



Norwegian Ministry  
of Education and Research

Summary

Meld. St. 4 (2018–2019) Report to the Storting (white paper)

# Long-term plan for research and higher education 2019–2028





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*Recommendation of 5 October 2018 from the Ministry of Education and Research,  
approved in the Council of State on the same day.  
(Solberg Government)*

## 1 Government policy for research and higher education

### 1.1 **Ambition**

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The Government is working to facilitate growth in overall value creation, create new profitable jobs, restructure the Norwegian economy and implement the transition towards a greener society. It is important to fulfil Norway's climate obligations and take part in the joint global effort to facilitate widespread sustainability. As the digital transformation gains momentum, it is essential to create an inclusive working life in which all individuals can continue to play a part. The Government will take steps to reduce poverty and boost integration, to encourage its citizens to get involved and to build an active civil society.

Research and higher education play a key role in the development of a society that is environmentally, socially, culturally, economically and politically sustainable. Adequate knowledge is a prerequisite for taking decisions that make it possible to sustain prosperity and welfare, preserve a planet at risk of overload and protect fundamental values such as freedom and democracy. The

Government has high ambitions for Norwegian research and higher education. Norway will invest in knowledge as a means of preparing for the future; establishing new, green and profitable jobs; and creating a better, more effective public sector. High-quality education must therefore be made available to all who seek it. High-quality education and research are crucial to ensuring a viable working life and business sector, and the continued, stable development of the Norwegian welfare society.

But knowledge development is driven by more than goals and targets; in many cases, it is curiosity-driven research that has led to the most extraordinary results. It takes time to accumulate knowledge, which is why it is necessary to employ a long-term perspective and be willing to allocate the necessary resources. Norway needs to have a world-leading academic and research community that helps to generate knowledge that can give people better, richer lives.

Climate change is the defining challenge in the world today, and this is reflected in the priori-

ties set out in this long-term plan. This is an area that requires international cooperation toward common goals. The Sustainable Development Goals adopted by the UN member states in 2015 provide direction for these efforts and constitute an important part of the framework for the long-term plan.

In keeping with its political platform, the Government will increase investments in higher education and research and establish mechanisms for ensuring that new knowledge is put to use. The Government will focus on the entire spectrum of research and educational institutions and encourage greater interaction and cooperation between public and private research actors. A combination of diversity and quality is called for: While different actors need to have different capabilities, they must all aspire to achieve equally high quality. The Government's long-term plan for research and higher education provides objectives and priorities to support these efforts.

## 1.2 Further escalation of efforts

For the upcoming long-term plan period, the Government is launching three new plans for escalating appropriations:

- NOK 800 million for an initiative to boost technology;
- NOK 450 million for R&D on renewal and restructuring in the business sector;
- NOK 250 million for activities to enhance quality in higher education

The escalation plans will incorporate measures on the budgets of multiple ministries.

### *Technology initiative*

Focus areas of particular relevance in this context include:

- the enabling and industrial technologies, especially basic ICT research and ICT security;
- increased admission capacity for students in technology subjects;
- technologies that will contribute to the green shift in the economy;
- technologies for a better and more efficient public sector;
- e-infrastructure for open research.

In 2019, the Government is proposing a total of NOK 260 million for follow-up of this escalation plan.

### *R&D on renewal and restructuring in the business sector*

Focus areas of particular relevance in this context include:

- basic allocations for the technical-industrial institutes;
- research training for the new business sector;
- measures for increased commercialisation, research-based innovation and industry-oriented research.

In 2019, the Government is proposing a total of NOK 136 million for follow-up of this escalation plan.

### *Enhanced quality in higher education*

Focus areas of particular relevance in this context include:

- strengthening programmes for quality in higher education at the Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education (Diku);
- measures to promote better and more workplace training, primarily in the municipal sector for health and social care students;
- teaching and learning venues.

In 2019, the Government is proposing a total of NOK 85 million for follow-up of this escalation plan.

In this long-term plan, the Government also presents a comprehensive policy for development, management and priorities for planning the building stock and campuses of Norway's higher education institutions. The Government expects the university and university college sector to view buildings as an input factor in the same way as other resources in research and higher education, and to continuously assess the need for development and maintenance. The Government also expects investments in university and university college buildings to be cost-effective, but at the same time to play a role in innovation and environmentally friendly solutions. The Government expects the university museums, with their unique collections of importance for Norwegian history, culture and identity, to be safeguarded. The Government proposes to allocate NOK 161 million for adaptation and upgrades of teaching and research venues at universities and university colleges in 2019. This is an increase of NOK 86 million, of which NOK 50 million is included as part of the escalation



plan for enhanced quality in higher education. See Chapter 8 for a more detailed discussion.

### 1.3 Objective of the long-term plan

The Government's first *Long-term plan for research and higher education 2015–2024* was presented together with the 2015 national budget. The long-term plan sets out ten-year objectives and priorities as well as more concrete goals for efforts in the upcoming four-year period. The plan is revised every four years to accommodate changes in the political and societal landscape. The revised long-term plan still has a ten-year perspective (2019–2028), with a specification of goals and priority areas for the upcoming four-year period.

The long-term plan will set the course for policy development and investments in research and higher education. Long-term, prioritised efforts provide a predictable framework for research and education communities and promote better coordination of policy. In this long-term plan, the Government sets out the areas it believes will be particularly important to focus on in a national perspective. There will be increasing pressure on public budgets in coming years, and this plan is to serve as a tool for setting priorities in periods of weaker growth as well. The Government expects the universities, university colleges, health trusts and research institutes that receive public basic funding to use the long-term plan as a basis for formulating their own strategic priorities as far as their authority extends. The same applies to the Research Council of Norway and other public agencies within the research and innovation system.

### 1.4 Structure of the long-term plan

Some 130 written comments were received from research and higher education institutions, policy agencies, interest organisations, the private sector and public entities in connection with the revision of the plan. This input shows broad support for the long-term plan as a tool, as well as for the objectives and priorities in the initial plan.

The objectives and long-term priorities remain largely unchanged in the revised long-term plan. The three overall objectives are:

- enhancing competitiveness and innovation capacity;
- tackling major societal challenges;

- developing academic and research communities of outstanding quality.

Buildings, equipment and other infrastructure are a vital input factor for achieving the overall objectives of Norway's research and education policy. When the Storting reviewed the first long-term plan, it adopted the following decision: «In connection with the revision of the long-term plan in 2018, the Storting asks the Government to prepare an investment plan with a queue system for investments and large-scale building and maintenance projects for buildings in the university and university college sector.» The Government's policy for development, management and priorities for building stock and campuses of Norway's higher education institutions is included in the revised long-term plan, cf. Chapter 8.

As part of the basis for revising the long-term plan, the Ministry of Education and Research commissioned the OECD to conduct a review of Norwegian research and innovation policies. The report from the OECD was presented in June 2017. One of the recommendations from the OECD was to change the structure of the long-term plan.<sup>1</sup>

The Government has chosen to adjust the structure in line with the recommendations of the OECD. The first long-term plan had six long-term priority areas. Two of these, «Innovative and adaptable industry» and «World-leading academic groups», overlap with two of the overall objectives, «Enhanced competitiveness and innovation capacity» and «Developing academic communities of outstanding quality», respectively. To promote greater clarity in the revised plan, these two long-term priorities have been incorporated more directly into the overall objectives and are no longer represented as separate priorities. This is partly to give the general objectives a clearer scope and partly to make it easier to identify the overall objectives versus the thematic areas of particular strategic significance for Norway.

The overall objectives concern Norwegian research and higher education as a whole, while the long-term priorities reflect areas where Norway has a competitive advantage or a special need for knowledge. The four other long-term priorities in the first long-term plan remain unchanged.

In addition, the Government has introduced a new long-term priority, «Societal security and social cohesion in a globalised world», based on

<sup>1</sup> OECD *Reviews of Innovation Policy: Norway, 2017*

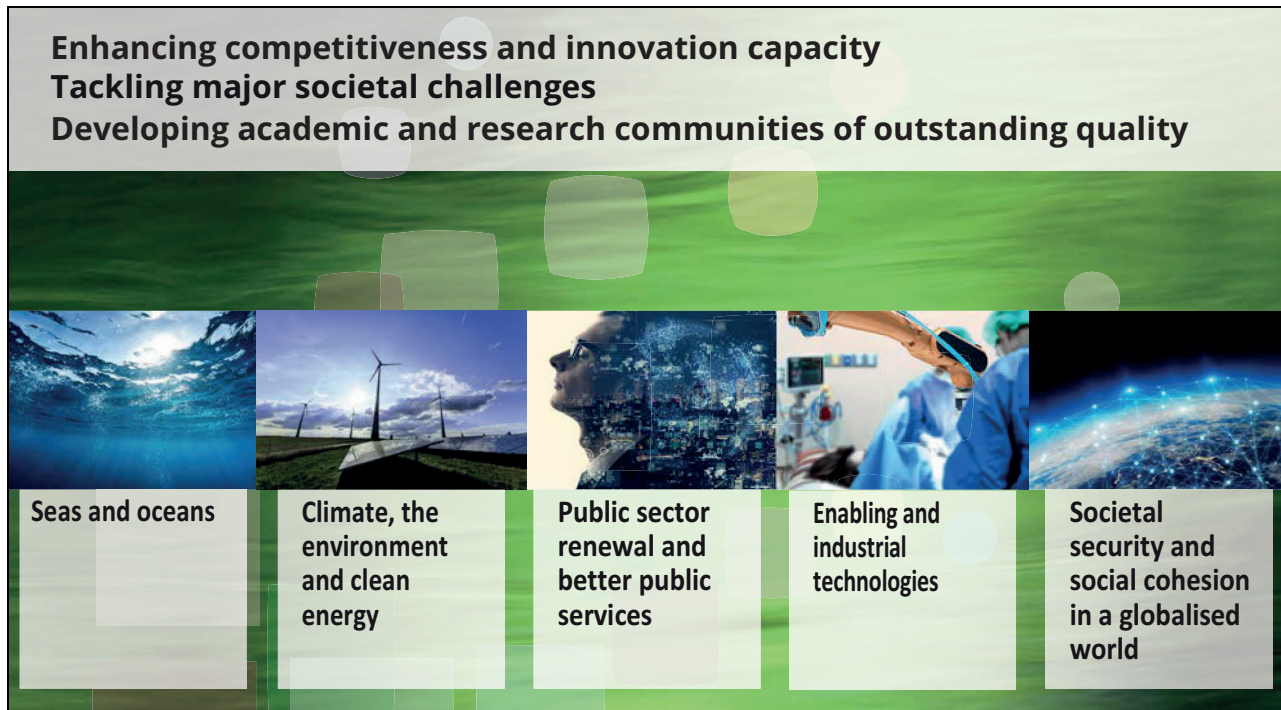


Figure 1.1 Overall objectives and long-term priorities in the revised long-term plan

the trends described below and input to the revision process.

The Government has also changed the name of the long-term priority «Enabling technologies» to «Enabling and industrial technologies», to clarify that this priority also covers advanced production processes. The EU Framework Programme for Research and Innovation, Horizon 2020, employs a unified view of enabling technologies and advanced production in the «Leading Enabling and Industrial Technologies (LEIT)» programme. The substance of this priority is in keeping with the initial long-term plan (ICT, biotechnology, nanotechnology and advanced production).

In keeping with its political platform, the Government will increase appropriations to research and higher education. The Government's priorities are based on the long-term plan's three overall objectives and the following five long-term priorities, described in more detail in Chapters 3–7:

- Seas and oceans
- Climate, the environment and clean energy
- Public sector renewal and better public services
- Enabling and industrial technologies
- Societal security and social cohesion in a globalised world

## 1.5 Trends and new perspectives

One of the reasons for revising the long-term plan every four years is that it needs to be updated to accommodate societal developments and new political priorities. The world has changed in fundamental ways since the first long-term plan was presented. This applies both in terms of political decisions, such as accession to the Paris Agreement and the UN 2030 Agenda, and in terms of general trends such as technological change and increased digitalisation.

### 1.5.1 Sustainable Development Goals

The 2030 Agenda with its Sustainable Development Goals was adopted by the UN member states in 2015 and consists of 17 global goals for sustainable development. Many indicators are pointing in the right direction. For example, more than a billion people were lifted out of poverty between 1990 and 2015. While the Sustainable Development Goals are intended to help to eradicate extreme poverty, they do not apply to developing nations alone. The Agenda is based on a different understanding of development from the previous Millennium Development Goals, which the Sustainable Development Goals have replaced. Development is seen as comprising more than financial growth. Sustainable development



Figure 1.2 The Sustainable Development Goals

Source: United Nations Association of Norway

involves assuming responsibility for the totality of a country's policies. Achieving the Sustainable Development Goals will require new knowledge from the entire spectrum of subject fields. The Sustainable Development Goals are an integral part of all areas in the long-term plan.

The Sustainable Development Goals view the environment, the economy and social development as interconnected. The 2030 Agenda therefore represents an invitation to collaborate across sectors, and a challenge to approach sustainable development from a new perspective. An integrated approach to the Sustainable Development Goals will yield benefits both nationally and internationally. In the Government's view, the Sustainable Development Goals are a crucial component of dealing with the global challenges of today, and will play an active role in how these are followed up.

Universities and university colleges have a major role to play in following up the sustainable development agenda through both education and research. In 2017, the University of Bergen launched «SDG Bergen»,<sup>2</sup> a new mechanism for linking together the need for new knowledge for sustainable development with multidisciplinary research communities through science advice. The university has also taken the initiative for a

national committee for Agenda 2030, and several universities and university colleges have developed their own sustainable development strategies or integrated the Sustainable Development Goals into other internal strategies. For example, the new strategy of the Norwegian University of Science and Technology includes active efforts to help to achieve the Sustainable Development Goals as part of the university vision.<sup>3</sup> The university website highlights concrete education, research and innovation activities that are targeted toward the 17 goals.<sup>4</sup> Potential students can choose study programmes based on the goals they wish to work to achieve. The University of Oslo has established the «Oslo SDG Initiative».<sup>5</sup> Students, lecturers and researchers will be a pivotal factor in the effort to achieve the Sustainable Development Goals.

