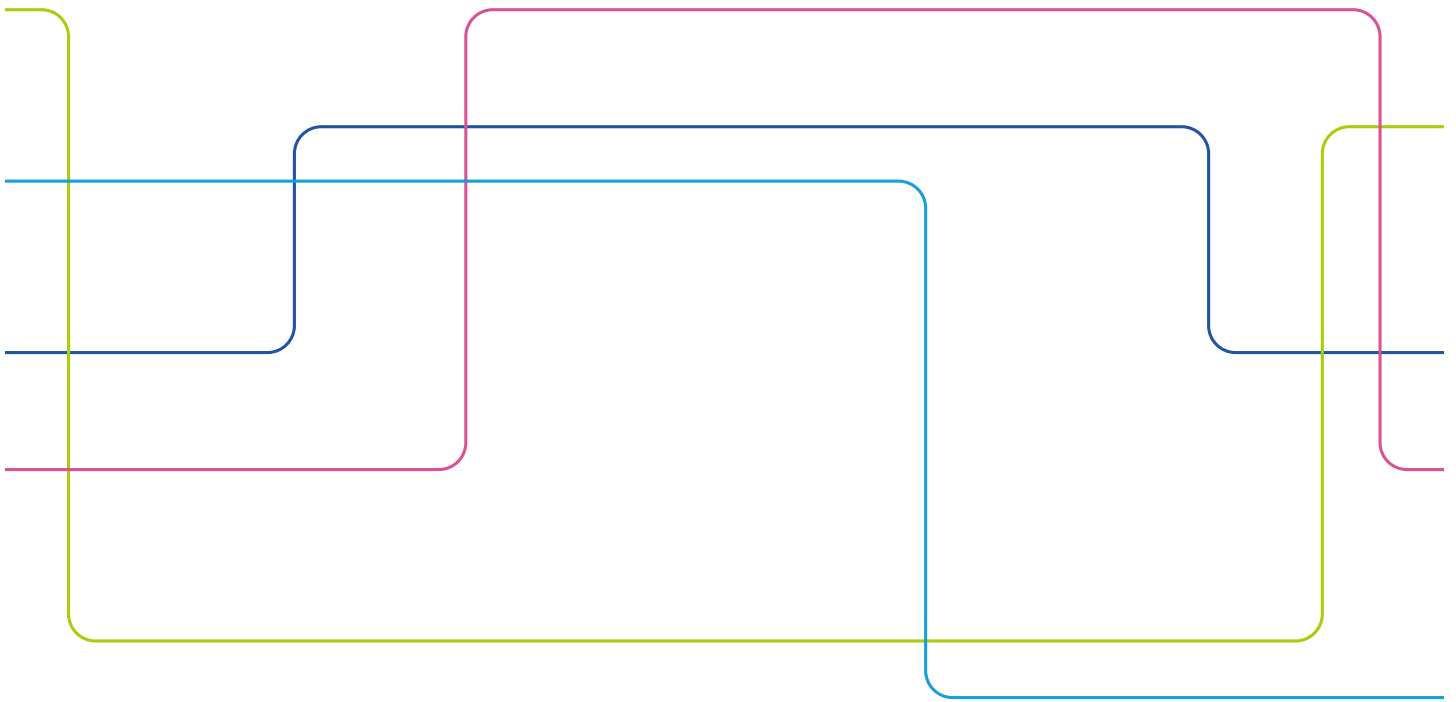




# Annual Report 2021





# Content

<b>ABOUT THE ANNUAL REPORT</b>	<b>3</b>	<b>Centres and other special initiatives</b>	<b>34</b>
<b>THIS IS KTH</b>	<b>4</b>	<b>Skills development for heads of research collaboration</b>	<b>35</b>
<b>ORGANISATION</b>	<b>5</b>	<b>Strategic research areas</b>	<b>35</b>
<b>A NOTE FROM THE UNIVERSITY PRESIDENT</b>	<b>6</b>	<b>Digital Futures – a research centre that meets societal challenges through digital transformation</b>	<b>36</b>
<b>THE STUDENTS HAVE THE FLOOR</b>	<b>7</b>	<b>Science for Life Laboratory, a national centre for life science research</b>	<b>37</b>
<b>EDUCATION</b>	<b>8</b>	<b>Research platforms</b>	<b>38</b>
<b>First-cycle and second-cycle education</b>	<b>8</b>	<b>European Institute of Innovation and Technology</b>	<b>39</b>
Educational programmes	8	<b>Research Assessment Exercise</b>	<b>40</b>
Recruitment of students to KTH's programmes that commence at the first-cycle level.	11	<b>Research infrastructure</b>	<b>41</b>
Recruitment of students to second-cycle educational programmes	12	<b>Investment in sustainable production in Södertälje</b>	<b>41</b>
Tuition-fee funded activities	13	<b>Export control</b>	<b>42</b>
Collaboration with the Swedish Migration Agency	13	<b>Ethics in research</b>	<b>42</b>
Demand for KTH's educational programmes	14	<b>Honorary doctorates</b>	<b>42</b>
Alternative selection process	15	<b>COLLABORATION</b>	<b>44</b>
Separate admissions for fee-paying students	15	<b>Strategic partnerships</b>	<b>44</b>
Assessment of real competence	15	<b>Personal mobility</b>	<b>44</b>
Beginners	15	<b>Work to increase the societal impact of KTH's research and education</b>	<b>44</b>
Preparation for higher education courses following upper-secondary school.	17	<b>Development projects related to strategic collaboration</b>	<b>45</b>
International mobility	17	<b>Other collaborative initiatives</b>	<b>45</b>
Integration initiatives	19	<b>Alumni relations</b>	<b>45</b>
Performance	20	<b>Fundraising</b>	<b>45</b>
Degrees	23	<b>Innovation Office</b>	<b>46</b>
Career guidance	23	Activities supporting innovation	46
<b>Third-cycle education</b>	<b>23</b>	<b>DIGITALISATION</b>	<b>48</b>
Recruitment	23	<b>Digitalisation and education</b>	<b>48</b>
Admissions	24	Working group for digitalisation of education	48
Level of activity and financing of academic studies	25	Digital examinations	48
KTH's doctoral programmes	25	Support for teachers	48
Student mobility within the programmes at the third-cycle level	25	<b>Open science and digitalisation of research data</b>	<b>48</b>
Degrees	25	Open Access publications	48
<b>National partnerships</b>	<b>25</b>	Digitalisation of research data	49
Prerequisites for educational partnerships	25	<b>Development of KTH's IT management system</b>	<b>49</b>
Teacher training programmes	25	<b>Research programmes within digitalisation</b>	<b>49</b>
Collaborations with colleges of fine, applied and performing arts	28	<b>The digital workplace</b>	<b>49</b>
Stockholm Trio University Alliance	28	<b>The digital work environment in systematic occupational safety and health</b>	<b>50</b>
Other partnerships	28	<b>Digital accessibility in accordance with the Act on the Accessibility of Digital Public Services</b>	<b>50</b>
<b>International collaborations</b>	<b>29</b>	<b>KTH participation in external initiatives linked to digitalisation</b>	<b>50</b>
Strategic partners and networks	29		
KTH Global Development Hub	29		
China Scholarship Council	29		
European Institute of Innovation and Technology	29		
Erasmus+	30		
European Universities – Unite!	30		
Marie Skłodowska-Curie Actions	30		
Projects funded by SIDA and the Swedish Institute	30		
<b>RESEARCH</b>	<b>31</b>		
<b>Objectives</b>	<b>31</b>		
<b>External research funding</b>	<b>31</b>		
International research funding	31		
EU funding: Horizon 2020 and Horizon Europe	31		
National external funding	33		

<b>GENDER EQUALITY, DIVERSITY AND EQUAL OPPORTUNITIES (JML)</b>	<b>51</b>	<b>Survey follow-ups</b>	<b>61</b>
<b>Collective organisation</b>	<b>51</b>	Mid-point surveys	61
KTH Equality Office	51	Career survey	61
The JMLA group	51	<b>Rankings</b>	<b>61</b>
Integration of JML into the Sustainable Development Goals	51	<b>STAFF</b>	<b>63</b>
Gender and change management, GOFL	52	<b>Skills supply</b>	<b>63</b>
<b>Knowledge and awareness</b>	<b>52</b>	Employer brand	63
Integration of JML in education, JMLIU	52	The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers	63
JMLIU reference group	52	Unite! H2o2o	63
Mandatory component of basic knowledge of JML	52	Skills and career development	63
Higher education pedagogy	53	Introduction	64
Follow-up of previously announced project funds	53	Career support	64
Material from the gender network	53	<b>Management and leadership</b>	<b>65</b>
<b>Equal opportunities</b>	<b>53</b>	<b>Collegiality</b>	<b>65</b>
Study of the process for recruitment and promotion of the faculty	53	<b>Occupational safety and health</b>	<b>65</b>
Partners in Learning, PIL	53	<b>Staff structure</b>	<b>66</b>
Continuous follow up and quality discussions	53	Age structure	66
Coordination of data on distribution of research funding based on	53	Teaching staff and researchers	66
Trade union collaboration	53	Associate professors and lecturers	66
Active measures against discrimination	53	Career-development positions: assistant professor and postdoc	66
<b>Inclusive cultures</b>	<b>54</b>	Researchers and research engineers	67
In-depth work on values	54	Doctoral students with employment	67
Collaboration programme against sexual harassment and gender-based vulnerability	54	Technical and administrative personnel	67
Handling cases of sexual harassment against students and employees	54	Docents	67
The reception of new students	54	<b>PREMISES</b>	<b>68</b>
Diversity and Inclusion for Organisational Development and Equality, DIODE	54	<b>Accommodation for students and visiting researchers</b>	<b>68</b>
<b>THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT</b>	<b>55</b>	<b>FINANCE – EARNINGS, RESOURCE UTILIZATION AND FINANCING</b>	<b>69</b>
<b>Environmental management system</b>	<b>55</b>	<b>Financial result and change in capital</b>	<b>69</b>
<b>Education</b>	<b>55</b>	<b>Revenue</b>	<b>70</b>
<b>Research</b>	<b>56</b>	First-cycle and second-cycle education	70
<b>Collaboration</b>	<b>56</b>	Research and education at the third-cycle level	70
<b>Organisation and working methods</b>	<b>57</b>	<b>Costs</b>	<b>71</b>
<b>Resource management</b>	<b>57</b>	First-cycle and second-cycle education	71
Travel and transportation	57	Research and education at third-cycle level	71
Procurement and waste	57	<b>MANAGEMENT OF FOUNDATIONS</b>	<b>73</b>
Sustainable buildings	57	<b>Purpose-driven management</b>	<b>73</b>
Food and catering	58	<b>Asset management</b>	<b>73</b>
Biodiversity and ecosystem services	58	<b>FINANCIAL STATEMENT</b>	<b>74</b>
<b>SYSTEMATIC QUALITY MANAGEMENT</b>	<b>59</b>	<b>Financial Statement per operational area</b>	<b>74</b>
<b>KTH's quality system</b>	<b>59</b>	<b>BALANCE SHEET</b>	<b>75</b>
Continuous follow-up	59		
Regular review	60		
<b>Quality Management within the European University Alliance, Unite!</b>	<b>60</b>		
<b>The Swedish Higher Education Authority's reviews and evaluations</b>	<b>60</b>		
Educational evaluations	60		
Thematic evaluation	60		

# About the Annual Report

KTH's Annual Report is regulated by the Ordinance concerning Annual Reports and Budget Documentation (2000:605). The Annual Report shall provide a true and fair view of the organisation's results.

The Annual Report includes not only information that KTH must report in accordance with the law and its government remit, but also other information that KTH has chosen to provide about its activities in general, and events that have taken place in 2021 in particular.

According to the Swedish National Financial Management Authority's directives for Chapter 3, Section 1 of Ordinance (2000:605) on Annual Reports and Budget Documentation, the public authority shall also produce performance indicators and report in accordance with said indicators. The Annual Report contains accounting and follow-up of a large number of parameters arising, among other things, from the accounting requirements contained in the Higher Education Act, appropriation directions for the financial year 2021 regarding universities and higher education institutions and Ordinance (2000:605) concerning Annual Reports and Budget Documentation. There are a small number of

performance indicators, and they constitute a minor part of the total reporting of KTH's operations.

Reporting requirements as a result of spending authorization or other decisions are presented on a grey background for increased visibility. The performance indicators that KTH has chosen to highlight in the 2021 Annual Report are presented on a light grey background.

Quantitative data about volume and development are mainly derived from KTH's business systems. Quantitative data in the text is often specified in the form xx (yy), where xx is the information for 2021 and yy is the corresponding information for 2020.

Qualitative data about operations and development have chiefly been obtained from decisions, minutes, information on KTH's websites, etc.

The Annual Report has been compiled within KTH's University Administration.

A considerable number of abbreviations have been used in KTH's Annual Report. To avoid having to define them all in the running text, the most important ones are listed below.

## KTH internally

<b>ABE</b>	School of Architecture and the Built Environment
<b>CBH</b>	School of Chemistry, Biotechnology and Health
<b>EECS</b>	School of Electrical Engineering and Computer Science
<b>ITM</b>	School of Industrial Engineering and Management
<b>SCI</b>	School of Engineering Sciences
<b>GVS</b>	University Administration
<b>JML</b>	Gender Equality, Diversity and Equal Opportunities
<b>JMLA</b>	Director of Gender Equality, Diversity and Equal Opportunities
<b>SciLifeLab</b>	Science for Life Laboratory

## Authorities, organisations etc.

<b>EIT</b>	European Institute of Innovation and Technology
<b>HPR</b>	Annual Performance Equivalent Student
<b>HST</b>	Full-Time Equivalent Student
<b>KIC</b>	Knowledge and Innovation Communities (within EIT)
<b>RISE</b>	RISE Research Institutes of Sweden AB
<b>SFO</b>	Strategic Research Area
<b>SSF</b>	Swedish Foundation for Strategic Research
<b>SUHF</b>	Association of Swedish Higher Education Institutions
<b>THS</b>	Student Union at the Royal Institute of Technology
<b>UHR</b>	Swedish Council for Higher Education
<b>UKÄ</b>	Swedish Higher Education Authority
<b>Vinnova</b>	Swedish Governmental Agency for Innovation Systems

# This is KTH

Since its foundation in 1827, KTH has grown to become one of Europe's preeminent technical and engineering universities, as well as a key centre of talent and innovation. As Sweden's largest provider of technical education and research, KTH attracts students, lecturers, and academic researchers from all over the world.

In collaboration with wider society, KTH works on sustainable solutions for, among other things, climate change, energy supply, urbanization, and quality of life for an ageing population, which are some of humanity's greatest challenges.

KTH's education and research spans an extensive area, in addition to technology and science it includes architecture, industrial economics, urban planning and learning. The innovative climate promotes versatile solutions and creates a new generation of engineers, architects, and teachers. In the next few years, additional focus will be placed on digitalisation, sustainability, internationalization, and gender equality.

KTH participates in international research collaborations as well as many different exchange and educational programmes with universities and colleges around the world. KTH's collaboration with strategic partners within compa-

nies, public authorities and organisations provides students and researchers with a wide network of contacts of which they can avail.

KTH conducts its education and research at five campuses in the Stockholm region. KTH Campus is located in Stockholm's inner city next to Norra Djurgården. KTH and Stockholm University jointly organize educational programmes and research in biotechnology and physics at AlbaNova, near Roslagstull, and adjacent to the KTH Campus.

The Science for Life Laboratory is located in Solna, and is run together with Karolinska Institutet, Stockholm University and Uppsala University. At KTH Kista, north of Stockholm, education and research are conducted in the field of Information Technology, in close proximity to companies and research institutes within the sector.

KTH is a part of Campus Flemingsberg located in the southern suburbs of Stockholm, where the focus is on medical technology. In Södertälje, KTH is expanding its education programmes and research within sustainable production. In collaboration with Scania, AstraZeneca, and Södertälje Municipality, KTH is a key partner in Södertälje Science Park.

## KTH IN FIGURES 2021

### EDUCATIONAL ACTIVITIES

- Master of Architecture and 17 Master of Science in Engineering programmes
- Master of Science in Engineering combined with Degree in Education
- 9 Bachelor of Science in Engineering programmes
- Subject Teacher Education in Technology
- Supplementary teacher education
- Master's programmes (one and two year)
- Bachelor's programmes and two-year university diplomas
- Further education, technical preparatory year/semester
- Third cycle education
  
- 13,524 full time students, of which 35 per cent are women and 65 per cent men (including fee-paying students)
- 11,448 annual performance equivalents (including fee-paying students)
- 1,657 active research students (at least 50 per cent activity), of which 33 per cent are women and 67 per cent men
  
- 2,781 new students on the first year of Master of Science in Engineering, Master of Architecture and Bachelor of Science in Engineering programmes of which 31 per cent are women and 69 per cent men
- 1,092 admitted to the Technical Preparatory Year/Semester, of which 32 per cent are women and 68 per cent men
- 2,345 new students on one and two-year Master's programmes, 39 per cent women and 61 per cent men, of whom
  - 1,121 students previously on Master of Science in Engineering studies programmes and
  - 1,224 students studying on a one or two-year Master's programme at KTH
- 293 newly-admitted students to doctoral studies programmes, of which 35 per cent are women and 65 per cent men
  
- 99 Master of Architecture, 57 per cent to women and 43 per cent to men
- 1,310 Master of Science in Engineering degrees, 37 per cent to women and 63 per cent to men
- 388 Bachelor of Science in Engineering degrees, 32 per cent to women and 68 per cent to men
- 1,967 Master/Master of Science (one and two-year) degrees, 35 per cent to women and 65 per cent to men
- 258 PhDs, 33 per cent to women and 67 per cent to men
- 46 licentiate degrees, 35 per cent to women and 65 per cent to men

### FLOOR SPACE

292,000 m<sup>2</sup>

### RESEARCH

Primary responsibility for five national strategic research areas

- E-science
- IT and mobile communication
- Transport research
- Production engineering
- Molecular biosciences (Science for Life Laboratory)
- Partner in another five areas

Lead partner in five programme areas within the European Institute of Innovation and Technology (EIT);

- EIT InnoEnergy
- EIT Digital
- EIT Health
- EIT Raw Materials
- EIT Urban Mobility

External financing, income from grants, 1,847 MSEK (excluding transfers):

- MSEK 288 the Swedish Research Council
- MSEK 254 Wallenberg Foundations
- MSEK 243 EU
- MSEK 166 Swedish foundation for Strategic Research
- MSEK 174 Vinnova
- MSEK 447 other government agencies
- MSEK 276 other external financing including private funds

### FINANCIAL SITUATION

MSEK 6,158 in total turnover (of which MSEK 750 transfers)

Government grants (excluding transfers);

- MSEK 1,395 First and second level (undergraduate) educational programmes
- MSEK 1,406 Research and third education cycle

### EMPLOYEES

5,197 employees, the equivalent of 4,051 full time positions, of which 1,648 are women and 2,403 men of which;

- 335 professors, 65 women and 270 men (including visiting and adjunct professors)
- 290 associate professors, 76 women and 214 men

# Organisation

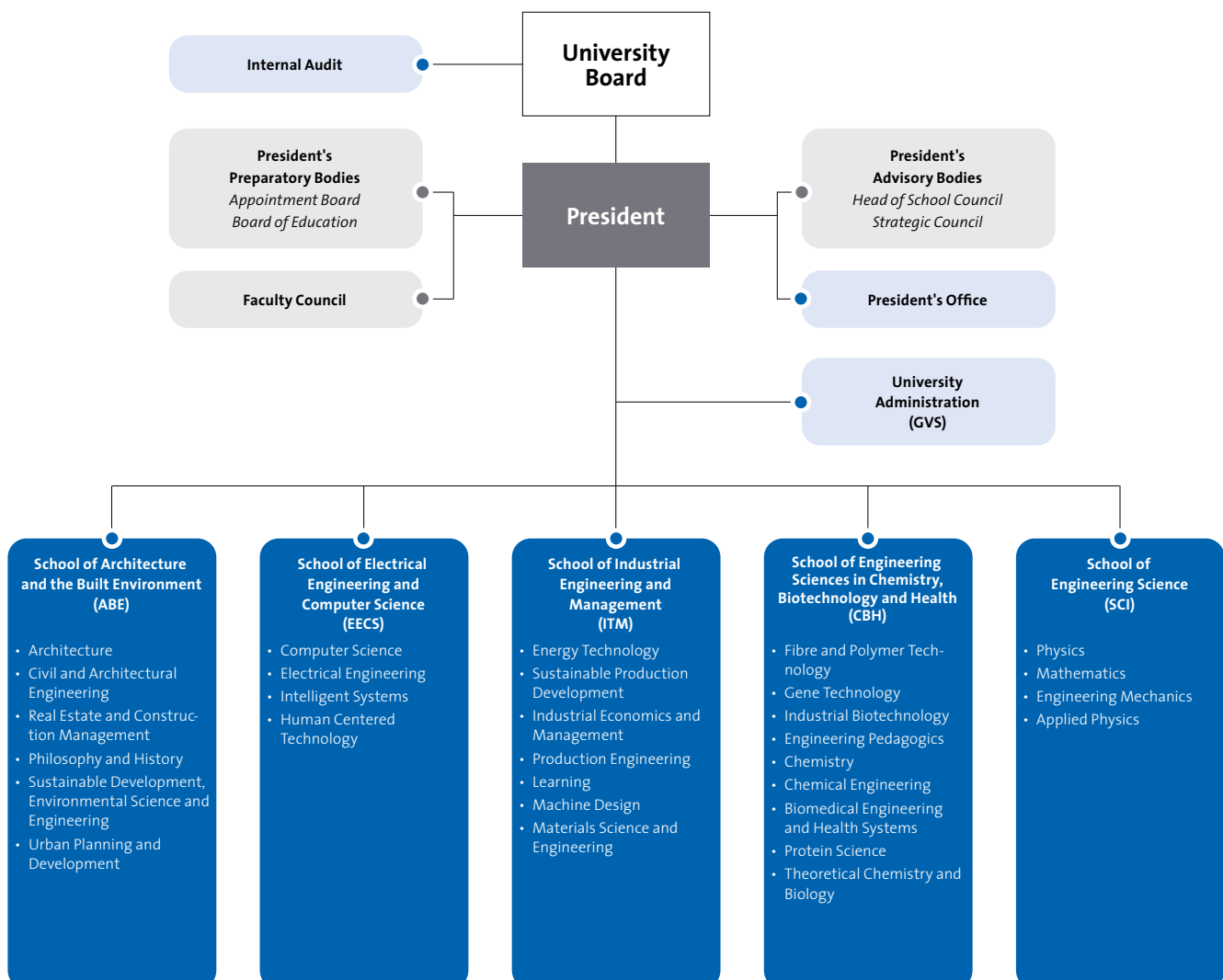
KTH's education and research are organised into five Schools. Under each of the Schools, there are a number of departments, institutions, and research centres. All of the Schools report directly to the President. Each School is led by a Head of School and has a Management Team. There is also a Strategic Council for each School, which is an advisory body to the Head of School in relation to certain issues.

The University Board monitors all of KTH's internal affairs and is responsible for ensuring that its responsibilities are fulfilled. The Board consists of 15 members: the President, eight external members, three faculty members and three student representatives.

The President leads the University, under the direction of the University Board. The Deputy President acts on behalf of the President in her absence. The University Director is the university's most senior administrative head. There are also Vice Presidents for research, education, digitalisation, global relations, sustainable development, as well as gender equality and values.

The President leads a Strategic Council that deals with strategic issues that concern all the Schools, and acts as an information and discussion forum. The Strategic Council comprises the President, Deputy President, Vice Dean of Faculty, Vice Presidents, Heads of Schools, University Director, Communications Director and two student representatives. In addition, there is a Heads of School Council comprising the President, Deputy President, Heads of Schools, and the University Director. The Heads of School Council deals with school-specific issues.

The Faculty Council is a university-wide body for KTH's work on quality development and collegial support. The Faculty Council has overall responsibility for issues related to quality in education, research, and collaboration. The majority of members are scientifically skilled and are appointed through elections among teaching staff and researchers.



# A note from the University President

The past year was also characterized by unpredictability in view of the COVID-19 situation in Sweden and around the world. But it has also clearly demonstrated the ability of KTH to adapt to the situation and at the same time continue to develop.

A lot has happened throughout our entire organisation, and I probably cannot really do justice to all the teachers, researchers, students, and administrators who, in the course of their work, strive to make KTH a little better every day. But here is a selection from within education, research, and collaboration from the past year.

## Lifelong learning is increasing

Demand for KTH's programmes remains high. This applies to virtually all of our educational programmes that lead to a professional qualification, i.e. for students who want to obtain a Master of Science in Engineering, a Bachelor of Science in Engineering or want to become architects and teachers. Firstly, more students applied for these programmes in 2021 than in the previous year, 6,713 students compared with 6,641, which also applies to the number of new students. Even within the group of international students, including fee-paying students, the level has been above expectations in light of the pandemic.

The focus on lifelong learning continues to grow. In comparison with the year before, the number of further education courses has more than doubled – from 67 to 147. It chimes well with our goal that 20 percent of KTH's educational programmes will consist of lifelong learning from 2023. Lifelong learning refers to both commissioned education and publicly funded further education, and is based on a combination of demand from students, what the demand is like in the labour market and KTH's extensive expertise.

When it comes to research, KTH has worked extensively to further increase quality. Through the comprehensive research evaluation, Research Assessment Exercise that took place during the year – where foreign experts reviewed and evaluated our research, KTH has an excellent basis for the continued strategic steps in our development.

## Extensive and cutting-edge expertise

During the year, the work on internal systematic quality has made significant progress. For example, the Swedish Higher Education Authority reviewed our broader recruitment base and evaluated research topics in chemistry – with good results for KTH.

KTH started several important and exciting centres that show both breadth and excellence in our research; Blue food (research on food from the sea) and the consortium Sustainable Finance Lab led by KTH and KTH Climate Action Center, to mention but a few. Sustainable development continues as a common green theme in KTH's business, both internally and externally. One sign of this is that our ranking in the THE Impact Rankings has clearly improved – from 77th place to 41st in the world in this area – despite the fact that more universities participated in the current ranking.

KTH continues to make its excellence clear in the international arena. There are many international universities that want to collaborate with us. The foundation was laid during the year, and the aim is to build even more new partnerships across borders in both research and education, with countries such as the United Kingdom, the United States and South Korea.

## The number of strategic partnerships are increasing

KTH's interaction and collaboration with various stakeholders is part of our life blood and has been ever since our foundation almost 200 years ago. The goal is to create long-term collaborations for the benefit of students, lecturers, researchers, and our strategic partners. To mention just one of many examples of beneficial and well-developed collaborations, KTH and Scania have taken another step in terms of lifelong learning and, among other things, established a joint steering group for learning in professional life. KTH currently has 15 strategic partnerships with the public sector, leading research institutes and global companies. In 2021, we can include another strategic partnership, an international one with Hitachi Energy.

Further steps in the development of digitalisation and gender equality have been taken in 2021. The two areas are two of the four cornerstones on which KTH is built, and which permeate KTH's business, together with the areas of internationalization and sustainable development.

Welcome to the world of KTH in 2021 – summarized in text and figures in this report.



*Sigbritt Karlsson, President of KTH*



# The students have the floor

## Community, development, and joy

Since 1902, the Student Union of the Royal Institute of Technology, THS, has represented all students at KTH. THS aims to monitor and participate in the development of education and study conditions at KTH. In practice, this means that we want our students to obtain the best education they can, while having the most beneficial period of development in their lives, as well as having the most fun. This is something we, as student representatives, can proudly say that we work with, and not *against*, KTH to achieve. By being an active partner who highlights student needs, and at the same time are cognizant of KTH's opportunities and limitations, we will move forward together!

## Main issues of the year

The year 2021 could easily be divided into two completely different semesters with widely differing circumstances. The spring was characterized by distance learning, digital meetings, and a strong focus on psychosocial well-being during social distancing and the demands it placed upon us. Under the slogan *Stay Well TH(I)S Winter*, THS and KTH organized many minor activities, specifically aimed at international students who were hit particularly hard by the demands of social distancing. An important collaboration for student health was also initiated, where KTH students through THS were offered psychological support online. During the spring, the *Education of the Future* project was also launched, which aims to take advantage of the lessons learned and pedagogical research during the pandemic, in terms of both education and study conditions. The autumn was instead characterized by eased restrictions and a return to Campus. This affected all education at KTH, which during the autumn worked with the issues in an attempt to obtain a balance between proven experience and the new

methods that emerged during the pandemic. The fact that change and development are now happening so rapidly only makes it even more important to have effective student representation, where THS coordinates students at all levels to find new well-functioning solutions.

## The reception of newly admitted students

For many students, the reception is the first and most important memory from their studies. It is a period of high-intensity where the whole of KTH is bursting with colourful and energetic students who do everything in their power to make the newcomers feel as welcome as possible in the daunting university world. This year's reception was not like the customary one, but with several early and clear decisions from KTH, and a strong focus on the purpose of the reception, most of the reception's values could be maintained. Vigilance, testing, and established procedures reassured us that this year's reception took place without spreading the infection. It was a fantastic result given that we welcomed several thousand students who were introduced to student life, with all that it entails.

## Study conditions

A vibrant campus! In addition to being a cornerstone in the work for the education of the future, it is also one of our most important issues. We want a safe, welcoming, and enjoyable student life, which connects education with the rest of life. During the year, the foundations were put in place for the work that will bring about a vibrant campus, and we are very much looking forward to the upcoming discussions. KTH's role in providing us with the right conditions to continue working on this should not be underestimated.

*Teo Elmfeldt, THS Union Chair*

# Education

## First-cycle and second-cycle education

### Educational programmes

KTH's range of educational courses consists primarily of courses provided as part of a programme leading to an academic degree. Less than two percent of KTH's total educational volume is provided in the form of standalone courses, but the ambition at KTH is that the percentage of publicly funded further education courses will increase. Priorities in our educational offering are mainly made between programmes and programme types. However, over the course of the year, both the government's special investment in lifelong learning and KTH's internal goal of increasing the proportion of lifelong learning in our educational offering meant that priorities were also made in order to be able to offer more standalone courses.

KTH is working to ensure that lifelong learning increases in the coming years, which KTH considers to be in line with the needs of the labour market. Lifelong learning refers to both commissioned education and publicly funded further education and other more informal learning activities such as open lectures. Priorities and assessments are mainly based on student demand, the needs of the labour market and KTH's existing expertise.

One of KTH's goals is increased internationalization. The educational offering is affected by the work on internationalization, for example through exchange agreements and international partnerships. In 2021, KTH also had, through the Operational Plan for 2021, the goal that ten percent of its educational activities will be offered as digital education from the year 2023. For more information about the breakdown of education between campus and online teaching, see the section on *Digitalisation*.

Labour market representatives participate in several of the strategic councils and programme councils that exist within each School at KTH, wherein they have the opportunity to express their opinions. External representatives are also present on the Faculty Council and the University Board. In these groupings, there are regular discussions about what kind of education is needed in society and which are in demand by, for example, companies, public authorities, and organisations. More specific discussions are also held within the strategic partnerships that KTH has with a number of companies, public authorities, and organisations. See also the section on *Collaboration*.

KTH's funding for first-cycle and second-cycle education increased significantly in 2021 compared with the previous year, as a result of the government's various educational initiatives. These consist partly of a permanent investment in educational programmes for in-demand professions (SEK 33 million), and partly of temporary investments – mainly Technical Preparatory Year (SEK 73 million), second-cycle education (SEK 29 million) and lifelong learning (SEK 11 million).

The previous increase due to the government's expansion of engineering education and the government's investment in urban planning began in 2018. The number of new students in these educational programmes increased in 2018, despite the fact that KTH had already produced education above the maximum amount. With regard to the maximum amount, KTH could not further increase the number of new students in 2019. In 2020 and 2021, KTH prioritized the various temporary investments.

The number of new students in the Master of Architecture programme has increased slightly since 2017, but has remained relatively stable over the years. The number of new students in the Master of Science in Engineering programmes increased from 1,730 to 1,852 between 2017 and 2021. The number of new students in the Bachelor of Science in Engineering programmes increased from 636 to 815 in the corresponding period. In the Master of Science in Engineering programme for Urban Management and the Bachelor of Science in Structural Engineering and Design, the number of new students has increased by eight and 83, respectively, since 2017. See *Figure 2*.

The number of full-time equivalent students in the Master of Architecture programme has decreased slightly from 449 to 429 from 2017 to 2021. The number of full-time equivalent students in the Master of Science in Engineering programmes as a whole decreased marginally from 7,504 to 7,425 full-time equivalent students in the period 2017 to 2021. The number of full-time equivalent students in the Bachelor of Science in Engineering programmes as a whole has increased annually since 2017, from 1,489 to 1,633 full-time equivalent students. The greatest increase took place from 2020 to 2021. With regard to the Master of Science in Engineering programme within Urban Management and the Bachelor of Science in Structural Engineering and Design, the number of full-time equivalent students has increased by nine and 63, respectively, since 2017.

The government's investment in urban planning aims to meet society's significant demand for educated people in this sector. KTH has a continuous dialogue with representatives of various stakeholders in the sector via the strategic councils that exist at the School of Architecture and the Built Environment. The strategic councils have external representation from, among others, the business community, and public authorities. There are a large number of applicants to the educational programmes in the field of urban management. KTH already has a large volume of education within the field, both in the form of education that leads to a professional qualification and education that leads to a general degree. The Master of Architecture programme had an increase in the number of places in 2017, which is in line with the government's investment.

There is a substantial shortage of teachers in certain scientific and technical subjects. Therefore, KTH started a teacher training programme in Södertälje in the autumn of

2019. The number of new students in the programme in the autumn semester of 2021 was six, the same number as the previous year.

KTH is also meeting the considerable need for trained teachers by, together with Stockholm University, conducting supplementary pedagogical education. In 2015, KTH was tasked with starting and implementing bridging teacher education programmes. The first round of the educational programme commenced in 2016. Furthermore, KTH, also together with Stockholm University, has been tasked with conducting bridging teacher education for people with a third-cycle degree. The programme was provided for the first time in 2017. KTH already provides the programme, Master of Science in Engineering and Education, which includes both master's degrees. See also the section on *National partnerships*.

#### **Government education initiatives in connection with COVID-19**

The investments in the Technical Preparatory Year, educational programmes for in-demand professions and lifelong learning were outside KTH's funding for education at first-cycle and second-cycle levels in 2020, and the financial report was then presented separately. For 2021, the investments are included as part of KTH's maximum amount. The funds for investment in the Technical Preparatory Year and lifelong learning that were not utilized in 2020 were used to finance the corresponding education in 2021.

