian data economy



Source: WIK Consult

6.3 Policy recommendations

6.3.1 Policies to support the exploitation of the opportunities

Support commercial data supply further

In Norway the commercial data supply (data monetisation) seems to have a stronger effect on the overall data economy compared to other benchmark countries. Policies should therefore support the further development of the commercial data suppliers. The number of data suppliers could be increased significantly and above all the value of the data monetisation market (as this is 40% lower in Norway compared to benchmark countries).

The large amount of public data including health data can be leveraged here by the commercial data suppliers in Norway making this data more easily available in standardised format via commercial portals. This will also drive increased data usage, which is currently around the EU average. There are segment-specific commercial data markets in Norway (e.g. the Veracity data platform) where best practices can be used for other data marketplaces.

Another aspect which can play a role here is the long-standing experience from data spaces from the Oil & Gas sector and the Energy sector in general. The Diskos National Data Repository seems to be a good example of a data space covering many functions. Increased usage of (public) data spaces like the European ones will contribute to more standardised data and governed aspect to that data, which addresses the (privacy) concern of combining all the public data (and in particular of health data).

Support the development of Norwegian data analytics solutions

A different aspect in the data supply is using Norway's leading position in several industries (Oil & Gas, Energy, Sustainability, Carbon capture, Health) and supporting the Norwegian data analytics companies which are developing segment specific solutions which are state-of-the-art and can be resold worldwide.

As the IoT usage in Norway is significant, not only in the consumer segment but also in the industrial and smart city segments, this might contribute to the collection and sharing of data and hence might be candidate to support via policies. Furthermore, the combination of IoT and robotics represent an opportunity to reduce (high) labour costs and/or replace manual labour in difficult and dangerous conditions.

Improve weaknesses which prevent making use of opportunities

In addition, Norway's position in the data economy should be reinforced to improve weaknesses which prevent making use of opportunities:

- The public sector should, in coordination with the commercial data intermediaries, prioritize which datasets are most important for the commercial sector and ensure the (ongoing) quality and availability of these as well as compensation of the related costs for the public sector.

- Contracts ensuring the sharing of data between suppliers of IoT devices and consumers using the devices like machines should be made generally applicable to ensure that all companies can easily enforce these towards suppliers.
- Policies should support the development of ICT/Data analytics/AI skills specifically to ensure the availability of skilled workforce for all stakeholders: from data suppliers, data intermediaries to data users.
- The further development of the data economy specifically for the Finance sector is also promising due to the data intensive nature of the business combined with the availability of public data. However, anonymisation of data will become more important to warrant data privacy and not damage the trust of the Norwegian customers.

6.3.2 Policies to support the aversion of threats

These combinations will indicate actions to use strengths of Norway's data economy against market driven threats (defensive actions). However, where no relevant strengths are available, threats still need to be countered. Policy initiatives are aimed at preventing these issues in the near future.

<u>Speeding up implementations of data analytics solutions</u>

- Data analytics solutions take some time to be implemented. It was noted in interviews that internal departments took years to build certain data analytics solutions but also that commercial pilots last up to 1.5 years. Policies can support swifter implementation by sharing best practices and or making experience available for SMEs.

<u>Supporting the supply of data analytics solutions & related services</u>

- For the data supply side, venture capitalist investment should be stimulated to enable start-ups to bridge the longer time-to-market despite having a good solution.
- Another illustration of the conservative nature might be that in 2023, the venture capital investments in AI as proportion of the size of the AI market is seven times lower in Norway compared to Sweden. As AI is an enabling technology in many data technologies, policies to support investments will contribute positively.

- Data sharing obligations should be proportional for developing market segments and Norwegian start-ups where the used data is a crucial element of the developed service and technologies. Full data sharing would jeopardise the competitive position of these companies.

<u>Removing regulatory uncertainties</u>

- As the Data Act most likely will be implemented in Norway, regulatory certainty can be created for companies by issuing guidelines which clarify to the market

parties which obligations and rights are upcoming regarding the sharing and use of data including clarifying any interpretation issues.

- This does not only relate to the Data Act but also to the interplay between regulations such as the AI Act, GDPR, DSA and DMA. Hence clarifying the aggregate regulatory obligations, especially for companies which do not have the regulatory expertise and/or budget to investigate this in detail themselves.
- Furthermore, the possible overlap with existing national rules should be addressed including possible conflicts with (older) national sector regulation, which might prevent the re-use of shared data for innovative purposes.
- The concept of the standard license for open government data does not only provide a legal basis for data owners but also arranges practical matters such as copyright, personal data, exemptions of rights of use of the data and liability. As the Data Act will provide for a legal basis for data owners in general, it needs to be reviewed whether the practical aspects before arranged in the standard license are also covered for the commercial data.

Topics to be monitored

On the market for enabling infrastructure, Microsoft has a significant market share. In addition, they will expand their commercial data marketplace. Google and AWS also provide commercial data marketplaces in Norway in addition to their infrastructure services. This is not necessarily a problem but should be monitored as commercial marketplaces are important for the Norwegian data economy and aspects such as data governance to ensure controlled access is better arranged in data spaces.

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Annex 1 – Comparison of benchmark countries

Our analysis is mainly based on desk research and quantitative data, depending on data availability, granularity and quality. In addition, we have derived qualitative data from the interviews by asking those parties active not only in Norway but also in the benchmark countries, how they evaluate Norway's data economy and regulatory environment compared to those of the benchmark countries.

In order to compare the data economies and the related aspects of the selected benchmark countries and Norway, several areas have been identified as important and have been analysed:

1. The underlying infrastructure enabling the data economy, with indicators describing the availability of internet access or data centres. These indicators will give insights into whether various foundations on which the data economy can build are in place, and where policies may be needed to catch up.
2. The availability of data in both the public and also commercial sectors and the extent to which data is used are initial indicators of the potential and prevalence of the data economy.
3. Lastly, we investigate indicators describing the consequences of a well-functioning data economy, such as the contribution of the data economy to the GDP, the level of innovation in a country and the uptake of data services by consumers and businesses. This will indicate areas that may or may not be working properly currently and may need support or could be exploited.

Data infrastructure

Connectivity

A well-developed connectivity infrastructure is a prerequisite for many activities related to the data economy. Regarding connectivity, Norway performs worse than Denmark and the Netherlands and similarly to Sweden in the DESI 2022 ranking. Norway, like Sweden, had much untapped potential in terms of expanding 5G coverage compared to Denmark and the Netherlands. As mentioned in 4.2, Norway has already covered this area and has significantly increased this percentage, and Sweden also closed the gap heavily.[120] This is particularly important for the expansion of the IoT.

Regarding other subdomains in the ranking, Norway, and especially the Netherlands, could increase their take-up of at least 1Gbps, and Norway, and to a lesser extent also Sweden, could increase their VHCN coverage compared to the others. This is also the focus of the digital component of Sweden's Recovery and Resilience Plan, as Sweden is using its funds mainly to support the provision of VHCNs in rural areas, as the cost of connecting the remaining households rises.[121] VHCN take-up is particularly important

120 European Commission. (2024). Digital Decade country report 2024: Sweden. https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports
121 European Commission. (2024). Digital Decade country report 2024: Sweden. https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports

for the data economy since it focuses not only on bandwidth, but also on latency, availability and reliability.

These factors are important to the data economy for a variety of reasons, including providing the best quality of service to end users of data-related services, the reliable implementation of IoT and many more. FTTP is considered to be the future proof prime example of a VHCN. The Netherlands is a little behind in terms of FTTP coverage, but shows an annual growth rate of 22.5%, underlining the efforts currently being made.[122] Norway is generally doing well regarding its lower bandwidth broadband take-up.

Cloud

When it comes to the cloud infrastructure, the importance of the different types of publicly available cloud services ('public cloud') , i.e. IaaS, PaaS, SaaS, Business Process as a Service and Desktop as a Service, in terms of revenue, gives a similar picture in all four countries.[123] The only major difference is that in the Netherlands, the share of revenue generated by IaaS is less than half that of the other countries, so the other types have comparatively higher shares. Revenues from publicly available cloud services, expressed as a percentage of GDP in 2023, are highest in Denmark and Sweden at around 1%, followed by the Netherlands at around 0.9% and Norway at around 0.7%.

The most important public cloud provider is Microsoft Azure in all four countries, although its dominance is strongest in Norway. AWS is also the second most important provider in all four countries, although it is slightly more established in Sweden than in the other countries. In terms of cloud usage by businesses, 61.2% of businesses with at least 10 employees have purchased cloud computing services in 2023 in the Netherlands, 69.5% in Denmark, 71.3% in Norway and 71.6% in Sweden.[124]

Data centres

When it comes to data centres, the Netherlands had by far the most data centres in February 2024 (300), followed by Sweden (95), Denmark (50) and Norway (46).[125] When these figures are related to GDP, the order remains the same and the Netherlands has by far the most data centres per unit of GDP, followed by Sweden, Denmark and, at a considerable distance, Norway.