The Research Council of Norway's main strategy, *Research for Innovation and Sustainability 2015–2020*, shows that Norway is in a good position to supply research that will promote achievement of the Sustainable Development Goals. The Research Council will prioritise sustainability in

<sup>3</sup> NTNU *Strategy 2018–2025 Knowledge for a better world*. 2017

<sup>4</sup> See <https://www.ntnu.no/baerekraftmaal>

<sup>5</sup> See <http://www.sum.uio.no/english/research/groups/oslo-sdg-initiative/>

<sup>2</sup> <https://www.uib.no/sdgbergen>

its funding of research and development, will further develop instruments that target the sustainability challenges and strengthen the sustainability perspective in international cooperation.<sup>6</sup>

The Government has delegated responsibility for the 17 Sustainable Development Goals, with associated sub-goals, to the respective sectoral ministries. In its budget proposal to the Storting, each ministry provides a report on current national initiatives and Norway's international contributions toward realising these goals. The Ministry of Finance compiles an annual summary of follow-up of the Sustainable Development Goals in the national budget. The Ministry of Foreign Affairs coordinates the international follow-up of goals through its report to the annual session of the UN High-Level Political Forum (HLPF).

### 1.5.2 The transition to a green society

According to projections from the UN, the population of the world will reach nine billion by 2050. The population increase will lead to higher demand for food and energy and greater use of land area and natural resources, with a potential for more pollution to air, sea, soil and water. The inherent challenge is that the same limited natural resources must provide a basis for food security, energy security and sustainable development for current and future generations. In its report on the European environment, the European Environment Agency points out that if Europe is to live well within ecological limits, there must be fundamental changes in the systems of production and consumption, which are the root cause of environmental pressures.<sup>7</sup> The greatest environmental challenges are climate change, loss of biodiversity and the spread of hazardous substances that accumulate in food chains and can have a negative impact on human health. Loss of natural and cultural history capital also poses a challenge.

It is necessary to implement a shift towards a greener society. In 2017, the global temperature was about 1°C higher than pre-industrial levels. According to the Intergovernmental Panel on Climate Change, global warming could increase by more than 4°C by the end of this century if emissions of greenhouse gases are not significantly curtailed. Even if countries around the world meet the commitments of the Paris Agreement (see

below), global warming could reach 3°C by 2100 compared to pre-industrial levels. This far exceeds the temperature goals in the Agreement. If the world does not succeed in cutting emissions in coming years, there is a high risk that the resulting climate changes will have serious, wide-ranging ramifications. More extreme weather events, such as heatwaves, droughts and heavy rain, as well as warmer, more acidic and rising seas, will have direct implications for Norway. Moreover, transnational climate change affects Norway indirectly in the form of more expensive imports, increased migration and upheaval in financial markets.<sup>8</sup>

Agreement was reached on a new global and legally binding climate agreement in Paris in December 2015. The number of countries ratifying the agreement is increasing steadily, and as of October 2018 there are 180 signatories. Through the Paris Agreement, Norway is committed to reducing its emissions of greenhouse gases by at least 40 per cent by 2030, compared with 1990, and a statutory goal is in place to become a low-emission society by 2050. Norway is in dialogue with the EU on joint fulfilment of the emissions target for 2030. Achieving the climate targets will require changes in all sectors of society – particularly within transport, oil and gas production, industry and agriculture. This is also an important message in the Government's plan for university and university college buildings, cf. Chapter 8, which specifically addresses green campus development.

Norway's input to the EU's ninth Framework Programme for Research and Innovation, Horizon Europe, attaches considerable importance to promoting the transition to a green society based on the Sustainable Development Goals and the Paris Agreement. Technology will play a key role in reaching the climate targets. There is a widespread need for research in order to further develop technological solutions, and to learn more about the impact of various policy instruments and how to design these to obtain the necessary overall effect. Together with 22 other countries and the European Commission, Norway is participating in «Mission Innovation», an initiative

<sup>6</sup> See also *Research for Sustainable Societal and Industrial Development*, the Research Council's Strategy for Sustainability, 2017–2020. 2017

<sup>7</sup> <https://www.eea.europa.eu/soer>

<sup>8</sup> United Nations Environment Programme, *The Emissions Gap Report 2017: Executive Summary*. [https://wedocs.unep.org/bitstream/handle/20.500.11822/22101/EGR\\_2017\\_ES.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/22101/EGR_2017_ES.pdf?sequence=1&isAllowed=y)  
*Consequences for Norway of transnational climate impacts*, Norwegian Environment Agency 2018 <http://www.miljodirektoratet.no/no/Nyheter/Arrangementer/Grønneover-skridende-klimarisiko/>

launched during the 2015 Paris Climate Conference to accelerate technology development for clean energy. One important element is that all participating countries must seek to double their investments in the development of new environment- and climate-friendly energy technology over a five-year period.

Climate change is caused by human interventions and activities and affects all segments of society: from culture and communication to economics and politics. In-depth knowledge about people, culture and society is essential to understanding how challenges can be addressed, why resistance and conflicts relating to change arise, and how such conflicts can be resolved in a manner that yields solutions that work. Thus, humanities and social sciences have an important role to play in the effort to achieve climate targets.

Education, research and innovation that can promote the achievement of climate targets will be given priority moving forward. Norway has a number of strong academic and research groups in this field.

### 1.5.3 Digitalisation

New waves of technological developments will fundamentally change the way people work, live and interact. While the exponential expansion in processor and storage capacity is not a new phenomenon, these changes are having a significantly greater impact. Combined with strong growth in bandwidth and reduced costs for data storage, these developments open the door to entirely new opportunities and perspectives.

Digitalisation involves using technology to renew, simplify and improve. It lays a foundation for increased value creation and innovation and can help to boost productivity in the private and public sectors. It is the simultaneous development within the enabling technologies that is driving digitalisation and creating a potential for transformation and growth.<sup>9</sup> The transition to new systems within a digital infrastructure leads to changes in business models, production methods, goods and services. This in turn forms the basis for new products and solutions.

At the same time, increased digitalisation leads to a shift in the societal risk picture. Vulnerability increases due among other things to the complexity of ICT systems and a lack of analogue or manual back-up solutions. Digitalisation also

provides a breeding ground for new forms of crime that are often transboundary and difficult to investigate and prosecute. Vast amounts of personal data accumulated through the use of digital technology can be exploited in marketing, including in a political context. This creates challenges relating to protections of personal privacy, ownership of and rights to data. The new Norwegian Personal Data Act, which implements the EU General Data Protection Regulation (GDPR), entered into force in July 2018. This will play an important role in safeguarding the rights, obligations and instruments required to maintain the pace of digitalisation without a loss of public trust.

Increasing digitalisation changes the need for knowledge and expertise in society. Growth in productivity is contingent on businesses and individuals that are capable of restructuring, and Norway's competitiveness largely depends on the ability to take advantage of and utilise technology developed in other countries.<sup>10</sup> A high level of knowledge and competence together with openness to the outside world will facilitate the use of new ideas and technologies. At the same time, automation of work processes may cause the elimination of routine tasks, which will have implications for the kinds of competence that will be sought in the labour market and for the structure of the economy. A high level of professional and academic expertise will be called for.

Fundamental digital competence is necessary for everyone, and lifelong learning will become even more important in a digital reality characterised by rapid change. Students in higher education must be prepared for a working life under constant restructuring. Good learning skills will be essential for mastering change. Educational programmes must be relevant for society's need for labour and competence in both the short and the long-term, from undergraduate education through continuing and further education. In addition to development and adaptation of educational programmes, it is also important for universities and university colleges to modify their buildings and campuses to facilitate efficient use of digital infrastructure and ensure good learning arenas.

Technology exists within a cultural context that it is also necessary to understand. Humanities and social science experts are important voices in the public discourse on where Norwe-

<sup>9</sup> *Digital21: Digitale grep for norsk verdiskaping [Digital measures for value creation in Norway]*. 2018

<sup>10</sup> Official Norwegian Report (NOU) 2015: 1 *Produktivitet – Grunnlag for vekst og velferd [Productivity – Foundation for growth and prosperity]* – first report from the Productivity Commission; Meld. St. 27 (2016–2017) *A greener, smarter and more innovative industry*

gian society wants to go with technology. Research in the humanities makes it possible to see more of the opportunities that are emerging, and thus to deal with technology shifts in the best possible manner. It is therefore important that the introduction of new technology is supported by research that also addresses ethical and societal issues and impacts. At the same time, natural scientists and technologists must be trained to reflect on their own fields and view them in the overall context of society.

#### 1.5.4 Democratic development and public discourse

The public discourse is characterised by an expanding number of sources and participants. The internet and social media have lowered the barrier to sharing remarks and have come to play an increasingly important part in news coverage and communication. Facebook alone has more than two billion active users, and the platform is an important source of information for many. This is part of a larger picture in which there are actors who seek to make the truth a matter of opinion, and where tools include fake news, alternative news channels and internet trolls. It is challenging for media consumers to distinguish between serious and credible information and more propaganda-like statements.

At the same time, the exposure of users of social media to differing views and nuanced arguments is diminishing, due to individually tailored content among other things. The business model of the largest technology companies – Facebook, Google, Amazon, Microsoft, Apple – is based on obtaining as much data as possible about their users. Through complex algorithms, these data are used to adapt content to the user. The algorithms are considered to be trade secrets and are not publicly available.

Political players have also understood the value of using these data to communicate more targeted messages to users. In the 2016 US election, the British consultancy Cambridge Analytica used Facebook user data in a manner that has since been strongly criticised.<sup>11</sup> This case has contributed to growing scepticism about data-driven political marketing. In July 2018, the UK House of Commons Digital, Culture, Media and Sport Committee published its assessment of how

<sup>11</sup> The case is still under investigation, and the company has been shut down. <https://www.theguardian.com/news/series/cambridge-analytica-files>

fake news influences democracy and the challenges this entails for the authorities in regulating the digital media landscape. Recommendations in the report include increasing transparency, providing training in digital skills through education and conducting more research into the impact of technology on the flow of information and democratic processes.<sup>12</sup>

There are grounds for concern as regards what this development could mean for public trust in research. A critical public discourse requires well-considered, balanced participation, not least from academia. Conspiracy theories, planted news and active attempts to sow discord in the population must be dealt with in a systematic and objective manner. Research results are not always unambiguous, which makes it easy to cast doubt on good research.

Academia has traditionally enjoyed high credibility, but this can no longer be taken for granted. Education and research institutions must work to preserve trust by communicating effectively with the public in a new media landscape. Universities and university colleges, with their fundamental norms for critical and fair discussion, have a responsibility to help to ensure that the public discourse is rooted in knowledge, fact and reliability. Interaction between research and education communities and the public at large has become increasingly important. The principles for Responsible Research and Innovation (RRI),<sup>13</sup> adopted by the European Parliament in 2014, stress the importance of broader civic engagement. This will promote greater openness and trust between research communities and stakeholders in society, and is essential for incorporating new perspectives into research as well. Greater attention in higher education to community involvement and responsibility is also an important part of this perspective.<sup>14</sup>

The education system, from kindergarten through higher education and research, has an important role to play in efforts to develop demo-

<sup>12</sup> *Disinformation and 'fake news': Interim Report*, House of Commons Digital, Culture, Media and Sport Committee (29 July 2018); <https://publications.parliament.uk/pa/cm201719/cmselect/cmcmds/363/36302.htm>

<sup>13</sup> *The Rome Declaration on Responsible Research and Innovation in Europe* states that «Decisions in research and innovation must consider the principles on which the European Union is founded, i.e. the respect of human dignity, freedom, democracy, equality, the rule of law and the respect of human rights, including the rights of persons belonging to minorities.»

<sup>14</sup> The international literature uses the terms «social responsibility» and «civic and social engagement».



cracy, protect human rights, promote gender equality and inclusion and counteract radicalisation. The education system has a particular responsibility for preventing hate speech.<sup>15</sup> It is therefore important to cultivate critical thinking, ethical reflection, digital judgement, democracy and equality within all disciplines.<sup>16</sup> Students must learn to navigate a complex landscape in which it is increasingly difficult – but also increasingly important – to be able to evaluate sources critically and distinguish facts from propaganda. As part of this, they must be given training in research processes and methods.

Alongside functional media, an active cultural sphere and a strong non-governmental sector constitute part of the basis for public discourse and civic engagement, and for the framework of a democratic society. Changes taking place in society, such as digitalisation and the shift in the public discourse mentioned above, also affect cultural life, the media and the way they fulfil their social mission. Such change processes should be explored through research.

### 1.5.5 Norway in the world

In an age characterised by globalisation, international trade, migration and technological change, Norway is part of a global, Western, European and Nordic community. Like other countries, Norway is facing societal challenges that call for knowledge about complex, wide-ranging cultural, social and global change processes. Many of these issues are international or global in essence, and dealing with them will require both comparative perspectives and cooperation with recognised research communities in other countries.

Financial, social and political developments in Europe and other parts of the world affect what is perceived as major societal challenges in Norway. Research that increases understanding of these processes is important. The UK decision to leave the EU may lead to considerable changes for other countries, also where cooperation on education and research is concerned. Much will depend on the agreements the UK reaches with the EU and other partners after Brexit. Another area of major significance for research and higher education is the emergence of China as the world's strongest economy next to the US. China has also become the world's number two research nation

measured in publications. China is defined as one of Norway's prioritised partner countries in the Panorama Strategy. In spring 2018, Norway and China signed an agreement on educational cooperation, and many agreements have also been signed at the institutional level.

Global change processes can lead to uncertainty and weaken social sustainability. There is a need to expand knowledge about risk and vulnerability in light of the ever-accelerating pace of change in society. Climate change, urbanisation and new transportation patterns have led to increased exposure to natural events such as landslides, flooding, storms and extreme temperatures, which in turn may pose threats to the energy and food supply and increase the spread of infectious diseases. Technological change and the ensuing transition to digital management systems have led to new vulnerabilities and risks related to natural disasters, organisational error or human error.

The challenges regarding extremism and the threat of terrorism have grown more complex in recent decades. This development severely tasks society's resources because dealing with it calls for preparedness, security measures and surveillance, which in turn can diminish trust, security and democratic values. There is a need to understand how the authorities can design and implement appropriate measures without disproportionately affecting other important civic values.

Good integrative measures and high labour and civic engagement are crucial for dealing with the problems related to migration, inequality and socio-economic consequences of exclusion and drop-out from education. In an inclusive society, citizens have a high level of trust in each other, in public institutions and in the authorities. Effective, knowledge-based governance and organisation of society is essential in order to prevent conflicts, counteract unacceptable inequalities and safeguard societal security.