- **Technical Preparatory Year and Higher Education Access programmes**

As a result of the investment, KTH started two completely new Technical Preparatory Year programmes in the autumn of 2020, which were taught in the academic year 2020/2021 and which are being taught in the academic year 2021/2022. These are partly provided through distance learning. The number of new students on all KTH's Technical Preparatory Year programmes was 720, 1,204 and 1,092 respectively, for the years 2019–2021, see *Figure 2*. The two new Technical Preparatory Year programmes had 340 (210) full-time equivalent students in 2021.

- **Educational programmes for in-demand professions**

Virtually all of KTH's educational programmes fall into the category of educational programmes for in-demand professions.

A total of 618 more new students commenced their studies at KTH in 2021 compared to 2019. Of these, 372 were in the Technical Preparatory Year programmes. In comparison to 2019, the corresponding number for 2020 was 664 more new students in total, of whom 484 were in the Technical Preparatory Year programmes. For the Master of Science in Engineering and the Bachelor of

Science in Engineering, the number of new students has increased annually since 2019. See *Figure 2*.

The total number of full-time equivalent students has increased since 2019 on KTH's Master of Science in Engineering programmes, Bachelor of Science in Engineering programmes and master's programmes. However, the increase in the number of new students from 2020 has not yet fully impacted the total number of full-time equivalent students, due to the duration of the various programmes.

The increase in the number of new students in the period 2019–2021 on KTH's Master of Science in Engineering and Bachelor of Science in Engineering, and the teacher training programme corresponds to an increase of 378 full-time equivalent students and 318 annual performance equivalent students. The calculation is based on each additional new student generating 0.5 full-time equivalent students per semester. Annual performance equivalent students were calculated in accordance with KTH's average performance rate of 84 percent.

- **Short courses for professionals**

KTH has further developed the project Materials in a Circular Society within the framework of the initiative for short courses for professionals. The project already had funding from Vinnova, and is part of Vinnova's pilot project for flexible short courses for professional specialists.

Furthermore, KTH has used the funding for a knowledge platform for artificial intelligence. AI Competence for Sweden is a national initiative for education and skills development in artificial intelligence, which the government launched in June 2018. Within the framework of the initiative, ten higher education institutions are currently collaborating to create a knowledge platform and offer courses for professionals. In the period 2018–2021, the higher education institutions have jointly published over a hundred courses on the web portal. The duration of the courses has varied from less than a day to several weeks. Örebro University is coordinating the collaboration. There is a steering group with representatives from each university. In addition to seminars that are open to the public and lectures at KTH with links to AI, which are regularly posted on the website as they arise, KTH has developed several different shorter and longer courses and seminars within the scope of the project. Among the courses that are more in demand are *Business implications of AI and the Impact of digital transformation*, as well as courses on cybersecurity.

- **Lifelong learning**

The government's special investment in lifelong learning coincided with the extensive development and adjustment

that the adaptation to distance education from campus-based education entailed at KTH as a consequence of COVID-19. The change entailed that few teachers had the time and opportunity to take advantage of the initiatives and opportunities that were offered. During the year, however, KTH developed a format for publicly funded further education, in the form of courses, concepts and business models that are scalable, effective, and attractive for professionals, companies, public authorities and organisations. The format provides flexibility and accessibility in terms of time and space and means a clearer target group adaptation to professionals. The experiences provide new opportunities in commissioned education and regular programme education as well. As part of its work, KTH continues to have a close dialogue with companies and organisations. KTH strives to develop more far-reaching and business-integrated collaborations concerning education and lifelong learning, especially with strategic partners.

In 2021, several organisational changes were made to facilitate the development of lifelong learning. Each School has appointed heads of lifelong learning, and joint working methods and support functions have been established.

**Publicly funded further education:** To enable more people to apply, KTH has made several standalone courses available for late registration. Courses within the special initiative for lifelong learning have generated a total of 149 (16) full-time equivalent students.

A total of 147 (67) further education courses were offered in 2021. Of these, 146 courses generated full-time equivalent students during the year. The increase reflects KTH's internal goal of dramatically increasing the proportion of lifelong learning. The KTH Operational Plan for 2021 specified the goal that of KTH's educational volume, 20 percent will be in lifelong learning from 2023.

**Commissioned education:** KTH continues to train personnel from companies in areas such as radio system technology, AI and neural networks, Lean and industrial production, sustainable transport systems, property valuation and analysis, as well as cyber defence and information security. In 2021, KTH's courses in commissioned education generated the equivalent of 31 full-time equivalent students and 31 annual performance equivalent students.

During the year, the collaboration with Scania on lifelong learning was expanded and a joint steering group for learning in professional life was established. During the autumn, KTH and Scania implemented a development project pertaining to a community-based social, more informal, and business-specific learning for selected employees at Scania.

- **Expansion of education at the second-cycle level**

In the master's programmes, the number of new students decreased marginally between 2019 and 2021, from 1,733 new students in 2019 to 1,719 new students in 2021. The number of new students in 2020 was 1,803. In the one-year master's programmes, the number of new students decreased slightly, from 57 new students in 2019, to 44 new students in 2020 and 39 new students in 2021. In recent years, KTH has reduced the number of one-year master's programmes and, in connection with this, redistributed new student places from one-year to two-year master's programmes. As a relatively large proportion of students at the second-cycle level are international students, who are fewer in number due to COVID-19, there has been a reduction in the number of new students in total at the second-cycle level. The number of full-time equivalent students at the second-cycle level, i.e. on the one-year and two-year master's programmes, increased between 2019 and 2021 from 3,358 to 3,557. Reporting only applies to students who are not fee-paying.

KTH does not have courses where internships are included except for on-site internships within the teacher training programmes, see the section on *National partnerships*.

***KTH's investment in sustainable production in Södertälje***

KTH is involved in an education and research initiative in Södertälje together with the Municipality of Södertälje, Scania, and AstraZeneca. One of the aims of the initiative is to strengthen the competitiveness of Swedish industry through cutting-edge education and research. The initiative includes four educational programmes, with the aim of doubling the number of educational places on KTH's campus in Södertälje in the long term. KTH Södertälje already has a Bachelor of Science in Engineering with a major in mechanical engineering. The courses have been developed in collaboration with the industrial sector in Södertälje, and several of the courses are also being carried out in close collaboration with the industrial sector.

In the autumn semester of 2021, the number of new students in the programme, Master of Science in Engineering with a major in industrial engineering and sustainability, was 39 (33) and in the two-year Master's programme in Sustainable Production Development there were ten (19). This programme is closely linked to the growing research activities at KTH Södertälje and the industry in the region.

In addition, the number of new students to the Bachelor of Science in Engineering with a major in industrial engineering and production maintenance was 18 (28), and to the Bachelor of Science in Engineering with a major in mechanical engineering was 100 (91). In the teacher training programme with a focus on technology, grades 7–9, the number of new students was six (six). The teacher training pro-

gramme is a dual-education programme and leads to a Master of Science in Education with a specialization in technology and mathematics as well as a Bachelor of Science in Engineering. The programme is mainly studied together with a major in innovation and design within the Bachelor of Science in Engineering programme with a major in mechanical engineering, and also with existing bridging teacher education.

At KTH Södertälje, the regular Technical Preparatory Year had 144 (140) new students. In the Technical Preparatory Year distance programme with campus meetings, which was established in 2020, the number of new students was 222 (262). In total, the number of new students in 2021 who were in education at KTH Södertälje was 539 (579). The decrease since the previous year was mainly due to the slightly smaller number of new students in the newly established Technical Preparatory Year distance programme with campus meetings.

### **Recruitment of students to KTH's programmes that commence at the first-cycle level.**

KTH's objective is that education in technology should be upheld as a natural choice for young people who want to contribute constructively to sustainable societal development. KTH has a communication platform that specifies what KTH should communicate to prospective students. It also forms the basis for the activities and measures that have been planned, or initiated, in order to achieve a more even gender distribution, reduce social bias in recruitment and stimulate diversity in terms of ethnicity. KTH also works long-term with young people in primary and secondary education as a target group.

In our recruitment work personal interaction between representatives of KTH and potential students is prioritized. This is carried out mainly through so-called student ambassadors, about 45 in number, who are KTH's representatives when meeting with upper-secondary school students. They represent most of KTH's educational programmes and its campus. The student ambassadors reflect the diversity at KTH in terms of gender, geographical origin, ethnicity, and social background. The election of ambassadors is conducted very conscientiously, where the ability to inspire young people is a high priority. All student ambassadors undergo training that includes youth communication, presentation techniques, student recruitment messages, target group knowledge and individual coaching.

In 2021, KTH's student ambassadors conducted approximately 25 student recruitment meetings with upper-secondary school students. During the spring, two digital lectures were also held during Södertälje Science Week and a further number of digital meetings with upper-secondary schools. In the spring of 2021, digital drop-in calls were also offered with the Career Counselling service. As was the case in 2020, operations were dramatically impacted by COVID-19.

In comparison, in a typical recruitment year, between 120–150 student recruitment meetings are held. A concept for offering digital meetings was developed in 2020 and has continued to be implemented in 2021 as well.

The most important channels for reaching the target group prior to their selecting an educational programme are the KTH website, the prospectus, and personal meetings such as upper-secondary school visits. In order to create opportunities to ensure that KTH is more accessible to more people, irrespective of where they happen to live, the website, along with other digital initiatives such as social media and student blogs, is a very important component.

COVID-19 affects the ways in which KTH usually communicates with its target group, making it more difficult to reach the target group as effectively as in a normal recruitment year. Therefore, a digital marketing campaign was carried out aimed at prospective students during the application round prior to the start of studies in the autumn semester of 2021. Through the marketing campaign, KTH was still able to reach the target group, increase awareness of KTH, and inspire prospective students to apply for one of its educational programmes.

KTH usually holds an open house every year to provide information about KTH's educational programmes on site in the university environment. In 2021, the Open House was conducted digitally due to COVID-19 and the restrictions that applied at the time to major events. Before the Open House in 2021, pre-recorded programme-specific films were produced. In addition to these films, a digital tour was offered of KTH's campus, information films about all campuses and the opportunity to talk in real time with teachers, students, and career guidance counsellors.

Around half of the participants who take part in KTH's student recruitment activities are women. The same applies to KTH's direct target audience, 2nd, and 3rd year upper-secondary students in science programmes. At present, the greatest challenge in terms of recruiting incoming students is that certain specializations and educational environments at KTH still have a distinct imbalance between men and women. The work of recruiting women has therefore to some extent been redirected towards the subject areas and programmes with the greatest imbalance.

Since 2014, KTH has conducted an initiative under the name "Giants" for the purpose of increasing the number of women students in programmes within computer engineering, IT, and electrical engineering, by providing inspiration and more in-depth knowledge in these subject fields. Since 2019, the fields of mechanical engineering, vehicle engineering, engineering physics and technical mathematics have also been included in the initiative. In 2021, the investment was developed, and a new concept was produced. Giants is now called Fill the Gap.

KTH is working to improve knowledge and interest in technology, science and mathematics among children and

young people. Vetenskapens Hus (the House of Science) is the hub of this work. Vetenskapens Hus is run by KTH and Stockholm University, together with the City of Stockholm as a long-term partner. Pupils from primary, secondary, and upper-secondary school are offered supervised activities in biology, physics, chemistry, mathematics, and technology in well-equipped laboratories at AlbaNova University Center and in the lush environment at the Bergius Botanic Garden. The supervisors are students from the universities who will act as role models for the students. Vetenskapens Hus also offers teacher training and hosts initiatives such as Teknikåttan (Technology Eight) and ForskarFredag (Research Friday). Vetenskapens Hus has the capacity to accommodate more than 80,000 students and teachers per year. In 2021, operations were affected by COVID-19, although it was possible to make some adaptation to enable online activities.

### **Recruitment of students to second-cycle educational programmes**

According to KTH's Development Plan, international exposure is essential for KTH, and the recruitment of qualified students must take place both nationally and internationally. A large number of fee-paying students is a measure of KTH's strong position internationally, and further efforts will be made to strengthen recruitment initiatives in this area. International programme students are mainly enrolled on one of KTH's approximately 60 two-year and one-year master's programmes, all of which are in English.

#### ***Focus during the year***

During the year, KTH focused on inspiring, informing and supporting the target group of international students with the help of digital communication initiatives. The recruitment initiatives that are normally carried out on site around the world, such as trade fairs, university visits and other events, were cancelled due to COVID-19 and were instead carried out in a digital format.

KTH continued to offer continuous and clear information about the impact of the pandemic on the education and reception of international students with the help of a website and communication in newsletters, social media, digital events, and webinars. Furthermore, a virtual campus tour was offered to provide the target group with an impression of KTH's campus and its resources.

Short themed films have been produced to highlight various issues that are important to the target group. This involves a general presentation of the master's programmes at KTH, what the application process is like and the possibility of scholarships. Furthermore, a number of films have been produced where programme directors present the master's programmes' structure and course content.

KTH has also provided about twenty webinars for pro-

spective international students. Themes have included a presentation of KTH, master's programmes in various subjects, how KTH works with sustainability and gender issues in education, as well as practical preparations before arrival. In association with the webinars, there was an opportunity to chat with the relevant staff and student ambassadors. All webinars have been recorded and are available on YouTube and kth.se.

As in previous years, students at KTH have been engaged to communicate with prospective students. Students in virtually all master's programmes have been engaged to answer questions on an ongoing basis, to contact admitted students, to contribute content to social media, and to participate in digital fairs and events.

KTH has also further developed communication regarding how sustainable development is integrated into the educational programmes and focused on highlighting gender equality, diversity, and equal treatment to a greater extent than before.

#### ***Activities to create better visibility***

During the year, KTH developed the initiative for digital advertising aimed at prospective international students, for example through search word advertising and dissemination on social media. This initiative is continually evaluated and adapted to reach the right target audience. A separate advertising campaign has been aimed at prospective female students to achieve a more even gender distribution.

KTH has participated in more digital fairs and events than before. The quality of the platforms used has been enhanced since the previous year. KTH has participated in 15 virtual fairs aimed at all major markets, both in collaboration with the Swedish Institute and with other stakeholders. Furthermore, digital events have been held, aimed at about twenty partner universities and other partners. At all fairs and events, participants have the opportunity to register an interest in continued information from KTH and the contacts are followed up through regular newsletters.

Digital communication in social media has been continually developed, both in terms of content as well as choice of channels. A particular focus is on activities in Chinese social media, as students in China cannot access the major international channels.

KTH has chosen to use recruitment agents in Indonesia, Thailand, Turkey, and Vietnam as a complement to other initiatives in these countries. All the agents charge commission. Of the registered new students in 2021, 18 (four) were recruited through agents.

#### ***Communication with applicants and admitted students***

The recruitment work continues until the students commence their academic studies, and it is therefore considered to be a priority to provide information and support to admitted students right up to registration.

When international students received their letter of admission in April, a new digital initiative was carried out in the form of an Admission weekend. Admitted students were able to ask questions and chat with staff and student ambassadors throughout the weekend and also contact each other. The event was well attended, and students felt it was very positive to have questions answered at an early stage and create the feeling of being on their way to KTH. We also reach admitted students by regular newsletters with current information and tips before arrival.

The pre-departure events that normally take place around the world were replaced by a number of digital meetings for students from different regions, with the opportunity to interact with administrators, teaching and research staff, as well as students from the region.

### Tuition-fee funded activities

The tuition-fee funded operations provide us with a large number of students with a non-European educational background, and contribute to diversity and internationalization in the education and study environment at KTH. The operations also affect education planning, which means that discussions regarding the design of education, especially at the second-cycle level, must take place continuously. Furthermore, requirements are set for adapted processing and support, for example regarding fee and scholarship management and collaboration with the relevant authorities.

KTH has built up a good deal of experience of the interests of tuition fee-paying applicants in our educational programmes, as well as their ability to participate in them. However in 2021, as in the previous year, due to COVID-19, it was difficult to predict how many fee-paying students who had been admitted would be able to commence their studies in Sweden. The outcome was still relatively positive when a large number of those admitted arrived at the start of the semester. However, as in 2020, a number of these students applied for a deferral to the start of their studies or for a refund of their tuition fees because they could not come to Sweden due to the pandemic. A total of 21 fee-paying students who had been admitted applied for a deferral to the start date of their studies prior to the autumn semester in 2021. The number of admitted students who requested a refund of their tuition fees was 75.

Since the introduction of fees, KTH has made investments in recruiting qualified international students. As KTH's activities for fee-paying students increase in volume, so does the work with student services and reception activities, both at the Schools and centrally at KTH.

KTH offers fee-paying students extensive support from admission to registration, of which most of the activities are aimed at all international students. In association with the letter of admission, KTH held an Admission Weekend to inform and answer questions prior to students commencing their studies, see the section on *Communication with appli-*

*cants and admitted students.*

KTH, in collaboration with the Royal Institute of Technology's Student Union, THS, organizes an arrival and introduction service for all international students prior to the spring and autumn semesters. During special reception days, students are offered transport from Arlanda to KTH Entré, where they can sign a student housing contract, are provided with information, and can partake of our services. The introduction in 2021 also included digital school meetings, a digital reception ceremony and social and digital activities organized by THS. Due to the pandemic, social activities were carried out throughout the spring of 2021, firstly aimed at international students and then at all students, to safeguard the students' mental health.

The students who have paid tuition fees are offered, in addition to the basic arrival and introduction service, which includes among other things a guarantee of housing, free primary healthcare, extended insurance coverage and a preparatory course in English and Swedish.

The activities are evaluated and developed continuously according to the needs of the students.

Since 2017, there has been an accumulated surplus regarding the activities relating to fee-paying students. The outcome for 2021 was negative, which is partly due to slightly fewer students, and partly because investments in excellent educational environments have been made. In addition to this, surpluses have been used to support students during the pandemic. At the end of the year, the business has an accumulated surplus of SEK 40 million, compared with SEK 47 million at the end of 2020.

The following tuition-fee levels apply to education that commenced in the academic year 2021/2022. The tuition fee for education at the first-cycle level and years 1–3 in the Master of Science in Engineering and the teacher training programme is SEK 122,000 per academic year. For the Master of Architecture programme years 1–3 and courses at the first-cycle level within the School of Architecture, the tuition fee is SEK 205,000 per academic year. For years 4–5 and programmes and courses at the second-cycle level in the School of Architecture, the tuition fee is SEK 260,000 per academic year. For other programmes and courses at the second-cycle level, the tuition fee is SEK 155,000 per academic year. Programmes offered in collaboration with other universities may have different tuition fee levels.

### Collaboration with the Swedish Migration Agency

KTH informs students about the process of applying for a residence permit and, if necessary, acts as a link between the student and the Swedish Migration Agency. When the Swedish Migration Agency receives an application for a residence permit, the student's tuition fee status is checked. If the student is liable for tuition fees, the Swedish Migration Agency checks against KTH's study documentation system that the tuition fee has been paid.

During the year, KTH had close contact with the Swedish Migration Agency regarding issues that arose during the current pandemic regarding residence permits. The processing times for applying for a residence permit in 2021 were acceptable for new incoming students. One challenge in the summer of 2021 was that embassies in several countries closed due to the pandemic, and thus did not issue residence permits. When such things happen, it would be preferable if the Swedish Migration Agency had a higher level of preparedness for informing students and higher education institutions. Another problem in 2021 was that students subject to partnership agreements who study only their second year at KTH only receive a twelve-month residence permit and thus are unable to get a Swedish social security number. This creates problems for the students in their day-to-day lives and entails increased administration for KTH.

Communication with the Swedish Migration Agency takes place largely via a central address at KTH. The Swedish Migration Agency is also in direct contact with administrators at KTH concerning certain issues.

The pilot project on two-year residence permits and intention to study that SUHF and the Swedish Migration Agency initiated in 2019 has continued and been extended until the end of 2022. KTH has actively participated in the project. In 2020, the Swedish Migration Agency and the participating higher education institutions implemented a procedure for reporting back to the Swedish Migration Agency, which has made it possible to grant two-year residence permits. In 2021, the Swedish Migration Agency carried out random checks to find out whether the higher education institutions in the pilot project correctly reported students who interrupted their studies. KTH had no discrepancies in these random checks and has followed the agreed procedure. Within the project, there is continued collaboration on analysing the applicants' intention to study.

### **Demand for KTH's educational programmes**

The demand for KTH's educational programmes leading to a professional qualification remains high and has increased compared with the previous year. The number of first-choice applicants for these programmes totalled 6,713 (6,641) in 2021. The number of planned new student places was 2,595 (2,298).

The most sought after programmes were, as previously, the Master of Architecture with 1,146 (1,104) first-choice applicants, the Master of Science in Engineering with a major in Computer Science with 690 (698), Industrial Economics with 681 (689) and Engineering Physics with 410 (448). The Bachelor of Science in Engineering programme with a major in Constructional Engineering and Design saw the most first-choice applicants at 363 (310).

KTH has an English language first-cycle study programme, the Bachelor's Degree programme in Information and Communication Technology. In 2021, the programme had 956 (984) first-choice applicants, of whom 407 (310) were

in the national admissions round and 549 (674) in the admissions round for courses given in English. This shows considerable continued interest in English-language education at the first-cycle level, even though the number of international applicants has decreased since the previous year, which is probably an effect of COVID-19.

The number of applications for two-year and one-year master's programmes given in English is substantial but has decreased compared to the previous year. Of 24,133 (24,988) web registrations to the courses given in English at the second-cycle level prior to the autumn semester in 2021, 18,187 (19,430) were from applicants who are liable for tuition fees, of whom 6,528 (7,171) paid the registration fee. The decrease coincides with reduced international mobility due to the pandemic.

KTH coordinates admissions to two of the master's programmes provided within the framework of the European Institute of Innovation and Technology, EIT. One is an eight-track umbrella programme provided by EIT Digital, and the other is a one-track programme provided by EIT Urban Mobility. Students in the programmes study at two of the affiliated partner universities, one of which could be KTH. Admissions to EIT Digital and EIT Urban Mobility are managed through the EIT's admissions portals.

A total of 1,028 (2,186) applications to the EIT Digital programme were received. One reason for the drop is that EIT Digital introduced a registration fee for this year's admissions. The EIT Urban Mobility programme received a total of 211 (114) applications. See also the section on *International partnerships*.

The Technical Preparatory Year programmes had a total of 1,731 (2,064) first-time applicants in 2021. We provide the opportunity to start a Technical Preparatory Year in both the autumn and spring semesters. The Technical Preparatory Year is a one-year qualifying education that is intended for students who have not met the full admission requirements for KTH's educational programmes during their upper-secondary school studies. The preparatory year provides supplementary education at the upper-secondary level in mathematics, physics, and chemistry. It is also possible to only apply for the second semester of the preparatory year, which is especially suitable for students who have taken an upper-secondary school technology programme. Approved results for KTH's preparatory year or semester provide the opportunity to apply for specially reserved places in one of KTH's Master of Science in Engineering, Bachelor of Science in Engineering, or teacher training programmes.

Admission to KTH's educational programmes is managed in nationally coordinated admission rounds in the NyA admissions system, which is administered by the Swedish Council for Higher Education.



## Alternative selection process

For admission in the autumn of 2021, KTH again used the mathematics and physics test, as well as the architecture test as an alternative selection process, following the cancellation of tests in 2020 due to COVID-19. The comparative figures in brackets in this section refer to 2019.

The mathematics and physics test has previously been used for selecting up to a third of the places in the Master of Science in Engineering majoring in Engineering Physics, Electrical Engineering, and Vehicle Engineering, and in 2021 also for Technical Mathematics and Materials Design. In the autumn semester of 2021, 46 (45) applicants were admitted to Engineering Physics, seven (13) to Electrical Engineering, three (six) to Vehicle Engineering, 21 to Technical Mathematics, and one to Materials Design in selection two.

For admission in the autumn of 2021, KTH has used the architecture test as a selection group for up to a third of the places for the Architecture programme. Ahead of the autumn semester in 2021, 34 (58) applicants from the selection group for the architecture test were accepted in the second selection round.

## Separate admissions for fee-paying students

Universities and higher education institutions can admit fee-paying students in a separate selection group. KTH has applied this to the English-language bachelor's and one-year and two-year master's programmes.

The number of fee-paying applicants admitted through separate admission to these programmes was 1,759 (1,720), while the corresponding number for fee-exempt applicants was 1,054 (1,028).

The admission numbers for the master's programmes were based on an overall picture of KTH's financial scope for new publicly funded students and the capacity available to receive fee-paying students. KTH strives for the level of knowledge to be equally high among applicants who are accepted from both selection groups, as they are integrated into the same educational programmes.

## Assessment of real competence

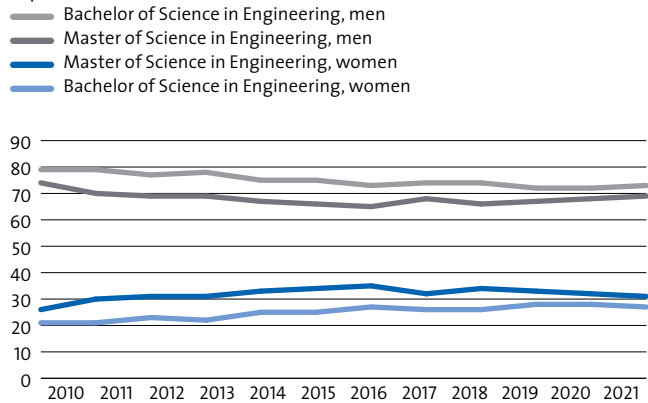
KTH has a working group that focuses on validation and assessment of real competence. In 2021, the group had regular meetings. The group has further developed processes, including questions about record keeping. The validation website was updated, and work has commenced on producing an information film on validation. In 2021, a validation procedure was adopted.

KTH also participated in an international project on validation, Recognition of Prior Learning in Practice, which began in 2019. The final report for the project was published in the spring of 2021.

During the period 2017–2019, KTH together with Chalmers University of Technology, Linköping University, and the University of Borås developed a model for validating real

Figure 1

Gender structure – new female and male students 2010–2021 in percent



Source: Ladok

competence for engineering programmes. The collaboration continued throughout 2021.

During the year, KTH also participated in conferences and seminars. In 2021, internal training initiatives on validation and real competence were implemented.

## Beginners

KKTH provides information on the Master of Architecture, the Master of Science in Engineer, the Bachelor of Science in Engineer, the Master of Science in Education which is taken after the bridging teacher education. See *Figure 2*.

In 2021, a total of 2,852 (2,697) new students commenced their first year of studies in KTH's educational programme leading to a professional qualification, of whom 114 (93) were in the Master's Degree in Architecture programme, 1,852 (1,819) in the Master of Science in Engineering programmes, and 815 (692) in the Bachelor of Science in Engineering programmes. See *Figure 2*. The final two years of a Master of Science in Engineering programme constitute a master's degree programme, which means that these engineering students are registered as new students on a master's degree programme when they commence their fourth year. This does not apply to the Master of Science in Engineering and Education, which is a combined five-year programme. In 2021, 54 (58) new students commenced the Master of Science in Engineering and Education programme.

The number of new students in the master's programmes was 2,380 (2,392). Of these 1,122 (1 217) were previously students in Master of Science in Engineering programmes. The one-year master's programmes had 66 (52) new students.

Of the total number of new students in 2021, 34 (34) percent were women, and 66 (66) percent were men. In the Development Plan for 2018–2023, KTH highlights the fact that several educational programmes have a low proportion of women. Of the new students in the Master of Science in Engineering programmes, 31 (32) percent were women, and 69 (68) percent were men in the autumn semester of 2021. Of

Figure 2

## Total number of new students 2018-2021

	2021		2020		2019		2018	
	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men
<b>Master of Architecture, Degree Programme 300 HE credits</b>	<b>114</b>	<b>60/40</b>	<b>93</b>	<b>61/39</b>	<b>117</b>	<b>58/42</b>	<b>119</b>	<b>58/42</b>
<b>Master of Science in Engineering Degree Programme 300 HE credits</b>								
Biotechnology	85	73/27	79	76/24	76	58/42	82	61/39
Engineering and Education	54	37/63	58	34/66	53	45/55	56	50/50
Computer Science and Engineering	194	21/79	196	19/81	175	18/82	191	17/83
Design and Product Realisation	109	53/47	107	46/54	107	46/54	115	47/53
Electrical Engineering	95	13/87	77	9/91	92	20/80	97	20/80
Energy and Environment	78	49/51	78	56/44	77	61/39	86	62/38
Vehicle Engineering	96	14/86	95	12/88	94	15/85	113	16/84
Industrial Engineering and Management	156	34/66	160	28/72	153	24/76	159	36/64
Industrial Technology and Sustainability	39	18/82	33	39/61	34	38/62	33	39/61
Information and Communication Technology	67	19/81	69	22/78	66	17/83	73	21/79
Mechanical Engineering	145	15/85	146	18/82	138	17/83	159	18/82
Materials Design and Engineering	53	23/77	45	31/69	41	49/51	47	40/60
Medical Engineering	38	55/45	57	44/56	51	59/41	56	41/59
Media Technology	80	31/69	73	36/64	69	52/48	79	42/58
Civil Engineering and Urban Management	172	47/53	176	48/52	163	45/55	180	48/52
Engineering Physics	148	15/85	121	24/76	128	28/72	150	19/81
Engineering Chemistry	73	58/42	75	47/53	61	48/52	68	54/46
Engineering Mathematics	57	18/82	49	23/77	-	-	-	-
Open entrance	113	26/74	125	27/73	114	25/75	133	29/71
<b>Sub-total</b>	<b>1,852</b>	<b>31/69</b>	<b>1,819</b>	<b>32/68</b>	<b>1,692</b>	<b>33/67</b>	<b>1,877</b>	<b>34/66</b>
<b>Bachelor of Science in Engineering, Degree programme 180 HE credits</b>								
Constructional Engineering and Design	236	38/62	182	35/65	170	34/66	185	33/67
Computer Engineering	199	17/83	167	20/80	146	23/77	157	15/85
Electronics and Computer Engineering	51	20/80	37	11/89	33	9/91	33	15/85
Electrical Engineering	63	14/86	57	16/84	37	14/86	40	10/90
Industrial Technology and Production Maintenance	18	28/72	28	21/79	23	13/87	32	22/78
Chemical Engineering	51	55/45	46	54/46	46	43/57	45	51/49
Mechanical Engineering	100	11/89	91	20/80	80	28/72	83	11/89
Medical Engineering	37	49/51	32	56/44	24	29/71	30	47/53
Engineering and Economics	60	30/70	52	33/67	50	32/68	50	46/54
<b>Sub-total</b>	<b>815</b>	<b>27/73</b>	<b>692</b>	<b>28/72</b>	<b>609</b>	<b>28/72</b>	<b>655</b>	<b>26/74</b>
<b>Subject Teacher Education in Technology, Secondary Education 270 HE credits</b>	<b>6</b>	<b>0/100</b>	<b>6</b>	<b>67/33</b>	<b>6</b>	<b>50/50</b>	<b>-</b>	<b>-</b>
<b>Supplementary teacher education 90 HE credits</b>	<b>65</b>	<b>37/63</b>	<b>61</b>	<b>43/57</b>	<b>29</b>	<b>55/45</b>	<b>57</b>	<b>37/63</b>
<b>Supplementary teacher education for Graduates with a third cycle degree 90 HE credits</b>	<b>-</b>	<b>-</b>	<b>26</b>	<b>50/50</b>	<b>15</b>	<b>55/45</b>	<b>13</b>	<b>31/69</b>
<b>Bridging programme for architects with foreign qualifications</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>67/33</b>	<b>26</b>	<b>69/31</b>
<b>Bridging programme for engineers with foreign qualifications</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>6</b>	<b>100/0</b>	<b>19</b>	<b>53/47</b>
<b>Masters programmes</b>								
Masters programmes 120 HE credits	2,279	38/62	2,380	35/65	2,392	35/65	2,472	33/67
<i>of which within Master of Science in Engineering programmes</i>	1,122	37/63	1,217	35/65	1,207	35/65	1,304	34/66
Masters programmes 60 HE credits	66	65/35	52	50/50	73	49/51	85	65/35
<b>Sub-total</b>	<b>2,345</b>	<b>39/61</b>	<b>2,432</b>	<b>35/65</b>	<b>2,465</b>	<b>35/65</b>	<b>2,557</b>	<b>34/66</b>
<b>Bachelors programmes 180 HE credits</b>	<b>119</b>	<b>32/68</b>	<b>119</b>	<b>36/64</b>	<b>123</b>	<b>37/63</b>	<b>117</b>	<b>37/63</b>
<b>University Diploma programmes 120 HE credits</b>	<b>31</b>	<b>35/65</b>	<b>33</b>	<b>45/55</b>	<b>36</b>	<b>31/69</b>	<b>45</b>	<b>33/67</b>
<b>Technical Preparatory Year, Technical Preparatory Semester 60/30 HE credits</b>	<b>1,092</b>	<b>32/68</b>	<b>1,204</b>	<b>35/65</b>	<b>720</b>	<b>30/70</b>	<b>738</b>	<b>33/67</b>
<b>Total</b>	<b>6,439</b>	<b>34/66</b>	<b>6,485</b>	<b>34/66</b>	<b>5,821</b>	<b>34/66</b>	<b>6,223</b>	<b>34/66</b>

Source: Ladok

the new students in the Bachelor of Science in Engineering programmes in 2021, 27 (28) percent were women, and 73 (72) percent were men. However, the distribution between men and women differs greatly between the various programmes at KTH, see *Figures 2 and 7*.

The median age for new students in the Master of Architecture programme was 22 for women and 23 for men. In the Master of Science in Engineering programmes, it was 20 for both women and men. The median age for new students in the Bachelor of Science in Engineering programmes was 22 for both women and men. The median age for new students on the two-year and one-year master's programmes was 24 for both women and men. In the Technical Preparatory Year, the median age was 21 for both women and men. The median ages are stable over time.

In addition to the admission of new students in year 1, it is possible to start a later module in certain educational programmes. The number of students from higher education institutions other than KTH who began the later modules of a Master of Science in Engineering programme was 155 (143) and for the one-year or two-year master's programmes 142 (131).

In the autumn semester of 2021, 601 (582) new fee-paying students were registered at KTH, of whom 211 (191) were women and 390 (391) were men. This indicates a certain recovery from the decline that was seen in 2020 as a consequence of COVID-19.