Relating the revenues of the data centres in 2023 to the GDP of the respective countries also provides possible insights into the size of the data centres. These shares are 0.50% in Denmark, 0.44% in Sweden, 0.43% in the Netherlands and 0.32% in

122 European Commission. (2024). Digital Decade country report 2024: The Netherlands. https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports

123 https://www.statista.com/outlook/tmo/public-cloud/custom?currency=USD&locale=en&token=Nl23bZ35SahVNUD1IShIg5hC6hxizPeXCoySBgPitr8TjdxfTK_u3kdVwyZ9lX3ds72cezm0ta7s0IXWPNo46c4I529mZzLQjMZEkJ7vgaF10iRgXfqu-38%3D#revenue

124 OECD Data Kitchen.

125 Cloudscene. (February 16, 2024). Number of data centers in European countries as of February 2024 [Graph]. In Statista. Retrieved October 11, 2024, from https://www.statista.com/statistics/878621/european-data-centers-by-country/

Norway.[126] The gap between Sweden, the Netherlands and Denmark is expected to narrow to 0.04% in 2029, but the gap between Norway and Denmark is expected to widen to 0.23%.

The key players are similar in all four countries, with HPE being the most important player.[127] In the Netherlands, it is closely followed by Seagate, which is a minor player in the Nordic countries. The next most important players are Dell, Huawei and IBM in all countries.

Overall, all four countries have a good connectivity infrastructure. Sweden and Denmark do well regarding cloud in terms of both revenue and users; Norway also has widespread use of cloud computing, which is perhaps the more important indicator. The Netherlands lags a little behind in the use of cloud computing, which could indicate a less cost-effective, secure and overall high-performance use of IT technologies and a lower adoption of new innovative data technologies such as Big Data, AI or Computer Vision, as these often rely on the use of cloud computing. Norway has remaining potential regarding the establishment of additional data centres and their value creation.

A large infrastructure provider noted in an interview that Sweden is characterised by large investments in infrastructure, data centres and connectivity to unlock the AI economy and that there is simply a bigger market in Sweden compared to Norway. However, the Nordics in general are forerunners in the digital space, sustainability and adoption of new technologies.

Data supply and use

Public data

As regards the availability of public data, the OURdata index, which covers national open government policies, provides insights into the differences between the countries. Norway ranks 11th; Denmark, Sweden and the Netherlands rank 8th, 9th and 20th respectively. [128] With the exception of the Netherlands, which has a lot of catching up to do, especially in terms of data availability and government support for re-use of data, the overall differences between the countries are not very pronounced.

Concerning areas where one country stands out, Denmark performs significantly better than the others regarding data promotion initiatives and partnerships in the realm of data re-use than the others. Norway does well in all subcategories of data accessibility compared to at least one medium score or low score of the other countries.

Compared to the other two Nordic countries, Norway could improve stakeholder engagement for data release, consisting of requirements, guidelines and

126 Data Center - Norway, Denmark, Sweden, Netherlands. (n.d.). Retrieved October 11, 2024, from https://www.statista.com/outlook/tmo/data-center/custom?currency=USD&locale=en&token=f_CTFsiE6EEf3N-NhR-nRHtoVTxMli-zoWWcpuX3siwCdgr2Uzg02Eyx8Xpu3Wf_AhxgEV7l4aXFa7fyMrzL7oljT2WkjQf8gUMxv0hAhU7EAp0F9csIUts%3D

127 ibid.

128 OECD (2023).

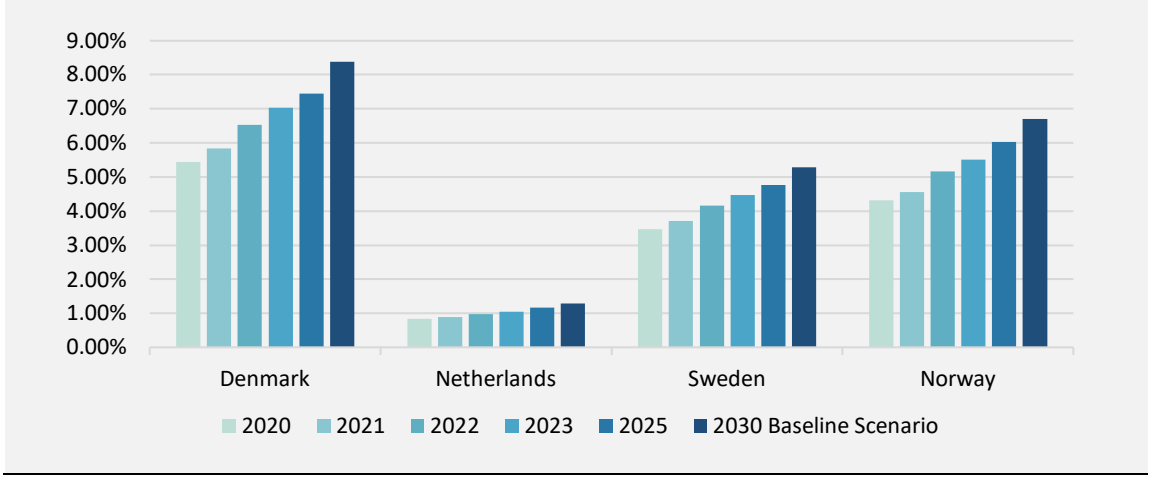
communication with stakeholders, as well as the quality of data literacy programmes in government. Compared to Sweden and the Netherlands, it could improve the monitoring of impact regarding data re-use.

According to an interviewee, Norway is more successful than Sweden in terms of public data sharing because Sweden started relatively late; its data sharing portal has only quite recently been launched. Denmark is more like Norway in this respect. This is supported by Sweden's lower score in the OURdata index in the two implementation subcategories concerning data availability and accessibility. However, as seen above, Sweden appears to be slightly better in other categories such as data literacy programmes in the government. The Netherlands lags behind in many aspects of public data sharing.

Commercial data suppliers

Regarding the other side of data supply, the commercial data suppliers, Figure 29 shows that the percentage of enterprises whose core business is data supply is highest in Denmark, followed by Norway, Sweden and with a large gap the Netherlands. The Netherlands therefore appears to be lagging behind in the prevalence of private data supply. Denmark seems to be generally the frontrunner, though the difference with the other Nordic countries is not as pronounced.

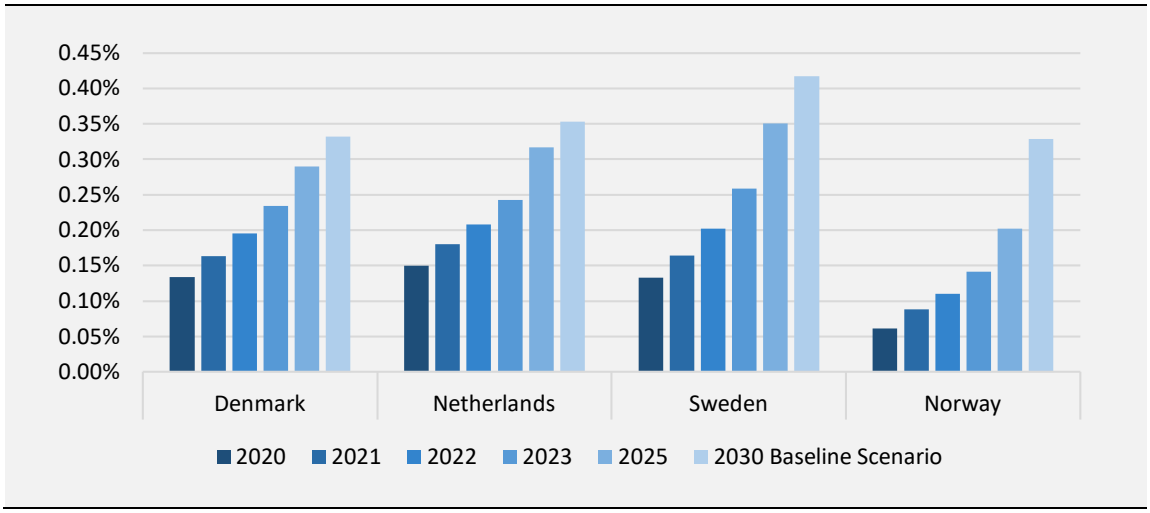
Figure 29: Share of data suppliers 2020-2030 Norway vs. benchmark



Source: WIK Consult, based on data from the European Data Market Monitoring Tool, IDC 2023, Classification of total companies A, C, D, E, G, H, J, K, M, P and Q.

The importance of data being directly sold, as measured by the percentage contribution of data monetisation to GDP, is relatively similar in the three benchmark countries, but Norway currently has a lower percentage contribution of data monetisation than the benchmark countries. However, it is expected to catch up with at least Denmark by 2030. Sweden's data monetisation value has increased significantly between 2022 and 2023 and is expected to continue to do so, putting it ahead of the others in this area.