## 1.6 Status

### 1.6.1 Norway as a knowledge nation

Norway has a solid basis for further social, financial and cultural development in research and higher education. The level of education among the population is among the highest in the world. According to the 2016 figures from Statistics Norway, 43 per cent of the population between the ages of 25 and 64 had completed higher education. This is on a par with Finland and Sweden, and higher than Denmark. Graduates from higher

<sup>15</sup> *The Government's Strategy against Hate Speech (2016–2020)*

<sup>16</sup> Meld. St. 16 (2016–2017) *Quality Culture in Higher Education*

education are generally well-suited to the labour-market's needs. The regular graduate surveys carried out by the Nordic Institute for Studies in Innovation, Research and Education show that unemployment among master's graduates six months after graduation is generally low, and that the vast majority have found relevant work, although there is some variation in adaptation to the labour market both between disciplines and over time.<sup>17</sup> At the same time, the rapid changes in the labour market mean that there will be an ongoing need for continuing and further education.

Norway is also among the countries with the highest researcher density, although it lags somewhat behind its Nordic neighbours. However, Norway's research and development (R&D) expenditures in the period 2005–2015 rose more than the other Nordic countries. Among OECD countries, only South Korea allocates more than Norway to R&D over the government budget measured as a share of GDP. Scientific publication by Norwegian researchers has moved in a positive direction, particularly over the last 10 to 15 years. Norway is among the countries that publishes the most per capita, and Norwegian articles are cited more frequently than previously compared with the global average. This means that Norwegian researchers have gained a higher profile in the international research community. In the European Commission's annual ranking of innovation performance in European countries, Norway was classified as a «strong innovator» in 2018.<sup>18</sup>

### 1.6.2 Follow-up of the first period of the long-term plan

The first long-term plan for research and higher education was well received. It provided predictability and concrete promises of increased investment in important focus areas over a four-year period. During the period 2015–2018, the plan was followed up with financing totalling approximately

NOK 3.7 billion. This includes both proposed appropriations from the Government and funds allocated in the Storting's budget negotiations in areas of relevance for the goals and long-term priorities of the plan. Among other things, the Storting has allocated funds for additional student admissions within health care, natural sciences and technology, and the annualised effect of this is included in the total. The Government also focused considerable activity on teacher education programmes through a variety of measures in addition to increased student admission. These efforts are also of relevance to the long-term plan, but have not been included in the figures for the overall follow-up.

In total, R&D allocations increased by NOK 7.3 billion during the four-year period. Overall R&D allocations include funds for research and development in subordinate agencies and construction projects in the university and university college sector over the budget of the Ministry of Local Government and Modernisation.

A different means of measuring research activities is to calculate the total research expenditures, as is done in the national research statistics which form the basis for the Research Council's report *The Norwegian research and innovation system: Statistics and indicators*, among other things. The figures in these statistics are obtained by asking research organisations to estimate their total expenses on research according to specific rules, including the share of the expenses that fall within pre-defined categories. These figures thus do not indicate allocations, but rather estimated research expenditures. With the introduction of the long-term plan in 2014, the statistical categories were changed to be better aligned with the thematic areas in the plan. It is thus impossible to compare research efforts in the various areas directly with previous years, but the figures for 2015 will be the point of departure for subsequent comparisons.

The target of increasing public allocations for R&D to one per cent of GDP was reached as early as in 2016. In the final 2018 budget, provisional public appropriations for R&D as a share of GDP are estimated at 1.01 per cent, or 1.22 per cent of mainland GDP. However, there is still some way to go before the target of three per cent of GDP allocated to R&D is reached. In 2016, overall R&D investments, both public and private, accounted for 2.03 per cent of GDP. This is a substantial increase from the 1.46 per cent from 2006, but is still considerably lower than the other Nordic

<sup>17</sup> Since 1972, the Nordic Institute for Studies in Innovation, Research and Education has been commissioned by the Ministry of Education and Research to carry out surveys among graduates of universities and university colleges regarding success in the labour market. Surveys examine the scope of employment, unemployment, where they graduates work, their occupation, their income, etc. In recent years, the survey has also included questions about their assessment of the quality and relevance of their education.

<sup>18</sup> The European Innovation Scoreboard 2018 classifies countries as either «Innovation leaders», «Strong innovators», «Moderate innovators» or «Modest innovators». All of Norway's Nordic neighbours are classified as «innovation leaders», along with the UK, Luxembourg and the Netherlands.



countries, where the share is around three per cent.<sup>19</sup>

In the first version of the long-term plan, the Government committed itself to augmenting some of the most important input factors for research and higher education. The Government launched three escalation plans for the four-year term:

- increase the number of doctoral fellowships by 500 new positions;
- increase allocations to research infrastructure by NOK 400 million;
- raise allocations to programmes that promote Norwegian participation in the EU Framework Programme for Research and Innovation, Horizon 2020, by NOK 400 million.

The escalation plans were completed in the 2018 national budget.

#### *Doctoral fellowships*

The targets of the escalation plan for doctoral fellowships have been surpassed, with earmarked allocations for a total of 624 new fellowship positions in the course of the four-year period. Of these, 237 positions were in the science, technology and mathematical disciplines (STEM disciplines), of which 68 had a focus on ICT, including ICT security and cryptology. A total of 347 have been established with academic requirements that comprise or could comprise STEM elements, e.g. within health and social care, teacher education and engineering. There were 40 positions distributed between the disciplines of nursing and art or without academic requirements. A total of 54 positions have been allotted to the research institute sector, 34 to private higher education institutions and 25 to the schemes for private and public sector Ph.D.'s.

#### *Research infrastructure*

The escalation plan in the first version of the long-term plan has been followed up with increased allocations totalling NOK 400 million in the course of the four-year period. This funding has primarily gone towards enhancing the national research infrastructure initiative under the Research Council of Norway in keeping with the Norwegian Roadmap for Research Infrastructure. It also covers participation in joint European infrastructure projects. The objective of the national initia-

tive is to build research infrastructure that can serve multiple research groups and contribute to research and innovation at the international forefront in areas of importance for Norwegian society. Funding is awarded through a national competitive arena, and there is keen competition for grants. In 2017, the Research Council funded a total of 19 projects with an overall cost framework of NOK 1 billion. A total of 92 projects applied for funding in that application round.

#### *Programmes that promote Norwegian participation in the EU Framework Programme for Research and Innovation*

The escalation plan in the first version of the long-term plan has been followed up with increased allocations totalling NOK 400 million in the course of the four-year period. The majority of the increase was used to strengthen the STIM-EU scheme at the Research Council. Established in 2012, the STIM-EU scheme is designed to encourage research institutes to apply for research funding from the EU Framework Programme for Research and Innovation, Horizon 2020, to take on the role of coordinator and to seek cooperation with the Norwegian private and public sectors in EU projects. Some of the funding from the escalation plan has been used to establish a separate stimulation scheme for health research, HELSE-EU. The objective of this scheme is to increase the participation of Norwegian health researchers in Horizon 2020 activities and to enable Norwegian health research groups to compete successfully for H2020 funding. Correspondingly, the PES2020 project establishment support scheme is a strategic funding scheme that helps to alleviate costs for universities, university colleges, research institutes and regional health authorities applying for EU funding, as well as to increase general competence with regard to participation in Horizon 2020 activities. The Government's target is for Norwegian research groups to be awarded two per cent of the competitive funds under Horizon 2020. In June 2018, this share amounted to 2.03 per cent. The amount will vary over time, however, so it is important to continue to monitor future developments. It is the view of the Government that these stimulation instruments must be given time to have an impact before any changes are considered.

#### *Long-term priorities*

The six long-term priorities in the first long-term plan have been followed up with roughly NOK 2.2

<sup>19</sup> *Research Barometer 2018*

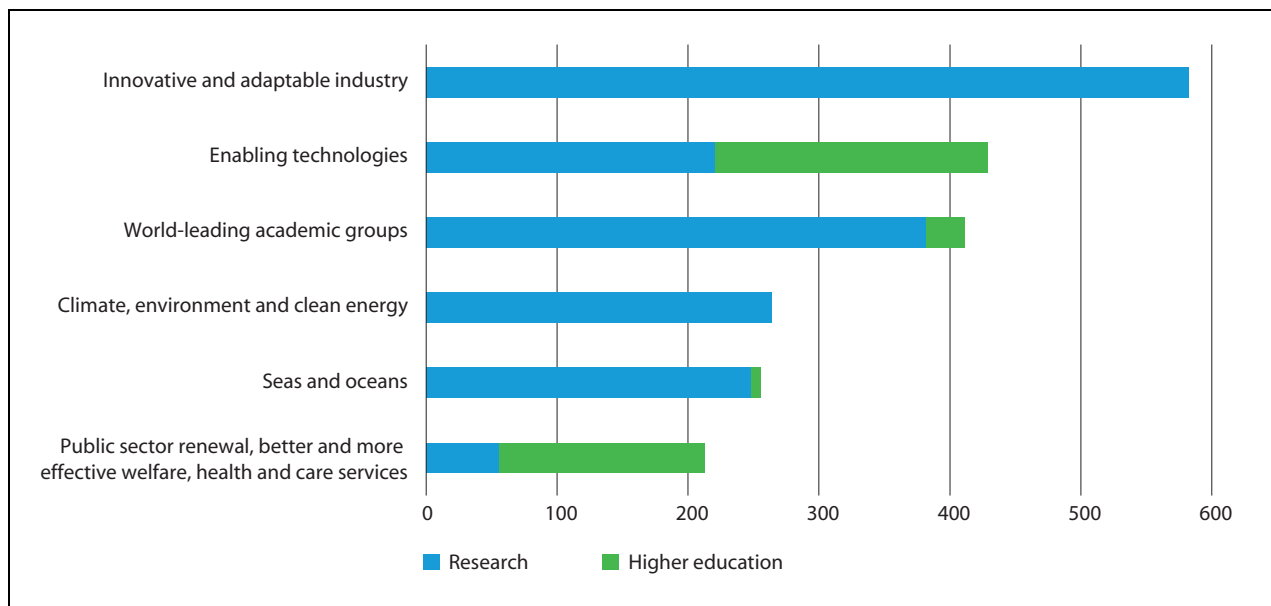


Figure 1.3 Overall growth in allocations for long-term priorities in the long-term plan, 2015–2018. NOK million.

billion in increased allocations. The growth has been greatest for the priorities «Innovative and adaptable industry», «Enabling technologies» and «World-leading academic communities». The priority relating to the public sector received the least extra funding, cf. Figure 1.3.

#### *Two prioritised construction projects*

Functional buildings are crucial to the quality of research and education. In the first version of the long-term plan, the Government gave special priority to two construction projects of particular importance to achieving the plan's objectives:

- New building for life science at the University of Oslo
- Upgrade of the Marine Technology Centre (Ocean Space Centre) in Trondheim

#### *New building for life science at the University of Oslo*

The life science building will be located in the Gaustadbekk valley, a short distance away from research communities at Oslo University Hospital, the Department of Informatics and SINTEF's Advanced Materials Characterization Laboratory. This will facilitate broad research collaboration with industry actors such as biotechnology companies and health trusts. The new building will have an area of 66 700 square metres and will be the daily workplace for close to 1 000 employees and 1 600 students. The facilities are designed

to promote advanced research collaboration across different disciplines and research groups, which will ensure high-quality, relevant education and research activities.

In the 2018 national budget, the Storting approved an initial appropriation of NOK 45 million and NOK 5 million for planning user equipment. The construction project has an estimated total cost of NOK 5 677 million (2018) with user equipment totalling NOK 1 141 million (2018).

The Ministry of Education and Research has commissioned Statsbygg to administer the construction of the life science building. The project will be carried out in close collaboration between Statsbygg and the University of Oslo. Detailed planning has begun, a project organisation has been established, and work on the foundations will start in the first quarter of 2019. Completion and handover to the user is scheduled for the second half of 2024.

#### *The Marine Technology Centre (Ocean Space Centre) in Trondheim*

Marine research and technology development are central to innovation and future value creation in areas where Norway has a strong international standing. The Marine Technology Centre opened in 1939 at Tyholt in Trondheim. The education and research activities carried out there have delivered expertise to the Norwegian private sector and helped to develop new solutions in a wide

array of areas. To begin with, the focus was on shipbuilding and equipment for ships and the fishing fleet; later, the centre mainly served the oil and gas industry. In recent years, the centre has focused increasingly on aquaculture and offshore wind.

The national laboratories are now more than 30 years old, and the maintenance backlog is considerable. At the request of the Ministry of Trade, Industry and Fisheries, the Norwegian University of Science and Technology and SINTEF Ocean

have drawn up proposals for upgrading the infrastructure to prepare for future development of Norwegian marine industries. A supplementary proposal, for what is being called Ocean Space Laboratories, was submitted in 2017. This also includes a fjord laboratory divided among three locations: in the Trondheim Fjord, on the islands of Hitra/Frøya and outside Ålesund. The project is currently subject to external quality assurance, which will be completed in the autumn of 2018.

## 2 Objectives for the next plan period

### 2.1 About the objectives

The overarching objectives for the long-term plan for research and higher education are firmly established:

- enhancing competitiveness and innovation capacity
- tackling major social challenges
- developing research communities of outstanding quality

The objectives apply for the entire plan period and for all subject areas, including the five long-term priorities (Seas and oceans; Climate, the environment and clean energy; Public sector renewal and better public services; Enabling and industrial technologies; Public security and social cohesion in a globalised world).

### 2.2 Enhancing competitiveness and innovation capacity

It is the Government's ambition to make Norway one of the most innovative countries in Europe. Like other high-cost countries, Norway's competitive approach must incorporate knowledge as a basis for innovation and higher productivity. It is therefore important to facilitate renewal and restructuring towards an even more knowledge- and research-intensive business sector, and a correspondingly knowledge- and research-intensive public sphere.