Of the new fee-paying students, 68 (63) had been awarded scholarships from Swedish organisations or through scholarship programmes where KTH has an agreement on scholarship financing: 23 (33) UHR scholarships, 15 (six) Erasmus Mundus, two (four) KTH India Scholarship Foundation, two (one) Colfuturo in Colombia, twelve (one) LPDP in Indonesia and 23 (18) through the Swedish Institute.

Of the remaining 533 (519) new fee-paying students, 48 (65) came via EIT Digital, 84 (65) via EIT InnoEnergy and ten (three) via EIT Urban Mobility. In 2021, 689 (688) externally recruited new programme students from Switzerland and

EU/EEA, including Sweden, commenced studies at second-cycle level, of whom 299 (270) were women and 390 (418) were men.

In 2021, 1,092 (1,204) students commenced the Technical Preparatory Year. The Government's investment in the Technical Preparatory Year will continue in 2021 and KTH has therefore provided the same range of these programmes as in 2020. Of the new students in the Technical Preparatory Year, 32 (35) percent were women, and 68 (65) percent were men. Of those who started the Technical Preparatory Year in the autumn semester of 2020 or the spring semester of 2021, 34 (31) percent, or a total of 394 (225) students continued to study a Master or Bachelor of Science in Engineering at KTH in 2021. Of these, 31 percent were women and 69 percent were men. The majority of those who continued their studies at KTH embarked on a Master of Science in Engineering programme.

### Preparation for higher education courses following upper-secondary school.

Online preparation for higher education courses in mathematics and programming were also offered to applicants for technical and science programmes in 2021. The courses aim to support new students and facilitate the transition from upper-secondary school to university. In 2021, work on further development of the courses continued according to an evidence-based digital learning model from the international network Open Learning Initiative.

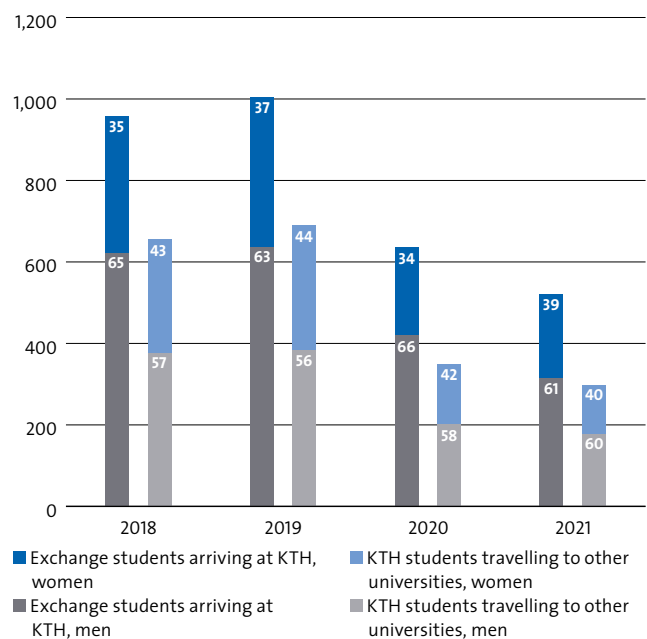
### International mobility

KTH works actively to ensure that, to a greater extent, students undertake part of their education abroad. The target according to KTH's Development Plan 2018–2023 is that a large proportion of the students should study at least one semester abroad within the framework of their educational programme. In 2021, 296 (348) students commenced studies abroad. The reason why the number is still low is due to COVID-19, among other things. KTH decided to cancel international student mobility that had not commenced in the spring semester of 2021. Ahead of the autumn semester 2021, KTH's position has been that study abroad can continue in countries to which Sweden's Ministry for Foreign Affairs has not advised against non-essential travel. Since August 2021, the advice against non-essential travel has been lifted for most non-European countries. However, most non-European universities chose not to accept exchange students during the autumn semester of 2021. Quarantine

Figure 3

#### Student exchange 2018-2021

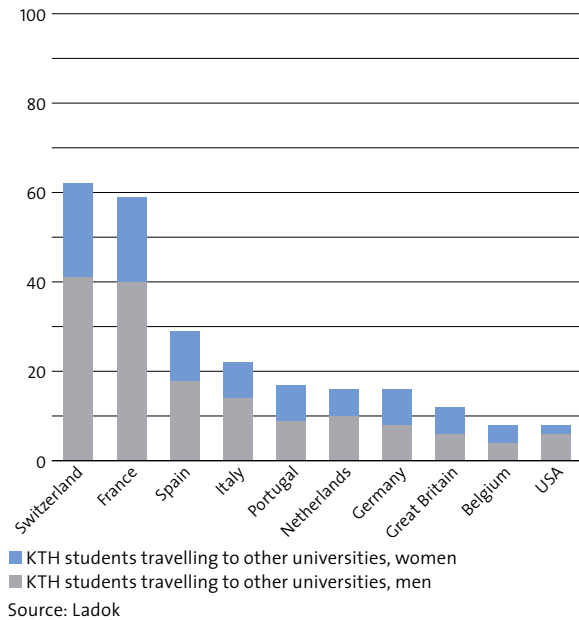
Number of students who began student exchange per year, in absolute numbers and proportion of women and men in percent



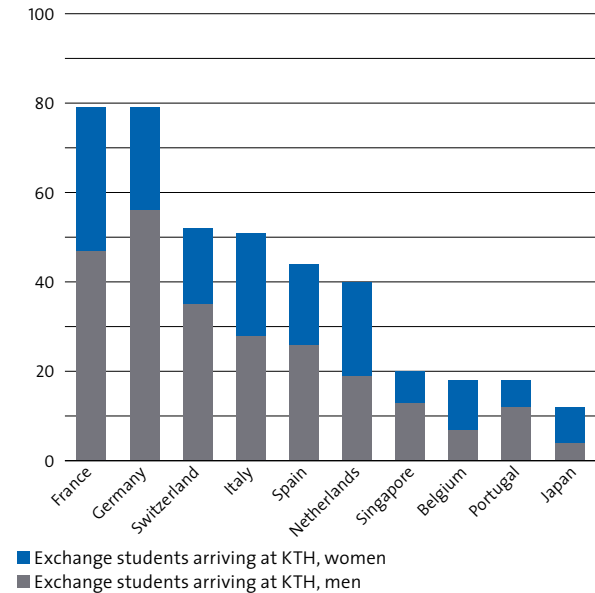
Source: Ladok

Figure 4  
Student exchange – most popular countries 2021

Number of students who began student exchange during the year: the most popular countries KTH students travel to



Number of students who began student exchange during the year: the most popular countries exchange students originate from



rules and visa restrictions have also led to difficulties with overseas mobility.

Within Europe, it has, to a greater extent, been possible for students to be able to avail of their exchange place during the autumn of 2021. The most common countries for studying abroad in the autumn of 2021 were Switzerland, France, Spain, and Italy, which is a change compared with the previous year, when the USA and Singapore were among the most common countries. Of the students who studied abroad, eight (35) percent studied at a university outside the EU/EEA/Switzerland/United Kingdom.

There continues to be considerable interest in studying as an exchange student at KTH. However, the actual number of students in 2021 was low. This is a consequence of the fact that during the spring semester of 2021, KTH did not accept exchange or internship students. During the autumn of 2021, there were fewer exchange students who began their studies at KTH compared with the autumn of 2020. Primarily, it was overseas students who did not have the opportunity to take up their exchange place at KTH. During the year, 521 (635) foreign exchange students commenced studies at KTH. Within Europe, most students came from universities in France, Germany, Switzerland, and Italy. Of the total number of incoming exchange students, 15 (33) percent came from countries outside the EU/EEA/Switzerland/United Kingdom, with the majority coming from Singapore, Japan, and the USA. 17 percent came from countries outside the EU/EEA/Switzerland.

For the tenth year in a row, KTH Global was held as part of

the work to increase interest in exchange studies. KTH Global is the annual event that highlights all the international opportunities offered to KTH's students during their studies. Some activities were digital while others were held in a physical format. For three days, the students got to take part in a live and recorded talk show about studying abroad. In addition, information about foreign opportunities was provided for existing international students. Digital and physical information meetings were also held at KTH's schools as well as a well-attended trade fair. The feedback on the various activities has remained positive.

**Double degree**

In addition to the exchange students, KTH has a relatively large group of incoming double degree students subject to special partnership agreements with universities in Europe and Japan. The students study mainly at the second-cycle level for one and a half to two years in order to then be able to obtain a Master of Science in Engineering from KTH and an equivalent degree from their home university. The number of double-degree students who commenced studies at KTH during the year was 150 (130).

In 2021, two (zero) KTH students commenced double-degree studies abroad. The destinations were École Centrale de Lyon in France and Technische Universität München in Germany. Since most of the double degree students KTH admits come from a partner university in Europe and commence their studies during the autumn, the impact of COVID-19 has been marginal.

### **Internships**

There are also opportunities for various types of international experience other than just exchange studies. During the year, 35 (82) KTH students commenced Erasmus internships at companies or organisations in Europe. The most popular countries are France, Germany, Belgium, and Denmark.

### **Minor Field Studies**

Due to COVID-19, KTH has decided not to issue an announcement for scholarships within Minor Field Studies, MFS, prior to spring 2021. KTH may also not grant scholarships to countries to which the Ministry for Foreign Affairs' has advised against travelling. As a result, no students have been granted the scholarship or been able to pursue studies within the framework of MFS in 2021. Scholarships from UHR that have already been granted can be used until August 31, 2023.

### **KTH-NOC**

Since 2005, KTH has collaborated with the National University of Singapore, NUS, for internships at startups in combination with courses. KTH did not send any students there within the scope of the programme during the year due to COVID-19.

Six students from NUS commenced distance learning courses from Singapore in January, while completing their internship in Singapore. They subsequently arrived at KTH in October. In August, eight students commenced the distance learning programme, of whom five came to KTH in November to complete the programme on site.

### **Integration initiatives**

The course Intensive Swedish for Engineers and Architects, Sfnx, in Stockholm County has, since 2011, been an educational programme that is an integral part of KTH's regular activities. The purpose is to facilitate entry into the labour market for graduate engineers and architects who have immigrated to Sweden. Sfnx is a collaboration between KTH, Järfälla Municipality, the City of Stockholm, the County Administrative Board in Stockholm County, the municipalities member organisation Storsthlm and the Swedish Association of Graduate Engineers (Sveriges Ingenjörer). Sfnx is part of the regional collaboration Swedish for professionals, Sfx.

For 18 months, the engineers can study Swedish, from the level Swedish for immigrants up to and including upper-secondary level, as well as English. They also have the opportunity to participate in courses at KTH without being registered and they have the opportunity to participate in a mentorship programme for which the Swedish Association of Graduate Engineers is responsible. They also receive information about Swedish industry and the Swedish labour market. The courses had just over 100 participants in 2021,

which was similar to previous years. In total, the courses have had almost 1,300 participants. The students' level of attainment takes the form of reports that are integrated into the teaching of Swedish and contribute to their grade in Swedish. A large proportion of the participants find employment during or after they have completed the programme.

Since 2017, KTH has conducted a Wallenberg-funded project "Software Development Academy," where newcomers to Sweden are quickly trained in software development with innovative pedagogical methods and in collaboration with the industry. Since 2018, the project has also been granted support from the European Social Fund. In 2021, 46 participants started the educational programme and, overall, 352 participants completed it. The successful digitalisation of the educational programme made it possible for the technical platform that had been developed to be passed on to the Fordonsdalen REACT Competence project, see the section on *Collaboration*.

The European Social Fund also finances certain development and research with a view to better understanding mechanisms around society's skills development capacity. The project has received additional funding from Erasmus+ for a European expansion under the name IncluSTEM. In the autumn of 2021, an international webinar series was held based on these three projects, with over a hundred participants from different parts of society. The project will run until 2022.

### ***Bridging programme for architects and engineers with a completed foreign education***

Within the scope of the remit, KTH has planned and established bridging courses for both architects and engineers.

The programmes comprise 120 higher education credits and include general vocational preparatory courses in subjects such as law, civics, communication, sustainable development, entrepreneurship, and leadership, as well as subject-specific advanced courses. For the subject-specific courses, a study plan is drawn up based on an interview with the student. Existing skills, personal interests and the specific skills needs of the labour market within the profession or field of work are taken into account. The aim is that the individual who has completed an education abroad as an architect or an engineer will receive the supplementary knowledge that is needed to be able to practise their profession in Sweden. The educational programmes do not lead to an academic degree.

KTH has accepted students for the two versions of this programme in both the spring and autumn semesters in 2018 and 2019. In 2018, a total of 26 architects and 19 engineers started the programmes, collectively generating the equivalent of 22 full-time equivalent students. Three architects and six engineers started the programmes in 2019, generating five full-time equivalent students. KTH decided to suspend admission to the start of the spring semester in 2020 due to

too few eligible applicants for the courses and difficulties in making the courses financially and pedagogically sustainable.

By 2021, the programmes had nine students registered as active, including five engineers and four architects. In 2021, the programmes generated a total of approximately 1.5 full-time equivalent students from the admission rounds in 2018 and 2019, of which one full-time equivalent student was studying the course for engineers and 0.5 full-time equivalent student was studying the course for architects.

KTH has responsibility for the national coordination for the bridging programme for architects and engineers. Only KTH and Chalmers University of Technology have conducted the bridging programme. Other higher education institutions, which from the beginning also had the task of conducting bridging education for engineers, have found that student numbers are too small, and the demand is too low for the programme to be pursued. Chalmers University of Technology has also had difficulty recruiting students and decided in August 2020 to discontinue its programme from the spring semester of 2021. KTH has not yet made a similar decision. There is a small number of students at KTH who have studied approximately 90–110 higher education credits and some of them should be able to complete their studies in 2022.

**Performance**

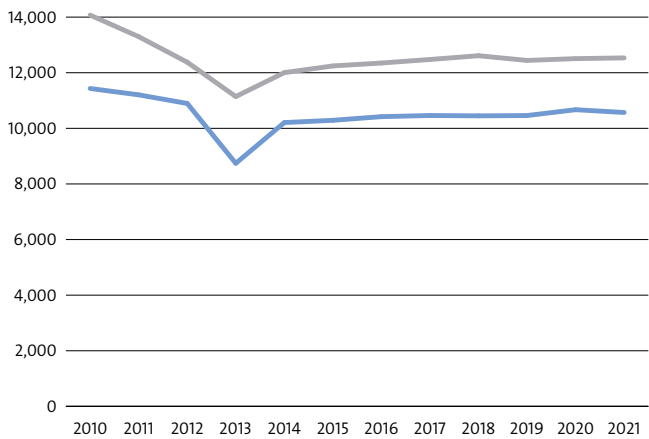
The number of full-time equivalent students and annual performance equivalent students, reconciled against public funding, who were in education at first-cycle and second-cycle levels in 2021 amounted to a total of 12,533 (12,507) and 10,570 (10,670), respectively, see Figure 7. Some of the examinations for the autumn semester are always scheduled for late in December. For the outcome in 2021, 413 annual performance equivalent students were registered in 2021 and relate to the examinations that took place in December 2020.

Of the total number of full-time equivalent students, 76 percent were connected to the field of education technology and 18 percent to the field of science, which adds up to 94 percent. According to the 2021 spending authorization, KTH was able to reconcile a maximum of 137 full-time equivalent students and annual performance equivalent students against the field of design. However, the field of design encompasses 349 (367) full-time equivalent students and 331 (331) annual performance equivalent students for 2021. The full-time equivalent students and annual performance equivalent students in excess of 137 are reconciled against the field of technology.

The performance rate for first and second-cycle programmes was 84 (85) percent, calculated as the number of annual performance equivalent students in relation to the number of full-time equivalent students. The performance rate is stable over time, within the range of 83–85 percent for the period 2018–2021.

The proportion of female full-time equivalent students was 35 percent, and the proportion of male full-time equivalent students was 65 percent, which is the same percentage distribution as the previous year. For those graduating with a Master of Science in Engineering, the proportion of women was 33 percent, and the proportion of men was 67 percent.

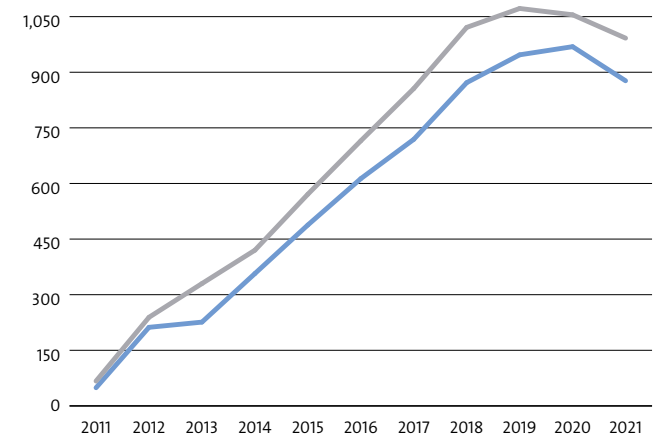
Figure 5  
Full year students and full year performances 2010-2021



— Full year students (FYS) are defined as the number of students who have started studies on a course multiplied by the number of course higher education credits divided by 60.  
 — Full year performance (FYP) is defined as the number of higher education credits gained on a course or sub-course divided by 60.

Source: Ladok

Figure 6  
Full year students and full year performances, fee-paying students 2011-2021



— Full year students (FYS) are defined as the number of students who have started studies on a course multiplied by the number of course higher education credits divided by 60.  
 — Full year performance (FYP) is defined as the number of higher education credits gained on a course or sub-course divided by 60.

Source: Ladok

Figure 7

## Full year students 2018-2021

	2021		2020		2019		2018	
	Proportion (%) of women/men		Proportion (%) of women/men		Proportion (%) of women/men		Proportion (%) of women/men	
	FYS		FYS		FYS		FYS	
Master of Architecture, 270/300 HE credits	429	61/39	461	60/40	446	58/42	455	58/42
Master of Science in Engineering 270/300 HE credits	5,033	33/67	5,165	34/66	5,371	34/66	5,415	33/67
<i>in addition, within Master programmes</i>	2,392	36/64	2,351	35/65	1,995	34/66	2,120	33/67
Bachelor of Science in Engineering 180 HE credits	1,633	28/72	1,513	29/71	1,511	28/72	1,491	27/73
Supplementary teacher education 90 HE credits	65	40/60	70	48/52	52	49/51	50	38/62
Subject Teacher Education in Technology, Secondary Education, 270 HE credits	9	39/61	5	55/45	2	53/47	1	100/0
Masters Programmes 60/90 HE credits	38	57/43	50	49/51	63	55/45	88	63/37
Masters Programmes 120 HE credits	3,519	36/64	3,486	35/65	3,295	34/66	3,372	34/66
<i>of which within Master of Science Engineering programmes<sup>2)</sup></i>	2,392	36/64	2,351	35/65	1,995	34/66	2,120	33/67
Bachelors Programmes 180 HE credits	262	36/64	272	35/65	261	34/66	259	35/65
Technical Preparatory Year, Technical Preparatory Semester 60/30 HE credits	951	33/67	811	32/68	605	32/68	613	35/65
University Diploma 120 HE credits	54	33/67	61	35/65	59	30/70	71	28/72
Exchange students arriving at KTH	306	37/63	431	35/65	634	37/63	606	35/65
Courses	234	38/62	184	41/59	143	39/61	189	39/61
<b>Total</b>	<b>12,533</b>	<b>35/65</b>	<b>12,507</b>	<b>35/65</b>	<b>12,442</b>	<b>34/66</b>	<b>12,612</b>	<b>34/66</b>

Source: Ladok

Figure 8

## Full year students and performance rate, fee-paying students 2018–2021

	2021		2020		2019		2018	
	FYS	performance rate (%)	FYS	performance rate (%)	FYS	performance rate (%)	FYS	performance rate (%)
Master of Architecture, 270/300 HE credits	0	479	-	-	-	-	-	-
Master of Science in Engineering 300 HE credits	4	79	7	71	2	36	1	79
Bachelor of Science in Engineering 180 HE credits	5	67	3	71	3	85	2	97
Bachelors Programmes 180 HE credits	16	75	15	93	12	88	10	90
Masters Programmes 60 HE credits	1	52	-	-	-	-	-	-
Masters Programmes 120 HE credits	16	94	13	99	18	87	20	87
Courses	949	89	1 013	92	1 032	88	978	85
Fristående kurser	1	107	0	105	0	119	2	59
Science without Borders	0	0	0	0	0	137	0	0
Study Abroad Programmes	0	0	3	98	4	96	8	124
Nordig	0	492	1	105	1	214	1	55
<b>Totalt</b>	<b>992</b>	<b>88</b>	<b>1,055</b>	<b>92</b>	<b>1,072</b>	<b>88</b>	<b>1,021</b>	<b>85</b>

Source: Ladok

The architecture programme has the highest proportion of women of all the programmes at KTH, with 61 percent women and 39 percent men.

In the Bachelor of Science in Engineering programme, the proportion of women was 28 percent, and the proportion of men was 72 percent, thus it is the type of educational programme that has the largest percentage difference between the genders. The master's degree programmes had 36 percent women and 64 percent men. The Technical Preparatory Year had 33 percent women and 67 percent men. In general, the percentage distribution between women and men is relatively stable over the period 2018–2021, with the

exception of the master's degree programmes in years 4–5, where the proportion of women has increased by one percentage point annually since 2018. See *Figure 7*.

In addition to the performances reconciled against public funding, the fee-paying students have generated 992 (1,055) full-time equivalent students and 877 (969) annual performance equivalent students in 2021. This corresponds to a performance rate of 88 (92) percent for 2021. See *Figure 8*. In addition to the outcome in 2021, 42 annual performance equivalent students were registered in 2021, which relate to the examinations that took place in December 2020.

In total, KTH had 1,559 (1,627) fee-paying programme

Figure 9  
First degrees 2018-2021

	2021		2020		2019		2018	
	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men
<b>Degree of Master of Architecture 270/300 HE credits <sup>1)</sup></b>	<b>99</b>	<b>57/43</b>	<b>86</b>	<b>55/45</b>	<b>114</b>	<b>57/43</b>	<b>84</b>	<b>60/40</b>
<b>Degree of Master of Science in Engineering 270/300 HE credits <sup>1)</sup></b>	<b>1,310</b>	<b>37/63</b>	<b>1,119</b>	<b>37/63</b>	<b>1,150</b>	<b>35/65</b>	<b>1,134</b>	<b>34/66</b>
Biotechnology	54	70/30	38	55/45	39	64/36	49	59/41
Engineering and Education	27	56/44	27	37/63	35	54/46	34	38/62
Computer Science and Engineering	129	24/76	110	15/85	87	14/86	83	18/82
Design and Product Realisation	84	54/46	85	55/45	91	53/47	66	55/45
Electrical Engineering	62	13/87	54	24/76	63	13/87	42	5/95
Energy and Environment	69	58/42	57	68/32	56	57/43	59	53/47
Vehicle Engineering	116	16/84	92	14/86	100	15/85	115	14/86
Industrial Engineering and Management	151	36/64	132	35/65	140	37/63	123	42/58
Information and Communication Technology	47	28/72	35	37/63	34	18/82	32	19/81
Engineering Chemistry/Chemistry and Chemical Engineering	4	50/50	36	50/50	30	57/43	35	69/31
Mechanical Engineering	141	32/68	109	28/72	123	25/75	122	18/82
Materials Design and Engineering	25	48/52	34	44/56	25	36/64	32	38/62
Medical Engineering	31	58/42	36	58/42	30	57/43	33	55/45
Media Technology	43	63/37	42	48/52	34	38/62	46	59/41
Microelectronics	2	50/50	0	0/0	4	0/100	4	0/100
Civil Engineering and Urban Management	127	45/55	146	50/50	142	53/47	138	41/59
Engineering Physics	120	24/76	77	22/78	98	18/82	105	14/86
Engineering Chemistry	68	49/51	0	0/0	0	0/0	0	0/0
Not within programme/specialisation	10	20/80	9	22/78	19	47/53	16	38/62
<b>Degree of Bachelor of Science in Engineering 180 HE credits</b>	<b>388</b>	<b>32/68</b>	<b>311</b>	<b>30/70</b>	<b>267</b>	<b>32/68</b>	<b>273</b>	<b>26/74</b>
<b>Degree of Master of Science</b>	<b>74</b>	<b>61/39</b>	<b>57</b>	<b>42/58</b>	<b>72</b>	<b>44/56</b>	<b>49</b>	<b>45/55</b>
in Secondary Education, 225 HE credits, 2 teaching subjects <sup>2)</sup>	4	100/0	1	100/0	4	0/100	8	75/25
in Upper Secondary Education, 210 HE credits, 1 teaching subject <sup>2)</sup>	14	64/36	4	75/25	5	40/60	3	33/67
in Upper Secondary Education, 300 HE credits, 2 teaching subjects <sup>2)3)</sup>	46	54/46	41	34/66	53	45/55	38	39/61
in Secondary Education, 270 HE credits <sup>2)</sup>	6	67/33	9	44/56	10	60/40	-	-
in Secondary Education, 180 HE credits, 1 teaching subject <sup>2)</sup>	3	67/33	1	100/0	-	-	-	-
in Secondary Education, 240 HE credits, 2 teaching subject <sup>2)</sup>	1	100/0	1	100/0	-	-	-	-
<b>Degree of Master of Science 120 HE credits</b>	<b>1,894</b>	<b>34/66</b>	<b>1,743</b>	<b>33/67</b>	<b>1,904</b>	<b>33/67</b>	<b>1,287</b>	<b>36/64</b>
<i>of which also graduated as a Master of Science in Engineering <sup>1)</sup></i>	<i>705</i>	<i>36/64</i>	<i>596</i>	<i>37/63</i>	<i>661</i>	<i>35/65</i>	<i>550</i>	<i>34/66</i>
<i>of which joint degree</i>	<i>38</i>	<i>47/53</i>	<i>47</i>	<i>41/59</i>	<i>31</i>	<i>48/52</i>	<i>23</i>	<i>30/70</i>
<b>Degree of Master of Science 60 HE credits</b>	<b>73</b>	<b>52/48</b>	<b>74</b>	<b>61/39</b>	<b>106</b>	<b>61/39</b>	<b>102</b>	<b>63/37</b>
<b>Master Degree 60/90 HE credits <sup>2)</sup></b>	<b>1</b>	<b>0/100</b>	<b>4</b>	<b>75/25</b>	<b>2</b>	<b>50/50</b>	<b>1</b>	<b>0/100</b>
<b>Degree of Bachelor of Science 180 HE credits</b>	<b>1,020</b>	<b>40/60</b>	<b>891</b>	<b>34/66</b>	<b>934</b>	<b>37/63</b>	<b>700</b>	<b>37/63</b>
<b>University Diploma 120 HE credits</b>	<b>27</b>	<b>22/78</b>	<b>17</b>	<b>47/53</b>	<b>28</b>	<b>14/86</b>	<b>28</b>	<b>25/75</b>

1) this year and earlier

2) according to older regulations

Source: Ladok



students in 2021, of whom 512 (492) were women and 1,047 (1,135) were men. Of these, 208 (177) were scholarship-funded by Swedish or KTH-affiliated scholarship programmes, which corresponds to about 13 (11) percent of fee-paying students. Among the scholarship recipients there were 79 women and 129 men. In addition, there were eight (13) fee-paying students, of whom one was female and seven were male, on standalone courses. The largest proportion of fee-paying students are either paying themselves or are financed by scholarship programmes about which KTH does not have information.

The fields of humanities, law, social science, and educational programmes with internships make up a total of about five percent of KTH's complete range of educational programmes, a total of 636 full-time equivalent students out of 12,533 at KTH in 2021. As the scope of the education in these fields constitutes such a small proportion of the total educational programmes at KTH, it is impossible to analyse changes in the number of teacher-led hours in these areas and especially for educational programmes with internships (only 29 full-time equivalent students).

KTH's resource allocation model clarifies the responsibilities and powers of KTH's five Schools to conduct education with good throughput and of high quality. The reimbursement for annual performance equivalent students per educational field is paid in full to the relevant School.

## Degrees

In 2021, a total of 1,310 (1,119) Master of Science in Engineering degrees were awarded, 99 (86) Master of Architecture degrees and 388 (311) Bachelor of Science in Engineering degrees. In total, KTH awarded 1,894 (1,743) Master of Science degrees during the year. Of those who took a Master of Science degree, 705 (596) also received a Bachelor of Science in Engineering degree in 2021 or earlier. Thus, KTH awarded 1,189 (1,147) master's degrees to students who do not also have a Bachelor of Science in Engineering from KTH. A Master of Science degree was awarded to 73 (74) people. See *Figure 9*.

Of the 1,020 (891) Bachelor of Science degrees awarded, 882 (713) were obtained by students in the Master of Science in Engineering programme and 24 (64) by students in the Master of Architecture programme.

The trend of students obtaining more than one academic degree based on the same discipline is continuing. Since 2018, the number of people being awarded multiple degrees has increased annually. In 2021, the proportion of students who obtained one or more additional degrees combined with a Master of Science in Engineering degree was 57 (61) percent.

The proportion of women among those graduating with a Master of Science in Engineering degree was 37 (37) percent and the proportion of men was 63 (63) percent. For those graduating with a Master of Architecture degree, the proportion of women was 57 (55) percent, and the proportion

of men was 43 (45) percent. See *Figure 9* for the gender breakdown within programme types and individual programmes.

In 2021, KTH issued 74 (57) Master of Science in Education degrees. These were issued after completion of the educational programme Master of Science in Engineering and Education or after completing a Bridging Teacher Education Programme or Bridging Teacher Education Programme for people with a third-cycle degree. The proportion of women among those graduating with a Master of Science in Education was 61 (42) percent and the proportion of men was 39 (58) percent. See *Figure 9*.

KTH also awards master's degrees jointly with other universities. The number of master's degrees awarded jointly with other universities was 38 (47) in 2021, of which seven (15) were to fee-paying students.

In 2021, 13 (16) one-year master's degrees and 590 (503) two-year master's degrees, seven (three) bachelor's degrees, three (two) Bachelor of Science in Engineering degrees and one (zero) Master of Science in Engineering degrees were awarded to students who paid tuition fees for their studies at KTH. These degrees are included in the data above.

## Career guidance

KTH's career counselling service is focused on providing support to students in their transition to working life. Activities during 2021 have included individual career coaching for students, drop-in review of CVs and application letters, as well as lunch seminars on career development in English and participation in job fairs. During the year, significant parts of these activities were conducted digitally via Zoom due to COVID-19. KTH Career has also hired international students who blog about their experiences of applying for jobs and degree projects in Sweden. In all, approximately 900 students have participated in the various activities.

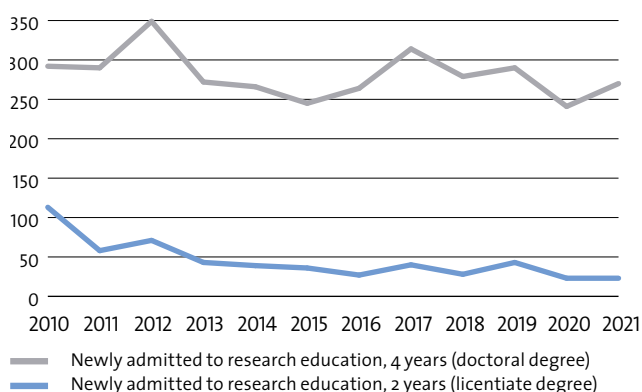
## Third-cycle education

### Recruitment

KTH conducts coordinated advertising for applications for vacant doctoral positions. The purpose of coordinated advertising is to make KTH visible both as a workplace and as a university, thereby increasing interest among prospective applicants. KTH advertises doctoral vacancies nine times a year.

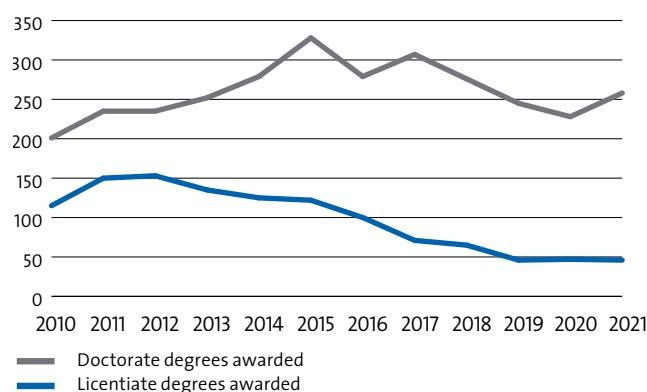
In 2021, a total of 264 (290) doctoral positions were advertised. In all, 15,941 individuals applied for these positions, of whom 4,510 were women, 11,342 were men and 89 did not state their gender. Recruitment for third-cycle education also takes place following advertising in a different order, as well as without prior advertising, which applies to externally employed doctoral students, for example.

Figure 10  
Newly admitted research students 2010-2021



Source: Ladok

Figure 11  
Licentiate and doctorate degrees 2010-2021



Source: Ladok

Figure 12  
Newly admitted and registered research students 2018-2021

New students per research field	2021		2020		2019		2018	
	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men
Biological Sciences	4	25/75	3	67/33	4	0/100	2	100/0
Computer and Information Science	74	32/68	62	27/73	65	15/85	55	33/67
Economics and Business	4	50/50	1	100/0	0	0	1	0/100
Electrical Engineering, Electronic Engineering, Information Engineering	42	17/83	29	17/83	47	30/70	45	29/71
Philosophy, Ethics and Religion	1	100/0	1	100/0	0	0	1	0/100
Physical Sciences	14	36/64	18	22/78	24	33/67	33	27/73
History and Archaeology	2	50/50	1	100/0	3	67/33	6	17/83
Health Sciences	9	67/33	6	67/33	3	67/33	6	50/50
Industrial Biotechnology	20	60/40	16	63/37	23	52/48	18	22/78
Chemical Sciences	5	40/60	8	38/63	9	22/78	10	30/70
Chemical Engineering	29	45/55	16	56/44	28	71/29	15	53/47
Arts	2	100/0	1	100/0	7	71/29	1	100/0
Mechanical Engineering	25	20/80	36	17/83	42	45/55	32	38/62
Mathematics	10	30/70	19	16/84	7	14/86	12	50/50
Materials Engineering	18	22/78	21	38/62	36	31/69	37	16/84
Medical Engineering	3	33/67	0	0	0	0	3	33/67
Environmental Engineering	1	100/0	1	100/0	2	0/100	2	0/100
Civil Engineering	26	31/69	21	29/71	23	35/65	23	43/57
Educational Sciences	4	75/25	4	75/25	10	90/10	5	20/80
<b>Total new research students</b>	<b>293</b>	<b>35/65</b>	<b>264</b>	<b>32/68</b>	<b>333</b>	<b>37/63</b>	<b>307</b>	<b>32/68</b>
<b>Total number of students registered</b>	<b>1,839</b>	<b>33/67</b>	<b>1,803</b>	<b>32/68</b>	<b>1,841</b>	<b>32/68</b>	<b>1,934</b>	<b>30/70</b>

Source: Ladok

### Admissions

In 2021, 293 (264) newly admitted doctoral students commenced their studies. Of those who started their studies, the proportion of women was 35 percent (32), and the proportion of men was 65 percent (68). Eight percent of the newly admitted doctoral students who started their studies have been admitted with the goal of completing a licentiate degree.