Figure 30: Data Monetisation Value (% of GDP) 2020-2030 Norway vs. benchmark

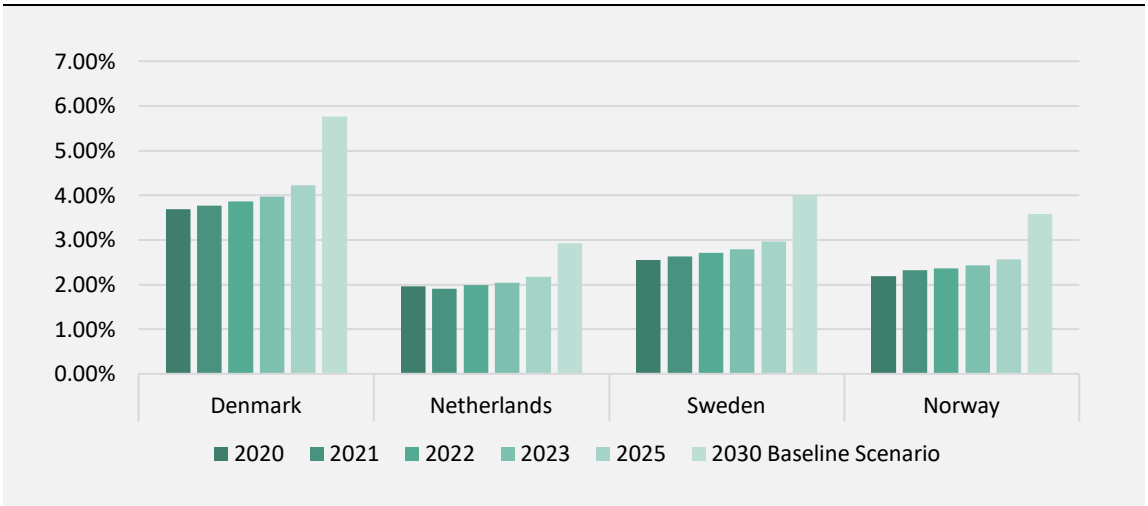


Source: WIK Consult, based on data from the European Data Market Monitoring Tool, IDC 2023.

Data use

Looking at the prevalence of the use of data in the different countries, visualised by the percentage of enterprises whose core business is to use data intensively, shows that Denmark has the highest percentage, with a significant gap to the other countries. The Netherlands have the lowest percentage. All countries are expected to see a large increase in data user companies in the 2030 Baseline scenario, especially the countries with the extreme shares, Denmark and the Netherlands. Norway is in the middle range, similar to Sweden. Both data use and supply are therefore most widespread in Denmark.

Figure 31: Share of data users 2020-2030 Norway vs. benchmark



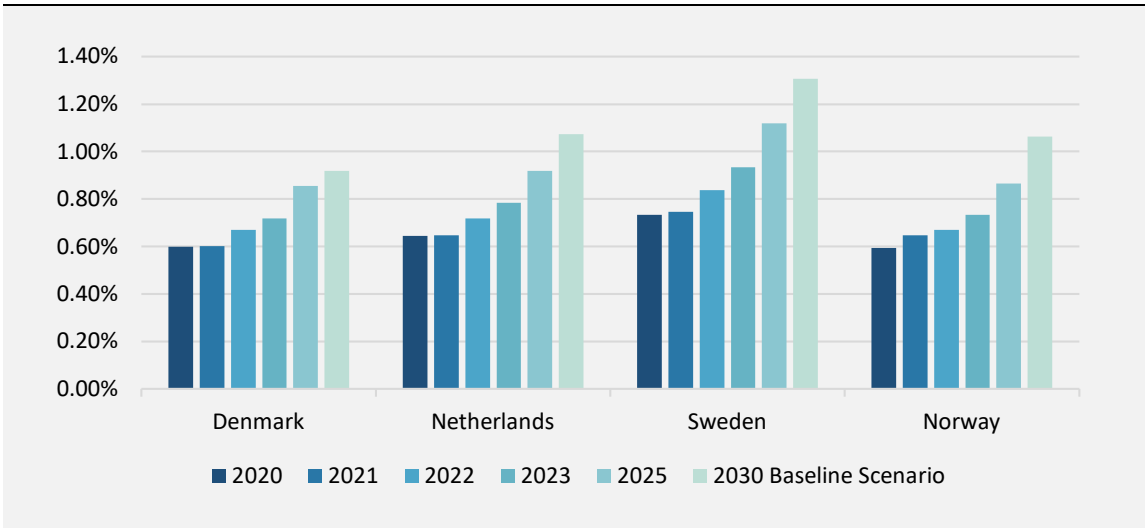
Source: WIK-Consult based on data from the European Data Market Monitoring Tool, IDC 2023, overall data economy.

Data market

All the previous characteristics play a role in creating the value of the data market and the data economy. Concerning the value of the data market, the benchmark countries and Norway show a similar picture in terms of the data market's share of GDP. However, Sweden's share is consistently slightly larger and Denmark's slightly smaller. This is interesting as Denmark has a higher percentage of data suppliers and therefore more contributors to the value of the data market. Hence, data suppliers in Denmark appear to be smaller and/or having less profitable data than in the other countries.

The Netherlands' share is mostly larger than Norway's, but Norway is expected to catch up in 2030. Therefore, given the lower share of data suppliers in the Netherlands, the data suppliers could be larger and/or having more profitable data in the Netherlands than in the other countries. This could be due to the larger financial sector in the Netherlands, as at EU level a few financial data suppliers create high value.

Figure 32: Data Market Value 2020-2030 (% of GDP) Norway vs. benchmark



Source: WIK Consult, based on data from the European Data Market Monitoring Tool, IDC 2023.

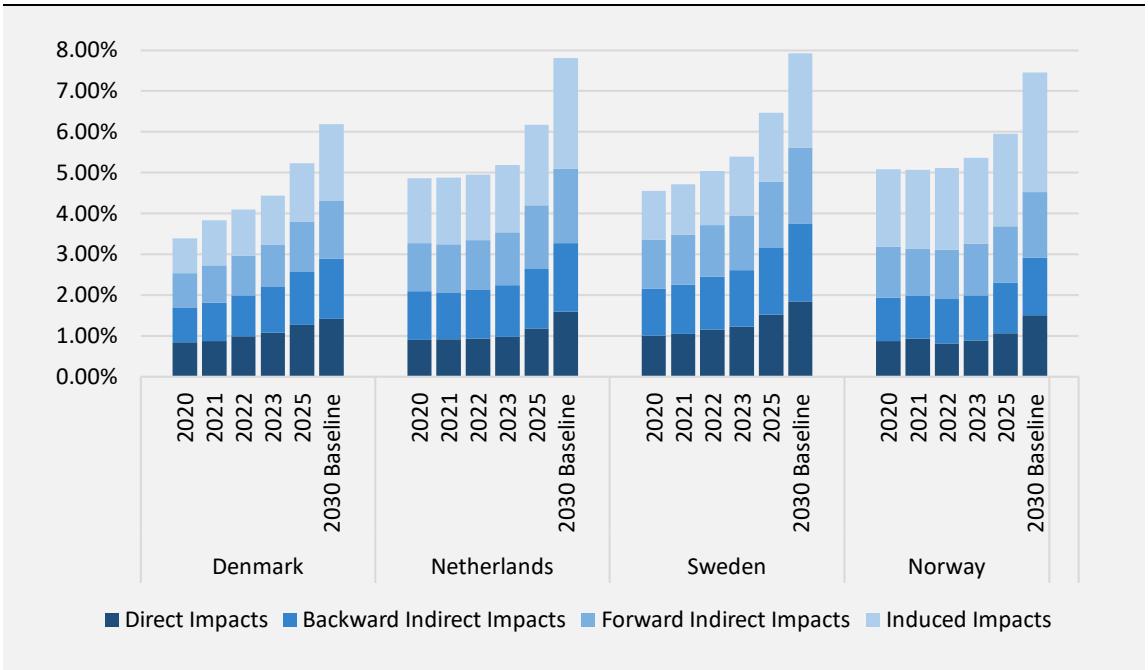
Data economy

The picture for the data economy as a whole (Figure 33) is slightly different: Sweden and Norway have the highest shares of the data economy in 2023, although Sweden's share is expected to increase more strongly in the coming years. The Netherlands' share is also expected to increase somewhat more than Norway's, slightly outperforming Norway. Denmark started from a lower level and also growths less such that the gap is expected to widen.

The difference in the rankings for the data market and the data economy is explained by the differences in the importance of the different parts that together make up the data economy. Regarding the data for 2023, the importance of the induced effects is by far the highest in Norway (39%) and the importance of the direct effects is the lowest (17%). This shows the high multiplier effect of the data market that is present in Norway. Moreover, the importance of the backward indirect effects is lower than that of the

forward indirect effects (20% vs. 24%), while in the Netherlands and Sweden both are equally important with 25%. In Denmark the backward effects are slightly more important than the forward effects (25% vs. 23%). In general, there is a relatively even distribution between the four effects in Denmark and Sweden, while in the Netherlands it is slightly tilted towards induced effects and away from direct effects, and even more so in Norway.

Figure 33: Data economy value 2020-2030 Norway vs. benchmark



Source: WIK Consult, based on data from the European Data Market Monitoring Tool, IDC 2023.

Hence, even though the previous sections have shown that Denmark has a good data infrastructure and that the supply and use of data is more widespread than in the other countries, it lags somewhat behind when it comes to the total value generated by the data economy. In addition to the previous assumption that the data suppliers are smaller in Denmark, the same could be true for the data users and/or the use of the available data is not as beneficial as in the other countries. The opposite may be true for the Netherlands, probably due to the larger financial sector.