Rapid technological development and globalisation have altered many aspects of daily life. Globalisation changes the international division of labour, leading to new opportunities as well as new challenges. It also serves to promote and spread technological innovation.<sup>20</sup> Developments in technology change production processes, goods, services, business models, value chains and trade patterns. In future, advanced production processes and increased use of developments in

artificial intelligence and robotics, 3D printing, sensor networks and sensor technology, among others, will make it possible to produce goods and services competitively in high-cost countries.<sup>21</sup> Furthermore, developments in the bioeconomy and the use of advanced materials and other enabling technologies may create a framework for green business activities and knowledge-based jobs throughout the country.<sup>22</sup>

To mitigate climate-related and environmental challenges, there must be a restructuring of trade and industry towards a low-emission society and an economy where future value creation is based on effective, sustainable utilisation of both non-renewable and renewable resources. Increased utilisation of green technologies and industrial processes is part of the Sustainable Development Goal for restructuring the business sector to become more sustainable by 2030.<sup>23</sup> The Government will maintain a close dialogue with the business sector to create profitable, green jobs based on the industries' own roadmaps to a low-emission society, and founded on the principles of green competitiveness.<sup>24</sup>

Restructuring will lead to the emergence of new work tasks, while others will be eliminated. Certain industries in the private sector have changed substantially. Public services are also encountering new opportunities as well as a greater demand for restructuring and innovation. In a labour market that increasingly requires higher skills and encompasses fewer routine jobs, there will be a need for professionals who exercise critical thinking, ethical reflection and creative problem solving.<sup>25</sup> Through their undergraduate edu-

<sup>20</sup> Meld. St. 29 (2016–2017) *Long-Term Perspectives on the Norwegian Economy 2017*

<sup>21</sup> Meld. St. 27 (2016–2017) *A greener, smarter and more innovative industry*

<sup>22</sup> *Familiar resources – undreamt of possibilities* – The Government's Bioeconomy Strategy. 2016

<sup>23</sup> Sustainable Development Goal 9 – Build resilient infrastructure, promote sustainable industrialisation and foster innovation

<sup>24</sup> *Better growth, lower emissions* – The Government's strategy for green competitiveness. 2017

<sup>25</sup> Meld. St. 16 (2016–2017) *Quality Culture in Higher Education*

cation and continuing and further education programmes, the universities and university colleges have a key role to play in equipping employees for a working life under constant restructuring.

The ability and willingness to utilise new technology are crucial to succeed in increasing productivity and value creation.<sup>26</sup> This calls for a high level of knowledge and competence in the workforce and an adequate flow of knowledge between academia and actors in working life and industry. Thus, it will become more and more important to invest in knowledge and competence in order to take advantage of the potential for value creation of new technology, facilitate the restructuring towards a greener business sector and prevent technological changes from creating and amplifying social inequality.

The Government will:

- encourage increased research and development in the private and public sectors in order to promote restructuring towards a greener economy, enhance competitiveness and strengthen innovation capacity;
- facilitate new, research-based business activities and better interaction between academia and the private and public sectors;
- lay the foundation for increased digitalisation and use of new technology.

### 2.3 Resolving major societal challenges

The 2030 Agenda views the environment, economy and social development as interconnected and thus promotes a better overall understanding of some of today's major societal challenges. Knowledge will be required to meet these challenges, whether they involve climate and the environment, access to food and energy, technology shifts or demographic changes such as a rising elderly population or increased migration. Common to all of them is that they are complex and transcend disciplinary, sectoral and national boundaries, and the solutions must be equally expansive. The brightest minds, independent of disciplinary, sectoral or national background, must join forces to produce the knowledge that is needed. Global trends will alter future patterns of consumption in Norway and the rest of the world, which will have

an impact on the environment and climate. Relevant trends include changes in demographics, economic growth, production and trade patterns, technological advances, changes in international power constellations and cooperative relations, migration, degradation of ecosystems and climate change. The middle class, which consumes the most resources and is exerting the greatest strain on the environment, will climb to five billion people from today's two billion.

The consumption of materials has grown ten-fold since 1900, and it could double again by 2030. The global demand for energy and water is expected to rise between 30 and 40 per cent over the next 20 years. Similarly, the current overall demand for food, feed and fibres is expected to increase by 60 per cent by 2050, while the average area of cultivated land per person may be reduced by 1.5 per cent per year.<sup>27</sup> A growing lack of resources in other parts of the world as a result of these trends could have major ramifications, also for Norway.

There is a need for research that can provide better insight into global development trends, both to deal with national challenges and to contribute constructively globally. A knowledge-based approach to societal challenges opens up opportunities for the business sector to develop new, future-oriented activities.

Norway will take part in this global knowledge effort, and is well-equipped to help to resolve major, global societal challenges in many areas. For example, there are strong agricultural science groups that contribute significantly to international knowledge-building on food security, climate scientists who participate in the work of the Intergovernmental Panel on Climate Change, and a medical science community that is part of the global effort to develop vaccines.

Some challenges may be shared by a limited group of countries, such as how to maintain a sustainable welfare state with high employment in conjunction with an ageing population. This issue is particularly relevant for Norway and other wealthy countries with well-developed welfare schemes, whereas many developing countries have a young population and are instead struggling with problems related to poverty and inequality and the introduction of universal welfare programmes. Furthermore, while the pace of the

<sup>26</sup> Official Norwegian Reports 2015: 1 *Produktivitet – Grunnlag for vekst og velferd [Productivity – Foundation for growth and prosperity]*

<sup>27</sup> European Environment Agency report SOER2015, *Global Megatrends*, <https://www.eea.europa.eu/publications/global-megatrends-assessment-extended-background-analysis>

technology shifts may differ in various parts of the world, the shifts affect everyone and entail a number of ethical issues that have different implications for different groups and stakeholders.

Most of today's societal challenges have their origin in human activity. In order to find solutions, it is therefore necessary to gain insight into the perceptions of reality and motives that underly the actions of the various stakeholders. In its white paper on the humanities, the Government states that the humanities are underutilised as a resource and sets out clear expectations for incorporating humanities perspectives, and humanities scholars and researchers, more widely into activities to deal with major societal challenges.<sup>28</sup>

During the next plan period, the Government believes it is particularly important to focus efforts on implementing the shift towards a greener society and achieving a sustainable welfare state.

The Government will:

- invest in education, research and technology development that helps reach the climate and environmental targets and promotes the shift to a greener society;
- facilitate research and innovation to enhance quality and effectiveness in the public sector;
- increase knowledge on how to reduce the number of those who fall outside working life and keep more people working longer, and shed light on challenges related to migration and an ageing population.

## 2.4 Developing academic and research communities of outstanding quality

Excellent academic and research communities develop new knowledge, new insight and new solutions. They provide high-quality education and disseminate the results of research and development to promote the application of knowledge. Over time, there has been steady, positive development in the most important indicators for both higher education and research.<sup>29</sup>

<sup>28</sup> Meld. St. 25 (2016–2017) *The Humanities in Norway*

<sup>29</sup> For a broader review of the status of Norwegian higher education and research, please see *Tilstandsrapport for høyere utdanning 2018 [Status Report for Higher Education 2018]*, *Forskningsbarometeret 2018 [Research Barometer 2018]* and *Indikatorrapporten 2018 [The Norwegian research and innovation system: Statistics and indicators 2018]*.

The best of Norwegian higher education and research can hold their own in international comparisons, and there are many examples of world-class academic and research groups.

The Norwegian authorities, education and research institutions and academic and research communities have directed efforts over many years towards enhancing quality in research and higher education. The last twenty years have seen considerable changes. Universities, university colleges and research institutes have taken strategic, targeted steps to expand and accommodate their top education and research groups and to recruit outstanding researchers externally.

While there is much that is moving in the right direction, there is a potential to achieve more. Norway still has relatively few academic and research groups of international excellence in relation to how much the country invests in research and higher education. The quality of higher education must be further enhanced. There must be greater recruitment of the best talents, and the average age of doctoral students must be brought down. There is still a long way to go in fully utilising the potential of the population as a whole, both in terms of diversity and in terms of gender balance in senior academic positions. It is possible to achieve even greater openness in research, which will enhance quality and make it easier for the business sector and public stakeholders to make use of the knowledge obtained. And there are many opportunities to encourage increased, closer international cooperation.

The Government will continue its efforts to enhance the quality of higher education and research and lay the foundation for developing additional world-leading academic and research groups in Norway.

The Government will:

- focus on young talents to build the excellent academic and research groups of the future;
- lay a foundation to enable Norwegian academic and research groups to cooperate with and be part of the best international groups;
- work to ensure that students, lecturers and researchers have access to world-class scientific equipment and infrastructure;
- promote increased diversity, greater openness and high ethical standards in research and education.

### 3 Seas and oceans

Norway is a maritime nation and must continue to develop a knowledge base and a management regime that promotes sustainable industrial development and a healthy marine environment. The ocean and the coastline have played, and continue to play, an important role in the development of Norwegian society and have shaped much of Norway's national identity. The value of the natural surroundings and the experiences afforded by the oceans and coastal areas are important for Norwegian culture, outdoor recreation and tourism. Norway's trade and economy are closely linked to the sea, from shipping and shipbuilding to seafood, oil and gas. New ocean-based industry based on innovative products, services and technology is also emerging. A major proportion of Norwegian value creation comes from the ocean and the continental shelf.

In spite of the ocean's past and present significance for Norway, there is still relatively little known about it compared to knowledge about land areas. Thus the seas and oceans may hold great opportunities that have yet to be unleashed. Norway's natural advantages have made it possible to develop dynamic academic and research groups and industries related to the ocean. Important segments of higher education, for example in technology, are aimed at exploiting resources on, in or under the ocean. It is important that educational programmes enable graduates to utilise the foremost new knowledge and technology to expand the maritime industries and be better stewards of marine resources. Social science and humanities perspectives must be incorporated into ocean-related research and education. For example, there is a need to understand how people, at different times and in different parts of the world, have used and are using the ocean, and how they are interpreting and adapting to changes in the climate and species diversity. Knowledge about the ocean and industrial activities is pivotal to efforts to develop a sound regulatory framework for how best to exploit it.

Understanding of seas and oceans is also crucial to the ability to understand and deal with climate-related and environmental challenges in Norway and across the globe.

The ocean is undergoing change as a result of climate change, acidification and discharges of pollutants such as hazardous substances and plastic waste. This affects not only the marine environment, but also the basis for future ocean industries. Knowledge about such changes and the ability to predict and counteract them is of critical importance, both for the management of species and ecosystems and for further development of ocean industries. This will also facilitate environmental improvements and strengthen green competitiveness in maritime industries.

The Government gives high priority to matters relating to seas and oceans. The Government will contribute to sustainable value creation and employment in the maritime industries by ensuring good framework conditions and soundly managed ecosystems, promoting the development of knowledge and technology and strengthening the international competitiveness of ocean-based industry.

A long-term commitment to knowledge and expertise related to the sustainable use of the ocean and the maritime industries will make it possible to exploit the resources in the ocean and on the continental shelf in a better, more sustainable manner. It will also help to preserve healthy and productive oceans for generations to come.

The Government will:

- strengthen research and higher education and the development of new technology in order to increase the value of the industries in ocean and coastal areas and on the continental shelf;
- prioritise research as a basis for sound management of ecosystems and resources in ocean and coastal areas;
- prioritise research for clean and productive seas and healthy and safe seafood.

## 4 Climate, the environment and clean energy

It is a Government objective that Norway will be a driving force in international climate activities and continue to lead the way in renewable energy. Research and education are a key part of the effort to reach the climate targets. Norway has many good academic and research groups in this area, and the Government will maintain and reinforce its focus on research, education and innovation as a basis for developing climate and energy technology.

To succeed in changing behaviour patterns it is necessary to understand why people act the way they do. This requires basic knowledge about values, attitudes, interests and motives, which is knowledge that the humanities subjects are vital in producing. Research targeting the environment and sustainability must therefore incorporate humanities and social sciences perspectives, cf. Meld. St. 25 (2016–2017) *The Humanities in Norway*.

Human activity is resulting in increased pressure on land area, natural resources and cultural history capital; the spread of alien species; outbreaks of new plant and animal diseases; and more hazardous substances and other kinds of pollution. These problems pose a threat to biodiversity, health and quality of life, and can in some instances be both exacerbated by and contribute to climate change. In order to establish effective measures, it is necessary to assess the overall environmental load. Next to climate change, the loss of biodiversity poses the greatest environmental threat the world is facing today.

The universities and university colleges must provide students with up-to-date knowledge about developments relating to climate change and the

environment, as well as the global and local impacts. Interdisciplinary perspectives will be needed to understand complex challenges and design viable measures and solutions. Stronger cooperation between higher education institutions, the business sector and working life is called for to optimise the relevance of educational programmes and simultaneously provide employers with ongoing inspiration from the most recent scientific developments.

Norway is an energy nation, and the Government's primary objectives are to increase long-term value creation and ensure reliable, cost-effective and sustainable utilisation of Norwegian energy resources. Norway has an excellent starting point with an electricity supply almost exclusively based on renewable energy, a highly functional energy market and wide-ranging access to additional renewable energy resources. Moreover, Norwegian companies and research and education groups have considerable expertise in a number of green technologies.

The Government will:

- strengthen research efforts for restructuring towards a low-emission society;
- give priority to developing technology and solutions for the transition to a greener society;
- strengthen research and higher education that can increase understanding of climate change and lay a foundation for successful climate change adaptation;
- strengthen research and higher education to further develop an integrated, knowledge-based public administration that safeguards considerations relating to climate and the environment.



## 5 Public sector renewal and better public services

It is a Government objective to ensure that Norway is a sustainable welfare state. High employment and labour force participation and an effective, adaptable and innovative public sector will be necessary to ensure welfare for the population in future.

The public sector consists of the public administration and businesses and companies wholly-owned by public sector bodies. Entities that find solutions to problems on behalf of the public sector will also be of major importance to achieving renewal and improving services in the public sector. The public sector accounts for just below 50 per cent of GDP and one-third of the labour force. The activities of the public sector include delivering public services and civil infrastructure, designing and implementing measures, ensuring good framework conditions and safeguarding democratic values.

The Government seeks to modernise the public sector in order to further develop the welfare framework. The public sector must be renewed and simplified, and efforts involving research and needs-driven innovation in the sector must therefore be intensified. The public sector must implement ongoing development and innovation and make use of new research-based knowledge and new working and organisational methods. High-quality research and education will play a key role in promoting modernisation, efficiency and innovation in public entities.

Public sector employees must be in possession of knowledge and expertise that can foster new ways of working and collaborating. This is imperative if the sector is to continue to provide high-quality measures and services in light of tomorrow's stricter budget constraints. The Government will promote higher quality in research and education overall, and seek to expand research in areas of strategic importance for the public sector in particular.

The business sector also plays an important part in public sector renewal. The business sector works together with public stakeholders to develop many of the solutions that help to modernise,

streamline and improve public services. Many of the services are also carried out by or in collaboration with private actors. The public sector procures goods and services worth about NOK 500 billion per year. There is a considerable unrealised potential for more innovation through pre-commercial and innovative public procurement.

The Government will step up the pace of digitalisation in the public sector. Automation and increased use of artificial intelligence can, over time, increase efficiency and make it possible to raise the quality of public services, thereby enhancing the sustainability of the welfare state. There is thus a need for more research-based knowledge about how public entities can make use of new technology and the impacts of this technology on users. Moving forward, digital competence should be incorporated as a more integral component of educational programmes aimed at jobs in the public sector.