And of these, 39 percent were women and 61 percent were men. See *Figure 12*.

Of this year's new admissions, 25 (36) doctoral students, of whom 36 (36) percent were women and 64 (64) percent were men, have their primary activities outside of the University and pursue doctoral studies within the framework of their employment, externally employed doctoral students. The

employer may be either private or governmental.

Of those who were admitted to a programme at the third-cycle level in 2021, 37 percent, or 108 individuals, have an academic degree from KTH. Of the new admissions with an academic degree from KTH, 74 percent have a master's degree and 25 percent have a Master of Science in Engineering degree. Of the new admissions in 2021, 45 percent have an academic degree from a country other than Sweden.

### Level of activity and financing of academic studies

Of the 1,839 unique registrants with some activity at the third-cycle level in 2021, 1,657 doctoral students had a level of activity of at least 50 percent and 1,824 had a level of activity of at least ten percent.

At year-end, 1,338, or 71 percent, of KTH's doctoral students had financing in the form of doctoral positions on a full-time or part-time basis. Of those who had a doctoral position, 34 (32) percent were women, and 66 (68) percent were men.

Of the doctoral students, 15 percent financed their studies by means of paid employment associated with their education, externally employed doctoral students, three percent by means of other employment at a higher education institution, and seven percent by means of full-time or part-time scholarships. Three percent of the doctoral students, who study full-time or part time, finance their studies in some other way. Many of the doctoral students whose studies are funded by scholarships, receive these through KTH's joint collaboration with the China Scholarship Council.

### KTH's doctoral programmes

The doctoral programmes were established in 2011 and there are currently 31 such programmes. In order to establish a doctoral programme, a number of quality requirements are set with regard to purpose, target group, and content, as well as other related considerations. All new doctoral students are admitted, in addition to a subject at the third-cycle level, to a doctoral programme or a programme that KTH offers in collaboration with one or more partners. The purpose of the doctoral programmes is to secure the quality of the educational programme through an organized structure.

### Student mobility within the programmes at the third-cycle level

There is a significant international component to KTH's third-cycle education, including many international doctoral students and supervisors. Statistics Sweden requests information, on behalf of the Swedish Higher Education Authority, concerning stays abroad for those obtaining doctoral degrees or licentiate degrees over the past year. The latest survey, conducted in 2020, showed that 40 percent of the newly graduated students had spent time abroad within the scope of their educational programme. KTH should continue its work to improve the documentation of doctoral

students' stays abroad. There is also the potential for more doctoral students to spend time abroad during the course of their studies.

### Degrees

In 2021, 258 (228) doctoral degrees and 46 (47) licentiate degrees were awarded. Of the doctoral degrees awarded, 33 (30) percent were to women and 67 (70) percent were to men. Of those who completed their licentiate degree, 35 (28) percent were women, and 65 (72) percent were men. Of this year's doctoral degrees, three (eight) were awarded jointly with other universities.

Obtaining a licentiate degree as a stage in your third-cycle education still remains relatively common at KTH. Of the doctoral graduates in 2021, 21 (20) percent had previously completed a licentiate degree. KTH's assessment is that a scientific licentiate degree is extremely relevant for employment within the industrial sector.

The net study time for doctoral students who graduated in 2021 was 4.2 (4.2) years for a doctoral degree, and 2.8 (3.0) years for a licentiate degree. Men had a slightly lower net study time than women when obtaining a doctoral degree, for a licentiate degree there was no difference between genders. The calculations of study time were produced according to the procedures provided by the Ladok study documentation system.

## National partnerships

### Prerequisites for educational partnerships

According to KTH's Development Plan for 2018–2023, KTH will extend and expand international partnerships. Collaborations will contribute to KTH's development both in terms of education and research. KTH has a large number of educational partnerships, both nationally and internationally. KTH has developed an internal set of rules that is used in the planning of educational partnerships. KTH has a consultative committee for educational partnerships that offers support to KTH's Schools.

### Teacher training programmes

#### *Master of Science in Engineering and Education*

The programme leads to both a Master of Science in Engineering as well as a Master of Science in Upper-Secondary Education in the field of mathematics, as well as one of the subjects of physics, chemistry, or technology. KTH has degree-awarding powers for both degrees. In 2021, some of the courses included in the programme were purchased from Stockholm University.

In the autumn semester of 2021, the programme had 94 first-choice applicants and 504 applicants in total. In 2021, 54 students started the programme, of whom 37 percent were

Figure 13

## Doctorate and licentiate degrees 2018-2021

Doctorate degrees per research field	2021		2020		2019		2018	
	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men
Biological Sciences	4	25/75	2	0/100	2	50/50	1	100/0
Computer and Information Science	26	35/65	19	32/68	28	14/86	41	24/76
Economics and Business	2	50/50	0	0	1	100/0	1	0/100
Electrical Engineering, Electronic Engineering, Information Engineering	44	23/77	37	16/84	36	31/69	50	24/76
Philosophy, Ethics and Religion	1	0/100	0	0	1	0/100	2	0/100
Physical Sciences	22	32/68	12	33/67	18	22/78	28	11/89
History and Archaeology	2	50/50	2	0/100	1	0/100	1	100/0
Health Sciences	8	50/50	4	0/100	5	80/20	4	50/50
Industrial Biotechnology	14	29/71	13	38/62	19	63/37	14	57/43
Chemical Sciences	13	38/62	23	48/52	8	38/62	9	44/56
Chemical Engineering	16	50/50	18	44/56	32	34/66	21	33/67
Arts	6	50/50	2	0/100	0	0	6	83/17
Mechanical Engineering	35	26/74	33	30/70	29	48/52	35	31/69
Mathematics	9	11/89	8	25/75	10	20/80	9	22/78
Materials Engineering	27	33/67	24	13/87	18	17/83	26	23/77
Medical Engineering	1	100/0	5	80/20	6	0/100	2	100/0
Environmental Engineering	1	0/100	5	40/60	9	33/67	4	25/75
Civil Engineering	27	41/59	16	31/69	21	29/71	22	38/62
Educational Sciences	0	0	5	40/60	1	0/100	0	0
<b>Total</b>	<b>258</b>	<b>33/67</b>	<b>228</b>	<b>30/70</b>	<b>245</b>	<b>32/68</b>	<b>276</b>	<b>30/70</b>

Licentiate degrees per research field	2021		2020		2019		2018	
	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men	Total	Proportion (%) of women/men
Biological Sciences	0	0	1	0/100	0	0	3	33/67
Computer and Information Science	3	33/67	2	0/100	4	0/100	2	0/100
Economics and Business	0	0	1	0/100	1	100/0	0	0
Electrical Engineering, Electronic Engineering, Information Engineering	9	22/78	13	23/77	11	45/55	15	13/87
Philosophy, Ethics and Religion	2	50/50	2	50/50	0	0	0	0
Physical Sciences	1	0/100	2	0/100	2	0/100	3	100/0
Health Sciences	1	0/100	0	0	0	0	0	0
Industrial Biotechnology	2	50/50	0	0	1	100/0	2	100/0
Chemical Sciences	0	0	1	0/100	1	0/100	1	100/0
Chemical Engineering	3	100/0	1	0/100	3	0/100	0	0
Arts	0	0	1	100/0	1	100/0	1	0/100
Mechanical Engineering	2	0/100	2	50/50	4	0/100	7	43/57
Mathematics	0	0	2	0/100	1	100/0	2	50/50
Materials Engineering	6	17/83	4	50/50	6	17/83	12	25/75
Medical Engineering	0	0	0	0	0	0	1	100/0
Environmental Engineering	1	0/100	2	50/50	1	0/100	3	33/67
Civil Engineering	15	40/60	13	31/69	10	30/70	12	42/58
Educational Sciences	1	100/0	0	0	0	0	1	100/0
<b>Total</b>	<b>46</b>	<b>35/65</b>	<b>47</b>	<b>28/72</b>	<b>46</b>	<b>28/72</b>	<b>65</b>	<b>37/63</b>

Source: Ladok

women and 63 percent were men. This means that the proportion of women has increased by three percentage points compared to 2020. In 2021, 27 students graduated from the programme, of whom 56 percent were women and 44 percent were men.

All students in the Master of Science in Engineering and Education programme had mathematics as their main teaching subject. In the first year of the programme, the students obtain basic knowledge in the subjects that are included in the programme's various majors. The subjects are physics, chemistry, and technology, with a major in computing or technology or a major in energy and the environment. Before year 2, students choose one of the four possible majors, which then provides them with their second teaching subject.

In association with their choice of a major, the students are informed that there is strong demand for teachers in all these subject fields. The most significant teacher shortages are in chemistry and technology. As a consequence of the shortage of teachers, it has been difficult since 2017 to find sufficient places for placement in upper-secondary schools, in particular in the field of mathematics.

The transition to digital teaching that took place in the spring of 2020, and which was also applicable in 2021 due to COVID-19 has placed new demands on teachers. In some instances, students who do their placement constitute a teaching resource. All the students in the Master of Science in Engineering and Education programme were eventually offered a placement in 2021, even if at times it was close to the start of the semester when they received the offer, or it entailed very long travel times. Due to pandemic restrictions, KTH has not had the opportunity to take any further measures in regard to placements in 2021.

### **Teacher Training Programme**

The teacher training programme with a major in technology comprises 270 higher education credits and commenced in the autumn semester of 2019. In the autumn semester of 2021, the programme had 38 (37) applicants, six (six) of whom started the programme.

The programme leads to two different academic degrees, a Master of Science in Secondary Education teaching grades 7–9 in technology and mathematics, and a Bachelor of Science in Engineering. The education comprises a total of four and a half years of full-time study, of which two are summer semesters. In 2021, one student had completed a placement.

### **Practical research and practice schools**

KTH is already involved in the project Compensatory Teaching for Learning and Research, K-ULF, which is part of the government's investment in developing long-term collaboration between universities and colleges and principals in the school system, regarding practical research. In

2021, KTH built up a network of schools with which KTH has signed agreements on collaboration for practical research. The municipalities are Värmdö, Lidingö, the City of Stockholm, Nynäshamn and Haninge. Representatives from the schools take part in K-ULF's steering group.

In 2021, KTH commenced work on developing so-called practice schools. Through the existing network of schools in K-ULF, KTH has identified secondary and upper-secondary schools that are also interested in receiving placement students. There is considerable interest, but one of the challenges is the availability of qualified supervisors at the schools. Therefore in 2021, KTH developed a course for future supervisors. The first round of the course is expected to be completed in 2022.

Although the work with practice schools is under development, a total of nine full-time equivalent students participated in a placement in 2021 at one of the schools that are interested in becoming practice schools.

Another challenge is the need for increased coordination between placements that take place via practice schools and those that take place via the so-called VFU portal, which is regulated through a partnership agreement between universities and municipalities in Greater Stockholm.

KTH forecasts that approximately the same number of students as in 2021 will participate in the activities with practice schools in 2022 and 2023. However, the forecast is very uncertain as agreements may be signed in 2022 between KTH and principals that will affect the number of placements.

### **Bridging Teacher Education Programme**

The Bridging Teacher Education Programme, KPU, constitutes 90 higher education credits and leads to a Master of Science in Secondary or Upper-Secondary Education in one or more of the subjects physics, chemistry, mathematics, or technology. In order to be admitted to the programme, applicants must have sufficient academic qualifications in one or more of these subjects. The programme is undertaken partly as a distance learning course with physical meetings at KTH. Some aspects of the educational programme are provided by Stockholm University. The programme also runs during the summer, which means that a student who starts in June could be a qualified teacher at the end of August the following year. One-third of the educational programme consists of a placement at a school where the students participate in daily teaching under supervision. VFU placements have become more difficult to secure in the right subject and at the right level for KPU students. This is especially true in the subjects of mathematics and technology in upper-secondary school. Some students complete their placement in years 7–9 of secondary school, even though they qualify in their subject for upper-secondary school.

In 2021, there were 227 applicants, of whom 184 were

first-choice applicants for the programme. 128 applicants were accepted, and 65 students commenced the programme at the start of the summer semester. In December 2021, 45 students were still active. It has been noted that the applicants are younger than previously and that fewer applicants have several years professional experience. Of those who started the educational programme, eight students have been accepted after validation of real competence for some eligibility requirement or part thereof. In 2021, 29 students graduated.

#### ***Bridging Teacher Education Programme for people with a third-cycle degree***

The government has given KTH and Stockholm University the remit to arrange Bridging Teacher Education for people with a third-cycle qualification, KPUFU. Those who are admitted to the programme can receive a special educational grant during their studies. The number of student places in the educational programme is governed by the allocation of the educational grants, which is limited to 50 students per year, on average. The programme comprises 90 higher education credits and runs over twelve months with an accelerated pace of study.

The KPUFU project began in 2016 and the first round of students was admitted in January 2017. The latest intake of students started in January 2020. The original investment ceased at the beginning of 2021, which is why KTH and Stockholm University did not carry out any admissions before the spring semester of 2021. In December 2021, the government decided to extend the remit until 2026. The next date for commencement of studies will be the spring semester of 2022. Prior to the new start date, the previous programme has been revised on the basis of the forthcoming regulation on education for teachers and preschool teachers, as well as new requirements in the National System of Qualifications. In 2021, 18 students graduated from the programme, of whom eleven were women and seven were men.

#### **Collaborations with colleges of fine, applied and performing arts**

KTH is working to develop collaborations with colleges of fine, applied and performing arts. In order to offer doctoral students, academic supervisors, and researchers a high-quality, shared environment, a centre was established in 2019, called Navet (the Hub). The centre works to strengthen research in the field of art, technology, and design. KTH; the University of Arts, Crafts and Design; the Royal College of Music in Stockholm, and Stockholm University of the Arts collaborate in Navet. The centre provides a networking space that can initiate new research projects that have been spread across different environments and provide them with support in the form of shared resources: laboratories, equipment, courses, and training.

In 2021, the centre continued its work and, among other things, Navet Week was held in December. Navet Week showcased work performed through lectures, performances, workshops, exhibitions, and installations.

#### **Stockholm Trio University Alliance**

In 2019, KTH formed the Stockholm Trio University Alliance together with Karolinska Institutet and Stockholm University. The aim of the Alliance is to promote international partnerships with prominent universities through collaboration in research and education, and to increase the universities' international appeal when recruiting, as well as to improve the universities' capacity to act jointly at a regional, national, and international level.

In 2021, Stockholm Trio has focused on integrating sustainability and the 2030 Agenda into the Alliance, among other things through the establishment of the Stockholm Trio Sustainability Group. The Stockholm Trio has also established a group of education directors with the aim of initiating strategic partnerships between the three universities in education at the first-cycle and second-cycle levels. Furthermore, a group of Vice Presidents was formed during the year to discuss educational partnerships at the third-cycle level.

During the year, the Stockholm Trio produced a report which, among other things, forms the basis for continued joint planning, programme coordination and student support functions. New procedures have been created regarding student status in Ladok.

Together with the University of Tokyo, the Alliance has conducted a digital workshop on the theme of sustainable development, see the section on *International partnerships*. Partnerships have been entered into with University College London within the Cities Partnerships Programme 2020–2023. The theme of the collaboration is climate change and urban health. During the autumn, the Stockholm Trio and University College London announced seed funding for collaborative projects, and joint workshops have been held to encourage EU applications.

Due to COVID-19, the joint Brussels Office has mainly conducted digital activities but has also had some physical staffing. In 2021, the focus has been on spreading awareness of the office and establishing contact with the European Commission and other stakeholders and networks in Brussels. As part of KTH's strategy for participation in Horizon Europe, KTH and the Brussels Office have begun work to increase the presence of experts in relevant research forums.

#### **Other partnerships**

Since 2011, KTH and Mid Sweden University have collaborated on the Master of Science in Engineering programme. During the year, the agreement was extended until 2023. The collaboration entails that after the first three years of the Master of Science in Engineering programme provided by

Mid Sweden University, students can continue in some master's programmes at KTH. In the autumn semester of 2021, 18 (24) students from Mid Sweden University began a master's programme at KTH. After completing their education, the students can obtain a Master of Science in Engineering and a master's degree from KTH, as well as a bachelor's degree from Mid Sweden University. The collaboration has been further developed and in 2020 a joint Master of Science in Chemical Engineering was established. In the autumn of 2021, the first students were admitted to the programme. Students will study their first three years mainly at Mid Sweden University, and their final two years at KTH. The programme leads to a joint Master of Science in Engineering from KTH and Mid Sweden University.

KTH already had established collaborations with the parties within the Stockholm Trio. In collaboration with Stockholm University, a master's programme in mathematics is being conducted, with 26 (23) new students in 2021. Together with Stockholm University and Karolinska Institutet, a master's programme in molecular techniques in life science is being conducted with 27 (29) new students. In addition, a joint educational programme at the third-cycle level in medical technology is run together with Karolinska Institutet. During the year, three doctoral students were accepted, and one doctoral degree was awarded.

## International collaborations

### Strategic partners and networks

In 2021, KTH extended its collaborations with the six strategic partner universities: The University of Illinois at Urbana-Champaign in the USA, Nanyang Technological University in Singapore, Shanghai Jiao Tong University, SJTU, in China, Indian Institute of Technology Madras, IITM, in India, Hong Kong University of Science and Technology in Hong Kong and the University of Tokyo in Japan.

KTH already has a Joint PhD agreement with Nanyang Technological University, NTU, in Singapore, where three doctoral students from NTU and KTH participated. In 2021, two of the doctoral students defended their theses.

The partnership with the University of Tokyo takes place together with Karolinska Institutet and Stockholm University within the framework of Stockholm Trio. For two days in September, a digital workshop was held with just over 300 participants, chiefly from the collaborating universities. The main theme was sustainable development and how the pandemic has affected research collaboration.

During the year, SJTU and KTH held two joint webinars. In August, a summer school in Biomedical Engineering and Science was held.

Within the partnership with IITM, the project Enhancing Quality Assurance Management and Benchmarking

Strategies in Indian Universities, EQUAMBI, was initiated. The project concludes with a course on how to implement the tools.

During the year, KTH also continued to engage in international networks, including Top Industrial Managers in Engineering, T.I.M.E. During the pandemic, the T.I.M.E. Network mainly focused on external monitoring, follow-up of alumni, and external communication to increase awareness of the network and double degree studies. KTH has held the presidency for two years and in October 2021, the presidency was handed over to the Universidad de Politécnica de Madrid in Spain. KTH continues as a representative in the governing body.

Other examples of networks in which KTH is involved are CESAER, within which about sixty technical universities collaborate on policy issues concerning higher education, Nordic Five Tech, which is an alliance of five technical universities in the Nordic region, and CLUSTER, which is an association of twelve technical institutions in Europe.

### KTH Global Development Hub

The KTH Global Development Hub, GDH, supports the development of challenge-driven education within KTH and partner universities in Eastern and Southern Africa. The purpose is to promote innovative skills and innovation by contributing relevant solutions that are also implemented in society. The GDH currently has partnerships with three universities in Kenya, Tanzania and Botswana and is also developing collaborations with universities in South Africa. During the autumn of 2021, a total of ten students from the partner universities participated in GDH's student exchange at KTH.

### China Scholarship Council

During the year, ten doctoral students with a scholarship from the China Scholarship Council (CSC) were admitted to KTH. Twenty-six visiting doctoral students and three visiting researchers have also been awarded scholarships. Ten of the 26 visiting doctoral students had originally been granted a CSC scholarship to other higher education institutions, but switched to KTH as their original higher education institution could not accept them due to COVID-19.

### European Institute of Innovation and Technology

KTH is a partner in five of eight consortia in the EU initiative within the European Institute of Innovation and Technology, EIT. The areas in which KTH is participating through EIT's knowledge and innovation communities, KIC, are ICT (EIT Digital), Energy (EIT InnoEnergy), Materials (EIT Raw Materials), Health (EIT Health) and Transport Systems (EIT Urban Mobility). It has been a challenging year for double-degree programmes that require mobility. Events have been cancelled and summer schools have had to be held online, while regulations and funding models have been

reviewed.

EIT Urban Mobility admitted its second intake of students for the autumn semester of 2021. 19 (five) students started at KTH. As with EIT Digital, KTH will be responsible for the coordination of the Master's School. Interest in the master's programmes within the scope of the EIT is considered to be high despite the challenges the programmes have faced with the ongoing pandemic. With the exception of the EIT InnoEnergy, the programmes saw a decrease in the number of applicants compared to the previous year.

During the year, 701 (1,094) applicants were admitted to EIT Digital's master's programmes, and 279 (288) students started their studies at one of the 18 partner universities within the consortium. Of these 279 students, 34 (60) began their studies in the first year at KTH. After spending their first academic year at one of the partner universities, 70 (85) students began their second academic year at KTH in 2021. KTH's main commitment within EIT Digital remains the Master's School, but there has also been an initiative to recruit externally employed doctoral students.

KTH is participating in five of the master's programmes offered within EIT InnoEnergy. Investments have been made in a new admissions portal and in international recruitment, which has yielded results. In the autumn of 2021, 95 (69) students began their first year and 28 (20) students the second year of their studies at KTH after one year at one of the partner universities within the consortium.

In the autumn of 2021, EIT Health welcomed its first students to a Master's in Innovative Technology for Healthy Living. Within EIT Raw Materials, the main focus is on courses and study programmes with a particular focus on sustainability issues, such as life cycle analysis, recycling, and replacement of critical raw materials.

### Erasmus+

In 2021, a new seven-year programme period for Erasmus+ began. The summary of the previous programme period shows that KTH has participated in 76 Erasmus+ projects for the programme period 2014–2020, for 20 of these projects we acted as coordinator.

As in previous years, KTH received a large number of scholarships for mobility within Europe for studies, internships, and staff exchanges. For 2021, announcements for the project aspect within Erasmus+ have been limited. During the year, KTH was granted funding for four projects with a focus on digitalisation within the Collaborative Partnership section, for two of these projects we will act as coordinator.

Due to COVID-19, meetings, conferences, and training courses have been conducted digitally. During the autumn, however, several projects have been able to hold conferences and training courses as planned.

KTH participates as a partner in two Erasmus Mundus joint master's programmes. A total of 22 (ten) Erasmus

Mundus Joint Master's students were registered in 2021.

### European Universities – Unite!

The University Network for Innovation, Technology and Engineering, Unite!, is a network of seven universities in as many European countries. The goal is to create a new European university model where students at all levels can shape their educational programme through virtual or physical mobility at one of the seven higher education institutions. The purpose of the collaboration is also to create innovative pedagogical methods and harmonized governance models and to jointly develop models for collaboration with and disseminating research results to wider society.

The collaboration and goals are long-term. The European Commission has allocated funding for a three-year pilot phase, 2019–2022. During the year, the network offered seminars for educational development, virtual student exchanges, mentorship for students, collaboration on innovation and startups, and student competitions, so-called hackathons, with teams composed of students from the seven universities. The concept developed for virtual exchange of courses has been highlighted by the European Commission as a particularly good example.

In 2020, Unite! was granted funds from the EU's Horizon 2020 research programme with a view to creating a platform for research collaboration and a common agenda for disseminating research results to society at large. As a result, the Unite! Universities jointly participated in the 2021 edition of ForskarFredag, arranged by Vetenskapens Hus.

### Marie Skłodowska-Curie Actions

Marie Skłodowska-Curie Actions is the EU's programme for researcher mobility. In 2021, KTH's researchers did not have as many MSCA announcements to apply for as before, as 2020 was the final year in the previous Horizon 2020 framework programme and the new Horizon Europe was launched. Within Individual Fellowships, however, KTH was granted funding for three new postdocs. In total, KTH is participating in 59 projects within the programme.

### Projects funded by SIDA and the Swedish Institute

The 2021 announcement from SIDA for collaboration with universities in Latin America resulted in six approved projects with partner universities in Bolivia and Colombia. KTH has also participated in projects within the Swedish Institute's Baltic Sea Cooperation Programme. The initiative to create a project within the Swedish Institute's framework for participation in existing Erasmus+ projects has been successful. Lecturers and researchers from Ukraine and the Caucasus have thus been able to participate in training and conferences within projects coordinated by KTH.



# Research

## Objectives

According to the Development Plan for 2018–2023, KTH shall be characterised by world-leading research. Basic research and curiosity-driven research have an obvious place at a technical university together with applied and business-specific research. The innovative and cutting-edge research that is being conducted in a number of fields will be clearly highlighted both externally and internally. Up-to-date and effective infrastructure is of fundamental importance to outstanding research. KTH will therefore, during the period, take an inventory of the need for investment and ensure that the infrastructure is used as efficiently and widely as possible.

## External research funding

The research community has slowly begun to return to what it was like before the pandemic. Announcements that were cancelled or rescheduled during the pandemic are now going ahead as usual. Many new announcements have also been added as a result of the pandemic.

KTH has a high proportion of external funding, both from the public sector as well as from other parties in Sweden and abroad. Swedish and foreign companies contribute to external financing through involvement in many research projects. KTH has worked for several years to establish strong strategic partnerships with companies, where research funding is part of the collaboration, for example via centres or research projects. In most instances, however, collaborative efforts with the business community do not mean that the financing is actually coming from the companies, but rather is based on the fact that they contribute to the work. See also the section on *Joint Collaboration*.

## International research funding

International research funding accounts for approximately eight percent of research revenue. The EU is the largest source of funding. KTH also receives research funding from other financiers, primarily within Europe and the United States.

## EU funding: Horizon 2020 and Horizon Europe

In early 2021, the final announcements within the EU's eighth framework programme Horizon 2020, which ran from 2014–2020, closed and the new Horizon Europe framework programme commenced. The new framework programme will run from 2021–2027. In 2021, KTH submitted project applications and was granted funding from both programmes. KTH has compiled the total outcome from participation in Horizon 2020 in a special report and worked out a strategy for successful participation in Horizon Europe. For a summary of the outcome in Horizon 2020, see the section on *Conclusion of Horizon 2020*.

## Activity in 2021

In 2021, KTH participated in 36 applications within Horizon 2020, the majority of which are within the EU's Green Deal, a package of measures with the goal of Europe being the first climate-neutral continent by 2050. In 2021, 15 projects with participation from KTH have been approved within Horizon 2020. Of the projects approved, two are within the European Research Council's ERC's contribution to individual pioneering research, four within the mobility programme Marie Skłodowska-Curie Actions, MSCA, four within the EU's Green Deal and five within other areas of Horizon 2020.

Within the new framework programme Horizon Europe, KTH submitted or participated in 211 applications in 2021. Horizon Europe has three main orientations, so-called pillars:

- pillar one – Excellent Science
- pillar two – Global Challenges and European Industrial Competitiveness
- pillar three – Innovative Europe

Most of the applications, 117, have been submitted in the category excellent science, followed by 61 in global challenges and European industrial competitiveness and 29 in innovative Europe. Each pillar is divided into so-called clusters with different focus areas. Within pillar two, KTH is participating in most applications within cluster four (digital issues, industry, and space), followed by cluster five (climate, energy and mobility).

Most of the results from the 2021 applications will be announced in 2022, but four projects were approved in 2021. Of the approved projects, one is in pillar one under the ERC Starting Grant, two in pillar two under cluster four and cluster five and one within pillar three under the European Innovation Council's sub-programme Pathfinder.

Joakim Lundeberg, the CBH School, has been awarded the ERC Advanced Grant, which is awarded to world-leading researchers. The five-year project Tissue-Wide Identification of Genome Alterations in Cancer, with a grant of EUR 2.7 million, will take the next step in studying the genome from a tissue perspective, both experimentally and with analyses based on machine learning. The research project aims to find early changes in the genome of tissue long before other cellular changes that can normally be seen with a microscope.

Maurice Duits, the SCI School, has received the ERC Consolidator Grant, which is awarded to researchers with the potential to become world leaders in their field. The Patterns in Random Tilings project is to receive funding of EUR two million over a five-year period. The project is about how many large random systems are not so uncontrolled. When the systems become large enough, patterns of fluctuations appear that can be described by universal laws.

Michael Liverts, the SCI School has received the ERC Starting Grant, which is given to promising researchers at

the start of their careers as support to start their own research groups and develop innovative projects in various scientific fields. The DYNPRESS Towards Materials at Extremes project: From Intense Dynamic Compression to Expansion is to receive funding of EUR 1.5 million over a five-year period. The project aims to develop robust, reliable, and effective methods for generating extreme conditions in a medium.

**Conclusion of Horizon 2020**

Within Horizon 2020, funding for research and innovation has been granted for a total of EUR 68 billion during the programme period. KTH is participating extensively in Horizon 2020 and until December 2021 participated in 343 projects with a grant value of approximately EUR 181 million. KTH participated in more than 2,100 applications submitted to Horizon 2020 during the current time period.

Horizon 2020 had three main orientations, so-called pillars. The pillars consisted of sub-areas which in turn included various announcements. KTH's most extensive participation was within pillar one: Excellent Science. Within this pillar, KTH has been granted 168 projects and

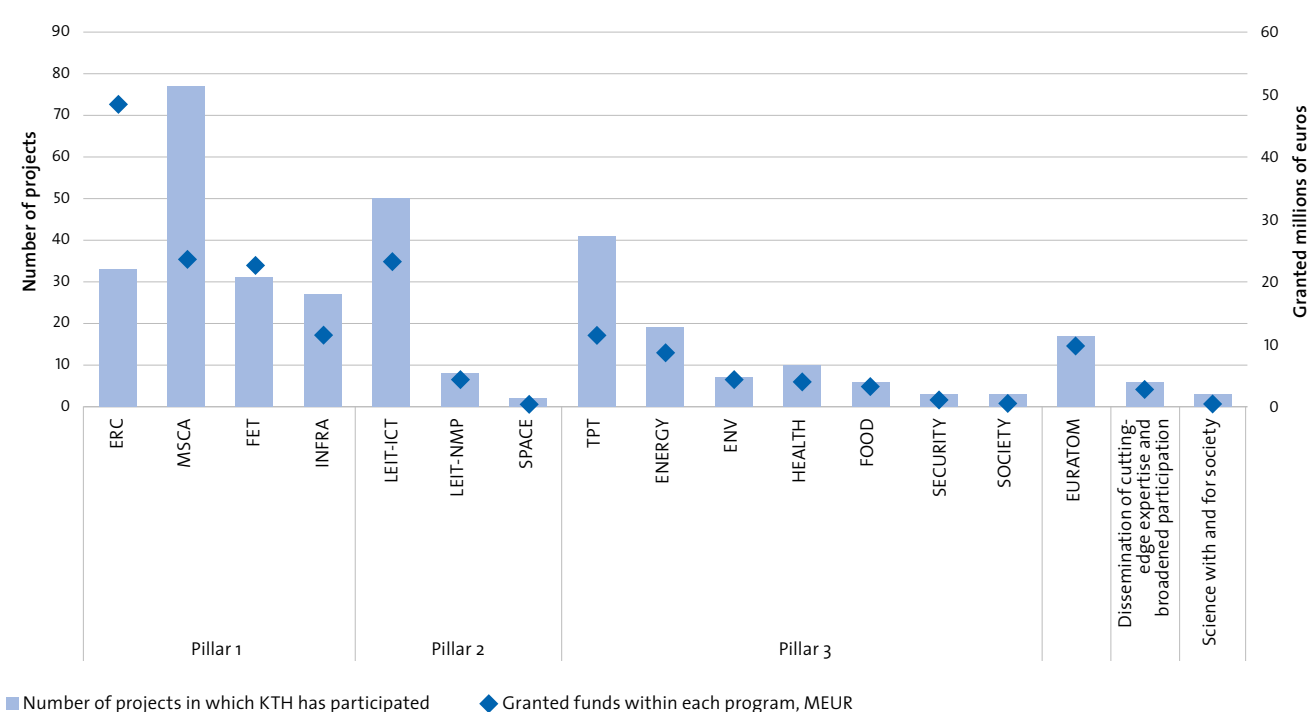
approximately EUR 106 million. Of these, 33 are projects within the ERC and 77 projects within the MSCA KTH also has a high level of participation in pillar two: Global Challenges and European Industrial Competitiveness with a total of 60 participations and a total of approximately EUR 28 million in grants awarded. Most of these are within the programme information and communication technology, ICT. KTH has

50 participations in ICT with a total contribution of approximately EUR 23 million. Within pillar three: Innovative Europe, KTH is involved in 89 projects, of which seven as coordinator, at a total value of approximately EUR 33 million.

KTH has also had successful participation in the European Atomic Energy Community's research and training programme, Euratom. Within Euratom, KTH has been granted 17 projects worth a total of about EUR ten million.

KTH is also participating in six projects within the programme Spreading Excellence and Widening Participation, approximately EUR 3 million, as well as three projects within the programme Science with and for Society, approximately EUR 0.5 million.

Figure 14  
KTH's participation within Horizon 2020 for the period 2014-2021



- Number of projects in which KTH has participated
  - ◆ Granted funds within each program, MEUR
- |          |   |          |  |
|----------|---|----------|--|
| ERC      | European Research Council                           | ENV      | Climate action, environment, resource efficiency and raw materials                                 |
| MSCA     | Marie Skłodowska-Curie Actions                      | HEALTH   | Health, demographic change and wellbeing   |
| FET      | Future and Emerging Technologies                    | FOOD     | Food security, sustainable agriculture and forestry, marine and maritime and inland water research |
| INFRA    | Research infrastructures                            | SECURITY | Secure societies - Protecting freedom and security of Europe and its citizens                      |
| LEIT-ICT | Information and Communication Technologies          | SOCIETY  | Europe in a changing world - inclusive, innovative and reflective Societies                        |
| LEIT-NMP | Nanotechnologies, Advanced Materials and Production |          |  |
| TPT      | Smart, green and integrated transport               |          |  |
| ENERGY   | Secure, clean and efficient energy                  |          |  |

Source: EU Dashboard

Even though announcements are now being made within Horizon Europe, several projects that were approved during Horizon 2020 are continuing. *Figure 14* shows an overview of the distribution and financing of KTH's projects within Horizon 2020.