In addition to these findings, a large Nordic ICT provider noted that there are more similarities than differences between Sweden and Norway in respect to the data economy. This underlines the fact that the differences between the benchmark countries are less pronounced than between other countries. From other interviewees, we heard that Sweden is simply a larger market than Norway. Therefore, Sweden may have options in general that Norway does not have due to its size.

Indicators of a well-functioning data economy

Skilled workers

An important and fundamental part of the data economy is the availability and use of skilled labour. In the human capital dimension of the DESI 2022 ranking, Norway performs slightly better than Denmark and similarly to the Netherlands and Sweden. Regarding the subcategories which make up the overall score, it appears to be the case that Norway is comparatively well equipped with people having a basic level of fundamental skills but is comparatively behind in terms of employed ICT specialists and ICT graduates, although the Netherlands have the lowest proportion of ICT graduates.

This can be augmented by data showing that in 2021 only 8.1% of Norwegian companies with 10 or more employees offered positions for ICT specialist, while in Sweden, the Netherlands and Denmark this figure was 12.0%, 15.2% and 19.1% respectively.[129] Around 51.2% of these businesses in Norway stated that these positions were difficult to fill. This percentage was 61.2%, 61.2% and 70.4% in Sweden, Denmark and the Netherlands respectively. The lower percentage of enterprises looking for ICT specialists may explain the lower difficulties in Norway and not an overall better situation in Norway. It is unclear what the situation would be like if more enterprises in Norway were looking for ICT specialists; the difficulties might be at the same level as in the benchmark countries or even higher.

Regarding the provision of training to develop ICT-related skills in 2021, around 34% of businesses in Norway, Sweden and Denmark provided such training, compared with 29% in the Netherlands.[130] In general, more companies provided such training to people who were not employed as ICT specialists than to those who were, thus improving the ICT skills of their overall workforce. Compared with the other countries, Norway and Sweden had a higher proportion of training for non-ICT specialists than the other two, while Denmark and the Netherlands had a higher proportion of training for ICT specialists than the other two.

Norway therefore lags in terms of the supply and demand of ICT specialists. The country has a good base, with many people having basic skills, which could make upskilling slightly easier and less advanced functions more widespread, but more sophisticated skills are needed for a well-functioning data economy.

Digital technologies

In the area of digital technology integration in the DESI 2022 ranking, Norway is scoring similarly to the Netherlands and worse than the other two countries. Norway scores significantly better than the benchmark countries in the use of e-invoicing, but could improve in the use of big data, as could Sweden, and more Norwegian SMEs could sell online across borders. In Sweden and Norway, 19% of companies use big data, compared to 27% in the Netherlands and Denmark. A similar picture emerges when looking at 2023 data on enterprises with at least 10 employees that have performed big

129 OECD Data Kitchen.
130 OECD Data Kitchen.

data analysis: 50% have done so in Denmark, 49% in the Netherlands, 35% in Sweden and only 19% in Norway.[131]

There are also differences in the use of other important technologies. IoT-related revenues as a percentage of GDP are significantly higher in Sweden than in the other countries, showing that more is being spent on IoT here. In 2023, the percentages were 1.01% in Sweden, 0.64% in Norway, 0.61% in the Netherlands and 0.56% in Denmark.[132] In terms of IoT-related investment as a percentage of GDP, Denmark has had the highest percentage in recent years, followed by Norway, Sweden and the Netherlands. In 2021, 40% of companies in Sweden were using IoT, 24% in Norway, 21% in the Netherlands and 20% in Denmark.[133]

Hence, Sweden currently seems to have an advantage when it comes to IoT. Denmark may currently be the furthest behind but seems to be trying to close the gap by investing heavily. Norway and the Netherlands are currently in the middle of the field, although Norway is expected to outperform the Netherlands in the future due to higher investments in Norway. As noted in 4.4.7, slightly more consumers in Norway use IoT devices and therefore accept them than in the benchmark countries, indicating the potential future availability of this part of IoT data in Norway.

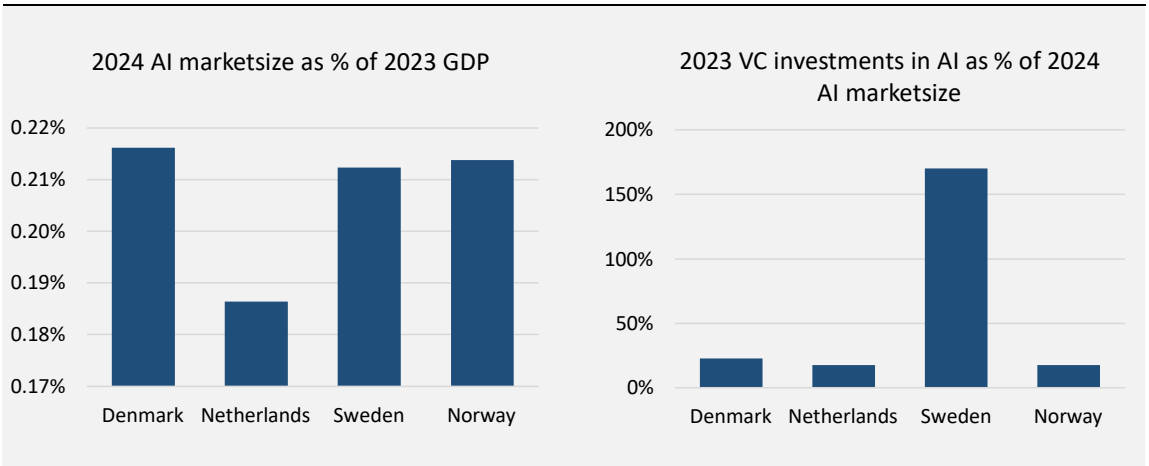
According to the DESI 2022 ranking on the use of AI, Sweden comes last with 10% of enterprises, preceded by Norway (11%), the Netherlands (13%) and Denmark (24%). Similarly, according to the OECD Data Kitchen data, Denmark comes first with 15% of enterprises using AI, followed more closely by the Netherlands (13%), Sweden (10%) and Norway (9%).

However, the picture is very different when it comes to investments in AI in 2023. As shown in Figure 34, AI investments expressed as share of GDP is comparable between Denmark, Sweden and Norway, but clearly lower in the Netherlands. The second graph shows that venture capital investments in 2023 related to the size of the 2024 AI market size is however much larger in Sweden.

In addition, the OECD database on investment in AI[134] shows in which part of the data economy venture capitalists are investing. It is interesting to note the difference between Norway, where most VC is invested in 'Media, social platforms and Marketing', Sweden, where it is mainly invested in ’IT infrastructure and hosting‘, and the Netherlands, where AI investment via VC is split roughly fifty-fifty between ’Agriculture’ and ’Business processes and support services‘. No detailed data is available for Denmark.

131 https://goingdigital.oecd.org/datakitchen/#/cover/1/toolkit/indicator/explore/en
132 Internet of Things - Norway, Denmark, Sweden, Netherlands. (n.d.). Retrieved October 10, 2024, from https://www.statista.com/outlook/tmo/internet-of-things/custom?currency=USD&locale=en&token=gCcoEGebM3-jvCoOAj6lib9D3q0hBLmSNFg8GQcaIwe5E756iGKJPdFKVIDddsdQtw3pU763HzNury7fXXgmvLsdH5xt8E6xbjq7UarzWITfokfHsdZO2Is%3D
133 OECD Data Kitchen.
134 Source: Live data from OECD.AI - OECD.AI

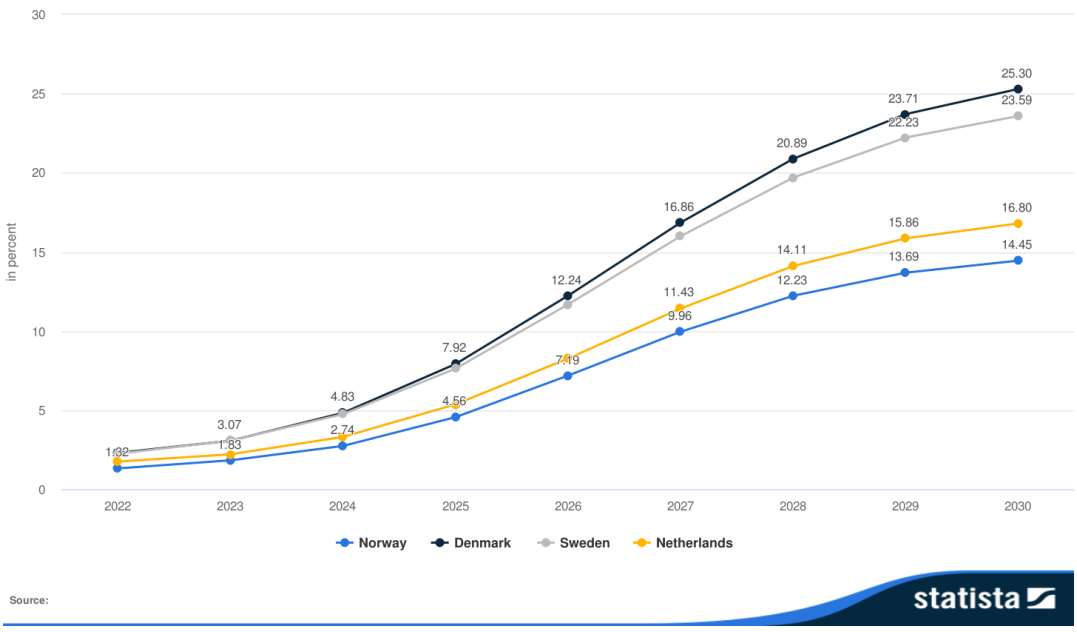
Figure 34: AI market size related to GDP and Venture Capital investment