Making public data more easily accessible for researchers, the business sector and the public at large is an established objective. Data sets generated by various public actors are often of great relevance for research. Better access to public data, for example health data, for researchers could lead to better and more relevant research and smarter service development in the public sector.

The Government will increase allocations for research and higher education that is targeted towards renewal, improvement and increased efficiency in the public sector, and that can lead to better, more effective services and measures for the population.

The Government will:

- encourage higher quality and relevance in education and research to lay the foundation for a more knowledge-based public sector and better service production;
- expand the scope and raise the quality of research in areas of strategic importance for the public sector;
- facilitate more research and needs-driven innovation in the public sector;

- encourage broader cooperation between the public sector, business sector and research institutes through the use of innovative public procurement;
- lay the foundation for better utilisation of public data for research and innovation.

## 6 Enabling and industrial technologies

Enabling technologies are basic technologies used to develop new solutions, products and processes in many applications areas and can lead to major changes in society. Historical examples include letterpress printing, the combustion engine and electricity. Norway's activities in the enabling and industrial technologies encompass information and communications technology (ICT), nanotechnology, biotechnology and advanced production processes. The focus areas largely coincide with the programme «Leading Enabling and Industrial Technologies» under the EU Framework Programme for Research and Innovation, Horizon 2020.

A national initiative on the enabling and industrial technologies facilitates knowledge-based innovation and necessary restructuring in all parts of society. Enabling and industrial technologies have broad applications within many different sectors and industries and can be of use in dealing with major challenges in society and help to enhance the competitiveness of Norwegian trade and industry. Development in these technologies also facilitates new applications in advanced production processes through the Internet of Things, robotics and automation, virtual or augmented reality, Big Data, additive layer manufacturing and advanced biorefining and processing. This forms the basis for a wide array of new solutions and products.

Technology development is rapid and will continue to gain in importance. Research and development in the enabling and industrial technologies is a key instrument for achieving national objectives in many areas. The Government's ambition is for Norway to be at the forefront of research, education and innovation in enabling and industrial technologies. This particularly applies in areas where we have strong academic and research groups, and where the technologies can promote business development or play a key role in resolving major societal challenges.

The enabling and industrial technologies are based on knowledge from different academic disciplines, and a cross-disciplinary approach is therefore necessary. Interdisciplinary perspectives, e.g. from the humanities and social sciences, can

help to ensure that the development and use of the technologies takes place in a responsible manner. Educational programmes should also emphasise ethical awareness.

The interconnections between the different technology areas and with other academic disciplines such as applied and industrial mathematics have become stronger in recent years. This has led to the emergence of multiple convergent and to some degree ground-breaking technologies. Increasing convergence between different technologies and within advanced production processes means that the technology initiative must be sufficiently flexible to accommodate the rapid development in technology, including the development of disruptive technologies.

Over the next four-year period, the Government will increase allocations for education, research and innovation in technology by NOK 800 million, cf. Chapter 1.2. Relevant focus areas for the escalation plan include the enabling and industrial technologies, especially basic ICT research and ICT security. The Government's technology initiative supports the long-term plan's overall objectives and other long-term priorities.

The Government will:

- employ capacity-building, competence development and development of research infrastructure to strengthen the basic framework for developing and utilising the enabling and industrial technologies;
- design the initiative for the enabling and industrial technologies to support value creation, restructuring and advanced manufacturing in the business sector;
- ensure that the initiative for the enabling and industrial technologies is focused on concrete societal needs, particularly with regard to digitalisation, the transition to a greener economy and renewal and improved services in the public sector;
- facilitate greater convergence between the technology areas and interaction with other subject areas such as the humanities and social sciences.

## 7 Societal security and social cohesion in a globalised world

The Government aspires to create a Norway that is safe and secure for all. This will require insight into the components of secure, well-functioning societies. There will also be a need for up-to-date knowledge about the national and global change processes Norway is facing.

Questions relating to social cohesion and identity are an important aspect of the creation of an inclusive society. Measures to enhance cohesion and societal security will require an interdisciplinary approach in research and education, with input from the humanities and social sciences, legal science, technical disciplines, and economics and business administration. In a time of widening gaps and growing polarisation of society, there is also a need for knowledge about how the media, history, cultural sphere and volunteer sector help to build social cohesion and the role they play in democracy, community fellowship, integration and trust.

The rapid pace of technological development affects Norway as a society and Norwegians as individuals. It creates vast opportunities, but also entails new and complex challenges.

In the wake of the 2008 financial crisis, uncertainty has risen widely in many parts of the world, with mounting tendencies toward populism and protectionism. In Europe, Brexit is putting a strain on the cooperative relationships established in economic, political and legal areas within the EU and EEA. Globalisation, technological develop-

ment, economic cooperation and migration all hold great potential, but may at the same time lead to uncertainty and a risk of serious incidents and diminished sustainability, effectiveness and legitimacy in society. There is a need for knowledge about various threats to societal security, including political development trends, serious natural disasters, global health threats, deficiencies in the energy or food supply or intentional acts such as terrorism, sabotage and crime. This knowledge will also be instrumental in achieving more of the Sustainable Development Goals, for example through research to improve food security and development of new vaccines and medicines against infectious diseases.

The Government will:

- work to establish a reliable, up-to-date knowledge base on factors of importance for social cohesion and stability and a safe, secure society;
- strengthen research activities and awareness in relevant educational programmes on potential negative impacts and vulnerability in connection with increased technology use and digitalisation;
- prioritise research on how to protect society against both man-made and natural threats;
- strengthen research on the social and cultural changes that occur as a result of rapid technological development.

## 8 Planning the building stock and campuses of Norway's higher education institutions: development, management and priorities

Those responsible for building the campus of the future won't pretend to know what the future holds. They only hope they're building something malleable enough to handle it.

Dan Huttenlocher, Dean and Vice Provost of Cornell Tech

### 8.1 The importance of well-designed university and university college buildings

Buildings, equipment and other infrastructure are a vital input factor for achieving the overall objectives of Norway's research and education policy. Well-designed buildings can encourage cooperation and multidisciplinary and interdisciplinary approaches, and improve communication between students, between students and researchers, and between academia, the business community and the local community. Poorly designed buildings

can hamper such cooperation, promote one-way communication from teachers to students, and prevent efficient use of digitalisation, entrepreneurship, and outreach activities.

A campus may consist of anything from a single building to a large estate of many buildings and their grounds. Decisions concerning university and university college buildings determine where and how students, academic staff and other knowledge workers live, learn, study, innovate and communicate. A campus may be an independent entity, but it will always depend on and influence the society to which it belongs.

Norway's higher education sector, with buildings covering a total of 3.4 million square metres, has one of the largest public property portfolios in the country. The Government's objective is to ensure that universities and university colleges can make the best possible use of these resources.

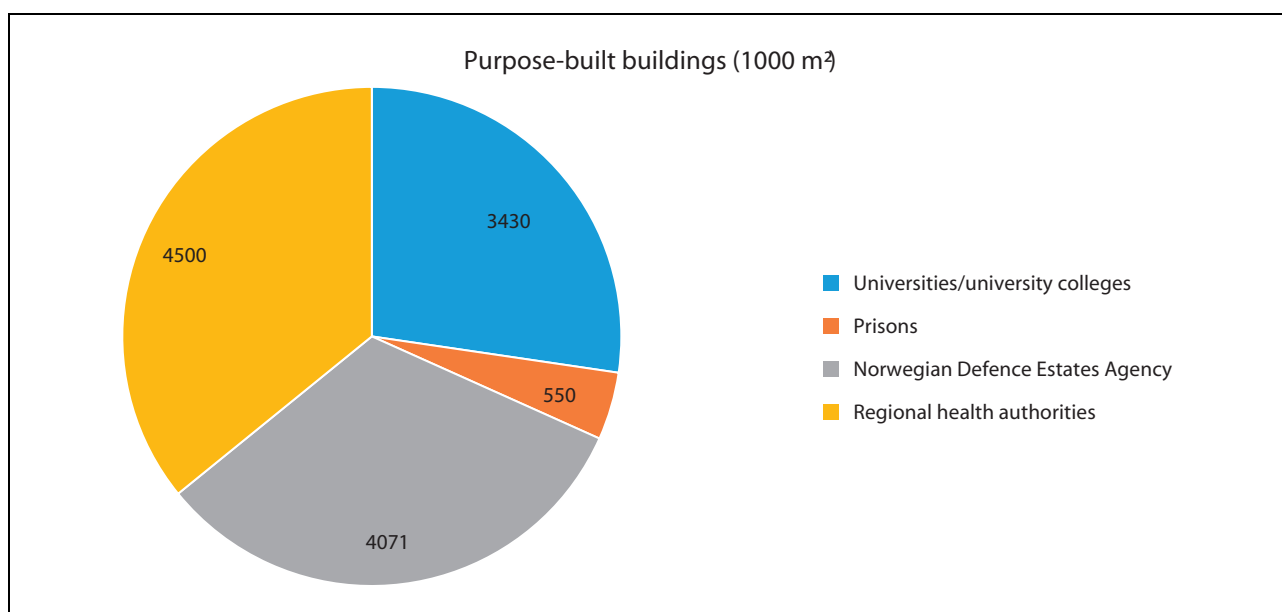


Figure 8.1 Area of purpose-built buildings belonging to regional health authorities, universities and university colleges, prisons and the Norwegian Defence Estates Agency, in square metres

A number of major building projects are currently in the construction or planning phases and require significant resources. Tables in this chapter give an overview of construction projects in both phases. The universities and university colleges have already drawn up campus development plans or are in the process of doing so, and several institutions have identified a need for new buildings and adaptation of their current building stock to improve functionality and make better use of these resources. The Government expects universities and university colleges to carefully consider their need for new buildings, for renovation of or alterations to existing properties, and to lease buildings. Adaptation is needed to promote high-quality education and research. The Government also expects investments in university and university college buildings to be cost-effective, while at the same time contributing to environmentally friendly solutions. The Government considers it necessary to develop a clearer policy framework for developing, managing and setting priorities for the building stock and campuses. The point is not necessarily to expand, but to provide the right kinds of facilities. Norway needs a building stock for the higher education sector that lends itself to knowledge generation and communication, promotes a sense of identity and conveys the values of the institutions.

### 8.1.1 Capacity development and adaptation to the needs of a knowledge society

Buildings and campuses at universities and university colleges have been adapted and changed in response to developments in society and higher education and research. Norway's first higher education institutions played a key role as drivers for education, nation building and the development of a national identity. As the economy became more industrialised and later on service-driven, the need for a highly educated workforce increased. Educational institutions were needed throughout the country to provide a qualified workforce and contribute to wealth creation. Expansion began in earnest in the 1970s. By the early 1990s, Norway had over 100 higher education institutions. More recently, major structural changes and institutional mergers have resulted in new trends in the development of the university and university college building stock.

Buildings are also an instrument and an input factor in industrial policy. Campuses are used jointly by the academic and business communities. Carrying out teaching, basic research and

applied research at the same site is an excellent basis for innovation and economic development. The marine technology laboratories at the Norwegian University of Science and Technology (NTNU) in Trondheim are one of the oldest examples of this kind of joint use. The first part of this facility was the Towing Tank, which was opened as early as 1939. Ever since, these laboratories have been important for the development of marine industries in Norway. See also the description of the Ocean Space Centre in Chapter 1.6.2. Another example is that NTNU in Ålesund is located close to the GCE Blue Maritime Cluster, which plays a key role in maritime business development and innovation. The Mechatronics Innovation Lab<sup>30</sup> has been co-located with the University of Agder to allow for closer cooperation between research, education and industry.

Furthermore, there are overlaps between different disciplines. Several of the major construction programmes that are now being planned focus precisely on how the spatial dimension can give rise to knowledge generation and innovation. This was a major reason for the Government's choice of concept for the new life science building at the University of Oslo, see Chapter 1.6.2. Promoting interdisciplinary activities and higher-quality education and research were also key considerations when the Government decided on a unified campus concept for NTNU in Trondheim that will also include the faculties currently located in the Dragvoll and Midtbyen areas of the city, see Box 8.2.

The way buildings, properties and campuses develop is also driven by digitalisation and by the ambition that they should play a part in achieving overall climate and environmental targets. Buildings are becoming steadily more advanced technologically and in order to meet safety, working environment, universal design and other standards. These developments have cost implications.

### 8.1.2 Government policy for the building stock at public universities and university colleges

The aim is to pursue a long-term, predictable policy for buildings and campus development at Norwegian universities and university colleges that supports the overall objectives for research

<sup>30</sup> The lab is a national centre for innovation, pilot testing and technology qualification within mechatronics and related disciplines

and higher education and provides good incentives for investments in and management of the buildings. The Government expects the sector to take the following into account:

1. *Policy instrument* – Buildings are an input factor in the same way as other resources in research and higher education
2. *Adaptation* – There is a need for development and maintenance
3. *Sustainability* – Investments in university and university college buildings must be cost-effective, but should also play a role in innovation and climate and environmentally friendly solutions.
4. *The university museums* – Unique collections of importance for Norwegian history, culture and identity must be safeguarded.

These points provide a framework for an integrated policy for the university and university college building stock. They are further discussed later in this chapter, after an overall review of the organisation and management of construction projects at public universities and university college and the status of current projects.

The Ministry of Education and Research asked the Knowledge Centre for Education to review research on the aspects of campus design that have a positive impact on teaching, research, cooperation and learning.<sup>31</sup> In addition, the Ministry asked Statsbygg to review the current situation for university and university college buildings based on data on the building stock, i.e. the physical element of a campus.<sup>32</sup> Statsbygg was asked to consider this element in the context of information on students and staff (the human element), costs (the financial element), how well buildings and sites are suited to their purpose (the functional element) and how campuses contribute to climate and environmentally friendly solutions (the environmental element).

A knowledge base has been built up on the basis of research on campus management and development.<sup>33</sup>

The knowledge base, together with a dialogue with universities and university colleges, cooperation with other ministries and comparisons with other sectors that manage a substantial proportion of Norway's large-scale buildings and infrastructure, forms the basis for the Government's policy for the university and university college building stock.