### **Horizon Europe and strategy for participation in Horizon Europe**

Europe is the EU's ninth framework programme for research and innovation. The programme offers several opportunities for research funding for KTH. KTH's goal is successful participation and increased research funding compared with previous framework programmes.

In 2021, KTH decided on a strategy for participation in Horizon Europe. The strategy will be applicable until 2027. It sets out overall goals, principles, and a number of initiatives to be implemented to strengthen the business and achieve KTH's ambitions in Horizon Europe.

### **National external funding**

KTH's external research funding from Swedish financiers follows the same pattern as in recent years. During the year, KTH was successful in receiving funding from the Swedish Research Council's major announcement, which predominately supports basic research. Revenue from grants are grants that have been used and financed costs during the year, which differs from grants awarded.

In order to increase KTH's national external funding, KTH has conducted a number of support activities in the form of seminars, workshops, and individual counselling in 2021. Most of the activities have been conducted digitally due to the pandemic. KTH has extensive external funding of research. Below is a description of some of the news from the year.

In 2021, the Swedish Research Council granted KTH a grant of SEK 335 million, of which SEK 179 million was granted in the major announcement for science and technology. As in previous years, KTH was one of the higher education institutions that received the most funding in this announcement. KTH was also successful in the Swedish Research Council's infrastructure announcements in 2021. In the announcement for grants for research infrastructure of national interest, the School of Industrial Engineering and Management was granted SEK 39 million for Petra III as the Swedish hub and where KTH is the coordinator. Furthermore, seven applications were granted in the same announcement, to which KTH is party. In the announcement for grants for investments in research infrastructure, the SCI School was granted SEK 15 million for the NMI project – upgrading microscopes. The project will run from 2021–2025. In the announcement for grants for interdisciplinary research environments, the SCI School was granted SEK 25 million for the project Fibres for life:

Advanced fibre optics for cancer therapy and diagnostics during the period 2022–2027.

The Knut and Alice Wallenberg Foundation is investing just over SEK 3 billion in materials-related research that will create better conditions for a more sustainable society. KTH shares the grant with Uppsala University, Lund University, Chalmers University of Technology, Stockholm University and Linköping University. The investment is divided into two parts. The first, SEK 2.7 billion distributed over the period 2022–2033, goes to the research programme Wallenberg Initiative Material Science for Sustainability, where Linköping University is the host university. Within the programme, 25 international research groups will be recruited, and a research school will be created with space for 150 doctoral students and 30 externally employed doctoral students, as well as 150 postdocs and 30 externally employed postdocs. The second part consists of SEK 380 million for continued funding of the Wallenberg Wood Science Center, WWSC, where KTH is the host university. The centre was established in 2009 with the aim of developing new sustainable materials from Swedish forests, i.e. replacing oil with wood in the manufacture of plastics, creating stronger and more fireproof materials, as well as discovering and developing new functional materials. The expansion of WWSC means that six heads of research, 36 doctoral students and as many postdocs, as well as four visiting professors, can be recruited. As a result, the foundation has invested a total of SEK 1 billion in research within WWSC.

The Knut and Alice Wallenberg Foundation is also financing SciLifeLab with an additional SEK 15 million during the period 2021–2023. The donation is an additional grant to previous donations regarding primarily studies of the function and efficacy of COVID-19 vaccines and secondarily other COVID-19-related research.

In 2021, researchers at KTH received three out of 15 grants from the Knut and Alice Wallenberg Foundation's initiative to promote eminent mathematicians.

In 2021, the Swedish Foundation for Strategic Research, SSF, awarded grants to KTH totalling SEK 50 million. In the announcement for Biotechnology and plant breeding – food, feed, and forest products, the CBH School was granted SEK 29 million for the project on Food ingredients from CO<sub>2</sub> with microbial consortia during the period 2022–2029. In the announcement SSF Strategic Mobility, KTH is participating in three out of a total of nine approved projects that give researchers the opportunity to develop by changing their working environment for a period of time. The project enables researchers to go from academia and research institutes to business, public authorities, and hospitals, or vice versa. SSF's announcement for Adjunct Professor is aimed at people in industry, public authorities or the health-care sector who meet the eligibility requirements for an

adjunct professor at a Swedish university. In this announcement, five out of the eleven adjunct professorships were allocated to KTH. SSF has also decided on funding for twelve new externally employed doctoral students, three of whom are at KTH.

In 2021, Vinnova granted KTH funding totalling SEK 181 million. In the announcement for the Centre for Financial Market Research 2020, the Sustainable Finance Lab project was allocated SEK 47 million over a five-year period, 2021–2025. The project is coordinated by the ABE School and aims to create a more sustainable world through the transformative power that the financial system possesses when it avoids doing harm and instead does good. The overall ambition is to bring about change through innovation and development towards increased social and environmental sustainability, both in Sweden and internationally. In the announcement Innovation environments within precision health, the GeneNova project was allocated SEK 37 million. The project is ongoing from 2021–2026 and is coordinated by the CBH School. The project will enable a sustainable and scalable production process for drugs based on Adeno-associated viruses, so-called AAV-based drugs. It will also enable more of these pre-clinical research projects to be taken to the next stage more quickly and to come further in the development process, which in the long run can lead to more patients receiving essential treatment.

Formas, a Swedish research council for sustainable development, granted KTH funding of SEK 91 million in 2021. In Formas and NordForsk's joint announcement for interdisciplinary research in 2020, the ABE School was awarded SEK 15 million for the project Unconventional methods for sustainable lighting design: The challenges of balancing light for people and nature in Nordic urban environments 2021–2024. In urban development and the design of urban environments, human needs are usually given priority. Green areas are an important part of urban infrastructure, and in recent years there has been a growing awareness that sustainable development requires a balance between human needs and the needs of nature.

Mistra is allocating an additional SEK 57 million to the research programme Mistra TerraClean, where KTH is the programme host. The extension will take place over a four-year period, 2022–2025. Mistra TerraClean's goal is to develop materials that have the ability to communicate with users in order to achieve a smoother and more efficient purification process. It is about both developing existing technology and developing new smarter materials. Another programme where KTH is the host, Mistra Sustainable Consumption, is to be financed with an additional SEK 50 million over a four-year period, 2022–2025. The programme

aims to stimulate a transition to more sustainable consumption in Sweden as well as internationally, with a focus on the three areas of food, holidays, and home furnishings.

The Swedish Research Council for Health, Working Life and Welfare, Forte, is not a financier from which KTH usually receives a lot of funding. In the announcement for Challenges of Working Life in 2021, the ITM School was allocated SEK 17 million for the project Men in Focus – to explore homosocial cultures in organisations and develop methods and measures to counteract sexual harassment. The project extends over a six-year period, 2021–2027.

## Centres and other special initiatives

Research centres are important for developing competitive research environments with relevant problems and for contributing networks for academic researchers and other stakeholders. A research centre is a collaborative platform where different parties agree on a joint operational plan and contribute resources for its implementation. KTH has over 50 centres within research and some highlights from the year have been listed below.

Blue food – Centre for seafood of the future was established on January 1, 2021. KTH coordinates the centre, which includes the parties University of Gothenburg, Chalmers University of Technology, Swedish University of Agricultural Sciences, Uppsala University, RISE, IVL Swedish Environmental Research Institute and Innovatum. About seventy other companies and organisations are also involved in the centre. The centre is funded by Formas.

SUNRISE – Sustainable Nuclear Energy Research In Sweden was established on January 1, 2021. KTH coordinates the centre. The centre conducts research together with Uppsala University and Luleå University of Technology, among others, to prepare for the construction of a fourth generation nuclear reactor. The centre is funded by SSF.

PUSH – Production, Use and Storage of Hydrogen was established on January 1, 2021. KTH coordinates the centre, which includes the parties Umeå University, Lund University, Chalmers University of Technology and RISE. The centre is funded by SSF.

The Sustainable Finance Lab was established on January 1, 2021. KTH coordinates the centre, which conducts research on sustainable financial markets in Sweden and the rest of the world. The parties are Stockholm University, University of Gothenburg, Luleå University of Technology, Stockholm School of Economics, IVL, and the Royal Swedish Academy of Sciences. In addition, a number of banks, fund companies, Nasdaq, and additional organisations and stakeholders such as the Church of Sweden, the Fair Finance Guide and the World Wildlife Fund, WWF, are also participating. The centre is funded by Vinnova.

KTH Climate Action Center was established as an interim centre on August 1, 2021. The centre was initiated by KTH and funded by KTH and the H&M Foundation for an initial 18-month period in order to find additional partners during this time. The centre is multidisciplinary, collaborative and research-focused with the aim of contributing to reduced emissions and climate adaptation in synergy with the UN Sustainable Development Goals.

The Center for Data Driven Health was established as an interim centre on December 1, 2021, and is funded by KTH and other parties for an initial two-year period. The centre creates an arena for solving basic problems concerning the integration of individuals' health data through research on a technical platform. The parties are Karolinska Institutet, Karolinska University Hospital, Region Stockholm, Läke-medelsindustriföreningen and Digitaliseringskompaniet.

Within the network of centre directors, two meetings took place in 2021. The theme for the first meeting was how research centres can create the best conditions for external funding. The second meeting focused on skills for business collaboration managers. The purpose of the second meeting was to identify what skills for business collaboration managers entail.

Work has also been underway in 2021 to revise KTH's guidelines for research centres in order to achieve more uniform management.

## Skills development for heads of research collaboration

Research funders and partners place ever higher demands on KTH to work for sustainable development, gender equality, open data, integrity issues, utilization, management of intellectual assets, etc. KTH has therefore initiated a seminar series focusing on these areas. The aim is to increase skills and exchange between business collaboration managers and other relevant staff. The seminar series is primarily aimed at the business collaboration managers for major or strategic research initiatives at KTH, but will also be made available to all researchers and relevant staff at KTH.

The seminars in 2021 involved about 50 participants on each occasion and have dealt with issues such as ethics and compliance within collaborative research, for example export control and skills for business collaboration managers. During the year, KTH completed courses in the learning platform Canvas within Data Management and Open Science and Research Communication. Production has also begun of the material that will be included in the Canvas courses Ethics and Skills for Business Collaboration Managers. Both courses will be launched in 2022.

## Strategic research areas

The investment in strategic research areas, SFO, has been ongoing since 2010. KTH is participating in ten out of a total of 43 strategic research areas and is the principal for five of them. In its role as principal, KTH has received a total of SEK 2.6 billion in grants for strategic research areas during the period 2010–2021, including SEK 323 million for 2021. Within KTH, several new interdisciplinary and internationally successful research fields have emerged through strategic investment, where, among other things, assistant professors have been recruited. The five national strategic research areas for which KTH is the principal are in transport, production, e-science, IT, and mobile communication, as well as molecular biosciences. At a national level, the strategic research areas have created natural incentives for higher education institutions to develop strong research fields, as interdisciplinary collaborations between different disciplines are required in order to achieve excellence. This enables Sweden's combined research resources to be utilised optimally.

During the year, the agreement between the parties was renewed for the strategic research areas where KTH is the principal. This has also led to all strategic research areas for which KTH is the principal having been set up as centres. The reorganisation has been carried out in discussion with the parties in each strategic research area.

**The strategic research area within transport research**, at KTH called SFO TRENOP, has during the year contributed to the employment of several new postdocs and an assistant professor. Within SFO TRENOP, a multidisciplinary research collaboration is underway on transport, communication, and energy systems, which includes several external parties. Several projects have been completed within Senseable Stockholm Lab in collaboration between the City of Stockholm and MIT – Massachusetts Institute of Technology. A particular focus has been to explore how big data, AI, and machine learning can integrate urban technology, urban science, and design. During the spring of 2021, a number of conferences with international participants were held by researchers in SFO TRENOP. Some examples of these conferences are as follows: How to Avoid the Gender Data Gap in a Digitized Transportation Infrastructure, Rev2021 – the Resource Efficient Vehicles Conference and INSTR2021 – the 8th International Symposium on Transport Network Reliability. The project Sustainable and Integrated Urban Transport Systems, HITS2024, aims to develop smart solutions for sustainable goods and passenger transport in urban environments. The project studies, among other things, how the choice of vehicle design, for example size, battery size, and maximum speed, affects the performance of transport services.

The strategic research area within production research, at KTH called SFO XPRES, has during the year continued to work for a paradigm shift within production by integrating sustainability and digitalisation issues. In 2021, one associate professor and one assistant professor were employed within XPRES. Collaboration with European universities has increased through more doctoral exchanges and guest lecturers. A new major collaborative project will start with Loughborough University and other British partners. XPRES has also been selected as the main organiser of CIRP 2025, the International Academy for Production Engineers, the world's largest conference within production technology, which will take place in Stockholm in 2025.

The strategic research area within e-science at KTH is called SFO SeRC. Since 2019, research has been conducted in multidisciplinary collaborative programmes with the aim of achieving added value through collaboration between strong research environments within applied research, method development and infrastructure. SeRC's research areas are as follows: Brain IT, e-science for cancer prevention and screening, data-driven computational materials design, high-performance software, visual data analysis and data analysis. In 2021, researchers within the SeRC organized the international databases for models and drug development for SARS-CoV-2 and have been responsible for coordinating COVID research on supercomputers between the EU and the USA. The collaborations between infrastructure and research have resulted in a number of new EU projects, particularly within the programme The European High Performance Computing Joint Undertaking. Within this

programme, researchers from SeRC have, among other things, developed software for the new Swedish-Finnish-Swiss supercomputer LUMI in Finland. A large number of SeRC groups have published articles within, for example, life sciences, materials sciences, fluid mechanics, and visualization in high-profile journals and at major conferences. SeRC has also worked closely with other initiatives to create a critical mass for research in artificial intelligence, data-driven life sciences and digitalisation through a number of different activities during the year.

The strategic research area IT and mobile communication consists of two parts: Information and Communication Technology the Next Generation and the Digital Futures Centre. Digital Futures developed rapidly during the year, thanks to increased government funding of SEK 78 million per year from 2020.

## Digital Futures – a research centre that meets societal challenges through digital transformation

Digital Futures, which was established jointly by KTH, Stockholm University and RISE in 2020, is Sweden's largest investment in research in digital transformation and addresses societal challenges. Approximately 200 researchers work within Digital Futures. Sixty interdisciplinary projects are currently underway that address the societal challenges Smart Society, Digitalized Industry, Rich and Healthy Life and Educational Transformation. The projects

Figure 15

### Professors 2021

During the year, KTH appointed professors in the following areas

#### Newly appointed professors (externally recruited)

- Physical Chemistry with specialization in Physical Environmental Chemistry
- Genomics

#### Direct appointed

- Electric Engineering with specialization in Sustainable Integrated Energy Systems
- High Performance Computing

#### Promoted to professor

- Electromagnetic Field Theory
- Fluid Mechanics/Multiphase flows
- Physical Chemistry
- Industrial Economics and Management with focus on Industrial Dynamics
- Industrial Management with specialization in Technology-based Entrepreneurship
- Mathematics (2)
- Environmental Strategic Analysis
- Economics
- Numerical Analysis
- Organic Chemistry with specializaion in Organic Synthesis

- Automatic Control with a focus on System Identification
- Automatic Control with emphasis on Transportation Systems
- Theoretical Physics
- Theoretical Physics with specialization in Astroparticle Physics
- Applied Physics
- Wood Chemistry

#### Newly appointed visiting professors

- Fluid Mechanics with specialization in Climate Modelling

#### Newly appointed adjunct professors

- Sustainable Infrastructure in the Bedrock: Groundwater Flow and Solute Transport
- Sustainable Consumption and Production
- Wireless Industrial Communication
- Polymeric Materials
- Automatic Control
- Lubricant Design
- Engineering and Molecular Diagnostics
- Highway Engineering

Source: HR+

have different orientations and target groups and some of them are described briefly below.

Nine major collaborative projects are currently underway, involving about fifty research teams. The projects will run over a five-year period and focus, among other things, on digital assistants within elderly care, handling of sensitive personal data, smart solutions for water distribution and programmable robotics material on a microscale. Digital Futures also runs five demonstration projects. The projects will span a two-year period and focus on the social potential of digital technologies, DNA diagnostics, the potential of drones, and battery-free devices that are powered by energy generated by the user. In addition, there are projects that focus on air quality and health risk predictions and the use of a digital twin to reduce carbon dioxide emissions through smarter traffic infrastructure. Furthermore, a project is underway in Sri Lanka to use drone technology in the fight against dengue fever, and one in Uganda where digitalisation is used to reach more patients suffering from mental illness and to improve care.

Digital Futures also funds ten research pairs, consisting of young researchers from two different departments who represent different disciplines and thus combine their different perspectives to tackle a research issue from different angles and create the greatest possible societal benefit. Among these projects is one that develops biodegradable technology using enzymes to reduce waste from packaging. Another project is developing models for cyber insurance that take into account new phenomena related to cyber risk that arises as society becomes increasingly digitalized. Another project involves identifying risk factors for the development of anxiety in young people in order to improve diagnosis and treatment.

Through Digital Futures, 14 postdocs from different parts of the world have come to KTH, Stockholm University and RISE to conduct research. The research encompasses everything from gender-neutral cybersecurity and how robotics can be used in the treatment of children with neuropsychiatric diagnoses, to monitoring fires in real time and adapting infrastructure in smart cities to protect public health in the wake of the pandemic. Additional postdocs and doctoral students are involved in other projects within Digital Futures. A visiting researcher programme has been initiated to create further exchanges with other countries, but at a senior level. Furthermore, a fellowship programme has been established that initially will include twelve senior researchers.

Since the beginning of the year, KTH has been a member, through Digital Futures, of the American consortium c3.ai Digital Transformation Institute as their first international partner. The consortium includes the University of California, Berkeley; Carnegie-Mellon University; MIT – Massachusetts Institute of Technology; Stanford University, and the University of Illinois Urbana-Champaign. World-leading

researchers are being commissioned to conduct interdisciplinary research in digital transformation and artificial intelligence; cybersecurity; machine learning; cloud services; the Internet of Things; organisational influence; policy issues and much more. Researchers from Digital Futures are currently participating in five projects in the field of artificial intelligence for energy and climate security, where they are collaborating with researchers from the University of California, Berkeley; MIT; Princeton University, and the University of Illinois Urbana-Champaign.

In addition to basic research, work is underway to develop a partnership programme to collaborate with business and public administration. A steering group for the partnership programme has been established. In 2021, an announcement was made for societal innovation projects and one for partner innovation projects, which resulted in two projects of each type. The projects in societal innovation focus on remote rehabilitation, especially in light of the specific challenges posed during a pandemic. The projects within partner innovation focus on the transport industry and the construction industry. The partnership programme aims to identify challenges and strategies for industry, the public sector and academia in digital transformation and to shape collaborations to address these challenges. The partnership programmes also aim to contribute to increased success for such collaborative projects with both national and international research funders and to establish Stockholm as an international hub for digital transformation.

Additional activity that took place in Digital Futures in 2021 was a study of older people's relationship to digitalisation to better understand opportunities and challenges.

The annual Digitalize in Stockholm conference took place in October. The conference was held in hybrid form and 650 people from about 50 countries participated. International speakers, partners and researchers participated in panel discussions and presentations. In October, the Future Digileaders conference was also held online, where young researchers from different parts of the world participated in career development activities. In addition, seminars, lectures, and workshops were held every week to gather researchers, companies and public authorities for the exchange of knowledge, ideas and to provide inspiration for new research and innovation.

## Science for Life Laboratory, a national centre for life science research

The Science for Life Laboratory, SciLifeLab, is one of the government's major investments in research infrastructure in Sweden. SciLifeLab assists Sweden's research community in molecular life sciences with advanced technologies and expertise to facilitate cutting edge research and answer complex biological and medical questions. In addition to this remit, in 2021, SciLifeLab was given an extended remit from

the government, Laboratory support for future pandemics, to coordinate and establish a national laboratory capacity that will provide Sweden with better conditions to meet future pandemics.

The direct state funds for SciLifeLab were approximately SEK 349 million in 2021. The activities at SciLifeLab are also funded through strategic research areas from the SciLifeLab's four host universities: KTH, Karolinska Institutet, Stockholm University and Uppsala University. In 2021, the funds for strategic research areas were approximately SEK 165 million. The funds contribute to enabling SciLifeLab to make targeted local efforts to further strengthen the local research environment at each university.

In 2021, the research infrastructure continued to provide service to academic researchers from all the major universities that conduct life science research in Sweden. In addition to the academic projects, the research infrastructure has also provided services to health and medical care and to industry. In 2021, a new project was initiated to increase the synergies between the three large-scale research facilities and reach new users: Collaborative hubs in the life sciences for the national research facilities SciLifeLab, MAX IV and the international research facility ESS (InfraLife). Furthermore, a strategic international collaboration has been entered into between the European Molecular Biology Laboratory and SciLifeLab.

During the autumn, SciLifeLab's international advisory body conducted a comprehensive evaluation of SciLifeLab through a four-day digital meeting. The report from the international advisory body is expected in early 2022 and will form the basis for future further development of SciLifeLab.

As a result of COVID-19, SciLifeLab initiated a number of initiatives to meet the needs identified as most important in the fight against the pandemic. This was accomplished through a focus on, and promotion of, national research partnerships and open data sharing. Analysis methods and expert support for research projects in molecular life sciences related to COVID-19 were made more widely available, which was guaranteed by prioritizing these projects. SciLifeLab's Data Centre created, on behalf of the Swedish Research Council, a web portal for sharing collected research data on COVID-19. The web portal is the Swedish hub in a European network led by the European Commission. In 2021, the national research programme on COVID-19 has continued. The programme has resulted in many new research partnerships, the building of capabilities and tools for research around COVID-19, including a vaccine programme, as well as a large number of advances in research that were published in reputable journals.

Over the years, support from the Knut and Alice Wallenberg Foundation has enabled several major investments in SciLifeLab's infrastructure in order to contribute to its creation and expansion. The financial support from the

foundation was a prerequisite for the implementation of SciLifeLab's efforts in the fight against the pandemic. Through continued funding from the foundation, the investments in SciLifeLab's national research programme for COVID-19 will be able to continue until 2023.

In January 2021, the twelve-year investment in a national programme in data-driven life sciences began: SciLifeLab and Wallenberg's national programme for data-driven life sciences, DDLs. The Knut and Alice Wallenberg Foundation is donating SEK 3.1 billion to the programme under the leadership of SciLifeLab, and KTH is the host university for the programme. Within DDLs, SciLifeLab collaborates with the Wallenberg Centre for Molecular Medicine at the University of Gothenburg, Lund University, Linköping University and Umeå University. Chalmers University of Technology, the Swedish University of Agricultural Sciences and the Swedish Museum of Natural History are also part of the collaboration. During the year, a national reference group was created consisting of representatives from the eleven collaborating parties within DDLs. The role of the reference group is to safeguard the interests of the parties in the programme.

In addition to the research infrastructure and its users, SciLifeLab's scientific activities also encompass research environments that consist of researchers working at the host universities and who are affiliated with SciLifeLab. The research infrastructure, its users and the research environment are part of an ecosystem where technologies and knowledge are utilized and developed to facilitate competitive research in molecular life sciences in Sweden. The Stockholm hub of SciLifeLab, Campus Solna, is the largest single research environment. In 2021, the director of Campus Solna, together with the curator and the Campus Solna committee, will continue the work to improve the coordination of the research environment and to streamline and increase the quality of the service provided at Campus Solna.

This programme helps to improve the quality of research in the field of life sciences, and in the longer term, to ensure that the level of knowledge in Sweden increases. The programme also contributes to Sweden being at the forefront internationally. The host universities employ and finance the SciLifeLab fellows through SFO funds. During the year, there were 34 group leaders active in SciLifeLab's fellowship programme, three of whom joined during the year, and five SciLifeLab fellows completed the programme. The programme now has eight alumni and one of these was promoted to professor in the autumn of 2021.

## Research platforms

The research platforms are linked to KTH's strong interdisciplinary research areas and aim to catalyse organisation-wide activities and strategic initiatives within each field of research. KTH has a total of six active and fully staffed



research platforms: Digitalisation, Energy, Industrial transformation, Materials, Life Science and Transport.

**The digitalisation platform** has continued the strategic pilot activities with KTH Live-in Lab and Senseable Stockholm Lab. A workshop focusing on cybersecurity for the industry and a follow-up think-tank was held, together with the platform for industrial transformation. The platform initiated an Expert Group for Advocacy and Advice consisting of KTH researchers in various areas to, among other things, represent the platform and KTH in European networks, partnerships and assist with responses from the consultation process. Through three internal announcements, the platform has granted support to various research projects in the field of digitalisation.

**The energy platform** has held a number of seminars, workshops, and external events. All major events are documented, and articles are presented in newsletters and on the website. At the beginning of the year, a seminar was held, which provided input to the national electrification strategy, and in June, a seminar was held in collaboration with Sällskapet riksdagsledamöter och forskare, Rifo. Four internal announcements, to support initiatives in energy research at KTH, were carried out in 2021. The announcements support initiatives for new research partnerships between researchers at several of KTH's Schools. This year's KTH Energy Dialogue was held at KTH with up to 200 participants and focused on science for sustainability and the effects of research. At the end of the year, a dialogue seminar was held on Sweden's energy portfolio, which problematized various technology solutions and system issues. The director of the energy platform received Årets Kraftkvinna 2021 (the Power Woman of the Year 2021 Award). During the year, one area of focus for the country's energy researchers has been work on applications to the Swedish Energy Agency's skills centre, where the platform has supported the work.

**The platform for industrial transformation** had an internal announcement and through this was granted funding for several projects. Financial support has also been given to, among other things, the KTH Centre of Embedded Systems. In addition to the seminar series, the platform's research network has worked actively to bring in more members. The feasibility study in Construction Business has continued and a feasibility study in food production has been initiated. The theme for this year's Transformation Day was urban development under the heading The Construction Industry is transitioning. The platform has also continued the collaboration with Scania on lifelong learning.

**The Life Science platform** approved funding for about ten activities through a total of two internal announcements

during the year. In October, KTH Life Science Day 2021 was held, with COVID-19 and KTH's research for future pandemics as its theme, where the extensive range of COVID-19-related research at KTH was highlighted. Furthermore, the platform has participated in the development of responses to the consultation process and participated in expert panels and working groups. During the year, the platform formally changed its name from Life Science Technology to Life Science.

**The Materials Platform** approved a number of applications regarding travel support for the use of large-scale infrastructure and funding for several material-related initiatives. Furthermore, funds were granted in support of four Knut and Alice Wallenberg pre-proposals in 2021 within the materials field. Together with the Energy Platform and the Life Science Platform, the Materials Platform has financed the start of an interim centre for electron microscopy, RSEM, at KTH. This year's theme for the Materials Day was materials for transport infrastructure, with a focus on roads and railways.

**The Transport Platform** has continued its internal work within transport-related centres at KTH and collaborates with the Platform for Industrial Transformation in the Fordonsdalen project. The film project Transport Stories was initiated during the year.

## European Institute of Innovation and Technology

KTH is the main partner in five of the EIT's eight knowledge and innovation groups, KIC. KTH is involved in the areas of ICT (EIT Digital), Energy (EIT InnoEnergy), Materials (EIT Raw Materials), Health (EIT Health) and Transport Systems (EIT Urban Mobility). Digital and InnoEnergy have been running since 2010, while Raw Materials and Health were established in 2015. Urban Mobility is the latest and was decided upon in December 2018.

The commitment within EIT has been strategically important for KTH and a tool for promoting KTH researcher networks and collaboration with European research groups and industrial partners. The networks have enabled an increased capacity for strong EU applications and a higher degree of EU funding for KTH. Furthermore, EIT offers many opportunities to renew KTH's own core business in both education and research, as well as to support entrepreneurship and innovation.

In 2021, EIT has continued to develop in a direction that has not been favourable to participation from KTH. The effect of the EIT pushing to ensure financial sustainability for each KIC has shifted the focus of activities to more short-term projects, greater technological maturity, and

specific commercialization requirements. Furthermore, KIC has developed towards a model where the partners are more passive owners of an independent organisation. KTH has made the assessment that this development leads to reduced opportunities for financing projects within KIC.

In EIT Digital, KTH continues to play an important role as one of the major academic partners. KTH's main contribution in 2021 was through the Master's School. In addition to the educational activities, KTH has participated in innovation projects in areas such as personal data management and electroanalytical chemistry.

Within EIT InnoEnergy, the number of innovation projects remains low from the perspective of KTH. However, there are several good examples of start-up companies founded by researchers from KTH or students who have progressed further in their development and attracted attention both nationally and internationally.

Within EIT Health, two projects within the innovation track were successfully completed in 2021: POSITIVE which involves home monitoring of an individual's physical, mental, and psychological ability and IndiRock'nSole which focuses on foot ulcers in diabetics. KTH is also the coordinator of the doctoral programme BEHEalSy, which has received the EIT Label and funding for 2022 with the possibility of an extension for another three years. The digital summer school HelloAI and its further education course HelloAI Professional, which followed the summer school, focused on the application of artificial intelligence in European healthcare. The courses were conducted in collaboration with the EIT Regional Innovation Scheme.

Within EIT Raw Materials, KTH has led one and participated in five educational projects including university education, lifelong learning, and broader societal learning. KTH has led the upscaling project ENDUREIT, which aims to increase resource efficiency in mineral and metallurgical processes. Five new upscaling projects with participation from KTH are planned to commence in 2022. These involve recycling magnets, batteries, and industrial waste as well as the replacement of critical raw materials, and improving the durability of components in electric vehicles. In 2021, KTH joined the European Raw Materials Alliance to contribute with research and education on the materials that are key factors for green energy conversion.

Within EIT Urban Mobility, KTH has coordinated the courses for the Master's School and managed the secretariat. KTH is currently participating in one of the four master's programmes, Sustainable Urban Mobility Systems. KTH is also the coordinator for the entire master's programme initiative within EIT Urban Mobility. In 2021, KTH has also participated in several projects, including an innovation project, two skills hub projects that involve further education and a business development project.

## Research Assessment Exercise

KTH has a quality system which involves invited external experts regularly reviewing the research activities, called Research Assessment Exercise, RAE. Two RAEs have previously been carried out, in 2008 and 2012. The third was planned to be carried out in 2020 but was rescheduled for 2021 due to the pandemic. The RAE 2021 was carried out digitally from 23–29 August. It is essential for KTH's future development that regular reviews of its research are carried out, which is reflected in the results from the RAE in 2021.

For the implementation of the RAE in 2021, the President appointed a steering group, with the Vice President for Research as chairman and a working group led by a project manager for the RAE in 2021. The activities at KTH's five Schools were divided into nine panels, all of which were assigned a coordinator and a deputy coordinator. The main task of the coordinators was to compile each panel's self-evaluation report and to coordinate the evaluation week itself. The self-evaluation reports, which included strategies to increase the quality of the research work, formed the main basis for the external experts. By grouping KTH's 29 departments into nine panels, both department-wide and department-specific recommendations have been produced.

The external experts mainly came from countries outside Sweden. At least one of the experts in each panel would have been part of the RAE conducted in 2012 and one expert would come from the industry. The Vice President of Research appointed a chair of each panel. In addition to the nine research panels, three comprehensive panels were also set up, focusing on the three areas of sustainable development, research infrastructure and impact. Due to the pandemic and in order to provide the experts with good insight into KTH's research, a three-minute film was produced for each department and research facility. These films received positive attention from the experts as an acceptable substitute for site visits.

During the autumn, the experts completed their work and summarized their conclusions, in the form of one report per panel, regarding how KTH can develop and strengthen its research activities. The reports contain recommendations for each department. Taken together, these reports show that KTH's research activities are of an excellent standard. The panel reports contain analyses at both the departmental and School level. The analyses aim to identify development areas and develop strategies for increased quality in research. Some of the most important issues concern publishing strategies, choice of publishing channels, systematic communication, and general work for scientific impact, the importance of current and appropriate research infrastructure, strategic partnerships, and the departments' contributions within sustainable development.

The reports will be an important contribution to KTH's quality management over the coming years.

## Research infrastructure

KTH relies on access to modern and up-to-date research infrastructure to conduct cutting-edge research and education. In 2021, KTH continued to conduct extensive development work with the goal of ensuring that the research infrastructure that is strategically important for the University's research and education is supported in the long term.

The RAE in 2021 included a separate panel for the evaluation of research infrastructure. In the implementation of the RAE, self-evaluations and films for each established KTH research facility were developed. The experts in the panel participated digitally for a week, having meetings with the directors of each research facility. The panel's conclusions have been discussed at a subsequent meeting of the Board of Directors and will be used in a major effort to develop a roadmap for infrastructure at KTH.

During the year, KTH submitted a response from the consultation process to the government inquiry, Strengthened focus on future research infrastructure. The consultation process involved several different parts of KTH's organisation.

KTH has been successful in the Swedish Research Council's infrastructure announcements in 2021. In the announcement for grants for research infrastructure of national interest, Petra III was approved as a Swedish hub. Furthermore, all seven applications where KTH was included as a party were approved. These are Artemi, Fusion reactors: ITER AND DEMO, Huminfra, InfraVis, Protein production Sweden, SND and SwedNMR. For the special announcement Investments in existing research infrastructure, grants were awarded to the KTH coordinated research facilities Parallel Data Centre, National Genomics Infrastructure and National Microscopy Infrastructure. The research facilities Spatial Omics, MyFab (Electrum) and National Bioinformatics Infrastructure Sweden, to which KTH is a party, were also approved.

A number of activities were carried out in 2021 within KTH's research infrastructure. At the beginning of the year, a decision was made and then announced regarding allocation of SEK 22 million to the established KTH research facilities with the aim of investing in new instruments or upgrading existing ones. The annual quality evaluations of the research facilities, which are usually accompanied by meetings with the Deputy President, were suspended in 2021 in favour of the RAE. Two quality-enhancing meetings were held during the year, together with representatives of all research facilities.

## Investment in sustainable production in Södertälje

The research profile for the department's sustainable production development in Södertälje has three different

specializations: production management, industrial reliability, and production logistics. At the end of 2021, around 65 people were working at KTH Södertälje. At the end of the year, the research organisation had 26 people on site. They include three professors, two adjunct professors, three visiting professors, two associate professors, one assistant professor, four postdocs, one researcher, six employed doctoral students, three externally employed doctoral students, two lecturers and one research engineer. In addition to these, other KTH employed researchers and doctoral students also periodically spend time in Södertälje. The next step in the process is to increase staff numbers, mainly in the form of assistant professors. At the same time, there is close collaboration with Scania and AstraZeneca in regard to taking on a number of externally employed doctoral students. Collaboration within the framework of Södertälje Science Park has also been further strengthened in 2021, including through Science Week. In 2021, work commenced on a merger between the Department of Sustainable Production in Södertälje and the Department of Production Engineering in Stockholm, which in 2022 will create a unified institution with research and education within production.