Source Eurostat. (April 9, 2024). Gross Domestic Product (GDP) of European Union member states in 2023 (in trillions of Euros) [Graph]. In Statista. Retrieved November 08, 2024, from https://www.statista.com/statistics/1373346/eu-gdp-member-states-2022/ and OECD.AI (2024), visualisations powered by JSI using data from Preqin, accessed on 7/11/2024, www.oecd.ai

As can be seen in Figure 35 the impact of the AI market on GDP is estimated to be highest in Denmark and Sweden, which is expected to be persistent in the future. Norway has the smallest impact. This could also be explained by the recent high venture capital inflow in AI in Sweden which likely also has a positive effect for the coming years. Norway seems to have some growth potential compared to its Nordic counterparts.

Figure 35: Impact of AI market on GDP (Moderate Scenario)



Source: Statista Market Insights. Artificial Intelligence - Norway, Denmark, Sweden, Netherlands. (n.d.). Retrieved November 08, 2024, from https://www.statista.com/outlook/tmo/artificial-intelligence/custom?currency=USD&locale=en&token=j4VNyo4Vi3SUZz37uRwfrlUbe1VeHpNHNjMtMx8GahT57VuVk8pe9LiJPw547AhyLW9q-DTiyepcM0-p0NCIqaWXKw0L9_LkXaJubsjaP5wvJw9J6ewBZxw%3D

The picture of the state of AI can also be enriched by examining the similarities and differences in the challenges and strengths of Norway and the benchmark countries in using AI.[135] Challenges in all countries concern the technical aspects needed for a trustworthy and ethical use of data and AI, including for example the data management and meeting privacy requirements and ensuring legal compliance and ethical use in general. The lack of interaction between academic research and companies also contributes to a lower uptake of AI, as does the poorly functioning transfer of AI pilot projects to a larger scale. The aforementioned shortage of skilled workers in all the benchmark countries is a further constraint.

However, according to Nordic Innovation's report 'The Nordic AI and data ecosystem'[136], the Nordic countries also have a good foundation for the use of AI, consisting of the availability of high-quality national datasets, a strong foundation of trust-based and ethical behaviour with concern for equality and fairness, and digital competitiveness. Their moral stance helps to develop solutions that can withstand new requirements and help to meet future demand.

However, there are also differences between countries in the Nordics.[137] Denmark struggles more with an uneven geographical distribution of AI competence. However, it benefits from strong public sector efforts in AI development and efforts to support organisations in developing ethical AI. Sweden lacks a clear national strategy for the ethical use of AI, which challenges the cooperation between different actors and the activity in general. However, Sweden is particularly benefiting from innovation in the private sector, supported by R&D funding and VC investment. Norway is particularly challenged by the transition from pilots to large-scale projects. The lack of skilled labour may also be particularly pronounced in Norway. However, it is particularly successful in achieving a twin transition.

In summary, Norway is lagging in terms of adoption in the area of big data analytics. Sweden currently has the most widespread use of IoT in businesses and high IoT-related revenues, but Norway also shows potential in this area. In terms of the overall use of AI, Sweden and Denmark seem to be leading the way. Denmark has the most widespread use of AI in businesses, and Sweden has high investment; in both countries the impact of AI on GDP is high.

Investments and innovation

Capital for new and innovative companies is crucial to support innovation and a dynamic data economy. In 2023, total VC investment in the ICT sector in Sweden was equivalent to 0.04% of GDP. In the Netherlands and Denmark this figure was 0.03% and in Norway 0.02%.[138] Also in terms of VC investment in general, Norway lags behind with 0.03%, compared to 0.14%, 0.11% and 0.07% in Denmark, the Netherlands and

135 Nordic Innovation (2022a); https://www.government.nl/documents/parliamentary-documents/2024/01/17/government-wide-vision-on-generative-ai-of-the-netherlands, https://ii.tudelft.nl/bnvki/wp-content/uploads/2018/09/Dutch-AI-Manifesto.pdf; European Commission (2024b), Digital Decade country report 2024: The Netherlands.
136 Nordic Innovation (2022a).
137 Nordic Innovation (2022a).
138 https://goingdigital.oecd.org/indicator/35

Sweden respectively. This shows that not only in terms of investment in AI, but also in terms of overall VC investment, Sweden is in the lead and Norway rather behind.

A look at the Global Innovation Index confirms this picture: Norway achieves the lowest score among the benchmark countries of 49.1 in 2024, while Sweden, the Netherlands and Denmark achieve scores of 64.5, 58.8 and 57.1 respectively.[139] They land in 2nd, 8th and 10th place, while Norway is ranked 21st. All the countries are therefore among the most innovative, but compared with the benchmark countries, Norway lays behind.

Especially regarding the output part, Norway is doing worse, for example in the subcategories of knowledge creation and diffusion. In the input dimension, lower R&D, lower VC and less developed collaboration between different actors lead to a lower score for Norway.

The institutional, regulatory and business environment and infrastructure are areas where Norway performs as well or slightly better than the benchmark countries. Sweden's high innovative power is also reflected in the large number of unicorns[140] relative to the size of its economy.[141] Therefore, Norway could benefit from supporting its research landscape and innovative companies by increasing R&D and VC and promoting collaboration between different actors.

139 World Intellectual Property Organization (WIPO) (2024).
140 A startup company valued at over US$1 billion which is privately owned.
141 European Commission. (2024b). Digital Decade country report 2024: Sweden. https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports

Annex 2 – Detailed information on the scenarios

Baseline scenario

Assumptions

The assumptions regarding the Baseline scenario are based on the assumptions proposed by IDC.

The Baseline scenario envisions a steady continuation of current growth patterns, with ongoing improvement in data innovation and the evolution of existing regulatory frameworks. It takes into account high interest rates and trade tensions until next year and a gradual take-up thereafter. It anticipates a balanced expansion of the data industry, with power being moderately distributed among leading data owners. A key element of this scenario is the establishment of data governance structures that safeguard individual rights, ensuring that the benefits of data innovation are widespread, albeit unevenly distributed across different sectors of society.

In this scenario, Europe's data industry is expected to grow healthily, with increasing demand for data products and services, especially among the most innovative and competitive businesses. Legislative measures like the Data Governance Act, the Data Act, and the Digital Markets Act are projected to foster a competitive environment and promote data sharing, leading to a globally acknowledged governance framework that both protects individual data rights and prevents a few stakeholders from monopolizing data assets.

The Baseline scenario also foresees the gradual development of a robust data ecosystem, supported by various industry-specific and cross-sector platforms that offer secure environments for data exchange and transactions. This will be driven in part by the progress of the European Data Spaces initiative, which aims to establish secure data-sharing infrastructures across key industries within the EU. The scenario also highlights the importance of sustainable development, with significant efforts directed towards reducing the environmental impact of data centres and advancing green ICT initiatives by 2030.

Overall, this scenario reflects a cautious but positive outlook, with the EU making gradual progress toward its digital goals for 2030, despite some challenges in achieving full cooperation among Member States.

Data review - Baseline scenario

In the Baseline scenario, ICT spendings in Norway are expected to grow at a CAGR of 4.8% until 2030 compared to 2025, slightly above the EU average. The number of data suppliers in Norway is expected to grow with a CAGR of 3.9% compared to 2025, reaching a fraction of data suppliers of total companies of 6.7% (an increase of 0.7% in 2030 compared to 2025). This trend is mainly based on the opportunities for emerging data suppliers to monetise their data and new methods of using data (e.g. through AI) that increase demand.

Data users are expected to grow at a higher CAGR of 8.0% until 2030, leading to an increase of 1.0% to 3.6% in the share of data users in total enterprises. Again, the emerging capabilities of data technologies will play an important role. The main reasons for using data continue to be to reduce costs and increase productivity, but over time more companies are also using data for product improvement and business transformation. The development of data platforms and some of the European Data Spaces play a role in increasing both the number of providers and the number of users due to greater ease and security. However, the re-use of data from the public sector is still not without problems, and data ownership remains unclear in some cases.