## 8.2 A clear planning, construction and management system for the university and university college building stock

In order to develop the building stock at universities and university colleges efficiently and in a way that promotes high quality, it is important to consider carefully how these properties are planned, constructed and managed. Several decades may pass between a need arising and the completion of a building. A construction project involves many stakeholders and different types of legislation. There are also several different management regimes and funding models. Moreover, there is wide variation in the size and type of sites different institutions have at their disposal. This is explained by differences in size, activities, study programme portfolio and research profile. Disciplines that require laboratories, animal accommodation, towing tanks or other large-scale equipment need different types of space from disciplines that largely need offices and group rooms. It is common to distinguish between «wet» areas (wet labs, clinics etc.) and «dry» areas (analytical labs, reading rooms, auditoriums, offices). This section gives an account of the different elements of the system for the university and university college building stock: management regimes, central government responsibilities and management, types of funding, and the institutions' plans, opportunities and responsibilities. It also contains an overview of construction projects in different phases.

### 8.2.1 Management regimes

The building stock at the disposal of public universities and university colleges has a total area of around 3.4 million square metres. The largest share, about half, is central government property for which the institutions themselves act as property managers. One quarter is managed by Statsbygg, and one quarter is leased in the private market. Following the structural reform of the higher

<sup>31</sup> Sølvi Lillejord et al. *Campusutforming for undervisning, forskning, samarbeid og læring: En systematisk kunnskapsoversikt*. [Campus design for teaching, research, cooperation and learning: a systematic overview] 2017

<sup>32</sup> Statsbygg. *Kunnskapgrunnlag for universitets- og høyskolesektoren*, rapport A, B, C og D [Knowledge base for the university and university college sector, reports A, B, C and D]. 2018

<sup>33</sup> Den Heijer. *Managing the university campus: Information to support real estate decisions*. Eburon Academic Publishers. 2011

education sector, most institutions have buildings in all three categories. Acting as property manager means that an institution is responsible for managing, maintaining and operating the buildings. Seven institutions, the University of Oslo, UiT The Arctic University of Norway, the University of Bergen, the Norwegian University of Science and Technology, the Norwegian University of Life Sciences, NHH Norwegian School of Economics and the Norwegian School of Sport Sciences, manage most of their buildings themselves and are considered to be property managers.<sup>34</sup> For buildings managed by Statsbygg, the institutions pay rent to cover the cost of building management, operation and sufficient maintenance to preserve the value of the property, plus a fixed return on invested capital.

**8.2.2 The Ministry’s management framework**

The Ministry of Education and Research is responsible for overall management of universities and university colleges. Public and private universities and university colleges are governed by the same law, the same sector objectives, the same funding and accreditation system and the same supervisory framework.

In 2017, public universities and university colleges had a total income of around NOK 43 billion.

Direct central government funding made up around NOK 33.9 billion of this. External contributions and commissions constituted most of the remaining income. Recruitment of students and staff, investments in buildings and equipment and ambitious plans for international cooperation are all examples of initiatives that may require funding from the institutions’ budgets, and the boards are responsible for considering all of them together.

As a basis for the boards’ priorities with regard to construction projects, all public universities and university colleges are required to follow up the white paper on structural reform of the higher education sector (Meld. St. 18 (2014–2015)) by preparing campus development plans. These are overall plans for developing the building stock and using existing and new campuses efficiently. In each plan, the institution is expected to identify the changes and investments needed to make the campus a good tool for research, education and communication. Institutions that are property managers must also have long-term plans for maintenance to preserve property value and for upgrades, together with the associated annual budget allocations.

Before an institution notifies the Ministry of Education and Research of any need for buildings and space, it must have assessed whether its construction needs are in line with its overall strategy. Efficient utilisation of and alterations to existing buildings must always be considered as an alternative to a newbuild. The board decides which needs are notified to the Ministry.

<sup>34</sup> The budget proposal for 2019 (Prop. 1 S (2018–2019)) from the Ministry of Education and Research proposes that management of the NHH properties should be transferred to Statsbygg

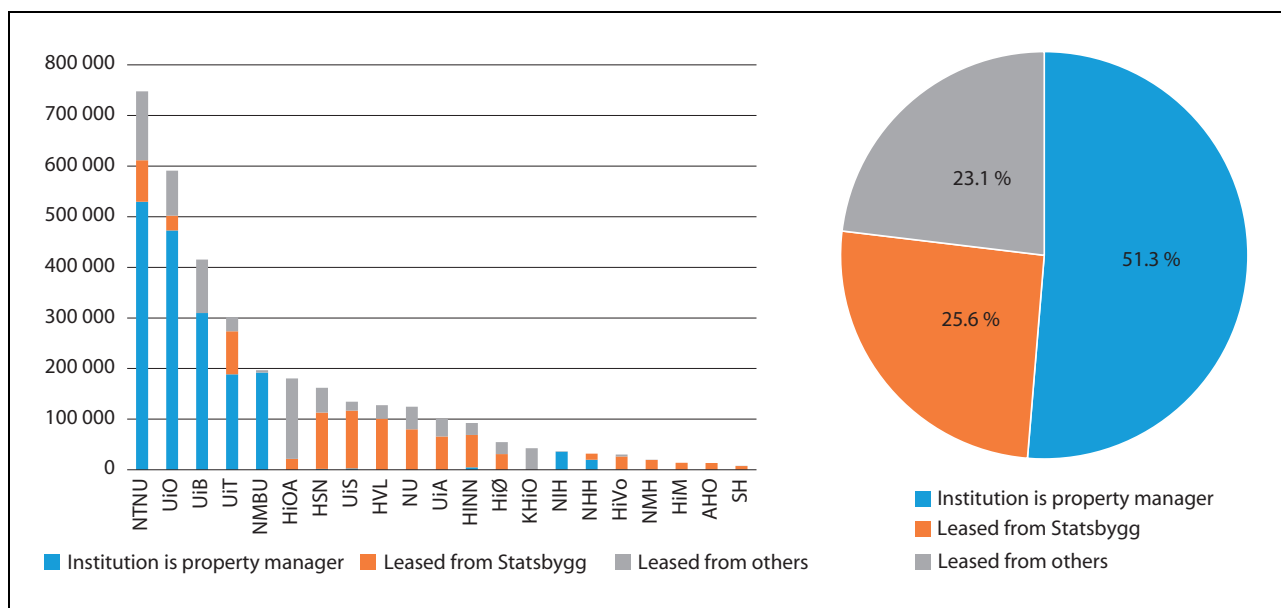


Figure 8.2 Area of buildings (m<sup>2</sup>) and management regimes 2016 (Source Norwegian Centre for Research Data)



When universities and university colleges assess plans and needs for construction projects and notify the Ministry, they must also carry out the necessary needs analyses and preparations in line with current instructions, legislation and procedures. The most important of these are the instructions for planning and management of central government programmes and projects and the instructions for construction projects and leasing in the central government civilian sector.<sup>35</sup> The institutions must always make it clear which alternative solutions have been considered. The central government planning guidelines for coordinated housing, land-use and transport planning also govern land use, re-use and quality for buildings and other structures.

### 8.2.3 Funding models

Construction projects may range from minor alterations and adaptations to existing properties to large newbuilds and renovation projects. In the central government sector, a distinction is made between purpose-built buildings and buildings leased or purchased on ordinary market terms. Central government institutions that need new premises must determine at an early stage which category is appropriate for their project. Building types for which there is no functional market are classified as purpose-built. Most university and university college buildings are purpose-built. Construction projects at universities and university colleges may be financed in several different ways:

- i) *Projects managed by the institution.* Construction projects carried out by an institution that is a property manager without any change to the budget.
- ii) *User-financed construction projects.* Construction projects where the institution undertakes to meet the rent for the building(s) from its own unchanged budget. This form of funding is available to central government institutions that pay rent to Statsbygg. Funding is allocated by the Ministry of Local Government and Modernisation (Chapter 2445 Statsbygg).
- iii) *Ordinary construction projects.* These follow the governmental model for major investment

projects, which has pre-defined phases including planning and implementation, external quality assurance if required, and fixed decision gates. Proposed initial appropriations and cost ceilings for these projects are presented in the national budget. The Government normally considers whether to grant compensation for an increase in rent costs when determining the initial appropriation for a construction project. As a general rule, institutions are expected to meet rent costs within their current budget. Compensation is not normally granted for more than 75 per cent of the increase in rent. Principles for rent compensation were laid down in a Royal Decree of 7 October 1997.

- iv) *University premises in hospitals.* The Storting has adopted principles for planning, construction and funding of university premises in new hospital buildings, effective from 2018. This means that the health trusts plan and build university premises for the training of medical students in new hospital buildings. The health trust owns the premises, and the university leases them. Compensation for rent increases is dealt with under the same rules as for ordinary construction projects. Proposals to increase appropriations for the universities' rent costs are considered in the ordinary budget process together with proposed appropriations for investment loans. Compensation must not exceed 75 per cent of the increase in rent costs. The universities own user equipment in these premises. There are currently six health trusts that are classified as university hospitals: Haukeland University Hospital, Stavanger University Hospital, St. Olav's Hospital, University Hospital of North Norway, Akershus University Hospital and Oslo University Hospital. For existing buildings, both the agreements between universities and university hospitals and the way they are practised vary, as described in a commissioned report.<sup>36</sup> Work has been started at several institutions to find solutions for the use of premises. There is generally close collaboration between health trusts, hospitals and universities, including

<sup>35</sup> *Utredningsinstruksen 2016 [Instructions for planning and management of central government programmes and projects].* Ministry of Finance. *Instruks om håndtering av bygge- og leiesaker i statlig sivil sektor 2017 [Instructions for construction projects and leasing in the central government civilian sector],* Ministry of Local Government and Modernisation

<sup>36</sup> *Samordning mellom universiteter og helseforetak. Identifikasjon av utfordringsbilder med forslag til løsninger [Coordination between universities and health trusts. Identification of barriers and proposed solutions]* Report from a national working group appointed by the Ministry of Education and Research and the Ministry of Health and Care Services. 2016

### Box 8.1 Decision gates and cost thresholds in construction projects

There are several fixed decision gates during construction projects where approval is required at ministry or government level. In some cases, this is because a project is entering a new phase (choice of concept, pre-study, pre-project or implementation). In others, it is because the estimated cost of the project exceeds thresholds where ministry/government approval is required. For construction projects in the higher education sector, the following rules apply:

- User-financed construction projects above NOK 50 million: the Ministry of Education and Research submits them to the Ministry of Local Government and Modernisation for approval.
- User-financed construction projects above NOK 100 million: must be submitted to the Ministry of Local Government and Modernisation. The Ministry of Education and Research prepares a decision paper for the Government, generally together with the Ministry of Local Government and Modernisation.
- Lease agreements with private lessors with a cumulative cost of more than NOK 100 million over the lease period: must be submitted to the Ministry of Local Government and Modernisation.
- Projects above NOK 300 million: a pre-study phase is required after choice of concept. The results are summed up in a report that provides the basis for a decision on whether to move to the pre-project phase. This decision gate does not apply to user-financed construction projects.
- Projects, including lease agreements with private lessors, that have a total cost above NOK 750 million: the governmental model for major investment projects.

hospitals that are not classified as university hospitals.

- v) *Projects in cooperation with private lessors.* Universities and university colleges may also carry out projects in cooperation with private owners, in which case they enter into lease agreements on commercial terms and conditions. The rent must cover the same elements as rent paid to Statsbygg, and is determined in an agreement between each institution and the lessor. When assessing whether a local need should be covered by leasing in the market or through a government construction project, the main consideration must be what is financially most favourable for the central government.

Projects with an estimated cost of more than NOK 50 million have fixed decision gates where approval and/or external quality assurance is required, see Box 8.1.

#### 8.2.4 Major government investments in university and university college buildings

Major government investments are here defined as construction projects with an estimated investment cost of more than NOK 300 million. In the period 2010–2017, average annual investments in buildings for the university and university college sector were NOK 1.76 billion at the 2018 monetary value. This made up 41 per cent of expenses for government-owned purpose-built buildings.

According to the review by Statsbygg, there were active construction projects at 15 of 21 public universities and university colleges in the spring of 2017. These included 21 projects in the construction phase and 14 projects in the planning phase. The projects under construction are expected to be completed in the period 2018–2020.

The tables below provide an overview of major construction projects that have been completed, are under construction or are in the planning phase.

Table 8.1 Completed construction projects 2010–2018

Institution	Project	Type	Cost ceiling (million NOK)	Gross area (m <sup>2</sup> )	Purpose	Completed
University of Oslo	IFI II	Newbuild	1 356	17 000	Informatics	2010
University of South-Eastern Norway	Bakkenteigen	Newbuild	816	18 900	Teaching, nursing, engineering	2010
Western Norway University of Applied Sciences	Central building Sogndal	Newbuild	384	7 605	Teacher training	2012
Oslo Metropolitan University	Andrea Arntzen's house, Oslo	Renovation and new-build	777	19 000	Nursing training	2012
University of Bergen	Odontology	Newbuild	853	15 000	Odontology	2012
Western Norway University of Applied Sciences	Newbuild for co-location	Newbuild and renovation	2 544	53 200	Teaching, engineering, health and social sciences	2014
University of Oslo	City centre buildings, phase 1	Renovation	540	33 000 (phases 1 and 2)	Social sciences, law	2014
University of Oslo	City centre buildings, phase 2	Renovation	393	33 000 (phases 1 and 2)	Social sciences, law	2014
UiT The Arctic University of Norway	Technology building	Newbuild	445	9 000	Engineering	2014
Norwegian University of Life Sciences	Animal Production Experimental Centre	Newbuild	389	12 000	Livestock research	2015
Norwegian University of Life Sciences	Clock Building	Renovation	472	8 190	Teaching and learning venues	2016
Norwegian University of Science and Technology	Technology building (Akrinn)	Newbuild	730	16 000	Engineering	2016
University of Bergen	Newbuild for co-location (merger with Bergen Academy of Art and Design)	Newbuild	1 072	14 800	Art and design, artistic development	2017

Table 8.1 Completed construction projects 2010–2018

Institution	Project	Type	Cost ceiling (million NOK)	Gross area (m <sup>2</sup> )	Purpose	Completed
Norwegian School of Sport Sciences	Renovation	Renovation and alterations	883	17 000	Health and sports sciences	2018
UiT The Arctic University of Norway	Medicine and health subjects phase 2, Tromsø	Newbuild and alterations	1 372	21 057	Medicine and health sciences	2018

The table shows major ordinary construction projects completed in the period 2010–2018. They were funded by the Ministry of Local Government and Modernisation from budget chapter 530 Projects outside Statsbygg management or 2445 Statsbygg.