In 2021, the department participated in six major Vinnova-funded research projects, a large Eureka-funded project, and several smaller projects with funding from national and European financiers. In 2021, two major initiatives were established, partly a national implementation of the Production Angels initiative, and partly the establishment of the national hub for sustainable production SuPr, both in collaboration with Södertälje Science Park. In 2021, the department also received a planning grant from Vinnova for an application for a skills centre within sustainable production.

The total research funding in 2021 amounted to approximately SEK 35 million, of which approximately SEK 15 million was public funding and SEK 20 million external funding, including the special investments from Södertälje Municipality, Scania, and AstraZeneca. Furthermore, the department is part of Vinnova's Helix skills centre, which has been in operation from 2017–2021 and which has its headquarters at Linköping University.

In 2021, the first doctoral student defended their thesis at the department and the first licentiate seminar was held. In 2021, researchers at the department published twelve scientific articles, 17 conference articles and two book chapters. In 2021, the department has also played an active role in the ITM School's Research Initiative on Sustainable Industry and Society, IRIS, and KTH's platform for Industrial Transformation.

In 2021, the skills centre, KTH Leancentrum (Lean Centre), has led the work in developing and implementing a new commissioned education in sustainable transport solutions for Scania, which has brought together different areas within KTH. Leancentrum also has a central role in

the ITM School's development of education in lifelong learning. In the EU project MatLust, Leancentrum is responsible for the Lean Programme, where companies receive both knowledge and tools to develop their operations. Leancentrum also has regional leadership responsibility in the national Produktionslyftet (Production Promotion) and Robotlyftet (Robot Promotion) programmes.

## Export control

KTH now have resources within export control that are equivalent to one FTE in the form of two certified export control officers. A significant part of their duties involves supporting researchers who need to classify their projects from an export control perspective. During the autumn, new internal guidelines and routines were developed for KTH as a consequence of the National Inspectorate of Strategic Products', ISP, inspection in 2019. Final feedback to the ISP took place on November 30, 2021. On September 9, 2021, the new Regulation of the European Parliament and of the Council on dual-use items ((EU) 2021/821) came into force and was directly applicable in the EU member states. Due to this, KTH revised existing export control documents. KTH's export control programme and export control website have been updated and the checklist for export control has been revised.

During the year, information initiatives were also carried out with KTH staff, including researchers who are in charge of the research environments in cyberdefence and nuclear technology, the Schools' contract coordinators and the staff at the department for research support. Support for the educational activities has been limited to answering individual questions, as well as recording and distributing a video to programme directors, students at the second-cycle level, and doctoral students. Administration of permits currently takes up a negligible amount of working hours, but several questions and requests for advance notice have been put to the ISP to clarify the impact of the legislation on KTH's research.

## Ethics in research

KTH has continued to develop the system for ethics and compliance. Researchers can now turn to KTH's ethics committee and request an ethics assessment of projects where an ethics review is not a legal requirement. The service was used on three occasions during the year. In April, a seminar on ethics and compliance in research was held as part of the research support's ongoing seminar series. In October, the ethics committee held a seminar on AI ethics for KTH employees.

A discussion forum for compliance issues in research has been established. The forum's discussion has been dominated by the need for a research data management system,

but has also touched on export control and possible problems with second jobs.

Since the autumn of 2020, KTH has had an ethics officer. Support and information has been provided to several different research environments and research supervisors. Support has also been given to doctoral students and researchers regarding specific research projects. During the year, lectures on research ethics and export control were recorded as a support for the educational programme. KTH also participates in national and international research ethics networks.

## Honorary doctorates

In June, the Faculty Council appointed four honorary doctors. The following reasons are stated in their decision:

**Professor Hilde Heynen**, Department of Architecture, KU Leuven, Belgium. Hilde Heynen is an international role model in architectural research. She has published a number of key books and co-founded the European Architectural Historian Network (EAHN). Hilde Heynen is an editorial board member of a number of highly ranked international journals. She was also central for the development of education in architecture and is a member of the steering group of the EAAE (European Association of Architectural Education). Through her long involvement in architectural research, she has contributed to developing the field into its own scientific discipline and worked to promote international criteria and guidelines in assessments of architectural research. Hilde Heynen has been a member of the Royal Flemish Academy of Belgium for Science and the Arts since 2009. She is also a visiting professor at the Massachusetts Institute of Technology, the Architectural Association School of Architecture in London, and RMIT University in Melbourne. Hilde Heynen is a regular guest at KTH and has made many important contributions over the years, including participating in scientific panels, and she is a very important source of inspiration and a role model for both researchers and students.

**Civilingenjör Bo Normark**, EIT InnoEnergy. Bo Normark is a legend in electric power technology and subsequently a pioneer in smart grids and battery systems. He is a visionary and an inspiration who has contributed greatly by creating the right conditions for major international initiatives such as EIT InnoEnergy. The initiatives have been of considerable importance for KTH's excellence and leading role internationally in the field in terms of both education and research. Through leading positions in both business and public authorities, he has played a major role in the development of the entire energy industry within research, innovation, and politics. As a result of his perspicacity and perceptiveness, he was ahead of his time in advocating energy storage and

electrification as the next step in the evolution of the energy system. Bo Normark is a member of the Royal Swedish Academy of Engineering Sciences and has over the years had a number of important board assignments and advisory assignments, including for Industrifonden, Svenska Kraftnät, Northvolt, the Swedish Energy Agency and Government Offices. He worked at ABB for much of his career. Bo Normark has an almost magical ability to create motivation, trust, and good relationships with everyone. KTH has often had the privilege of being part of this.

**Professor Martin Vetterli**, École Polytechnique Fédérale de Lausanne, Switzerland. Martin Vetterli is a world-leading researcher in digital signal processing. He has made contributions to a considerable number of areas such as mathematical development of wavelets and time-frequency analysis of signals, sampling and reproduction of signals, sensor networks and numerous practical applications for video and image processing. He has carried out innovative work both in theory and practical application. Martin Vetterli has received numerous awards for his research, such as the 2017 IEEE Jack S. Kilby Signal Processing Medal as well as fellowships from IEEE, ACM and EURASIP; he is an elected member of the US National Academy of Engineering and received the Swiss Science Prize Latsis in 1996. He has been the President of EPFL since 2017 and has previously been the Chief Executive Officer of the Swiss Science Council and has held professorships at the University of California, Berkeley and Columbia University. Martin Vetterli has extensive connections to KTH through the CLUSTER network and as a member of the Scientific Council for the ACCESS Linnaeus Centre.

**Sir Gregory P. Winter**, Trinity College, University of Cambridge, United Kingdom. Greg Winter's main research focus is genetic and protein engineering. He has pioneered techniques to make humanized and human therapeutic monoclonal antibodies, leading to antibody therapies for cancer and diseases such as rheumatoid arthritis and multiple sclerosis. More recently he has focused on the development of bicyclic peptides as small antibody mimics. In addition, he has established several successful spin-off companies. Greg Winter was awarded the 2018 Nobel Prize in Chemistry. He was elected a member of the European Molecular Biology Organisation in 1987, a Fellow of the Royal Society in 1990, as well as Fellow or Honorary Fellow of several other professional organisations. He has also been awarded numerous other prizes and medals and received a Knighthood for services to Molecular Biology in 2004. Greg Winter has had a working relationship with KTH since the 1980s as he has pioneered the field of protein engineering through the development of novel ground-breaking techniques in molecular biotechnology, such as phage display methodology. He has, on several occasions, found time to pay

a visit to KTH, giving seminars with updates on the latest developments in the field, as well as giving the keynote lecture at a major conference held at KTH in 2019.

# Collaboration

The purpose of strategic collaboration is to contribute to improved quality and relevance in education and research, while also creating benefits for external stakeholders. KTH is working to establish and develop a systematic approach to collaboration through support functions consisting of expertise within alumni relations, strategic partnerships and collaboration with small and medium-sized companies and regional stakeholders. The work on strategic collaboration is based on KTH's plan with specified goals for collaboration for 2021–2022.

## Strategic partnerships

KTH has 15 established strategic partnerships with major global companies, with the public sector and with leading research institutes that are of particular importance to KTH's business. The goal of strategic partnerships is to create long-term collaborations in order to raise the quality of education and research at KTH and strengthen the innovative capacity of our students, teachers, researchers and partners. In an annual discussion with the management at KTH and each partner, needs and areas of collaboration are identified that contribute to the interests of both parties.

In 2021, a strategic partnership was established with Hitachi ABB Power Grids (the company's new name since October 2021 is Hitachi Energy). The work on the strategic partnerships is led by the Deputy President and is followed up annually by KTH's management together with each partner's management team.

Strategic partnerships contribute to increased quality in KTH's research and education, increased opportunities to obtain research funding, increased opportunities for the university's students to work on relevant projects, and the increased use of research infrastructure. In 2021, this happened, for example, through:

- Granting of funds to and participation in centres within research.
- Preparation for joint applications to Horizon Europe and other financiers.
- Degree projects, guest lectures, project courses, study visits, participation in programme councils, and participation in interdisciplinary courses at second-cycle level via OpenLab.

In addition to activities within each partnership, KTH has also organized a number of partner-wide activities.

- Two roundtable discussions where KTH's President and Deputy President discussed current and important issues with management representatives from all the partnerships.
- The strategic partnerships have been the subject of a number of forward-looking analyses where the focus has been an externally led review in accordance with tasks in KTH's Operational Plan for 2021.

- At the beginning of December, approximately 75 people from the partnerships' steering groups as well as management from both KTH and partners gathered to listen to and discuss a number of current topics for the partnerships.
- Representatives from, among others, the strategic partnerships have met in a series of workshops to discuss what challenges future engineers will face in their professional lives and what future engineers may need to learn in their engineering education.

## Personal mobility

An important part of KTH's strategic collaboration consists of personal mobility between academia and other organisations – both companies and public bodies. KTH offers several forms of personal mobility into KTH: adjunct professor, affiliated faculty, affiliated professor, and externally employed doctoral student. In 2021, KTH's guidelines for affiliated faculties have been updated and clarified in order to make it easier for partners and other organisations. Affiliated faculty means that a person employed by a collaborating party, for a limited time, is affiliated with KTH as an affiliated faculty within the scope of their employment with the collaborating party. During the year, a digital brochure was produced that explains the difference between an adjunct professor and an affiliated faculty, in response to the demand for this type of information from companies and public bodies.

In the decision on the plan and specified goals for collaboration for 2021–2022, personal mobility is highlighted as one of five priority goals. Personal mobility has been in focus in the discussions within the strategic partnerships and also in the external web communication. In the external review of the strategic partnerships carried out in 2021, in accordance with the mandate in KTH's Operational Plan for 2021, personal mobility is specified as a priority issue. In accordance with KTH's Development Plan for 2018–2023, KTH continues to work to develop collaborative skills as a qualification in conjunction with employment and promotion, which is a prerequisite in order for personal mobility to be viewed as an attractive choice in a person's career.

## Work to increase the societal impact of KTH's research and education

The sector and societal impact work includes creating the prerequisites for increased societal impact, capturing effects and disseminating information about KTH's research and education. Impact leaders, who are located at all KTH Schools, have integrated the impact perspective into the business by, among other things, running doctoral courses with impact as a focus, conducted workshops on impact in research applications and research projects,

provided support to researchers and teachers to develop Impact cases, improve communication on research results, and conducted open seminars.

In 2021, KTH's research evaluation the Research Assessment Exercise, RAE, had a thematic panel in the Impact area.

Impact leaders have been involved in the design of guidelines for self-evaluation, provided support in the work on self-evaluation, and been involved in the thematic panel. The Schools' impact leaders have regular joint meetings to share their experiences. In addition to this, an external evaluation of the investment in impact leaders was carried out during the year.

## Development projects related to strategic collaboration

In 2017, Vinnova launched the programme, Development of the universities' collaborative capacity for strategic collaboration. In total, approximately SEK 135 million was allocated up to and including 2021, and 18 higher education institutions' joint development projects were implemented. KTH has been responsible for the project Methods for Relevance Assessment of Education, and participated in eight more projects. All in all, the participation has led to extensive learning and exchange of experience that has resulted in reports, methods, tools, checklists, training material, and recommendations to improve the collaborative capacity of higher education institutions. In 2021, KTH conducted a major workshop to discuss and prioritize how KTH can adopt the results from the projects. KTH has a so-called PriU group, prioritized issues for education, in working life and collaboration that works on how educational collaboration can be improved and further developed at KTH. The results from the higher education institutions' joint development projects will be a basis for the PriU group's continued work.

## Other collaborative initiatives

KTH promotes collaboration with small and medium-sized businesses and regional development by making it easier for both companies and KTH teachers and researchers to initiate and implement collaborative projects.

The EU's structural funds are aimed at projects that work to promote growth and employment in Sweden and with a particular focus on collaboration with small and medium-sized businesses. In 2021, KTH has continued to be involved in two projects funded by the structural fund partnerships Frontrunners for Sustainable Innovation and Fordonsdalen. Through Frontrunners, KTH has formed an innovation partnership with Södertälje Science Park and Kista Science City, where initiatives aimed at small and medium-sized businesses are integrated with each other, for

example through collaboration in KTH's courses and by making KTH infrastructure more accessible. Since June 2021, KTH has participated in Fordonsdalen REACT with the project Competence, where the goal is to investigate and secure the skills required for the transformation of the automotive industry. The project comprises almost SEK 16 million in total and runs until October 2023. During the year, the Digital Demo Stockholm initiative was integrated into the Digital Futures partnership programme, within the strategic research area Digital Futures.

KTH's Degree Project Portal enables students and employers to get in touch with each other. Via the Degree Project Portal, companies, organisations, institutes and departments can publish proposals for degree projects as well as seasonal and part-time jobs. In 2021, more than 1,400 assignments were published on the portal.

## Alumni relations

Alumni activities aim to establish and maintain good relations with KTH's former students, as well as to increase the long-term commitment of alumni both in Sweden and abroad. The focus during the year has been to develop and expand the mentoring programme so that more students at KTH have the opportunity to meet a mentor and connect to working life, and enable more alumni to share their experiences. Many activities have taken place despite the pandemic, albeit in a reimagined form. One of these is Alumnus of the Year 2021, where the recipient is honoured through a recorded film instead of an actual event.

Due to the pandemic, the international networks have been less active than usual, apart from the KTH UK Alumni Chapter which has carried out several activities. For alumni with a connection to France, a new network is being established.

## Fundraising

KTH's fundraising activities comprise strategic, structured and long-term work to increase private external funding for KTH. The activities should be viewed as a complement to traditional financing. The major financiers with a multi-year commitment include the Erling-Persson Family Foundation, Birthe & Per Arwidsson's Foundation, Daniel Ek and companies such as Brummer & Partners and Einar Mattsson. KTH's fundraising is a focused effort aimed at increasing the commitment and support for KTH from industry and society in existing and new networks. A complementary and very important part of the work is to hold various types of seminars that increase awareness of KTH's activities and strengthen relations with society at large.

## Innovation Office

Since the establishment of the Innovation Office, KTH has worked closely with the higher education institutions in the region. These collaborations have deepened over the years and KTH has allocated funds to provide support to other higher education institutions, especially to Mälardalen University, Stockholm School of Economics, the Swedish School of Sport and Health Sciences, and Södertörn University. KTH has a partnership agreement with these universities to provide services for innovation development and the transfer of funds to build up basic skills and innovation support at each of the universities. Services in innovation development include support and advice within business development, financing, patents and recruitment. Together with KTH, the four universities have developed an action plan for activities and initiatives that aim to strengthen innovation support locally, while KTH has opened its innovation support activities to individual researchers and students at the four universities. Since the Innovation Office at KTH was established, it has worked closely with Uppsala University in patent support and actively participated in other exchanges of experience with other innovation offices.

In October 2020, the report: Ett utvecklat innovationsstöd vid universitet och högskolor (Developed innovation support at universities and colleges) SOU 2020: 59 was published. The report was sent out for review in the spring of 2021 and KTH has submitted a response to the consultation process to the Government Offices.

### Activities supporting innovation

KTH Innovation works to ensure that research results and ideas from researchers and students at KTH will evolve and meet the needs of the market.

The overall objectives of KTH Innovation are to:

- Create the conditions for innovation to occur and develop throughout KTH in order to strengthen KTH's competitiveness and attractiveness as an innovative and entrepreneurial university.
- Enable more ideas and results from KTH students, researchers and employees to meet the needs of the market and become successful innovations that contribute to sustainable social development.
- Drive and further develop an efficient and inclusive innovation process to best develop and support the path of those who have ideas and their path to market.
- Further develop a strong, internationally connected, complementary ecosystem for innovation support at KTH.

In 2021, KTH Innovation has continued to work on refining and utilizing skills as part of the digital way of working that was developed in 2020. After the return to greater physical presence on campus in the autumn of 2021, it was possible to successfully use the combination of digital and physical

presence in many events. Building on digitalisation as a complement to traditional activities is now a stated strategy for KTH Innovation.

In 2021, KTH Innovation has continued the work of highlighting and following up how individual innovation projects relate to the UN Sustainable Development Goals. The activities are also well in line with KTH's strategies for sustainability and actively contribute to projects and initiatives at KTH that are multidisciplinary. One example of such an initiative is the KTH Innovation Challenge Campus 2.0 competition for ideas that can make the campus more sustainable. The competition was arranged in collaboration with Akademiska Hus and was open to all employees at KTH.

The annual Global Change Award, initiated by the H&M Foundation, aims to protect our planet and our living conditions by accelerating the shift from a linear to a circular fashion industry. New winners were chosen during the autumn, and they will participate in a twelve-month accelerator programme in which KTH is a partner.

KTH Innovation's work for equal innovation support continues on an on-going basis and in all parts of the business. In 2021, there was a special focus on following up and increasing funding for the development of women's ideas. Since 2015, the distribution of funds from the Vinnova-funded Validation for Application programme has been followed up. The programme is managed by KTH Holding AB. In 2015, 16 percent of the projects that were granted funding had at least one female team member, compared to 39 percent in 2021. The Validation for Application programme also finances more and more ideas that aim to contribute to sustainable development and so-called deeptech, which includes advanced technology that addresses important societal problems.

KTH Innovation possesses expertise in process-oriented innovation development. Individual licence agreements have previously been concluded with both Swedish and international companies, universities and innovation offices for the use of the tool KTH Innovation Readiness Level™ through the website that KTH Innovation has developed. The page describes the tool and how it can be integrated into innovation development in companies, public authorities and organisations. However, interest was so great that in early 2021, KTH decided to switch to a so-called creative commons license. This means that the tool can be made available to an even wider pool of people and by the end of 2021, 733 people from 553 unique organisations had registered. The organisations that have registered range from stakeholders in the innovation ecosystem, such as incubators, science parks, and innovation offices, to universities, global companies, charities, banks, public authorities, and start-up companies.

KTH has funding from the Bicky Chakraborty Entrepreneur Programme, which focuses on assisting entrepreneurs with ideas that focus on growth in Sweden. In 2021, about twenty people, divided into eight different business ideas, participated in a digital programme that included financing,



individual mentorship and advice from industry experts, as well as workshops.

The internationalization programme Brighter Startup was conducted for the eighth consecutive year, this time in a digital format. The programme is open to innovation projects from KTH, the Stockholm School of Economics, the Swedish School of Sport and Health Sciences, Mälardalen University and Södertörn University and included 16 projects that gained insight into innovation hubs in London, Boston and Tokyo. The aim of the programme is to increase the participants' knowledge of entrepreneurship in an international context and to promote interaction between Swedish startups and international stakeholders.

In July 2021, the first recipient was announced of the KTH Innovation Award, a new award instituted by KTH with donations from Professor Mathias Uhlén and the founder of Spotify, Daniel Ek. The award will draw attention to people from KTH who have taken on global challenges with creativity, perseverance and courage. This year's recipient, Rustam Nabiev, is a co-founder of the Shifo Foundation, which works to ensure that no mothers or children die from preventable diseases.

# Digitalisation

Digitization is one of the four pillars of KTH. In June 2020, KTH's board decided on KTH's digitalisation policy. The policy defines digitalisation as business development based on the opportunities that technology provides, i.e. a digital transformation that means that we can do things in completely new ways, or do completely new things. Digitalisation leads to improved quality, efficiency and user experience for students, staff and the wider community.

To strategically coordinate the work, KTH has created the role of Vice President for Digitalisation. Digitalisation basically affects all activities: education, research, collaboration and administration. Digitalisation has taken great strides forward during the pandemic and it has worked beyond all expectations. KTH focuses on taking advantage of the lessons learned during the pandemic about, among other things, digital education and examinations, digital and hybrid meeting formats, and streamlining administration through digital signatures.

## Digitalisation and education

Over the past year, the digitalisation of education has continued to develop as a result of COVID-19 and the restrictions that were implemented in the first half of 2021. The big challenge, from the autumn of 2021 and for the coming years, is not to go back to how everything was before the pandemic, but to build on the good experiences made by digitalizing educational activities. In 2021, a major project on KTH's future education has also been underway, which also contributes to the work on digitalisation. To achieve the goals, KTH has carried out several strategic investments and development initiatives, some of which are described below.

### Working group for digitalisation of education

The working group for the digitalisation of education that was established when the pandemic began in 2020 was disbanded at the beginning of 2021 in association with the end of the period of distance learning. During the pandemic, the working group has developed guidelines to support teachers, and these are available on KTH's intranet. In 2021, 15 so-called Lunch 'n' Learn webinars were also held. These webinars serve as a forum for KTH's teachers to share knowledge and their experiences of working with digital tools in teaching, with a focus on pedagogical solutions.

The total talk time in KTH's tools for digital meetings on an average working day has increased significantly since before the pandemic. Before the pandemic it was about 200 hours a day and in 2020 about 28,000 hours a day. In 2021, it was around 24,000 hours per day until the middle of the autumn semester, when usage fell to around 13,000 hours per day. At its peak, the number of digital meetings in 2021 was 5,507 per day with 30,763 daily participants.

Canvas is KTH's digital learning platform. The total number of page views in Canvas on an average working day

was 506,000 per day in 2021, which can be compared with 218,000 per day before the pandemic and 452,000 in 2020. In 2021, Canvas had two to four million page views per week which, distributed over a working week, corresponds to 14–28 clicks per second.

The experiences from the pandemic have resulted in the establishment of a project office that synchronizes the operational work between different groups. The project office also has the task of supporting the work with KTH's continued digitalisation of education, where an important focus area is examinations.

### Digital examinations

In the autumn of 2021, KTH initiated a development project with the goal that ten percent of the traditional on-site examinations will be conducted digitally during the academic year 2021/22. The goal is for 50 courses to have digital exams or for 10,000 assignments to take place digitally instead of in paper format. During periods 1 and 2, implementation of digital examinations was planned for over 40 courses. The pedagogical goal is not only to replace paper exams with a digital alternative, but to use digital tools to develop examinations to better suit the learning objectives.

### Support for teachers

KTH aims to increase the diversity of examination methods, which requires that the administrative support for teachers must be adapted to facilitate more digital and diversified forms of examination. To encourage the development of new forms of examination, the Local Support project was initiated in 2021. The purpose of the project is, among other things, to facilitate the administration of examinations and to develop local support in order to support teachers, regardless of the form of examination. The project is initially linked to the digital examination project.

## Open science and digitalisation of research data

### Open Access publications

In 2020, KTH published almost 70 percent of the peer-reviewed research results as open access, and is well on its way to achieving the goals in the research bill, Forskning, frihet, framtid – kunskap och innovation för Sverige (Research, Freedom, Future – Knowledge and Innovation for Sweden (Bill. 2020/21: 60) that all published material must be open access immediately upon publication. KTH continues to publish doctoral and licentiate theses with 90 percent of them as open access. Due to the time-lag associated with registration in the publication databases, data for 2021 cannot be presented until next year.

## Digitalisation of research data

KTH develops services and support for handling research data, partly to make the research itself easier where data needs to be shared within the project between different collaborating parties, partly to be able to publish data openly in connection with publication. The work is based on the FAIR principles (Findable, Accessible, Interoperable and Reusable) and provides the conditions for data to be shared as openly as possible with the necessary restrictions. During the year, a pilot study was conducted with user-centred methods to obtain the requirements for the testing and evaluation of systems to enable sharing and publication of KTH's research data. This is to ultimately achieve the goals in the research bill regarding open access to research data.

## Development of KTH's IT management system

In December 2020, KTH decided to establish portfolio management for IT development projects. The portfolio management aims to link projects and platforms to the strategic planning at KTH, and contains the initiatives, projects, and programmes required to develop and change the business based on overarching goals and strategies. The work in the portfolios includes, among other things, IT services, streamlining and savings, the environment and security, and compliance with regulations. The digitalisation strategy is an important component of portfolio management.

Under the portfolio steering group, there are three platform steering groups: the platform steering group for education, the platform steering group for research, and the platform steering group for administration. Under the platform steering groups, project offices are being established with the aim of synchronizing project activities and resources, as well as raising risks and issues that cannot be handled within the project organisations. The portfolio steering group consists of the University Director, Vice President for Digitalisation, the IT Manager, and the chairmen of the three different platform steering groups. In 2021, the group established working methods and an organisation as well as reviewing and prioritizing proposed measures.

## Research programmes within digitalisation

KTH conducts leading research in a number of different areas within the area of digitalisation. Below are some of the initiatives that KTH leads or in which we have a leading role.

Digital Futures is a research centre and strategic research area that was started through a major strategic research initiative from the government. The vision for Digital Futures is to shape an economically, environmentally and socially

sustainable society through digital transformation. Digital Futures was inaugurated in the autumn of 2020 and was developed mainly in 2021. See also the section on Research.

SciLifeLab and Wallenberg's national programme for data-driven life sciences is a twelve-year initiative financed with a total of SEK 3.1 billion from the Knut and Alice Wallenberg Foundation. The purpose of the programme is to educate the next generation of researchers in the life sciences, to create a strong computational and computer science base and to strengthen the expertise of today's research community. This will enable each researcher to better analyse data patterns and integrate their data with global data flows within biosciences. Furthermore, the programme aims to strengthen national collaborations between participating universities, connect the research areas of life science and computer science, and create partnerships with industry, healthcare, and other national and international stakeholders. KTH has leading roles in the programme. See also the section on Research.

The Center for Cyber Defence and Information Security connects researchers and educators within cybersecurity and information security. The goal is to develop knowledge, create new methods, tools, concepts, and applications in the field of cyber defence and information security. Among other things, KTH has developed the country's only training for conscripted cyber soldiers to disseminate cutting-edge research and to increase Sweden's preparedness in cyber defence and cybersecurity.

The Centre for Reliable Edge-Based Systems and Applications aims to provide methods, tools, and theories for building secure and predictable systems based on so-called Edge Computing. In 2021, researchers at the centre have, among other things, worked with model-based risk assessment and security analysis for autonomous driverless transport systems.

## The digital workplace

Occupational safety and health is an employer issue with complex legislation. To understand how KTH in a systematic manner best develops the university as a digital workplace, it is important to base decisions on development in a genuine understanding of how KTH's digital workplace looks and functions. Work takes place in offices, classrooms, laboratories, in the field, at international meetings, on foot, while travelling or sitting still. In the past 18 months, work at KTH has been characterized by the fact that many people have had to work in their home environment as a result of the pandemic. KTH wants to preserve the positive lessons learned from remote working, and compensate for the negative effects. KTH will therefore not return to how work was organized before the pandemic without due reflection, but systematically further develop the working environment based on the systematic accumulation of knowledge in this area.

As a first step in the accumulation of this knowledge, KTH conducted a major survey to map the digital workplace in the home in May and June of 2021. This report shows that many people experienced increased efficiency and productivity when the opportunity to work from home was offered, and wish to continue with this arrangement for an average of two days per week. The report will be followed by more reports, which will describe digital teaching environments, as well as digital meeting rooms and formats.

During the year, KTH has developed its digital forms of work in education in particular, but has also been able to develop digital meeting formats and new ways of communicating research and education. In addition, the opportunities for skills development and lifelong learning have increased through increased digitalisation.

## The digital work environment in systematic occupational safety and health

The work environment, including the digital one, is subject to the Work Environment Act. One of the pillars of the Work Environment Act is that employers must work with systematic occupational safety and health, which includes conducting safety and health inspections. However, these inspections rarely consider the digital tools for the workplace. Therefore, in the spring of 2021, KTH worked with a pilot project to carry out digital inspections within the framework of the HR organisation using the tool, SIS/TS 904501:2021 Ergonomi vid människa-systeminteraktion – Användbarhetsrond (Ergonomics in human system interaction – Usability inspection). The results of the pilot study were very promising and were presented to KTH's Central Collaboration Group in the autumn of 2021. The results of the pilot study show that the Usability Inspection as a tool works well for mapping problems in the digital work environment, that as a method it is able to consider the overarching perspectives in the digital work environment and that it focuses on the role of digital tools in influencing efficiency, quality and user experience in the digital work environment. A decision was made to train and establish the method on a broad front at KTH in 2022.

## Digital accessibility in accordance with the Act on the Accessibility of Digital Public Services

From September 23, 2020, all websites in the public sector must live up to the legal requirements for accessibility. The Act on the Accessibility of Digital Public Services requires that digital content must be accessible, regardless of any disability such as impaired vision or hearing. This means

that the website must contain comprehensible information and services, that it must be possible to interact with the website in a reliable manner and that the website must be able to be used with the help of a wide range of different programmes and products, such as different browsers or technical aids.

In order to coordinate the work, ensure compliance with regulations, and prioritize initiatives, it was decided in December 2020 to establish a project on accessibility to digital public service at KTH. An accessibility report is carried out annually, which describes how far KTH has come in terms of compliance and how the remaining issues will be handled. Among other things, it is important to interpret the law on the basis of our public remit, where KTH's remit as a university differs from that of many other public authorities.

KTH has also previously worked with analogue and digital accessibility, as well as the coordination of compensatory support for students with disabilities.

## KTH participation in external initiatives linked to digitalisation

KTH is active in the public discourse in the area of digitalisation, and participates in various expert groups and debate forums, as well as contributing to policy development in the area. KTH's Vice President for Digitization is one of ten members of the government's Digitalisation Council. KTH has participated in the development of the AI Agenda for Sweden, which was launched in February 2021. It is part of the government's digitalisation policy and aims to make Sweden the best country in the world at taking advantage of the opportunities that digitalisation provides. The AI Agenda contains several recommendations on policy development and investment needs in six different areas: research, education, business, the public sector, the general public, as well as infrastructure, test beds and ecosystems. Representatives from KTH have been leaders in the working groups for research and education.

In 2021, KTH has been active in the work that takes place within the scope of the government remit to the Swedish Higher Education Authority and the Swedish Agency for Economic and Regional Growth to define what is meant by digital excellence. The remit involves working with relevant stakeholders, including representatives from universities and colleges, in analysing and proposing how the supply of digital excellence can be developed both in the short and long term.

# Gender equality, diversity and equal opportunities (JML)

KTH's ethical policy states that gender equality between women and men and the rejection of all forms of discrimination are both a quality-assurance issue and a self-evident component of the university's core values. KTH's Development Plan 2018–2023 states that in-depth work on creating awareness and skills development is required in terms of gender equality and values in order to achieve the goal of an open and welcoming university.

A more gender equal KTH entails:

- having a more even distribution of women and men within the organisation and in executive bodies
- having leadership that is gender-aware
- integrating gender perspectives in education and research
- working for gender equality outside KTH as well
- the distribution of resources with a gender equality perspective and equal conditions for staff in different parts of KTH

KTH's Operational Plan for 2021 describes how the university during the current year will work with gender equality in education, research and collaboration. The plan has been followed up in the following manner:

- **Integration of JML in all educational programmes**  
Extensive and continuous work to integrate knowledge of JML in all educational programmes, JMLIU, has continued during the year. The process has been consolidated through a reference group. Workshops and training courses with programme directors and teachers have been implemented.
- **Faculty renewal and goals for gender equality**  
Training with recruitment committees, seminars with the Future Faculty Group and the Director of Gender Equality, Diversity and Equal Opportunities, JMLA, has been carried out.
- **In-depth work and activities on values**  
During the year, the KTH Equality Office worked to clarify KTH's values throughout the entire organisation
- **Coordination of data on the distribution of research funds based on gender**  
The task has been followed up to map the opportunities and obstacles that exist in order to obtain data on internal resource distribution based on gender.
- **Educational investments in gender equality and values, SEK 1 million per year**  
A project has been initiated for the production of materials for teachers in JMLIU. Assignments have been given to researchers to produce documents, tutorials, quizzes and films. They have also worked with content in Necessären, which is a web-based resource that contains educational aids, material and guidance for the integration of JML.

KTH's work on gender equality integration is based on the Plan for continued work for a gender equal KTH in 2021 and

2022, and has four priority goals: overall organisation, knowledge and awareness, equal opportunities and inclusive cultures.

## Collective organisation

A collective organisation refers to a structure for systematic work on JML where discrimination legislation, occupational safety and health legislation, gender mainstreaming and values-based work are interlinked and operate in the same way throughout KTH.

## KTH Equality Office

Through the KTH Equality Office, KTH conducts research-based proactive work at both a strategic and a practical level, with the aim of increasing gender equality, diversity and equal opportunities from an intersectional perspective throughout the university's entire organisation. This is based on legal requirements as well as KTH's own policy documents and guidelines. The work is conducted in collaboration with teachers and researchers, the University Administration and the student organisation. The work is being conducted in relation to both employees and students at all levels, and focuses on both structural and cultural aspects of inequality.

## The JMLA group

There is a JMLA in each School's management team, at the University Administration and in the student union. The JMLA group is convened by the Vice President for Equality and Values and is a strategic group for JML issues at KTH. A JML partner in the Schools' administration supports JMLA.

The JMLA group is responsible for coordinating and running the work locally on JML with a focus on both the work environment and the study environment. Each JMLA organizes a local JML group in its own organisation. In 2021, the JMLA group had regular meetings and a two-day conference together with the Future Faculty Group. New members in JML groups and newly formed JML groups in the Schools have been provided with training. The support for JML groups is designed according to demand and existing needs, which for example has led to workshops on the theme Resistance to JML work. At the end of 2021, reports were completed of the Schools' work with JML at JMLA meetings to provide an opportunity for the exchange of experiences and the development of ideas between the Schools. These in-depth descriptions will be compiled in a JMLA report.