In particular, data monetisation is expected to grow strongly with a CAGR of 11.8%, which is in Europe the third highest expected growth rate after Malta and Poland, resulting in a value equivalent to 0.33% of GDP. For data monetisation to increase, companies need to be aware of the value of their data and the opportunities to monetise it. The value of data as a service is also expected to grow, with the overall data market expected to grow at a CAGR of 5.7% to 1.1% of GDP. This is also reflected in the increase in direct impacts, with a CAGR of 8.8%. The direct impacts are expected to reach 1.5% of GDP (+0.4% compared to 2025). With a CAGR of 6.8% (lower than the EU average of 7.5%), the next largest increase is expected for induced impacts, leading to a share of GDP of 2.9% (+0.6%), which is significantly higher than the EU average. Forward indirect effects are expected to grow by 4.5% to 1.6% of GDP and backward indirect effects by 4.0% (below the EU average of 4.4%) to 1.4% of GDP. Therefore, the share of input suppliers' turnover in GDP is only 0.1% above the EU average, indicating that this market could be stimulated more.

Overall, the data economy is expected to grow with a CAGR of 6.1% to 7.5% (+1.5%) of GDP until 2030. The relevance across industries is expected to stay the same; hence, oil and gas, energy, health and finance likely stay important for Norway. There is still a noticeable gap of data professionals, which slows down growth.

High Growth scenario

The High Growth scenario is partly based on the characterization made in IDC’s study, but also altered and enriched by Norway-specific factors and assumptions.

Assumptions

In the High Growth scenario, IDC foresees an accelerated expansion of the European data market, driven by improved geopolitical conditions and the successful implementation of European digital and data strategies. This scenario is characterised by a rapid resolution of international conflicts, stabilising the global economy and encouraging closer integration of global supply chains, particularly between Europe, the US, South Korea and Japan. A significant reduction in dependence on Chinese manufacturing is also expected by 2030. Improved economic conditions lead to a quicker adoption of data innovation.

In this scenario, Europe experiences a robust digital transformation and a high level of data innovation, supported by an advanced and globally recognised data governance framework. The positive impact of significant investment, particularly in key areas such as semiconductors, hydrogen and batteries, is expected to strengthen Europe's technological and economic position. This environment fosters the rapid adoption of data technologies beyond early adopters to mainstream users, creating a dynamic, demand-driven data ecosystem. This creates a virtuous circle between data suppliers and data users by creating impetus through quick data technology adaption.

The High Growth scenario also assumes that EU policies such as the Data Governance Act, the Data Act and the Digital Markets Act are effectively implemented, reducing the dominance of big tech companies and encouraging the emergence of new digital players. This leads to a significant expansion of the data market, with the EU's share of the global data economy growing to reflect its economic weight by 2030.

Finetuning of assumptions

IDC is mentioning the faster than expected resolution of international conflict already by the end of 2024, but since it is foreseeable that this will not happen, a slightly lower GDP estimate should be assumed. This will in turn lower ICT investments slightly, which will thereby reduce the growth of the data market. The induced effect, generated by e.g. the spending of additional wages might also be slightly reduced due to more uncertainty.

In respect to the, by IDC considered EU investments in certain key areas, we estimate that the impact for Norway as an EEA country will be more conservative as these investments will most likely focus on European countries and not EEA countries. This could be with the exception of certain specific areas such as batteries where Norway might be leading. Hence, this will directly reduce ICT investment for Norway in this scenario. However, we also anticipate that in a best-case scenario, growth in other types of investment, such as data-related start-ups, could be slightly higher than IDC's forecast, as investors recognise the gap and Norway offers a good investment environment, so that much of the gap created by the first circumstance will be filled. In this best-case scenario, private investors and businesses recognise the potential profitability of additional ICT investment.

We also believe it is likely that application development for the data sector will flourish in the coming years, especially in the leading sectors of oil, gas, energy and health, which could significantly benefit the Norwegian economy. This could lead to a slight increase in the value of the data market and the number of data users compared to IDC’s estimate. This will have positive impacts on both direct and forward indirect effects.

The large energy sector in Norway has a high potential to become more efficient through the use of data analytics, so the expected forward indirect effect could be slightly higher in Norway.

We also expect that, with the right government support, Norway could accelerate the transition from pilot projects to large scale usage. This would slightly increase the value of the data market as more data and data-related services are sold, and also the

forward indirect effects as more potential profits are realised. These changes also have a small impact on the number of data users and data suppliers, as there are more good examples of data use on a larger scale.

Due to the large amount of public data available and the positive attitude towards data sharing, the starting point for Norway is better compared to many other EU countries, so the potential for increasing the uptake of data usage in a best-case scenario could be higher. The high use of IoT solutions among consumers could also contribute to this. This is also supported by our assessment that Norway will be able to close the gap in the percentage of data-using enterprises compared to Denmark and Sweden slightly more than IDC estimates. This would, for example, increase the value of the forward indirect effects as more companies experience efficiency gains.

The large amount of free public data also provides opportunities for commercial data intermediaries to enrich and resell, thereby increasing the sale of data and related services in Norway. This could increase the number of data providers, as more companies follow this business model, and increase the value of the data market, as more data/data-related services are sold, increasing e.g. the direct and backward indirect effects.

Data review - High Growth scenario

According to IDC, in the High Growth scenario, ICT spending is expected to increase at a CAGR of 7% until 2030 compared to 2025, which is around the EU average. However, for the reasons mentioned above, this increase seems to be on the optimistic side for Norway. Data suppliers are also expected to grow more strongly than in the Baseline scenario, with a CAGR of 5.8%. However, expressed as percentage of the total number of enterprises this remains 6.7%, the same as in the Baseline scenario. This increase in the number of data suppliers may be more optimistic than conservative, as we estimate lowered expectations for ICT spending and GDP growth. This will likely have a negative impact on the number of data suppliers, without being offset by other positive impacts on the data market.

In this scenario, the number of data users is expected to grow strongly with a CAGR of 12.4% (50% higher than in the baseline and the fourth highest increase in Europe after Estonia, Slovakia and Poland). However, due to a stronger expected increase in the total number of enterprises estimated by IDC, the share of data users is only 3.3%, lower than in the Baseline scenario. The estimate of the number of data users in the High Growth scenario may be on the conservative rather than the optimistic side given the Norwegian specific assumptions.

Data monetisation is expected to increase until 2030 at a CAGR of 15.1% (fourth highest increase in the EU) to 0.37% of GDP. As IDC's estimate of the value of data monetisation relies heavily on input from targeted interviews conducted by IDC, WIK has not changed this part of the estimate due to missing input. The data market as a whole is expected to grow at a CAGR of 11.8%, more than double the baseline and the third highest among the EU countries considered. It is expected to be equivalent to 1.4% of GDP. This estimate is in line with WIK's alterations. Norway has good

opportunities to develop leading applications in the data sharing market, especially in the energy and health sectors. However, certain obstacles need to be overcome.

Also in this scenario, the part of the data economy that is expected to increase most are the direct impacts (sales of data and related services) with a CAGR of 14.0% until 2030, leading to 1.8% of Norway's GDP. The induced impacts increase with a CAGR of 11.6% to 3.5% of GDP (third highest share in the EU after Estonia and the UK). Forward indirect impacts are estimated to increase with a CAGR of 7.2% to 1.8% of GDP and backward indirect impacts with 5.8% (lower than the EU average of 6.1%) to 1.5% of GDP. This order of the different effects as well as the increase for most factors is in line with WIK's alterations. Only the increase in forward indirect effects may be on the conservative side, as a higher estimate of the number of data users as well as a more effective transfer from pilot to large-scale projects could increase the benefits realised by data users.

Therefore, the overall data economy in Norway is expected to grow until 2030 at a CAGR of 10% (+3.9%) to 8.6% of GDP (1.1% higher than in the Baseline scenario), which is supported by WIK's assessment. With the supply of data professionals growing faster than demand, the skills shortage will be significantly reduced, although not eliminated. IDC also estimates that Norway has a smaller skills gap than the EU. As Norway is a smaller market, it could be effective to attract skilled workers from abroad and/or develop specific education for data analytics professionals.

The largest differences in growth rates between this High Growth scenario and the Baseline scenario are in the number of data professionals, the data market, the forward indirect impacts and the induced impacts. It is therefore these factors that are likely to benefit most from the improved conditions, although the other factors are also benefiting.

Challenge scenario

The same approach as for the High Growth scenario is followed for the Challenge scenario, i.e. the IDC characterisation is enriched and modified with Norway-specific information.

Assumptions

The Challenge Scenario presents a less optimistic outlook in which the data market experiences slower growth due to unfavourable geopolitical and macroeconomic conditions. This scenario is characterised by ongoing or worsening global conflicts, leading to continued economic uncertainty and heightened international trade tensions. These conditions are exacerbating inflation, particularly in energy and commodity markets, and contributing to a prolonged period of economic stagnation in Europe.

In this environment, digital innovation is progressing at a much slower pace, with significant disparities between countries. Wealthier countries such as Germany and France continue to invest in digital technologies, while economically weaker countries struggle to keep up, resulting in fragmented data flows across Europe. SMEs in

particular face challenges in adopting new technologies due to limited resources and support, further hindering the overall growth of the data market, especially for Norway, which has a high proportion of SMEs.

The scenario also predicts that the full potential of European digital and data strategies will not be realised. Inadequate implementation of policies such as the Digital Markets Act and the Data Governance Act leads to a lack of common standards and insufficient automation across the Digital Single Market. This creates barriers to widespread data sharing and the development of a cohesive data ecosystem. As a result, the data market remains technology-driven rather than demand-driven, with slow adoption of data innovations and limited growth in the number of data-driven businesses.