Table 8.2 Major ordinary construction projects in the construction phase

Institution	Project	Type	Cost ceiling (million NOK), price level 1 July 2019	Gross area (m <sup>2</sup> )	Purpose	Building period
Norwegian University of Life Sciences	Co-location with veterinary institutes at, Campus Ås, incl. Animal Production Experimental Centre	Newbuild	7 121	63 100 + 11 700	Livestock research and veterinary medicine	2013–2020
University of Bergen	University museum Part 2, Bergen	Renovation	395	9 200	University museum	2016–2019
University of Oslo	Life science building, Oslo	Newbuild	5779	66 700	Chemistry, pharmacology, life sciences	2019–2024

The table shows projects in the construction phase and the expected year of completion. Investment costs in this phase are funded by the Ministry of Local Government and Modernisation's from budget chapter 530 items 31 and 33 or chapter 2445 item 33.

Table 8.3 Major user-financed projects in the construction phase

Institution	Project	Type	Cost ceiling (million NOK), price level 1 July 2019	Gross area (m <sup>2</sup> )	Purpose	Building period
Western Norway University of Applied Sciences	Campus Kronstad, Bergen	Newbuild	536	14 300	Teaching	2018–2020
University of South-Eastern Norway	Campus Ringerike	Alterations	219	11 000	Teaching	2017–2019
UiT The Arctic University of Norway	Building for teacher training ILP	Newbuild	441	10 900	Teacher training and pedagogics	2018–2020

The table shows construction projects where the institutions cover the investment costs from their own budgets through the rent they pay to Statsbygg. The institutions do not receive compensation for any increase in rent costs, and must meet this within an unchanged budget.

Table 8.4 Construction projects, pre-project phase completed

Institution	Project	Type	Expected cost ceiling (million NOK), price level 1 July 2019	Gross area (m <sup>2</sup> )	Purpose
Norwegian University of Science and Technology	Health and social sciences, Trondheim	Newbuild	537	13 000	Health and social sciences, student welfare
University of Oslo	Viking Age Museum, Oslo	Renovation and newbuild	2 000	9 300	University museum
University of Stavanger	Museum of Archaeology, Stavanger	Newbuild	338*	6 130	University museum

\* price level 15 April 2014

The table shows construction projects where the pre-project phase has been completed and the expected investment costs exceed NOK 300 million (excluding user equipment). The objectives, overall scope and costs of these projects have been determined. Any initial construction appropriation will depend on the annual budget processes.

Table 8.5 Construction projects that have received pre-project appropriations

Institution	Project	Type	Cost ceiling (million NOK)	Gross area (m <sup>2</sup> )	Purpose
NHH Norwegian School of Economics	Main building, Bergen	Renovation	555	12 527	Economics and administration
Norwegian University of Science and Technology	Campus NTNU, Trondheim	Newbuild and renovation	Not determined	Not determined	Co-location
Nord University	Blue Building 6B, Bodø	Newbuild and alterations	Not determined	9 650	Biosciences and aquaculture, nursing and health sciences
University of Bergen	Faculty of Fine Art, Music and Design / the Grieg Academy	Newbuild	Not determined	10 000	Music and arts
University of Oslo	New exhibition greenhouse at the Natural History Museum, Oslo	Newbuild, alterations, renovation	Not determined	Not determined	University museum
University of Oslo	New clinic building, Oslo	Newbuild	Not determined	21 600	Odontology
UiT The Arctic University of Norway	Tromsø Museum, Tromsø	Newbuild	Not determined	19 700	University museum

The table shows construction projects where the Storting has granted an appropriation for further planning and the pre-project phase. It also includes projects expected to be in the planning or pre-project phase in 2019 (the projects at NHH and the University of Bergen). Pre-project funding is provided under budget chapter 530, item 30, for projects outside Statsbygg management, and chapter 2445, item 30, for projects where rent will be paid to Statsbygg.

Table 8.6 Projects notified to the Ministry of Education and Research with estimated costs exceeding NOK 100 million

Institution	Project	Type	Gross area (m <sup>2</sup> )	Purpose
Volda University College	Building for media and arts	Newbuild	4 700	Media and arts
Western Norway University of Applied Sciences	Maritime centre, Haugesund	Extension	8 500	Maritime studies
Norwegian University of Science and Technology	Trondheim Science Centre	Newbuild	35 700	Knowledge communication
Sintef/ Norwegian University of Science and Technology	Ocean Space Centre, Trondheim	Newbuild, renovation	Not determined	Marine technology labs for teaching, research and innovation

Table 8.6 Projects notified to the Ministry of Education and Research with estimated costs exceeding NOK 100 million

Institution	Project	Type	Gross area (m <sup>2</sup> )	Purpose
Oslo Metropolitan University	Campus project Romerike	Not determined	Not determined	Teaching
UiT The Arctic University of Norway	Narvik Campus	Renovation and development	7 200	Engineering
University of Stavanger	New technology centre	Newbuild	Not determined	Education

The table shows projects that the institutions are planning and have notified to the Ministry of Education and Research with estimated costs exceeding NOK 100 million. It includes both projects planned as user-financed and ordinary construction projects. It does not include university premises in new hospital buildings. Institutions that are property managers are also authorised to carry out construction projects within their own budgets. These projects are not included in the table. The Ministry has not yet assessed the projects in this table (scope, need and priorities).

### 8.3 Buildings as an input factor – the importance of strategic campus development

#### 8.3.1 The academic and organisational importance of strategic campus development

Long-term, strategic work on buildings and facilities must be seen in the context of the institutions' overall strategies, goals, plans and priorities. The Act relating to universities and university colleges sets out requirements for the students' physical learning environment, which are detailed in section 4-3. The board of each institution must ensure that buildings and facilities are dimensioned and equipped for the activities that take place there, and that they are properly maintained. In the past, property managers have focused largely on the need to maintain buildings and make sure they are safe to use. These are important issues, but in recent years there has in addition been more emphasis on the need for buildings and facilities to reflect the objectives of the institution and to be suitable for the activities taking place there. Buildings often have a long life span, and it must be possible to adapt them to new user needs. This is further discussed in Chapter 8.4.

Several studies discussed in the review by the Knowledge Centre for Education conclude that the physical design of learning venues has an impact on the types of teaching and learning practices they can be used for.<sup>37</sup> They also show that spatial design can encourage the maintenance of old practices or prevent new approaches from developing. The knowledge base indicates that there is a need for rooms and spaces that facilitate cooperation, discussion, participation and access to technological tools.

The development of teaching and learning practices must be coordinated with the design of teaching and learning rooms so that students thrive, learn what they are supposed to, complete their studies and achieve optimal learning outcomes. Campus development is part of organisational development and requires management accountability for and ownership of restructuring processes in all parts of the organisation. Figure 8.3 illustrates the links between the organisation of an institution and the physical design of buildings and spaces.

#### 8.3.2 Campus development plans

Campus development plans are an important tool for forward-looking development of single-campus and multi-campus institutions in a way that supports their academic priorities. The Ministry of Education and Research has asked all public universities and university colleges to prepare campus development plans, see Chapter 8.2.2. The knowledge base prepared by Statsbygg shows that 13 of the 21 institutions have campus development plans for one or more of their cam-

<sup>37</sup> Sølvi Lillejord et al. *Campusutforming for undervisning, forskning, samarbeid og læring: En systematisk kunnskapsoversikt [Campus design for teaching, research, cooperation and learning: a systematic overview]*. 2017

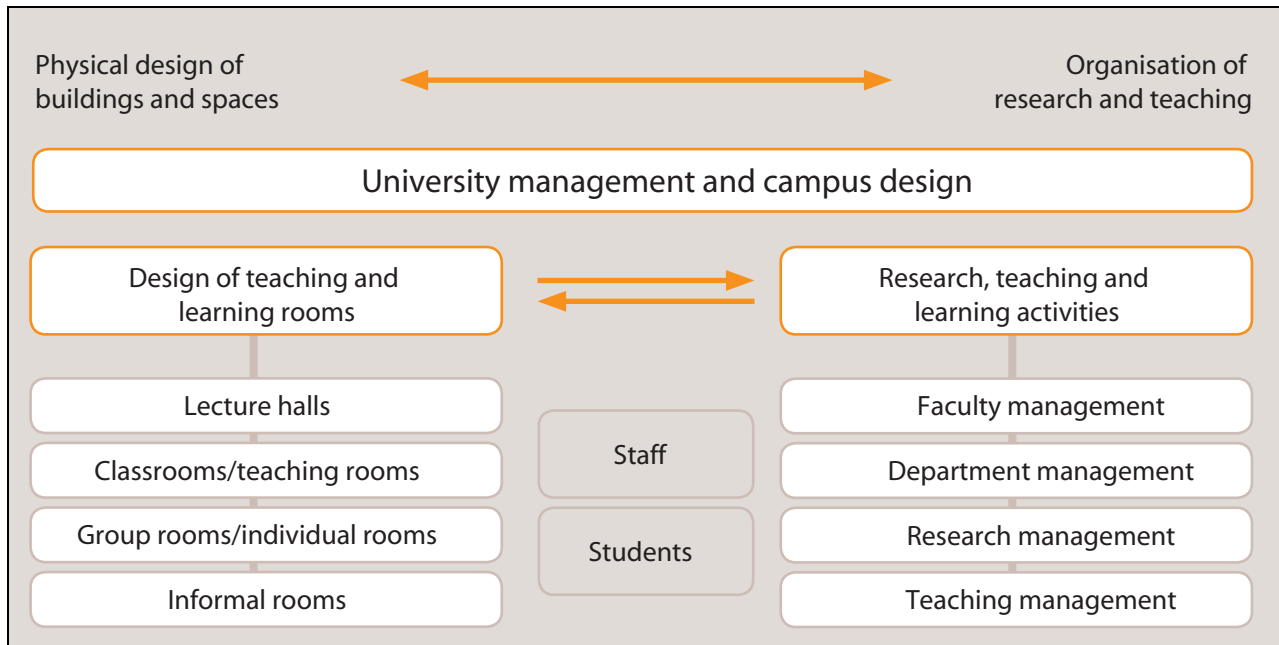


Figure 8.3 Links between the organisation of an institution and its infrastructure

pus. Some of the institutions that have recently merged are preparing new or revised plans in order to highlight the challenges and opportunities that may arise from a multi-campus structure. The structure and time horizons of the plans vary. The Universities of Oslo, Bergen and Stavanger and the Norwegian University of Science and Technology have long-term plans that extend to 2040 or beyond. Many other plans have a shorter time horizon, up to 2020–2025. The plans also vary in how well they reflect to the institutions' overall strategy, and how well they function as real management tools for the institutions.

University and university college estates must be managed and developed in ways that support academic and organisational activities at the institutions. It is therefore necessary to set priorities for resources to be used for buildings and find a balance between these and other priorities. Thus, campus development should be an integral part of the institutions' academic and organisational objectives, and they must develop a sound approach to innovative and efficient utilisation of their estates.

The Government expects:

- public universities and university colleges to have campus development plans that promote efficient use of their estates and support their academic and strategic priorities.

The Government will:

- evaluate practice for campus development plans by 2022.

## 8.4 Development and maintenance needs

University and university college buildings serve the very important social purpose of supporting and promoting the achievement of research and higher education objectives. The quality of a building is determined by how well it serves its purpose for its users, not merely by how well it is maintained. For the current planning horizon, most of the buildings of the future exist already, but they will need considerable adaptation. More space may be needed as student numbers and academic communities grow, and it may be necessary to adapt some sites to strategic initiatives such as the Centres of Excellence scheme, large-scale procurement of equipment, interdisciplinary cooperation, co-location and mergers. The Government considers it vital to ensure that the currently available areas can be used in the best possible way. Some of the main reasons why development and maintenance are needed are discussed below.

### 8.4.1 Growing student numbers

Like other OECD countries, Norway has experienced strong growth in higher education. In 1970,



### Boks 8.2 Concept for new Campus NTNU in Trondheim

The Government has selected the concept for the new campus for the Norwegian University of Science and Technology in Trondheim. This involves a unified campus achieved by relocating the humanities and social science faculties from Dragvoll, and the art, architecture and music faculties move from various sites in the city to the main Gløshaugen campus. The upper limits of 92 000 m<sup>2</sup> gross newbuilds and 45 000 m<sup>2</sup> gross of alterations at Gløshaugen have been set for the project. The Government considers continuity and an integrated planning process to be important. The pre-project phase must include an assessment of carrying out a phased development, and of the pace of implementation and the development strategy, including completion of the entire project over a ten-year period.

Measures to reduce costs must also be considered in the pre-project phase. According to the development agreement between the Ministry of Education and Research and NTNU, the university is to plan a forward-looking, unified campus that can become a model for future public-sector development in Norway. The Storting has also asked the Government to facilitate the use of ambitious environmental solutions in this project that produce more energy than the university uses.

The Ministry of Education and Research has commissioned Statsbygg to prepare a pre-study report for Campus NTNU which to be completed around the end of 2018. The pre-study report will undergo external quality assurance and will then be considered by the Government.

there were around 50 000 students in Norway. By 2017, this had increased to 257 000.<sup>38</sup> The number of students increased by 37 per cent in the period 1997–2016, most rapidly in the last ten years. The number of staff increased by 63 per cent in the same period. The need for greater capacity has implications for campus development and the development of related infrastructure and services such as student housing and transport. One construction project that has been carried out in response to increased activity is at UiT The Arctic University of Norway, where a new building for medicine and health sciences opened in 2018 and student housing has been built at the Breivika campus in Tromsø. However, increasing activity may not be such a strong driving force for development and renovation in the years ahead. There has been a considerable reduction in the number of births in Norway the last few years, so that youth cohorts will reach a historically low level in 20 years' time. Statsbygg's review also indicates that the current facilities can be utilised better.<sup>39</sup>

#### 8.4.2 Mergers and co-location

Many of the major construction projects have taken place in the wake of large-scale processes involving mergers. The first of these was the university college reform in 1994, when the Storting decided that 98 university colleges were to be merged into 26 larger units. The second was the structural reform adopted by the Storting in 2015. As a result of the structural reform, Norway now has 21 public universities and university colleges split between about 90 campuses.<sup>40</sup> Construction projects in response to co-location after structural changes include Campus Ås (for the Norwegian University of Life Sciences, formed by merging the University for Environment and Life Sciences in Ås and the Norwegian School of Veterinary Science in Oslo; the Norwegian Veterinary Institute is being co-located with the new University of Life Sciences), Campus Kronstad for the Western Norway University of Applied Sciences, and new-

<sup>38</sup> Norwegian Centre for Research Data (NSD), self-financed students, autumn 2017

<sup>39</sup> Statsbygg. *Kunnskapsgrunnlag for universitets- og høyskolesektoren, rapport B* [(Knowledge base for the university and university college sector, report B)]. 2018

<sup>40</sup> The number of campuses is based on Statsbygg, *Kunnskapsgrunnlag for universitets- og høyskolesektoren Rapport A* [Knowledge base for the university and university college sector Report A]. 2018. According to an Official Norwegian Report (NOU 2008:3), there were 57 campuses at public universities and university colleges in Norway at the time. The discrepancy is largely explained by the methodology; Statsbygg counts each site used by an institution in the same town as a separate campus, whereas the 2008 report did not. For instance, the current NTNU has 14 campuses in Trondheim according to Statsbygg, while the 2008 report only counted two, the main NTNU campus and Sør-Trøndelag University College (now merged with NTNU).

builds for art, music and design for the University of Bergen.