## Integration of JML into the Sustainable Development Goals

In association with the decision on KTH's new Sustainable Development Goals for the period 2021–2025, JML was presented in a clearer way. The goals make it clear that JML

is integrated into the work on sustainability at KTH. This has been particularly emphasized in the work on the integration of JML into all educational programmes where sustainable development is highlighted as an introduction to knowledge of JML in the educational programme.

### **Gender and change management, GOFL**

GOFL was a development programme from 2017–2018 that involved 18 women in leading positions within both the University Administration and the faculty in order to develop women as leaders of change. The group is now a strategic group in the work on JML. In 2021, some of the participants completed a study at one of the Schools of the culture within the faculty, with a specific focus on differences in conditions in academic careers based on gender. The report is used as a basis for discussion and reflection in various contexts.

### **Knowledge and awareness**

Knowledge and awareness involve increasing knowledge about gender and gender equality throughout the organisation. It must be carried out in such a way that the knowledge can be put into practice, both in society and at KTH in leadership development, higher education pedagogy and in education for students, for example. Research-based knowledge about gender is the basis for problem description and analysis, while knowledge about change in organisations is crucial for work on gender equality in practice.

### **Integration of JML in education, JMLIU**

For several years, voluntary initiatives have been taken to integrate knowledge of JML in education at KTH based on the needs and wishes of programme directors and teachers. Operational and specific work with mandatory integration of JML was initiated in 2020 by the Vice President for Equality and Values and the KTH Equality Office through preparatory workshops, among other things. Discussions and workshops continued in 2021. All those responsible for undergraduate and doctoral education as well as programme directors were invited. The purpose was to present why integration of JML was being planned, how the integration must be implemented and to get feedback and ideas from the participants. The results of these workshops form the basis for the work on change in education, for example proposals for education modules, in 2021–2022.

### **JMLIU reference group**

The reference group assists the KTH Equality Office in developing a plan for how a broader integration of JML can be designed, and consists of the Vice President for Education, the Vice Dean of Faculty, the Vice President for Sustainable Development, undergraduate education directors, doctoral education directors and representatives from the Department of Learning, the KTH Sustainability Office and THS.

### **Mandatory component of basic knowledge of JML**

Gender equality is one of the President's priority areas for the university's development. This must characterize processes, decisions and policy documents. KTH's values, the gender equality policy goals and the government remit on gender mainstreaming also presuppose that a mandatory component with basic knowledge of JML must be integrated into all programmes.

Sustainable development, another of the President's priority areas, must be integrated into all educational programmes at all levels so that students after graduation can contribute to sustainable societal development. As JML is part of sustainable development, there is already an opening for integrating JML into the education, which facilitates the work that could thus be developed in 2021. The mandatory component of basic knowledge of JML is called track 1. This form of integration differs from previous integration in education.

#### ***Track 1 – Content, design and implementation***

Track 1 means that all programmes at all levels at KTH must contain a component of basic knowledge of JML, which is subject to examination within the course where the component is included. The content of the mandatory component conveys the following knowledge about JML:

- what the concepts of gender equality and equality mean
- how they are linked to sustainable development
- how inequality can be expressed
- that gender equality and equality require change

In doctoral education, a scientific perspective on gender is also conveyed. In higher education pedagogy, knowledge about gender awareness and inclusive pedagogy must also be conveyed.

When designing track 1, there is a clear structure for when and how the integration must take place in each programme and a clear structure for follow-up via programme analyses in the quality system. Each School has identified ten educational programmes that are integrating JML in 2021. Support for programme directors and teachers in the implementation process is provided through Necessären, a web-based resource that was continuously updated in 2021, other educational material, higher education pedagogical courses and workshops. In 2022, the integration work will continue in all educational programmes.

Implementation entails teachers working to achieve a gender-equal and equal-opportunity educational environment free from discrimination, for example through procedures and information to counteract harassment and sexual harassment, and by practising gender-conscious and inclusive pedagogy as part of the work on KTH's values.

## Higher education pedagogy

The course *Gender Theory and Gender Equality in Technical Higher Education* provides support to teachers within higher education pedagogy. In 2021, the course had a total of 14 participants. The examination for the course consists of work with one's own courses and programmes from a gender equality perspective and/or a gender perspective. In 2021, work has continued to increasingly integrate gender and gender equality into more higher education teaching courses, such as supervisor training.

## Follow-up of previously announced project funds

The announcement for integration of JML and sustainable development in education was carried out in collaboration between the KTH Equality Office and the KTH Sustainability Office in the spring of 2020. The projects form an important part of the development work for the integration of JML into education. The projects were followed up at a seminar in November 2021 when the six projects, distributed over three Schools presented results, and the groups discussed experiences that can be shared with teachers at KTH.

## Material from the gender network

A scientific group at KTH with researchers with gender expertise will produce educational material that constitutes support in the integration of JML in track 1. Examples of the material are introductory texts, bibliographies, films, quizzes and a recorded lecture.

## Equal opportunities

Equal opportunities refer to equal opportunities in terms of salary, authority and career. KTH should increase the proportion of women in higher academic positions, in managerial positions, among its students as well as among its teachers and researchers. KTH needs to have equal processes regarding recruitment and employment as well as conditions for equal distribution of resources.

## Study of the process for recruitment and promotion of the faculty

A study focusing on following up the process of recruiting and promoting teachers from a gender perspective is planned for 2021. In collaboration with the Dean of Faculty, the Vice President for Equality and Values and an expert have participated in training courses for chairpersons and members of committees for recruitment and promotion in the faculty. Special training for chairpersons has been carried out on several occasions.

## Partners in Learning, PIL

The PIL programme is a career guidance programme for assistant professors. The programme is given continuously.

The programme is led by two expert researchers and always includes modules with elements of JML and KTH's values.

## Continuous follow up and quality discussions

The work with gender mainstreaming and active measures against discrimination are integrated into the quality system, including the Schools' plans for skills supply and faculty development. The work includes analysis of problems, identification of active measures, and implementation and follow-up of these through feedback from the KTH Equality Office to quality coordinators, the Schools, and the Vice Dean of Faculty prior to the quality discussion.

## Coordination of data on distribution of research funding based on

In KTH's Operational Plan for 2021, each School Head was commissioned to produce data on how grants for research and education at the third-cycle level are distributed between the sexes within the School. The Vice President for Equality and Values was given the task of coordinating the work, among other things in terms of uniform data production and compilation of the data. In discussions with the Schools in 2021, the Vice President discovered that within KTH there are no indicators for obtaining gendered statistics on the allocation of internal research funding, as the statistics are broken down into occupational categories but not by gender.

In KTH's Operational Plan for 2022, the Vice President for Equality and Values has been tasked with drafting a proposal for a systematized process for overall uniform gendered indicators for KTH's grants for research and education at the third-cycle level.

## Trade union collaboration

In 2021, KTH and the Central Collaboration Group will continue their work on trade union collaboration concerning several priority issues within KTH's work on JML. According to the partnership agreement, regular committee meetings take place, as well as executive meetings within the subject area. The work on the annual salary survey takes place in a joint working group led by a coordinator from the KTH Equality Office.

## Active measures against discrimination

In 2021, the work to coordinate, support and clarify the work on active measures against discrimination continued, both for KTH as an employer and as an education provider. The new structure for JML within KTH facilitates review and follow-up in all areas. The work on active measures is summarized and documented in two separate action plans where all grounds for discrimination are taken into account and correlated with each other. The work is developed continuously in dialogue with the organisation, for example through better synchronization with the work on occupational safety and health.

KTH conducts an annual salary survey that is completed prior to the salary review in order to form a basis for managers who are responsible for setting salaries. KTH monitors the occurrence of any unreasonable salaries and takes into account unequal pay structures in budget and salary processes.

Training initiatives have been offered for specific groups throughout the organisation, such as project managers in research, working groups, union representatives, departments, the student union and the university library. In 2021, the KTH Equality Office provided an opportunity for employees to learn more about mental ill health, as well as a training course on JML and workshop methodology for students.

During the year, work began on examining the conditions for the groups that the university has identified through employee surveys as more vulnerable than others, such as doctoral students and lecturers. The purpose is to identify problems but also work proactively to improve conditions. Therefore, a pilot training programme was developed that provides support for the business to create an equal process in the recruitment of doctoral students and junior researchers.

## Inclusive cultures

Inclusive cultures are based on an awareness of values, codes of conduct and how an inclusive culture can be created. This also means awareness of the relationship between sustainable development and JML issues, a clear zero tolerance of harassment and discrimination as well as transparency and clarity in communication about JML at KTH.

## In-depth work on values

KTH's values are systematically clarified in KTH's operations, for example in the work with gender mainstreaming and active measures against discrimination. Meetings, seminars and workshops on the work on values were carried out in accordance with the Operational Plan for 2021, where research on values in organisational culture, especially in academia, were presented. Continued work that focuses on the situation of doctoral students and the relationship between supervisors and doctoral students is ongoing. The Vice President for Equality and Values participated, together with the researchers responsible for the PIL programme and the training for recruitment committees, at Forskartorget at the Gothenburg Book Fair, in collaboration with the Swedish Gender Equality Agency, in a seminar on *Academic Freedom and Gender Equality*.

## Collaboration programme against sexual harassment and gender-based vulnerability

KTH, together with Karolinska Institutet, Malmö University and the Swedish Secretariat for Gender Research at the

University of Gothenburg, established the Research and Collaboration Programme against Sexual Harassment and Gender-Based Vulnerability. The goal is to establish research-based knowledge about inclusive work and study environments as well as a sustainable organisation for the prevention of sexual harassment and gender-based vulnerability in the academic world. The programme will ultimately help strengthen and intensify the work on the university's organisational culture, with a focus on quality, sustainable development, occupational safety and health, leadership, gender equality and equal opportunities.

Within the framework of the collaboration programme, a comprehensive prevalence study was conducted in 2021 on the prevalence of sexual harassment in the Swedish higher education sector. During the autumn of 2021, the focus was on completing a comprehensive report of the results. Digital seminars were held on, among other things, the #metoo appeal and on how zero tolerance for sexual harassment works in practice.

## Handling cases of sexual harassment against students and employees

In 2021, a major review of the process of dealing with sexual harassment and harassment of employees and students was carried out. The review resulted in the procedure for the handling and investigation of cases being made clearer. In December, a process was initiated in which the University must identify the specific support needs that exist, for example in the form of further training for those responsible for investigating cases concerning employees.

## The reception of new students

In 2021, KTH continued its work on the systematic integration of JML in the reception activities through a collaboration between the Human Resources Department, the Education Office and the Student Union, THS. During the year, approximately 900 students who arrange reception activities received training in JML as well as how to handle sexual harassment and racism.

## Diversity and Inclusion for Organisational Development and Equality, DIODE

In 2021, an initiative began for creating a network that is aimed at KTH's strategic partners in order to share knowledge and experiences, and to strengthen the companies and KTH in their efforts to improve equality, diversity and inclusion.



# The environment and sustainable development

KTH's ambition is to be a leading technical university within environmentalism and sustainable development, and to have an identity and a brand associated with these issues. As a technical university, KTH has a key role in influencing the development of society in a positive direction in order to contribute to the UN Sustainable Development Goals.

KTH's educational programmes provide the next generation of leaders with the knowledge and skills needed to address current and future challenges. In order to contribute to a sustainable society, it is important that KTH's research is disseminated and put into practice. Therefore, KTH attaches great importance to collaboration with various societal stakeholders and to highlighting new research findings.

Within KTH, there is the commitment and leadership to continuously develop and improve our work on environmentalism and sustainability. KTH's strategic work on environmentalism and sustainable development is based on KTH's sustainable development policy, the overall Sustainable Development Goals for 2021–2020 and the Climate Objectives and Measures for the period 2020–2045.

Since 2011, KTH has had a Vice President for Sustainable Development, with a focus on education, research and collaboration. In 2021, a new employee was appointed to the post. KTH has a sustainability manager who is responsible for the work on environmentalism and sustainability that is carried out within the scope of the KTH Sustainability Office, at the Property Department within the University Administration.

The KTH Sustainability Office is tasked with centrally supporting management, KTH's five Schools and the University Administration in the work on integrating sustainable development into the business and being a driving force in implementing and following up KTH's new Sustainable Development Goals and Climate Objectives and Measures with an associated action plan. KTH also participates in national and international meetings and networks, and is responsible for maintaining and developing KTH's certified environmental management system.

## Environmental management system

Since August 2015, KTH's environmental management system has been certified according to the international environmental management standard ISO 14001 and complies with the requirements in the Ordinance (2009:907) on Environmental Management in Government Agencies.

KTH's work to promote sustainable development has been linked to the environmental management system by planning, implementing and following up the work on integrating sustainable development into education, research and collaboration within the framework of the systematic working methods of the environmental management system. This also applies to sustainability regarding the environ-

mental impact of its own operations, such as business travel, energy consumption, procurement, chemicals, waste management, etc.

Within the framework of the environmental management system, KTH has established a sustainability policy, Sustainable Development Goals, Climate Objectives and Measures as well as action plans to achieve these goals. KTH conducts annual internal and external environmental audits where improvement proposals are highlighted. KTH follows up the work on sustainability twice a year at different levels within the organisation. This includes the follow-up of results from the Swedish Environmental Protection Agency's reporting to the government. KTH collaborates with other universities and colleges within the framework of Environmental Leaders within Universities and Colleges, MLUH, which is a network for environmental management within the state. KTH submitted comments on the government consultation regarding amendments to the ordinance (2009:907) "miljöledning i statliga myndigheter" (Environmental Management in Government Agencies).

KTH was ranked 41st in the world in the THE Impact Rankings, which address the 17 UN Sustainable Development Goals and the 2030 Agenda. This was a clear step forward from last year's 77th place, despite the fact that about 300 more universities took part. See the section on *Systematic Quality Management*.

In 2021, for the second consecutive year, KTH produced an annual report for the previous year that shows good examples of how KTH contributes to all of the 17 UN Sustainable Development Goals. The report includes best practice in education, research, and collaboration, as well as from KTH's efforts to reduce the environmental impact of its own operations such as buildings and business trips, etc.

In 2021, KTH has worked to secure support for the new Sustainable Development Goals and the Climate Objectives and Measures with an associated action plan. The new goals set out the additional steps that KTH intends to take to drive the work on sustainability forward. During the year, work continued on integrating the work on environmentalism and sustainability within institutions and departments. The KTH Sustainability Office collaborated with the Royal Institute of Technology's Student Union to support the union's work to introduce an environmental management system within the scope of its activities.

## Education

New Sustainable Development Goals for education were decided on during the year. These goals emphasize in particular that the students, in addition to being made aware and gaining knowledge about sustainable development, must also be able to promote sustainable societal development.

In 2021, an additional educational investment in sustainable development was announced with funds from both

public funding for education at the first-cycle and second-cycle levels, SEK 700,000, and from grants for research and education at the third-cycle level, SEK 300,000. The investment will be made annually until the end of 2023. Six projects were funded in this announcement. Among these, a three-year project was granted at the ITM School for the establishment of an interdisciplinary sustainability course that will be included in several educational programmes at KTH.

The number of first-cycle and second-cycle programmes with a focus on the environment and sustainable development is the same as in recent years, with two Master of Science in Engineering programmes, ten master's programmes and one doctoral programme. The number of courses categorized as related to the fields of environmentalism and sustainability increased from 786 to 947 between 2020 and 2021.

## Research

Through network building and support for new interdisciplinary projects, the KTH Sustainability Office supports researchers in developing new areas in sustainable development. Ten initiatives in research, education and collaboration were granted funds of up to SEK 100,000 each within the framework of the initiative Environment and Sustainable Development across Disciplines. An online toolbox that links to available resources for researchers was also developed.

During the year, KTH started an interdisciplinary and transdisciplinary research centre on climate change, the KTH Climate Action Centre. In addition to conducting research in collaboration with our partners, the centre will communicate research to a wider public. Additional new centres in sustainable development are the Sustainable Finance Lab and the Centre for Future Seafood, Blue Food. See the section on *Research*.

In 2021, 20 percent of the advertised teaching positions were linked to sustainable development, which is a decrease of one percentage point compared to the previous year. Scientific publications in the field of sustainability increased between 2019 and 2020, from 16 percent to 18 percent of KTH's publications. The indicator is measured with a one-year lag. The number of authors published in the field increased from 227 to 240. The share of external funding from research funding bodies in sustainable development increased from 13 to 14 percent of the total amount of external research funding. The funding bodies were the Swedish Environmental Protection Agency, Mistra, Formas and the Swedish Energy Agency.

During the period 2020 to 2021, KTH maintained its ranking in both the Academic Ranking of World Universities, 151st–200th place in Environmental Sciences and Engineering, and the QS ranking, 101st–150th place in the field of Environmental Sciences. KTH was also ranked 282nd in the subject Environment/Ecology in the National

Taiwan University Ranking. See also section on *Systematic Quality Management*.

## Collaboration

KTH's collaboration, research and innovation contributes to sustainable development, gender equality and climate transition. To develop collaboration and dialogue with existing and new partners, stakeholders and students, KTH has held over 200 events, workshops, seminars and other activities with a focus on sustainable development.

To increase the visibility of KTH's work on sustainable development, gender equality and climate issues, a list of experts who research various aspects of sustainable development at KTH was prepared for dissemination to journalists, among others. Furthermore, information is available on the external website, KTH's intranet, KTH's student website and via newsletters. Current news, events and information for employees and students is disseminated via internal newsletters. The external newsletter is aimed at the business community, legislators, public authorities and organisations, and was published six times during the year. The Vice President for Sustainable Development has continued to blog about sustainable development every sixth week. In social media, with prospective students as the target group, and in KTH Library channels, sustainable development at KTH is a recurring feature. Information regarding announcements of research proposals within the fields of environmentalism and sustainable development was also sent to doctoral students and researchers approximately twice a month.

In 2021, KTH was mentioned in approximately 6,300 national and international media outlets pertaining to sustainable development – a significant increase from approximately 3,800 in 2020. For 2021, 34 percent of KTH's total media exposure was linked to sustainable development, an increase from 27 percent in 2020. The increase can be seen in both national and international media. KTH has issued ten press releases related to sustainable development in Swedish, compared to 17 in 2020, as well as six press releases related to sustainable development in English, which is a decrease from 16 in 2020.

KTH has led a working group within the International Sustainable Campus Network, which has exchanged experiences regarding how a university's work on sustainability can be measured against the UN Sustainable Development Goals, based on different methods and ways of working.

KTH's researchers are part of several government councils and delegations linked to sustainable development. These include the Swedish Climate Policy Council, vetenskapligt råd för hållbar utveckling (the Scientific Council for Sustainable Development) and delegationen för cirkulär ekonomi (the Delegation for a Circular Economy).

Within the framework of the Conference of European Schools for Advanced Engineering Education and Research CESAER, KTH participated in a workshop and presented its work on sustainability and rankings.

During the autumn of 2021, a new working group within the Stockholm Trio was initiated. The purpose of the working group is to strengthen the collaboration between Stockholm University, Karolinska Institutet and KTH regarding sustainability issues in a broader sense. KTH is represented in the group by both the Vice President for Sustainable Development and the Sustainability Manager.

## Organisation and working methods

KTH has a new sustainable development goal which is about sustainable development and gender equality being integrated into the business, where employees and those who work on behalf of KTH have knowledge and are given the conditions to contribute based on their role. In 2021, KTH worked to update the internal training available for new employees. In the future, the training will also be aimed at students. During the year, efforts continued to integrate the work on environmentalism and sustainability into the education and research activities. The purpose is to secure support for the new goals and conduct a discussion about how work on sustainability is part of our employees' day-to-day work.

## Resource management

During the year, KTH completed an analysis, in accordance with the methodology for the Greenhouse Gas Protocol, of the climate impact of its own operations generated during the years 2015 and 2019. The analysis shows that the greatest climate impact is generated by KTH's business trips, in particular air travel, followed by purchased goods and services, as well as premises, in terms of new premises and the renovation of premises, as well as energy use. The following section presents a selection of the measures taken during the year to reduce the climate footprint of our own operations in order to contribute to sustainable development.

## Travel and transportation

Business trips by air are still at low levels due to COVID-19 and the transition to digital meetings and teaching methods that were implemented. Compared with 2019, carbon dioxide emissions from air travel decreased by 85 percent. This is a further reduction from 2020, when emissions from air travel decreased by 60 percent compared with 2019.

To reduce the climate impact of employee travel within and between KTH's campuses, bicycles will be available for KTH's staff to loan from 2021 onwards. These are second-hand bicycles that have been abandoned on campus or at tenant-owner associations. The bicycles have been

repaired, are compliant with the Swedish Transport Administration's rules and will be equipped with studded tyres in the winter months.

At KTH Campus, there are now five hydrogen cars that all employees can use both while on business and privately. The cars will also be used to demonstrate fuel cell technology for students at KTH.

## Procurement and waste

KTH has a new sustainable development goal which states that the amount of furniture and interior furnishings that go to waste management must be reduced. As part of this, during the year KTH signed an agreement with a new supplier for furnishings for university environments. The agreement promotes an increased circular flow of furnishings, as it enables, among other things, the upholstering and repair of furniture, the loan or rental of furniture, and the return of discarded furniture to the supplier.

KTH's waste project to improve and increase the separation of waste and to work out a uniform system for the separation of waste has been ongoing in the period 2019–2021. This has led to a significant increase in the opportunities for the separation of waste. In 2021, the initiative is primarily intended to enable the separation of food waste. Continued collaboration with the Royal Institute of Technology's Student Union and the property owner Akademiska Hus took place during the year, which enabled more efficient waste management of glass and corrugated cardboard next to the students' Chapter Halls.

During the autumn semester's reception days for international students, KTH held the annual Campus Fair together with the property owner Akademiska Hus, Stockholm Vatten och Avfall and KTH Students for Sustainability. During the fair, students and employees were able to obtain information and guidance regarding waste management at KTH through webinars and the opportunity to leave and pick up items for recycling in the Pop-up Recycling Container.

As new legal requirements regarding hazardous waste came into force in 2020, KTH has worked to guide and inform relevant functions within KTH's five Schools through workshops and by producing support material.

## Sustainable buildings

Several of the buildings that KTH uses for its operations are environmentally certified. Four of them are certified in accordance with the green-building gold rating, and five of them with the green-building silver rating. One of KTH's existing buildings with the silver rating was renovated and during the year got to the final of the Sweden Green Building Awards, which showcases projects that have contributed to promoting sustainability in urban planning.

At the KTH Campus, a number of energy saving measures were taken in 2021, such as setting up solar panels on six

buildings and improving ventilation. Furthermore, laboratory premises were refurbished, and energy-efficient fume cupboards were installed.

The KTH Campus was used during the year for various research and educational activities in collaboration with the property owner Akademiska Hus. For example, the project on indoor climate as a service with a focus on data-driven building optimization with AI.

During the year, KTH was also granted funding for the Co-kitchen project. The project will explore new ways of living and cooking together in the sustainable student housing of the future, and full-scale prototypes will be built in student housing at the KTH Live-in-Lab.

### **Food and catering**

In 2021, the follow-up of catering agreements took place, among other things to ensure that set sustainability requirements were being complied with. Discussions were held and measures implemented with a restaurateur on campus to increase their capacity for separating waste and managing food waste

### **Biodiversity and ecosystem services**

At KTH Campus, there are sixteen planters that are used both for recreational cultivation by staff and for the teaching of students. In accordance with an agreement between the KTH Sustainability Office and the growers, no pesticides, chemicals, fertilizers or anything else that negatively impacts the environment may be used. The garden waste is composted.

In 2021, KTH Campus had four beehives. The bees produced 90 kg of honey during the year. The honey is given away as gifts as well as used in restaurants and cafés on the KTH Campus and can be purchased at the KTH Entré. The property owner Akademiska Hus have placed an order with their garden contractor to create a meadow next to the hives, where the land is currently a lawn. The planting of oaks on KTH Campus was carried out and the number of nesting boxes was increased.

# Systematic quality management

KTH's systematic quality management is based on KTH's quality assurance policy. This is based on KTH's Development Plan for 2018–2023, as well as the quality requirements set out in the Higher Education Act, the Higher Education Ordinance and European standards and guidelines for the quality assurance of higher education.

According to the quality policy, quality management shall be characterized by clear responsibility, broad commitment, and inclusion. The Faculty Council has overall responsibility for ensuring the quality of education, research, and collaboration. The Council is also responsible for managing and developing KTH's quality system.

KTH's quality system consists of two parts; continuous follow-up and regular review. The former is carried out annually and is an internal process. Regular audits are scheduled to be carried out every six years and include external expert audits.

## KTH's quality system

### Continuous follow-up

#### *Education*

KTH has established assessment areas for education at the first-cycle and second-cycle levels as well as the third-cycle level. In the continuous follow-up, a couple of the assessment areas are selected every year. The continuous follow-up was carried out in the spring semester, despite the fact that the ongoing pandemic entailed major changes for KTH's business and personnel with distance learning and an increased workload. KTH's management considered it particularly important to carry out the annual follow-up, as it was feared that the adjustments caused by the pandemic would have an adverse effect on the quality of education. Digitalisation was therefore specifically selected as a focus area for follow-up, together with the integration of gender equality into education.

The follow-up showed, among other things, that the transition to distance learning has led to a rapid development in the use of digital aids. Before the pandemic, only a few educational programmes had a high degree of maturity in terms of digitalisation, but KTH's teachers and students have generally been well prepared to quickly adopt technology and tools. The two biggest challenges have been examinations as well as laboratory work and other practical elements. The biggest challenge with distance examinations is perceived to be security. The number of disciplinary cases increased significantly during the pandemic. During the period of distance learning, many programme directors have not been able to assess the consequences of the fact that practical elements and laboratory work in courses have been difficult to implement digitally. Therefore, this will continue to be followed up. The follow-up in the spring of 2021 did not

show poorer results or lower throughput overall in KTH's educational programmes.

In terms of gender equality, this year's follow-up showed that the work on integrating gender equality into the educational programmes has developed positively from last year. All five Schools now have plans for integration in the Schools' range of educational programmes and the introduction will take place successively on an annual basis. The follow-up shows that there is still need for support from the Equality Office at the Human Resources Department within the University Administration, including skills development for teaching staff, as well as the fact that gender mainstreaming needs to be followed up at the course level as well. Two Schools were highlighted as good examples as they have made a lot of progress. At one of these Schools, the management has shown a particularly strong commitment to the issue, something that has had a proven effect on the work on gender equality in general at the School.

During the second half of the year, work began on reviewing the continuous follow-up in order to shed light on the system's efficiency and degree of adaptation to KTH's operations and the need for follow-up and development. As part of this, a survey of working methods with programme analyses and school reports was conducted. The preliminary results show a need to adapt the follow-up areas to the different levels of education. A more collegial approach with the analyses both before, during and after the follow-up needs to be applied widely within KTH. The follow-up process as such provides a focus on quality issues, which is generally perceived as positive. Furthermore, the written feedback from those responsible for first-cycle education and those responsible for doctoral education, regarding the templates for programme analyses and School reports, has been used in a more systematic way than before. The feedback is primarily about the data that were used to analyse the status of the programmes and about the content and frequency of the continuous follow-up in general.

Through KTH's Operational Plan for 2022, the President has decided on an analysis of the quality system for education. The aforementioned survey and initial analysis will be included as a basis for the analysis.

#### *Development of the faculty*

The faculty's skills development and subject focus are important prerequisites in order for KTH to be able to maintain high quality in research and education, among other things. This year's continuous follow-up showed, among other things, that the recruitment process needs to be accelerated, something upon which KTH has already begun working.

The higher education pedagogical administration at the Department of Learning shall support and strategically promote the development of education at KTH. This is achieved by offering higher education pedagogical courses, as well as holding workshops and network meetings for

programme directors and directors of studies. Large meetings are also held for all staff. Working groups for prioritized development areas are also operational. The department's staff also analyse the Schools' data in the continuous follow-up regarding the education's and teachers' needs for pedagogical development. The work of strengthening collaboration and creating synergies between different stakeholders working with career and skills development for staff at KTH has continued in 2021, and will be further developed in 2022, with the Arena for Leadership and Pedagogy, ALP, as an important platform. See also section on *Staff*.

## Regular review

### Education

In 2021, regular review as a model for evaluation in education has been tested at KTH. The university engineering programmes were selected for this pilot review. The test was performed to assess whether the data included is well adapted for the review and how the process works. It was also of great importance to assess the value of the review both for the individual educational programme in its continued development and for KTH's management as a tool for following up the quality of the programmes and the development needs within an educational area. In the spring, the programme directors for the Bachelor of Science in Engineering programmes worked on self-evaluations based on the assessment areas that are included in KTH's quality system. The educational programmes were divided into three clusters, each with an assessment group. The assessment groups consisted of a representative from the profession and two experts from technical education, one of whom was from KTH.

A student representative was also to be included, but only one of the assessment groups included a student representative. The work of the assessment groups was completed in mid-December. Based on the results of the review, the programme directors will produce an action plan, which will be reported on and discussed in the continuous follow-up in 2022.

A follow-up of regular reviews has begun, by obtaining feedback from the programme directors and assessors on the method and process. An analysis, which will form the basis for further development of the method, has commenced and will be completed in 2022, within the scope of the analysis of the quality system, as mentioned above.

### Research Assessment Exercise

A regular review of KTH's research, the Research Assessment Exercise, RAE, began in 2020 and ended at the end of 2021. The RAE is an assessment of the quality of the research conducted at KTH. The results at the KTH level show, among other things, that research at KTH is maintaining an

excellent standard, but that strategies or specific visions, so-called roadmaps, may need to be developed. See also the section on *Research*.

The outcome of the RAE will be followed up in the continuous follow-up in 2022. At both the departmental and School level, action plans must be developed based on the recommendations from the expert groups, as well as on the strategic discussions that are encouraged within the organisation.

## Quality Management within the European University Alliance, Unite!

KTH is part of the university alliance Unite! See also the sections on *Staff* and *Education*. The quality coordination function is part of the project group that covers quality assurance. During the year, this project group further developed a manual to support other project groups in their quality assurance work. This manual was also evaluated by a European consortium, EUniQ, which works for a cohesive quality assurance of the education of university alliances. EUniQ considered the manual to be well-developed and adapted for the business.

## The Swedish Higher Education Authority's reviews and evaluations

### Educational evaluations

During the year, the doctoral educational subjects analytical chemistry, physical chemistry and organic chemistry were evaluated by the Swedish Higher Education Authority. KTH was informed of the decision, including the assessment group's opinion, at the end of 2021. The Swedish Higher Education Authority's decision meant that analytical chemistry was rated high quality, while organic and physical chemistry were rated as being of questionable quality. This means that KTH, for the last two subject areas, must remedy the stipulated quality deficiencies, and in 2022 submit an account of the measures that the university has taken to the Swedish Higher Education Authority.

### Thematic evaluation

In 2019–2022, the Swedish Higher Education Authority is reviewing how the higher education institutions in Sweden work with broadening recruitment. In the second half of the spring semester, KTH submitted a self-evaluation to the Swedish Higher Education Authority which describes the university's strategy for increasing diversity within and reducing skewed recruitment to educational programmes. It is expected that KTH will be informed of the decision in the spring of 2022.

## Survey follow-ups

KTH regularly conducts surveys of students, alumni and doctoral students, in the form of initial surveys, mid-point surveys, career surveys and doctoral student follow-ups. In 2021, KTH conducted the career survey. The surveys are part of KTH's work on systematic quality management, and the fact that they are conducted regularly provides the opportunity to monitor developments over time. The results can be analysed for the entire population as well as for individual programmes, broken down by gender, Swedish citizens/non-Swedish citizens, and the educational background of parents. The results are presented in tables and in an overall report. The results can therefore be used for development as well as quality monitoring at different levels of the business. These surveys are conducted in collaboration with Statistics Sweden, SCB. For a number of years, the surveys have been revised by working groups composed of employees from relevant parts of KTH's business. The purpose of the working groups is to secure support for the surveys and to adapt them to the needs of the recipients of the results.

In 2021, work on improving the dissemination and the use of the results of the surveys continued. This makes the strategic importance of the surveys and their importance for quality development clearer.

## Mid-point surveys

A working group with representatives from KTH's Schools and the University Administration was appointed for future mid-point surveys. The working group has begun the review of the questions included in the survey.

## Career survey

The 2021 career survey follows up students who graduated in 2016–2018. The response rate for this year's career survey was 42 percent, and the result is weighted and calibrated by Statistics Sweden so that the results can be interpreted for the entire target group. The objective of the follow-up of KTH's first-cycle and second-cycle education was to ascertain how well alumni have established themselves on the labour market, their primary duties, employers and how they evaluate their education when they look back on their experiences after completing the education.

The survey shows that an education from KTH leads to qualified employment with a relatively high salary. More than half of the alumni got a job before they graduated, and within three months another 23 percent had secured employment. The alumni believe that their education has tremendous relevance in their day-to-day work, and they use the abilities and knowledge they acquired during their education.

The alumni asked for more elements of planning, finance, law and career support in their education. They also provided feedback and requested updated pedagogy, increased

contact with the labour market and a greater understanding of their professional role. Those who responded to the survey are generally satisfied with their education and a clear majority would choose to study at KTH again.

## Rankings

Rankings measure excellence in research, education and collaboration, and can be seen as a measurement of the value of a university's international competitiveness. The importance of visibility and rankings continues to grow. This applies to areas such as student recruitment, recruitment of international researchers, international collaborations, opportunities to obtain external grants, as well as influence on various policies, investments in excellence, and expressions of national prestige. Several advocates of rankings, including the European Commission, see rankings as an incentive to increase the quality of research and higher education.

KTH generally performed well in 2021. In the QS World University Rankings, KTH advanced nine places compared to the previous year and is ranked as the 89th best university in the world. This is KTH's best result ever in this ranking list. KTH's international reputation, both among employers and academics, remains solid in the QS poll. In the THE World University Rankings, KTH is in the 201–250 interval, as in previous years. KTH continues to decline in terms of citation values and reputation. At the same time, other universities have advanced their positions, and the level of international competition is expected to increase.