Overall, the Challenge scenario envisages a Europe where digital transformation is uneven, with growth concentrated in a few leading economies while others lag behind. The expansion of the data economy is impeded, with lower-than-expected contributions to GDP and a reduced ability to compete on the global stage.

Finetuning of the assumptions

1. In the Challenge scenario, Norway implements the EU regulations later, which could lead to regulatory uncertainty, with negative consequences for the data economy, such as slightly lower ICT spending, less willingness to create new business models and take risks, and fewer pilots taken to scale. This could have a negative trickle-down effect on many aspects of the data economy and its overall contribution to the wider economy.

As in the High Growth scenario, the gap in the percentage of data-using companies estimated by IDC for Norway in the Challenge scenario compared to Denmark and Sweden seems slightly too large, hence the percentage of data-using companies is increased minimally.

Data review - Challenge scenario

In the Challenge scenario, ICT spending is expected to grow in Norway until 2030 at a CAGR of 2.5% compared to 2025. However, this appears to be a slightly optimistic estimate due to the uncertainty surrounding the delayed implementation of EU regulations. The number of data suppliers is forecast to increase at a CAGR of 2.4%, which is around 60% of the increase in the Baseline scenario. The share of data providers would be 6.6% (only -0.1% compared to the baseline due to less companies overall). This also appears to be on the optimistic side, as the uncertainty over the implementation of the EU regulation adds to the reduced incentives and opportunities for data providers to start a data supply business (due to reduced investments themselves).

The number of data users is still expected to increase (CAGR 3.9%), but this is less than half the increase in the Baseline scenario. However, as the total number of companies is expected to decrease more heavily, this would result in 3.8% of the total number of companies being data users, which is higher than in the previous two scenarios. The estimate of data users may be slightly on the optimistic side, but not to a

noticeable extent, as the two different assumptions specific to Norway (uncertainty and a slight increase in data users based on the comparison with Denmark and Sweden) offset each other.

Data monetisation growth is expected to fall sharply (4.1% CAGR until 2030 compared with 11.8% in the baseline), resulting in only 0.24% of the Norwegian GDP. However, even this growth seems slightly optimistic, as uncertainty will also hinder this market. However, this assessment is not quantitatively checked due to the above-mentioned interview inputs used by IDC. For the data market as a whole, the decline is expected to be even more pronounced (0.5% vs. 5.7% CAGR), amounting to 0.86% of GDP. According to the fine-tuning for Norway, this growth could be even lower, as the uncertainties related to, for example, the creation of new business models could hinder expansion; existing data and services sold are unlikely to decrease as they have proven their value, but SMEs (which form a high share of overall companies in Norway) may be reluctant to invest in data-related services. Hence, the introduction of new products and data is also less likely, which could have longer term effects.

Since in this specific case the IDC data on the different impacts do not exactly add up to the total effect of the data economy (3% deviation), it is assumed in the following that the data on the individual impacts are correct. Therefore, the sum of the individual impacts is assumed to be the total effect. Compared to the Baseline scenario, the largest reduction in growth would be for the induced impacts (1.1% vs. 6.8% CAGR), leading to 2.3% of GDP. Worse economic conditions and more uncertainty are likely to lead to a lower multiplier, which is used to multiply the also lower value of the other impacts. This reduction is followed by the direct impacts (1.9% vs. 8.8% CAGR), amounting to 1.1% of GDP. Backward indirect impacts are expected to grow by 1.8% CAGR (1.3% of GDP, lower than EU growth average of 2.2%) and forward indirect impacts by 2.4% (1.5% of GDP). Due to the slightly worsened situation of various parts of the data economy described above, the estimate of the various impacts from IDC also seems to be slightly on the optimistic side.

The data economy as a whole is expected to grow at a very low CAGR of 1.7% and contribute 6.2% (-1.3% percentage points compared to the baseline) to GDP. This also seems too optimistic.

The largest differences in growth rates between the Challenge scenario and Baseline scenario are in the value of the total data market, direct impacts, induced impacts and the number of data professionals. However, the other components of the data economy also grow less.

Annex 3 – Review of the Data Act

The European Union (EU) has introduced a framework of several legislative measures aimed at regulating the data economy and fostering innovation while upholding individual rights. These include the Data Governance Act (DGA), the Data Act, and the AI Act.

The DGA[142] is a cross-sectoral instrument aiming to regulate the reuse of public open data but also protected public data, by providing rules and safeguards to facilitate such reuse. The AI Act[143] aims to foster trustworthy AI in Europe and beyond, by ensuring that AI systems respect fundamental rights, safety, and ethical principles and by addressing risks of very powerful and impactful AI models.

While the DGA focuses on regulating the processes and frameworks that support voluntary data sharing, the Data Act[144] complements it by defining who is entitled to generate value from data and under what conditions. It entered into force in January 2024 and will become applicable in September 2025.[145]

The aim of the Data Act is to create a fairer and more competitive data economy within the EU. This is done by facilitating greater access to and sharing of data generated within the EU, but also by introducing measures to improve data portability and enable fast and fluid switching between data processing services and develop interoperable standards for data to be accessed, transferred and used. Furthermore, it introduces safeguards against unlawful third-party access to non-personal data.

Overall, the Data Act empowers consumers with greater control over data generated by their use of connected products, and facilitates the access to, use and portability of this data. Between businesses fair, reasonable, and non-discriminatory rules for mandatory data sharing are set, allowing for reasonable compensation to data providers.

- Articles 1, 2 and 3 relate to connected products (IoT) and the obligations on manufacturers to ensure that data gathered by these products are available to consumers using these products. Article 2c) is highly relevant for Norway as this concerns the on-device or remote storage of collected IoT data which occurs often on vessels due to expensive satellite communications.
- Articles 4 and 5 ensure that data users have access to the data generated by their connected devices and related services, taking into account the security

142 Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act).
143 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act).
144 Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act).
145 cf. https://commission.europa.eu/news/data-act-enters-force-what-it-means-you-2024-01-11_en (20.09.2024).

requirements of the product, but also trade secrets and the protection of personal data. Also, the sharing of collected data with third parties is limited to the fulfilment of the data holder's contract with the user.

- Article 7 is interesting for SMEs in Norway as it alleviates the obligations on data holders in Articles 3-6 for connected products and related services provided by micro or small enterprises. The same applies to 'fresh' medium-sized enterprises that have recently been qualified as such (within one year) and to connected services provided within a one-year period.
- Article 9 describes that the compensation for making the data available shall be non-discriminatory, reasonable and may include a margin. Interesting for SMEs in Norway is clause 4, which states that for SMEs this shall not exceed costs incurred.
- Article 10 is about the dispute settlement bodies which have to be established for data users, holders and recipients, but also for customers and providers of data processing services. These bodies shall make available public annual reports containing the filed disputes, their outcome and upon choice, recommendations on how to avoid problems. This could be a practical way of clarifying potential issues in Norway.
- Article 11 concerns the technical protection against unauthorised use or disclosure of data. It avoids the misuse of insights derived from obtained data and even obliges the withdrawal of product and services derived from that knowledge. This could tackle the concerns in Norway to share certain (IoT) data which was tightly linked to product/service development, but only in the EU area and not by US firms.

The Data Act contains articles (23 to 32) regarding obligations on providers of data processing (DP) services and rights for users thereof to ensure that effective switching is enabled via transparency on migration procedures, cost-based migration charges, functional equivalence for IaaS services and data and application portability. Furthermore, interoperability for cloud service of the same service type is obliged (to enable hybrid clouds). This could be relevant in the near future if more customers want to use hybrid cloud solutions and/or the cloud market position of certain providers is deemed too dominant.

A larger application developer noted that standardisation and standard data models also help to increase the interoperability between cloud providers. The Data Act addresses this, among other things, with an obligation to ensure interoperability between data processing services of the same service type for PaaS and SaaS in Articles 34 and 35. An interviewee also suggested that the relevant authority could drive this by requiring cloud providers to report on their compliance with this.

In respect to switching between DP providers, there were several remarks in Norway:

- IoT start-up: although being cloud agnostic, at some point you will make a choice for a certain cloud provider and there is always a certain lock-in due to specific formats or techniques used. Switching is supported, but the customer still has to do the migration themselves, which requires huge technical expertise to be covered and related costs. This can be an issue for SMEs in Norway.
- Application developers: the amount of data shifting from one cloud to another in a hybrid setup depends on how you structure your software and if done properly, the cost of switching cloud providers is not as high as people have been saying. Cloud agnostic solution design can be realized through clever software design and open APIs.
- DP service provider: cloud interoperability can be realized in different ways - between clouds, but also at the application level. At the application level, this can be realized faster but costs more effort for the developer and creates a certain lock-in for the end customer. A large ICT provider noted that in its view interoperability between clouds is not so much of a problem, but more a matter of technical preparation. Internally, the issue of different data formats due to older systems is more of an issue, which is solved by a common data model across the company.

Overall, the Data Act seems to complement the existing national strategies for data sharing and/or the data economy in general. The upcoming new data sharing law (for public data) could overlap with the Data Act as this regulation is cross-sectoral. Furthermore, existing detailed obligations like for example the standard license for open government data (NLOD) would need to align with the upcoming detailed obligations for data holders in the Data Act.