Many universities and university colleges also cooperate closely with other bodies with which they are unlikely to merge, but where co-location brings benefits. These may include local businesses, research institutes, welfare organisations and institutions in the health sector. Examples include MediaCity Bergen and SINTEF and the Norwegian University of Science and Technology. The food research institute Nofima and the Norwegian Institute of Bioeconomy Research both have their headquarters at Campus Ås. Health trusts, hospitals and universities also cooperate closely, as described in Chapter 8.2.3.

### 8.4.3 Historical buildings

Historical buildings are a valuable resource. They play an important part in forming the character of an institution, are often centrally located and can therefore serve the local community as well, and provide a distinctive atmosphere and a sense of belonging. The largest upgrade projects in recent years have been the renovation of the city centre buildings at the University of Oslo, the University Museum of Bergen, the Clock Building at the Norwegian University of Life Sciences and the Norwegian School of Sport Sciences. The main intention of these projects has been to maintain the heritage of the institutions while upgrading their buildings to meet today's requirements.

Just over half of the buildings at the institutions that are property managers date from before 1970, and about 70 per cent from before 1990. Around 11 per cent of the older buildings at these institutions have some form of protection.<sup>41</sup> At some institutions, this is true of up to 70 per cent of the buildings. This can make renovation and upgrading more demanding and more costly. The management of historical buildings requires special expertise.

### 8.4.4 Modernisation and upgrading

The objective of modernisation and upgrading is to ensure that buildings and facilities are in good condition and suitable for their purpose. A high-quality higher education requires buildings and facilities that support modern forms of education and provide a good learning environment. They

must be designed on the basis of knowledge about how and in what surroundings students learn best.

Several major initiatives require the adaptation and alteration of buildings and facilities. To achieve prestigious awards such as status as a Centre of Excellence under the Research Council of Norway's scheme or a grant from the European Research Council, an institution may have to make alterations on a larger or smaller scale. Adaptation of the existing building stock may also be important in reducing the climate and environmental footprint of the higher education sector.

The overview from the Knowledge Centre for Education refers to research documenting that spatial design may be a barrier to the use of innovative education methods and technology. Well-functioning buildings and facilities can promote better use of digitalisation, and this may enhance the labour market relevance of graduates from Norway's higher education system, see the OECD report on higher education in Norway published in 2018.<sup>42</sup> Students are not as dependent on actually being on campus as they used to be. Greater use of technology makes it less important where and when learning takes place. At the same time, new forms of learning and teaching are based more on cooperation, discussion and problem-solving. The campus design overview from the Knowledge Centre for Education and the knowledge base compiled by Statsbygg identify a pressing need to design buildings and facilities in a way that promotes and stimulates both real-life and virtual cooperation. Statsbygg points out that minor alterations such as moving walls or revitalising underused areas can make the use of space more efficient. Examples of such measures are alterations of the older auditoriums at the Norwegian University of Science and Technology to provide modern interactive learning and teaching spaces, and revitalisation of an entrance hall at Campus Kristiansand at the University of Agder (see Box 8.3).

In 2012, the Office of the Auditor General conducted an investigation of central government management of university and university college estates.<sup>43</sup> According to the report, there was a deterioration in the condition of 19 per cent of

<sup>41</sup> Statsbygg. *Kunnskapsgrunnlag for universitets- og høyskolesektoren, Rapport A [Knowledge base for the university and university college sector, Report A]*. 2018

<sup>42</sup> OECD, *Higher Education in Norway. Labour Market Relevance and Outcomes*. 2018

<sup>43</sup> Doc. no. 3:4 (2012–2013). *Riksrevisjonens undersøkelse om statens forvaltning av eiendomsmasse i universitets- og høyskolesektoren [Investigation by the Office of the Auditor General of central government management of university and university college estates]*

### Box 8.3 Campus Kristiansand: revitalisation of an entrance hall

A growing number of students and staff has made alterations and extensions necessary. Many students nowadays prefer to work in the cafeteria and other shared areas rather than in a reading room or group room. The University of Agder needed a bigger cafeteria and more work spaces for students. Their solution was to alter the entrance hall. This was an 800 m<sup>2</sup> space that people merely used to walk through, but is now also being used as a cafeteria and reading room. The alterations have given the university more space without the need to extend the buildings.

buildings in this sector in the period 2003–2011. The Ministry of Education and Research and the institutions that are property managers have taken a number of steps in response to the Auditor General's report. The Ministry requires institutions that are property managers to have long-term maintenance and upgrading plans. From 2018, the universities that are property managers have changed their internal rent system to ensure efficient use of their estates and to meet the requirements for sufficient maintenance to preserve property value. The Ministry has also asked all the public higher-education institutions to prepare long-term campus development plans to ensure efficient use of their estates, see Chapter 8.3. The institutions now spend a greater proportion of their basic allocation on their estates than they used to. For the last four years, the institutions that are property managers have spent NOK 1.1–1.3 billion annually on maintenance and improvements from their own budgets.

In the period 2015–2018, the Government allocated a total of NOK 330 million for upgrading of buildings in institutions that are property managers, on condition that the institutions themselves provide at least 50 per cent of the funding for the projects. In all, Government allocations and the institutions' own investments have resulted in upgrades worth more than NOK 1 billion.

Public universities and university colleges should carry out necessary adaptation and upgrading of their buildings and facilities and consider reinvestments as part of the needs analysis for construction projects.

The Government expects:

- universities and university colleges to carry out necessary adaptation and maintenance of their existing estates.

The Government will:

- encourage good progress and investment in upgrading and adaptation by increasing the funding available for upgrading at the institutions that are property managers;
- introduce a similar scheme for universities and university colleges that pay rent to Statsbygg for their buildings.

## 8.5 Cost-effective university and university college buildings that play a role in innovation and climate and environmentally friendly solutions

Norway's higher education sector has one of the largest public property portfolios in the country measured by area. Buildings influence their surroundings in various ways depending on how they are designed, sited, operated and used. This sector plays an important part in helping Norway to meet the Sustainable Development Goals – both through campus development and through the institutions' key role in promoting new sustainable solutions nationally and globally. Campuses are important outdoor areas for students and staff and also for the general public. If they are designed as an integral part of the urban space, outdoor areas in and around universities and university colleges provide good meeting places and thoroughfares. It is therefore important to take a broad-based approach to climate and environmentally friendly management, operation and development of buildings and facilities.

In its white paper *Long-term Perspectives on the Norwegian Economy 2017*, the Government emphasises the importance of coordinating the use of policy instruments, so that climate and environmental targets do not come into conflict with goals in other areas. Universities and university colleges are following different approaches to strategic issues relating to climate change and the environment. Some, for example the Universities of Oslo and Bergen and the Norwegian University of Science and Technology, have developed separate environmental and climate change strategies for their estate operations.

The higher education sector can limit its climate and environmental footprint through re-use

#### **Box 8.4 Environmental and climate change strategy for the University of Oslo's estate operations**

There are nine elements of the university's estate operations that are intended to give climate and environmental benefits:

- reduction of greenhouse gas emissions
- reduced and renewable energy use
- environmentally friendly transport
- waste reduction and more waste separation at source
- environmentally sound use of materials and resources
- using procurement as a driver of environmentally and climate friendly estate operations
- efficient spatial management that gives environmental benefits and creates a pleasant working environment
- environmentally efficient buildings
- environmentally efficient outdoor areas that create a positive environment.

<https://www.uio.no/english/about/strategy/environment/index.html>

of existing buildings, spatial management, energy and materials use, and by managing waste, transport and pollution. The universities and university colleges also have a special part to play in developing and deploying new, climate and environmentally friendly solutions in education, research, innovation and dissemination and procurement activities and in their contributions to the public debate.

Environmental requirements concerning technical solutions for buildings, materials and energy facilities are included in a number of instructions, Norwegian regulations and international agreements. However, the climate and environmental footprint depends at least as much on maintaining a constant awareness of the need for green operations. The knowledge base compiled by Statsbygg refers to research demonstrating that inappropriate user routines can counteract the effect of good technical solutions, and that even «poor» buildings can be run energy-efficiently.<sup>44</sup> However, investments will be needed to implement solutions that

<sup>44</sup> Statsbygg. *Kunnskapsgrunnlag for universitets- og høyskolesektoren, Rapport B* [Knowledge base for the university and university college sector, Report B]. 2018

#### **Box 8.5 Museum of Archaeology**

The Museum of Archaeology was established in 1975 and has been part of the University of Stavanger since 2009. The museum is responsible for collecting, conserving and safeguarding finds from pre-reformation times, and is currently housed in premises from the 1920s and 1990s. There are plans for a new adjoining building for education and visitor services, and the existing premises will be renovated. The overall floor space is 6 100 m<sup>2</sup>. The new-build will solve the problems of cramped visitor facilities and unsatisfactory safeguarding and conservation of valuable cultural artefacts.

satisfy the current environmental requirements, both in existing and in new buildings.

The Government expects:

- universities and university colleges to play a part in research, education and innovation that can be used in developing and deploying cost-effective, sustainable and climate and environmentally friendly solutions that satisfy the current technical building regulations.

The Government will:

- develop and use green indicators to highlight and monitor climate-related and environmental effects of campus development;
- review the overall effects of climate change and environmental measures implemented in the higher education sector.

## **8.6 Unique collections of importance for Norwegian history, culture and identity**

### **8.6.1 University museums**

The Norwegian University of Science and Technology, the Universities of Bergen, Oslo and Stavanger and UiT The Arctic University of Norway have been given a special national responsibility for running museums with both scientific collections and exhibitions open to the public. The university museums manage collections of great national and international value, containing a total of around 19 million objects, and have a total floor area



### Box 8.6 Viking Age Museum, Museum of Cultural History

The world's best preserved Viking ships, the Oseberg, Gokstad and Tune ships, will make up the core of the collection at the planned new Viking Age Museum, which is part of the Museum of Cultural History at the University of Oslo. This is Norway's distinctive cultural heritage, and together with a large number of other iconic finds, the ships make the collection globally unique.

Safeguarding the Viking Age collections properly is a very challenging task. In recent years, the university has discovered that the collections have deteriorated much more than was previously thought. In addition, more than 100 000 people visit the museum every month in the summer season. This puts great pressure on

both buildings and artefacts, and makes research and communication even more important. Extensive work has been carried out to find the best solution for the Viking Age collection.

An international group of experts appointed to make a risk assessment of future plans for the ships recommended in 2012 that the Viking ship assemblage should not to be moved, and the Government endorsed the proposal to keep the collection at Bygdøy in Oslo. Expansion of the museum buildings is therefore being planned to ensure that current and future generations are given access to Norway's cultural history and an understanding of the Viking Age. The framework for the project is a maximum gross area of 13 100 m<sup>2</sup>, of which 9 300 m<sup>2</sup> is newbuilds.

of more than 130 000 m<sup>2</sup>. In 2017, the university museums had just under 1.9 million visitors.

The Office of the Auditor-General has twice investigated the conservation and safeguarding of collections at public museums, and concluded that many collections at university museums have not been kept in appropriate conditions, and that the administration of these responsibilities has not been satisfactory.<sup>45</sup> In response to a white paper on the university museums (Report No. 15 (2007–2008) to the Storting), both the Ministry's overall administrative control and the universities' internal management of the museums have been improved. In particular, responsibility for the museums is now much better integrated into the universities' management documents and routines. The institutions have been making a concerted effort over several years to improve storage conditions, and some have solved their problems by renting external premises. Major challenges still remain, however. Various objects in the Viking Age collection in Oslo were treated using the alum conservation method and are disintegrated

from the inside out, see Box 8.6. Large parts of the university museum collections remain in storage, unavailable to the public. There were thefts from the University Museum of Bergen in 2017. According to the 2018 status report for the higher education sector, the risk of water damage is high at most of the museums. Several also need to improve routines, emergency preparedness and environmental conditions (humidity and temperature). The extent to which objects have been digitised and made available online varies widely. Safeguarding and conserving their collections is the most important task for these institutions, and the situation will only improve if their premises are expanded and upgraded.

Restoration of the buildings at the University Museum of Bergen was completed in the autumn of 2018, and the new exhibitions will be completed in spring 2019. The pre-project phase has been completed for the new Viking Age Museum (part of the Museum of Cultural History, University of Oslo) and for the Museum of Archaeology (University of Stavanger). The Government has decided on the new site for the Arctic University Museum of Norway in Tromsø, which is being planned as an ordinary construction project. The concept for the new Campus NTNU includes plans for an upgrade of storage areas at the NTNU University Museum. A new exhibition greenhouse at the Natural History Museum, University of Oslo is also at the pre-project stage.

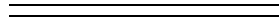
<sup>45</sup> The two reports are Doc. no. 3:9 (2002–2003). *Riksrevisjonens undersøkelse av bevaringen og sikringen av samlingene ved fem statlige museer*. [Investigation by the Office of the Auditor General of the conservation and safeguarding of collections at five public museums] and Doc. no. 3:10 (2007–2008). *Riksrevisjonens undersøkelse av bevaringen og sikringen av samlingene ved statlige museer* [Investigation by the Office of the Auditor General of the conservation and safeguarding of collections at public museums]

In its political platform, the Government announced that it would make Norway's cultural heritage more accessible by strengthening the museums' expertise in research and interpretation activities. The Government also considers it important that the pre-project phase has been completed for the Viking Age Museum, University of Oslo, and the Museum of Archaeology, University of Stavanger. These projects will make an important contribution to safeguarding and con-

serving unique historical and cultural collections, and to making them accessible and disseminating information about them.

The Government expects:

- the universities to fulfil their responsibility for safeguarding and conserving unique collections, including making the collections available digitally and ensuring good routines and satisfactory emergency preparedness.





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