Furthermore, it is observed that in Norway there are already various (semi-) government entities active in the area of data sharing like the Ministry of Digitalisation and Public Governance, but also the Research Centre for sharing of Data. Coordination, if not already happening, would be good.

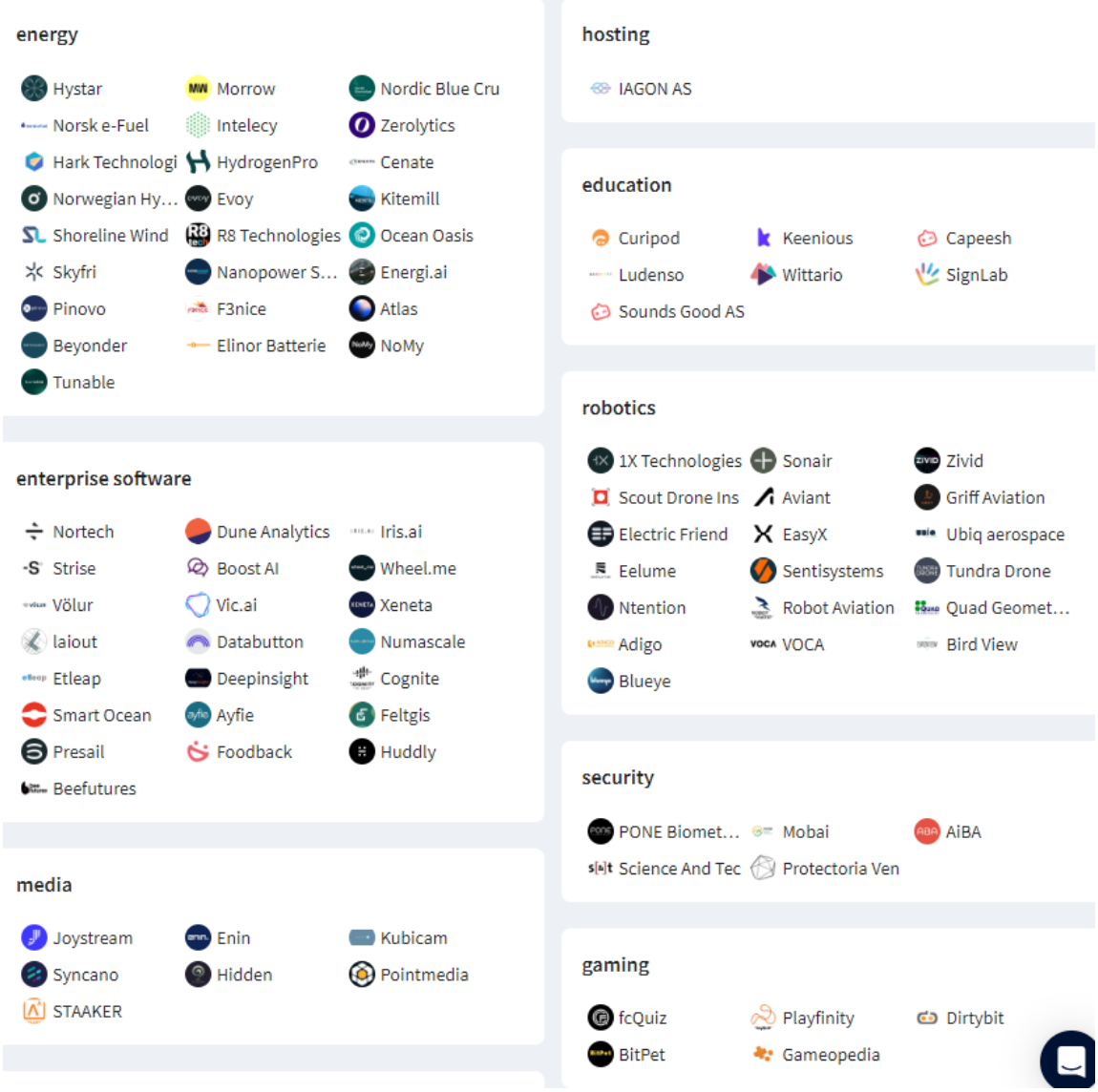
There is a government-appointed committee looking into the implementation of the Data Act among other things. In their report NOU 2024:14 as mentioned above, the committee concludes that the EU's regulations in the digital area, and which will apply to Norway through the EEA agreement, speak for a more holistic approach of the national supervision in the digital area; Both the Data Act, the Digital Services Act and the Artificial Intelligence Act contain requirements for an independent supervisory function with approximately the same expertise.

Annex 4 – Quantitative data

Description	Source	Comments	Link
European Data Market Monitoring Tool	European Commission	Important and relevant study (CNECT/LUX/2020/OP/0027–VIGIE 2020-0655). Excel files containing EFTA/EEA data (Norway, Lichtenstein, Iceland) for different scenarios (baseline, challenged, high-growth) and relevant indicators.	https://digital-strategy.ec.europa.eu/en/library/results-european-data-market-study-2021-2023
DESI		See for dig skills – DESI graphs	
ICT sector data and digital skills	Eurostat -	Data on the ICT sector and digital skills. (e.g. % of ICT sector in gross value added, % of ICT personnel on total employment, % of individuals with basic or above basic digital skills, etc.) See Statistics | Eurostat (europa.eu)	https://ec.europa.eu/eurostat/web/main/data/database (Example: https://ec.europa.eu/eurostat/databrowser/view/tin00074/default/table?lang=en&category=t_isoc.t_isoc_se)
European data flow monitoring tool	European Commission	Data on volume and economic values of enterprise cloud-based data flows (ECBDFs) across the European Union, EFTA/EEA countries and the UK. – Enterprise/workforce in cloud uptake-using enterprise – Volume and destination of enterprise cloud data flows – Volume and economic value of enterprise cloud data flows from EU to non EU – Economic value of enterprise data flows – For years 2023..30	https://digital-strategy.ec.europa.eu/en/policies/european-data-flow-monitoring and https://digital-strategy.ec.europa.eu/en/library/data-flow-and-economic-value-eu-framework-modelling-update-and-data-collection
Statista Market Insights	Statista	WIK has access to a professional commercial Statista account allowing us to inspect country specific data for the technology sector categorized by e.g.: data centres, devices, IT services, public cloud, artificial intelligence, cybersecurity, internet of things, robotics etc.	https://www.statista.com/outlook/
National data catalogue	Digitalisation Agency Norway	Public website providing an overview of descriptions of datasets, concepts, APIs and information models available in Norway. The content is supplied by various establishments, both public and private.	https://data.norge.no/datasets
Statistics Norway	Statistics Norway	Official statistics on different sectors, job-market, and population. (e.g. public support for R&D, innovation in the business enterprise sector)	https://www.ssb.no/en
OECD Data Explorer	OECD	Multiple statistics available based on the reference area Norway. (e.g. Digital Services Trade Restrictiveness Index, consumer survey data and very detailed and specific data on AI)	**General country data:** https://data-explorer.oecd.org/ **AI related data (click):** • **jobs-and-skills** • **VC investments by industry** • **AI research over time / country**
Norway Ecosystem Platform	Dealroom	This data platform gathers intelligence on startups, innovation, high-growth companies, ecosystems and investment in Norway. The platform allows for very fine granular filtering on data economy relevant categories. The European DATA Market Study 2021–2023 – EU Data Landscape report relies on this source). WIK does NOT have a commercial account for this provider. Therefore, its use will be limited in this project. However, WIK will use the free version of this data platform to identify relevant industry segments and relevant companies for interviews.	https://norway.dealroom.co/intro

Annex 5 – Dealroom output, overview of start-ups and scale-ups using data technologies in Norway per sector- as of October 2024

Source: Companies | Norway Startup Ecosystem (dealroom.co)



Alginor ASA
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Oivi
Picterus
Nordic Brain te
Invivo
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ECG247
Mode Sensors
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Resani
ExAC

transportation

Maritime Roboti
Podbike
Sparkpark AS
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Massterly
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Reltime
Semine
7Analytics
Quantik
FRiD
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Wakandi Group
Lucidtech
Inin
Capassa
Defispot
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Marketer Tech…
Factiverse
Pickr.AI
Rail Complete
WAU Solutions
ThumbAd
EIR of Norway

food

Saga Robotics
Nofence
optimeeringa…
ACT Cooperative

real estate

Findable
Carbon Crusher
Defigo
Fremby
Vixel
Consigli
Space Norway
Saferock.
Areo

home living

Airthings
RØST coffee AS
lilbit

sports

Be Your Best

semiconductors

Lace Lithograph
sensiBel
Equanostic
ONiO
Scale Protectio
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CHIP NANOIM…
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North Invent
AUROTECH UL…
MEMSCAP
BIOSORT AS
Fabriscale

music

Masterchannel
Nexro

telecom

Domos

legal

Lexolve
Orixe

jobs recruitment

Mojob
Ebber

engineering and manufacturing equipment

Depro AS
Sensorlink Bil

consumer electronics

MovieMask
Briks

space

Solstorm Rocket