KTH was ranked 41st in the world in the THE Impact Rankings, which address the 17 UN Sustainable Development Goals. This is an improvement of 36 places. The result is very positive considering that 349 more universities participated compared to the 2020 ranking. KTH has progressed within five of eight selected goals. KTH performed particularly well on Goal 13 Climate Action and Goal 17 Partnerships for the Goals, ranking seventh in both goals. The ranking was based on extensive documentation of texts related to the Sustainable Development Goals, primarily taken from KTH's website, as well as bibliometrics and other quantitative data.

KTH has continued to perform comparatively well in rankings of subject areas and subjects. In the THE's subject ranking for engineering science and technology, KTH climbed a place and was ranked as the 68th best university in the world and as number one in the country. However, this is a continued decline of 15 places since 2018. The decline can be attributed primarily to impaired rankings in terms of reputation and citations. In the corresponding QS ranking, KTH was ranked 31st best, which is an improvement of one place. In QS's subject rankings, KTH is represented in 16 subjects, eight of which are among the top 50. Electrical engineering was ranked highest, in 18th place, followed by architecture in 19th place.

KTH's foremost strength in terms of rankings is the very high production of publications per teacher and researcher. Furthermore, there is a very high proportion of co-publishing with researchers from international universities and with the business sector. KTH is successful in obtaining research funding from external financiers and does relatively well in the reputation surveys. KTH performs better in QS than most of the Nordic universities, and is ranked third among Nordic universities, after the University of Copenhagen and Lund University. KTH also has a high proportion of international researchers, teachers and students, which is important from a ranking perspective.

KTH's reputation is stronger than the university's performance in the bibliometric indicators. One weakness is the values in indicators that measure the impact and excellence of the research. This is shown by the relatively low field-standardized citation rate, which in 2021 was 1.15. This means that KTH's research is quoted 15 percent more than the global average. KTH only appears in 654th place according to THE World University Rankings. This is a decline of 83 places since 2017 and confirms the downward trend. KTH has relatively few highly cited researchers and only just over half of KTH's departments are cited above the global average.



# Staff

KTH is a university where people with a wide range of backgrounds and experiences work together with the common purpose of managing, renewing and imparting knowledge for the society of today and tomorrow. KTH shall be a workplace where the desire for personal development and personal responsibility is encouraged. The Development Plan for 2018–2023 states that KTH shall be a leading international university of technology that generates knowledge and expertise for a sustainable future. KTH strives to achieve the goals in the Development Plan to be preeminent, integrated, visible, open, increasingly digitalized, more sustainable, more international, and more equal. A number of activities that were carried out in 2021 in human resources, based on KTH's Development Plan, are outlined below.

## Skills supply

The overall goal of KTH's skills supply is that KTH shall always have access to the skills that the business needs in order to achieve its goals. This requires that the work on skills supply should take place in a strategic and structured manner, and that KTH works actively on its brand as an employer in all communications, both internally and externally.

## Employer brand

The employees are KTH's main resource for continuing to be a competitive international university. A strong employer brand supports KTH's strategic skills supply and is about being an attractive employer for both existing and potential employees. In 2021, KTH developed a strategy for communicating the KTH employer brand

## The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers

In 2021, KTH adhered to the principles of the EU Charter & Code and was awarded the HR Excellence in Research award. The award reflects KTH's commitment to continuously developing its personnel policy in line with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, the EU Charter & Code. It consists of general principles and requirements that define the roles, responsibilities and rights of researchers and their employers, and is a basic and common quality framework that aims to strengthen research in Europe. The implementation and development work based on the EU Charter & Code will continue over the ensuing three-year period and will be reported to the EU at three-year intervals.

## Unite! H2020

In January 2021, the project Unite! commenced. H2020, where KTH is one of seven participating universities, from seven European countries within the Unite! Alliance. The

project is divided into nine work packages, of which the personnel area is included in Work Package WP5 – Strengthening Human Capital, the development of human capital. WP5 consists of five sub-projects with the overall goal of identifying best practices and developing common strategies for skills and career development for researchers, thus promoting an open, attractive and sustainable European labour market. One of the five sub-projects was completed in December 2021 and has, among other things, resulted in a joint handbook to support researchers in the early stages of their careers.

## Skills and career development

KTH works actively for the development of future learning environments and training models for employees in order to equip teachers, researchers and the University Administration with continuous skills development.

The task of the University Administration to provide support in the work on prevention as well as on quality assurance and follow-up is performed, among other things, through functional training in each administrative area. Furthermore, specific investments are also made at the School level with adaptation to specific activities and needs. Due to the ongoing pandemic, 2021, as well as 2020, has been a year of adjustment that resulted in the regular range of skills development being postponed, cancelled, made digital or offered via hybrid solutions. During the latter part of the year, training was also possible on site.

Internationalization is an important aspect that characterizes KTH's entire organisation. All staff are encouraged to participate in the various forms of staff mobility that KTH offers. Through Erasmus+, a total of 19 scholarships were awarded in 2021. Ten scholarships were awarded to administrative staff who travelled outside the university for job shadowing or participating in courses and network meetings. Of these, eight were women and two were men. Nine scholarships were awarded to academic staff who went to teach at partner universities, make contacts and build good relationships for research and education. Of these, seven were men and two were women. A number of virtual events were also held during the year, mainly through Unite!, the Swedish Council for Higher Education, and partner universities.

Swedish language courses were provided with a total of five course start dates. During the year, 101 participants studied Swedish at A1 level, 73 at A2 level, 56 at B1 level and 21 at B2 level.

In a collaboration between KTH's Schools and the University Administration, a training course in rhetoric, especially for HR, was created. The purpose of the training is to improve the ability to successfully formulate and convey desired messages. With support in rhetorical tools, practise and exchange of experience around common challenges, HR employees can thus become more confident and more

effective in their supportive role to managers and employees.

Furthermore, training in skills-based recruitment with a focus on structured interview techniques was completed. The pursuit of gender equality, diversity and equal opportunities is both a quality issue and a self-evident part of KTH's core values. Skills-based recruitment is a methodology that promotes equal treatment and a non-discriminatory approach to the recruitment process. The training was offered to both HR and recruiting managers. 21 people participated in 2021, of whom 13 were women and eight were men.

During the year, four basic fire safety training courses were conducted in both Swedish and English with a total of 113 participants, of whom 70 were women and 43 were men.

### **Higher education pedagogical courses**

In 2021, eleven higher education pedagogical courses were completed, with 16 sessions of the course and 478 participants, of whom 184 were women and 294 were men. In the spring of 2021, all courses were conducted digitally, while during the autumn semester there was a mixture of physical, digital and hybrid courses.

In virtually all courses, course participants develop their own courses, learning environments or educational programmes. Examples of courses are *Developing learning with grading criteria* and *Learning for challenge-driven education with global development goals*. During the year, the course *Doctoral Supervision* was analysed, which gave rise to proposals for developing it into two courses, one for the early stages of a supervisor's career and one for supervisors with more experience.

A qualifying programme for teachers was initially announced in 2021. The programme will be run in 2022 and support teachers' continued establishment and visibility as educational leaders. Participating teachers will have the opportunity to hone their skills, and both contribute to and drive the development of KTH's education and pedagogical culture.

### **Introduction**

At KTH, all new employees go through an onboarding process in order to convey to them the shared context in which they will be working, but also to show the circumstances that are specific to the role. The university-wide Welcoming Day highlights our vision, culture and values and provides good examples of research, education and support for the business. In 2021, 44 participants attended the Welcoming Day. The business-specific onboarding at KTH takes place either as systematically recurring onboarding sessions or individually for each new employee. The onboarding process was converted to a digital format in 2020, and continued to be given digitally or in some cases in a hybrid format in 2021.

### **Career support**

Various forms of career support activities are offered to employees at KTH to develop their expertise or assume new roles. Associate professors and professors have been given the opportunity to apply for funding for a limited period, referred to as a sabbatical period, to spend time at another university or external body outside the university in order to concentrate on education and research. In the spring of 2021, one woman and four men applied for and were granted centrally funded sabbatical periods.

Employment within the academic career path, Tenure Track, entails long-term commitment from KTH in the form of resources and personal development opportunities. The career development support clarifies what is required to obtain the requisite qualifications and experience to become an associate professor or professor, and offers opportunities for development within relevant areas. Skills support for active career planning for assistant professors is offered in the Partners in Learning (PIL) programme, with the aim of clarifying the requirements for further qualifications to become an associate professor and professor, and to develop the participants' awareness of academic leadership and KTH's values. In 2021, the programme had 15 participants, of whom twelve were men and three were women. The course *Leadership for Associate Professors* was suspended in 2021 due to the pandemic and an ongoing review of leadership training, see the section on *Management and Leadership*.

The course *Leadership step 2 - Lead Yourself and Others* was started in 2020 but was not completed until 2021 due to the pandemic. It had 14 participants, ten of whom were women and four were men.

Every year, KTH's managers are given the opportunity to participate in mentoring programmes. In collaboration with other higher education institutions in the Stockholm region and companies in Sweden, KTH provides two mentoring programmes that each run over a one-year period. There were 23 participants from KTH during the year, of whom 14 were women and nine were men. In addition, subject-specific training courses are provided in regulations, processes and practices that are required knowledge for managers and directors at KTH. Training in basic employment law for managers and HR personnel was conducted with 19 participants, of whom 15 were women and four were men. The course *Managing Labour Disputes through Mediation* was held with 17 participants, of whom eleven were women and six were men.

Since 2008, KTH has offered its employees life and career planning, partly to promote personal development and partly to support internal and external mobility. Life and career planning includes individual guidance and coaching and is funded by local joint transition funds. During the year, a total of 20 employees, of whom 15 were women and five were men, applied for and completed life and career planning.

## Management and leadership

The year 2021, like the previous year, was defined by COVID-19 with demands for continued remote leadership and extensive self-leadership for both managers and employees. Return to campus-based work at the start of the autumn semester once again placed demands on both managers' and employees' ability to adapt and their willingness to change in order to meet the needs of the business. Support materials were prepared for managers for a safe and secure return, and group development activities were provided to use when needed. In addition, a collection of frequently asked questions and answers was made available, especially for managers. The support was communicated via KTH's intranet.

With regard to leadership development, it has continued to be suspended for review and development within the scope of the Arena for Leadership and Pedagogy, ALP. ALP is tasked with managing and channelling the needs of skills development at an organisational level, ensuring continuity in operations and deciding on strategic initiatives and associated resources. During the year, meetings were held continuously in order to map KTH's range of skills development in leadership and pedagogy, and to make an inventory of needs.

Within KTH's Schools, various initiatives were taken to support managers and directors, including leadership training with a gender perspective, systematic work on leadership development through leadership forums and managers' forums, and managerial support in weekly newsletters and on the website.

## Collegiality

The pandemic and the recommendation to work from home, if possible, placed demands on KTH's employees in terms of flexibility, ability to adapt and change, and collaborative leadership. For many of KTH's employees, their home environment also became a work environment, which meant working in different conditions, compared to when everyone works on campus. Not all employees can perform their duties from home, but even among those who can work from home, the conditions are different in terms of, for example, housing situation, family circumstances, socio-economic circumstances and varying degrees of disability. This placed new demands on both managers and leadership as well as the employer's responsibility for occupational safety and health.

During the pandemic, KTH's employees have developed their digital skills. For teachers, among others, the challenges with the use of technology have been particularly considerable, especially in terms of teaching and examinations.

The change in 2021, with a full or partial return to campus-based work, also placed demands on the ability to adapt and change among employees and managers. There are different approaches among both employees and managers, and concerns about returning to campus-based work must be addressed. The fact that everyone is no longer on campus

at the same time means that employees have different access to the informal contacts and information exchanges that take place in association with both scheduled and spontaneous meetings. The technology for hybrid meetings is another challenge that the organisation has faced.

## Occupational safety and health

The spring semester of 2021 was characterized by the pandemic, and a substantial number of KTH's employees worked from home. To investigate how employees experienced the changed work situation, a so-called heart rate survey was conducted between February and April. The 500 participants registered their interest after emails were sent to a randomized sample of people with representation from all staff categories. Overall, the results showed that both the core and support activities experienced high levels of stress, while contactable managers and accessible support were factors that stood out as positive. Special efforts due to the pandemic which continued from the previous year included increased opportunities for one-on-one counselling at the occupational health centre for employees, and the opportunity to use a computer programme to encourage exercise at work during breaks.

To strengthen the ability of KTH's employees to manage stress, a digital programme was implemented during the year. Approximately 300 employees participated, and an evaluation of the programme will be carried out at the beginning of 2022.

Prior to the return to campus-based work at the start of the autumn semester, digital workplace meetings were held to discuss, among other things, how the period of working from home had gone, and whether there were requests for different forms of working in the future.

2021, just like the previous year, was characterized by digital solutions. This put additional pressure on the IT Department, which provided training and support. The digital solutions included digital and hybrid meetings. As a number of employees could sit in digital meetings the entire working day without much time for breaks, a recommendation was made regarding digital meetings.

In the work on systematic occupational safety and health, KTH works with recurring health monitoring, digital support materials and training. The Schools draw up annual occupational safety and health plans, where activities in the physical, organisational, and social work environment are documented and followed up. The business conducts safety and health inspections as before, but during the year the risk of infection was also taken into consideration.

In order to effectively find ways to investigate the digital work environment at KTH, a project on the digital work environment was initiated during the year as part of the work on systematic occupational safety and health. See the section on *Digitalisation*.

The work of implementing IA, a digital system for handling deviations within occupational safety and health, continued in 2021. The system was implemented at the CBH School in February, and was subsequently evaluated, adjusted and then implemented on a major scale throughout all of KTH in November.

## Staff structure

The average number of employees in 2021 increased by 162 to 5,197 (2,197 women and 3,000 men), compared to 5,035 in 2020 and 5,044 in 2019. In terms of FTEs, there has been an increase of 156 to 4,051 (1,648 women and 2,403 men) in 2021 compared to 3,895 FTEs in 2020 and 3,760 in 2019. Measured in FTEs, the proportion of women increased by one percentage point to 41 percent compared to 2020.

## Age structure

The average age of employees at KTH is 39 years (41 for women and 39 for men). The average age of teachers and researchers is 41 (40 for women and 41 for men). The average age of doctoral students with employment is 30 (31 for women and 30 for men). The average age of technical and administrative staff is 46 (46 for women and 45 for men).

## Teaching staff and researchers

Researchers and research engineers increased by 24 FTEs to 840 (the number of women increased by nine to 221 and the number of men increased by 15 to 619). This professional group is made up of professors, visiting professors, adjunct professors, associate professors, assistant professors, and lecturers. The proportion of women teachers is still 26 percent, as was the case in 2020.

### Professors, visiting professors and adjunct professors

In 2021, the number of FTEs within the professorial group (professors, visiting professors and adjunct professors) increased by 17 FTEs to 335 (the number of women increased by five to 65 and the number of men increased by twelve to 270).

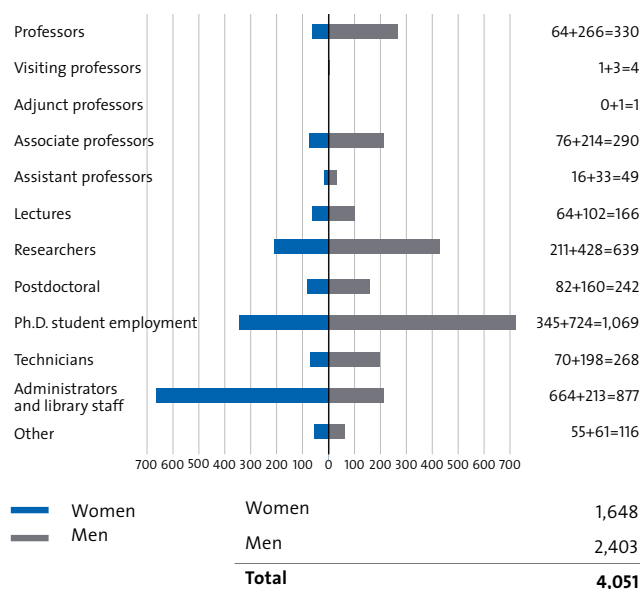
The number of professors increased by 17 to 330 (the number of women increased by six to 64 and the number of men increased by eleven to 266). The proportion of women is still 19 percent, as was the case in 2020. The number of visiting professors decreased by one FTE to four (the number of women decreased to one and the number of men is still three).

In 2021, 22 new professors and visiting professors were hired. Of these, the proportion of women was 36 percent. In 2020, 2019 and 2018, the proportion of new women employees within this category was 14, 25 and 36 percent, respectively.

The number of adjunct professors increased by one, and was 50 at the end of the year (the number of women decreased by one to six and the number of men increased by two to 44). All adjunct professors are employed by KTH, although their primary activities are based outside KTH.

Figure 16

### Staff 2021



Source: HR+

Their employment covers a minimum of 20 percent and a maximum of 30 percent of full-time working hours, and most of the adjunct professors do not receive a salary from KTH. The number of salaried FTEs rounded up amounts to one FTE in 2021.

## Associate professors and lecturers

The number of associate professors increased by three FTEs to 290 compared to 287 FTEs in 2020 and 2019 (the number of women increased by one to 76 and the number of men increased by two to 214). The proportion of women is still 26 percent, as was the case in the previous year. During the year, 24 new associate professors were hired (12 women and 16 men). The proportion of women among the new employees decreased by 15 percentage points to 33 percent compared to 2020.

The number of lecturers increased by six FTEs to 166 compared to 2020. The proportion of women in this category is still 39 percent, as was the case in 2020.

## Career-development positions: assistant professor and postdoc

At KTH, assistant professors and postdocs make up the category career-development positions. In 2021, the number of career development positions increased by 22 FTEs to 291 (the number of women increased by 13 and the number of men increased by nine). The proportion of women increased by two percentage points to 34 percent compared to 2020.

During the year, 19 new assistant professors were hired, (seven women and twelve men). The proportion of women

stands at 37 percent, which is a decrease of ten percentage points compared to 2020. In 2020, the proportion increased dramatically by 17 percentage points to compared to 2019. The number of assistant professors counted in FTEs was 49 (16 women and 33 men) and the number of all teaching and research staff was 1,721 (514 women and 1,207 men). The proportion of assistant professors among all research and teaching staff was thus just under three percent. See *Figure 16*.

The number of postdocs increased by 24 FTEs to 242 (the number of women increased by twelve to 82 and the number of men increased by twelve to 160) compared to the previous year. The proportion of women increased by two percentage points to 34 percent compared to 2020.

### Researchers and research engineers

Researchers and research engineers decreased by four FTEs to 639 (the number of women increased by seven to 211 and the number of men decreased by eleven to 428) compared to the previous year. The proportion of women increased by one percentage point to 33 percent compared to 2020.

### Doctoral students with employment

Doctoral students with employment increased by 66 FTEs to 1,069 during 2021 (the number of women increased by 25 to 345 and the number of men increased by 41 to 724) compared to 2020. For doctoral students with employment, the proportion of women is 32 percent, which is the same as 2020.

### Technical and administrative personnel

Technical and administrative personnel, including library staff, increased by 17 FTEs to 1,145 in 2021, compared to 1,128 FTEs in 2020 and 1,073 FTEs in 2019 (the number of women increased by seven to 734 and the number of men increased by ten to 411). The proportion of women is still 64 percent, as was the case in 2020 and 2019.

### Docents

In 2021, KTH accepted 28 docents, of whom twelve were women and 16 were men, compared with the previous year when 30 docents were accepted, of whom twelve were women and 18 men. The proportion of women accepted was thus 43 percent in 2021 and 40 percent the previous year. Being accepted as a docent is part of an academic career in which teaching staff and researchers, by acting as primary academic supervisors for doctoral students, can build up their own research groups. An individual who has been accepted as a docent is expected to be the primary academic supervisor for doctoral students, to act as an opponent and participate in grading committees during the public defence of doctoral theses within their area of expertise, to contribute to teaching within their field at second-cycle and third-cycle level, and to conduct scientific activities at an international level.

# Premises

At the end of 2021, KTH had approximately 292,000 m<sup>2</sup> of premises at their disposal, excluding accommodation for students and visiting researchers. Just over 41,000 m<sup>2</sup> are sublet to, for example, the Swedish Red Cross University, Stockholm University and Karolinska Institutet. KTH's premises also contain empty and available premises that are not leased for any specific activity.

In December 2021, that category was 4,400 m<sup>2</sup>, which is approximately 1.5 percent of the total rental stock, a decrease compared with previous years. The available premises are primarily office premises, individual labs and storage rooms.

## Accommodation for students and visiting researchers

In 2021, KTH Accommodation was able to provide accommodation for 1,600 exchange students and international master's students. The rental stock consists of 594 studio apartments, 289 rooms in halls of residence and 404 places in shared apartments, a total of 1,106 rooms and apartments with a total of 1,287 places. The occupancy rate was approximately 87 percent throughout the year. During the autumn semester, occupancy was 99 percent and during the spring semester 72 percent. In the summer when the accommodation is empty, maintenance and cleaning are performed. The occupancy rate during the summer of 2021 was 42 percent.

KTH Relocation provides accommodation for foreign doctoral students and visiting researchers. KTH had total holdings of 280 residences intended for the target group spread across the Greater Stockholm area in 2021. The occupancy rate increased after the summer due to the easing of restrictions and over the year it was just over 90 percent. In 2021, more than 600 incoming visiting researchers and new foreign visiting researchers and doctoral students obtained accommodation through KTH. After the summer, it was not possible to meet the demand and people who were only staying for a couple of months were turned down. It was deemed necessary to prioritize doctoral students and postdocs, as well as those who, for other reasons, came to stay for a longer period at KTH. KTH has assessed that the need for housing for foreign doctoral students and visiting researchers is covered for the next few years and no increase in the stock is necessary, but that demand will remain high in future years.

Revenue from fees for renting out accommodation are forecast to increase by just over SEK 4 million in 2022. Revenue from grants, which is reported internally within the full-cost model, is estimated to be approximately SEK 13 million, which is a reduction of SEK 2 million compared to the outcome for 2021.

# Finance – earnings, resource utilization and financing

## Financial result and change in capital

The financial result for 2021 amounted to SEK 171 million compared to the result of SEK 11 million in 2020. Revenue for 2021 increased by almost seven percent or SEK 335 million compared to 2020. Costs increased by just over three percent, which corresponds to SEK 175 million. Education at the first-cycle and second-cycle levels had a positive result of SEK 67 (-36) million. In research and education at the third-cycle level, the result was SEK 103 (47) million.

In the budget, the estimated result was SEK -36.5 million

The result can be attributed in part to increased revenue, mainly due to increased grants compared to 2020. The costs were lower than estimated in the budget, which can partly be explained by the pandemic.

KTH's commitment to SciLifeLab affects KTH's finances in several ways. For example, operations conducted within SciLifeLab generate revenues in the form of grants and fees of SEK 285 million, which corresponds to just under five percent of KTH's total revenue. Further information about the operations and funding within SciLifeLab can be found under the section on *Research* and in the annual report that KTH submits to the government in association with the annual financial statements. Furthermore, the principalship affects KTH's financial results and government capital through the research grants KTH receives that are largely transferred to other participating higher education institutions. In 2021, KTH received SEK 465 million within the research grant for SciLifeLab of which SEK 124 million was allocated to KTH's operations. The public funding is reconciled in its entirety in association with KTH receiving the funds and is not allocated in the accounts. This means that the previous years' funds for infrastructure construction at SciLifeLab and funds in SciLifeLab for research in the early stages of drug development, which have not been used in their entirety, resulted in a surplus that is included in KTH's government capital. In 2021, the funds within the grant for SciLifeLab have been distributed in their entirety, and SEK two million of previous funds have also been utilised, which

Figure 17

Surplus/deficit

(msek)	2021	2020
Revenues	5,408	5,074
Costs	5,238	5,063
<b>Profit/loss</b>	<b>171</b>	<b>11</b>
Profit/loss subsidiaries	0	0
Revenues for transfers	750	609
Grant issued (costs for transfers)	-750	-609
<b>Profit/loss</b>	<b>171</b>	<b>11</b>

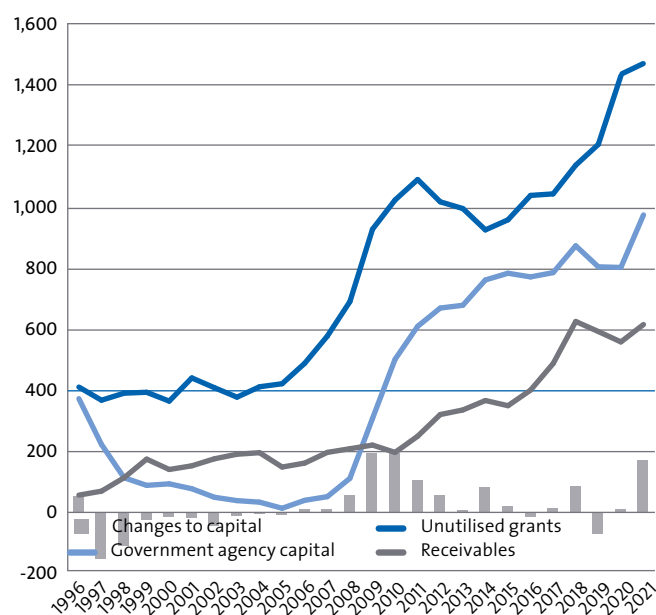
Source: Financial system

is having a negative impact on the result within research and education at the third-cycle level by the corresponding amount. In 2020, the result was negatively impacted by SEK 16 million for the same reason.

Turnover increased by just over eight percent compared to 2020, amounting to SEK 6,158 (5,683) million, measured as revenue from operations, including funds for financing of transfers. Over the past ten years, KTH's turnover increased by 46 percent, with revenue from operations increasing by 37 (mnkr)

Figure 18

Earnings and Capital Trend



Source: Ekonomisystem

Figure 19

Capital development

(msek)	Utgående balans 2021	Resultat 2021	Resultat 2020	Ingående balans 2020
First and second level studies	60	69	-36	27
Purchased courses	6	0	0	12
Commissioned courses	0	-1	0	-5
Research and doctoral studies	880	97	45	749
Commissioned research	23	7	2	14
<b>Total</b>	<b>968</b>	<b>171</b>	<b>11</b>	<b>798</b>

Source: Financial system

percent and transfers by more than 180 percent.

The fact that the transfers have increased by so much is primarily due to increased grants for the strategic research areas and the university's role as principal of SciLifeLab.

At the end of 2021, government capital amounted to 968 (796) million, which corresponds to 16 (14) percent of turnover as defined above and 18 percent (16) percent of operating income. KTH made several decisions on strategic investments financed with government capital. In 2019, a strategic investment was initiated in, among other things, career development positions such as assistant professors and infrastructure upgrades. The previous investment that started in 2016 also continued in 2021. In 2021, these investments affected earnings by SEK -52 (-58) million.

## Revenue

Operating revenue increased by almost seven percent compared to 2020 and amounted to SEK 5,408 million, SEK 335 million more than in 2020.

### First-cycle and second-cycle education

Compared to 2020, revenue increased by SEK 151 million and constitutes 32 (31) percent of total revenue. Revenue in 2021 amounted to SEK 1,741 (1,589) million. The explanation for the large increase is that revenue from grants at the first-cycle and second-cycle levels increased by 15 percent and amounted to SEK 1,395 (1,215) million.

The increased grants refer to the continuation of the investments that the government decided on in 2020 due to COVID-19, regarding Technical Preparatory Year programmes, lifelong learning and educational programmes for in-demand professions, etc. In addition, it includes the price and salary recalculation of the grants. During the year, KTH produced full-time equivalent students and annual performance equivalent students that form the basis for reconciling against the funding with a value just below the ceiling amount. Closing overproduction from 2020 was fully utilized and KTH has reconciled SEK 199 million below the ceiling amount and thus reported a saving of SEK 91 million in public funding.

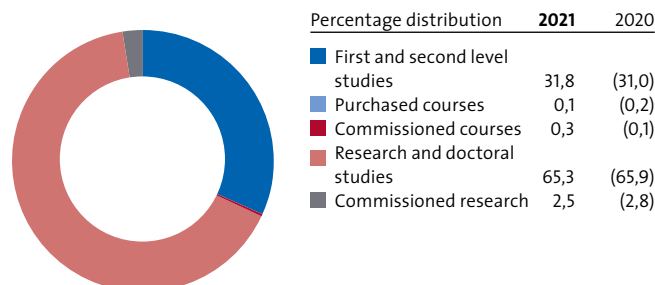
In 2020, KTH received a grant from Kammarkollegiet for the investments as a consequence of the pandemic. Parts of the grants could also be used in 2021 and amounted to SEK 27 (30) million in grant income within education.

Revenue from fees and other income in education decreased by six percent, SEK 17 million, and amounted to SEK 268 million in 2021. The decrease can mainly be explained by lower revenue in respect of fee-paying students, where revenue in 2021 amounted to SEK 139 (155) million. Tuition fees account for about eight (ten) percent of the total revenue in education. Revenue in commissioned education recovered after the significant decline in 2020, and is now close to the 2019 level.

Figure 20

Field of activity 2021 (2020)

Total msk 5,408 (5,074)

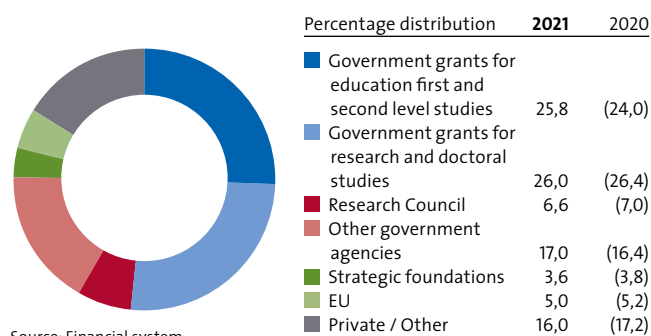


Source: Financial system

Figure 21

Sources of income 2021 (2020)

Total msk 5,408 (5,074)



Source: Financial system

### Research and education at the third-cycle level

Revenue accounts for 68 percent of total revenue and amounted to SEK 3,668 (3,484) million, which is an increase of just over five percent compared to 2020.

Revenue from the grant for research and education at the third-cycle level increased by SEK 65 million compared to 2020, which is due to increased grants, as well as price and salary recalculation. Part of the research grant has been used to finance transfers within SciLifeLab, among others, and this part of the grant is thus reported as transfers and not as business revenue.

Revenue from fees and other income increased by SEK 21 million, which is just over five percent. The change mainly refers to increased revenue from user fees within SciLifeLab's operations.

Revenue from grants increased by SEK 94 million compared to 2020. Part of the increase, SEK 28 million, pertains to a contribution from the government via Kammarkollegiet in the form of a temporary financial injection to reduce the effects of the pandemic for researchers in the early stages of their careers. The rest of the increase is due to a large number of research projects. The revenue correlates with



reported costs as grant revenue normally arises to match the reported costs for the year within a research project.

The revenue from KTH's three largest providers of funding within research and education at third-cycle level, in addition to direct government grants, have changed somewhat compared with 2020. As before, the Swedish Research Council is KTH's largest external provider of funding, with grants totalling SEK 288 (290) million. The Wallenberg Foundations are now the second largest external financier with grants totalling SEK 254 (215) million. Revenue from the EU amount to SEK 243 (237) million, making it the third-largest provider of funding. More information about KTH's financiers can be found in the section on *Research*.

## Costs

Operating costs increased and amounted to SEK 5,238 (5,063) million, which is an increase of just over three percent compared to 2020.

Payroll expenses increased by approximately SEK 153 million, which corresponds to an increase of almost five percent compared to 2020. This can largely be explained by the fact that the number of FTEs increased by 156 compared to 2020, of which doctoral students account for 42 percent of the increase, followed by postdocs with 15 percent. Other contributing factors for the cost increase are the annual salary review and increased costs for social insurance contributions. Further information about KTH's personnel structure can be found in the section on *Staff*.

The cost of premises, in accordance with the income statement, increased by one percent compared to the previous year, from SEK 963 million to SEK 973 million. The total costs have been kept down by the fact that certain premises have been vacated, which has also entailed reduced income from subletting as some of these premises were previously sublet.

Other operating costs increased by almost three percent but are still at a lower level compared to 2019. Among other things, costs for research assignments and costs from capital losses from the sale of fixed assets have increased. Travel costs have continued to decrease due to the pandemic, and amounted to SEK 9 million in 2021, compared to SEK 17 million in 2020.

## First-cycle and second-cycle education

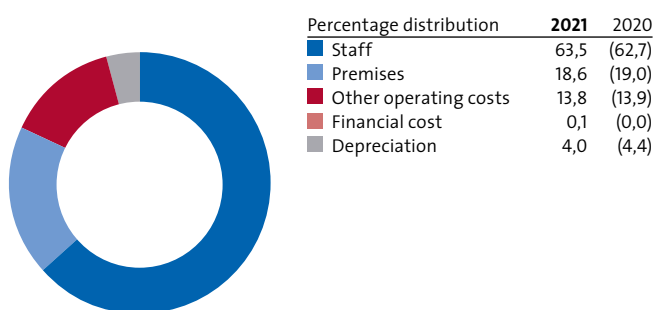
The costs for education at the first and second-cycle levels constitute approximately 32 percent of the total operating costs and amounted to SEK 1,673 million in 2021. Total costs increased by three percent, SEK 48 million, compared to 2020. Payroll expenses increased by three percent, SEK 26 million, and other operating costs increased by almost 11 percent, SEK 27 million compared to 2020. The increase in other operating costs is partly due to increased costs for repair and maintenance.

## Research and education at third-cycle level

Research and education at the third-cycle level amounted to SEK 3,564 million and constitutes 68 percent of the total operating costs. The total costs increased by almost four percent compared to 2020. Payroll expenses increased by six percent and other operating costs decreased by just under two percent. A contributing factor to the increased payroll expenses is that the number of doctoral students has increased.

Figure 22

Costs 2021 (2020)  
Total msek 5,238 (5,063)



Source: Financial system

Figure 23

## Outcome for education at first and second cycle

(msek)	2021	2020	2019
<b>Operating revenues</b>			
Government grants	1,395	1,215	1,180
Revenues from tuition fees and other charges	268	285	304
Revenues from grants	77	89	72
Financial income	0	0	1
<b>Total operating revenues</b>	<b>1,741</b>	<b>1,589</b>	<b>1,557</b>
<b>Operating costs</b>			
Staff costs	970	944	876
Costs for premises	367	371	397
Other operational costs	271	244	265
Financial costs	0	0	1
Depreciation	65	66	61
<b>Total operating costs</b>	<b>1,673</b>	<b>1,626</b>	<b>1,600</b>
<b>Total operating outcome</b>	<b>67</b>	<b>-36</b>	<b>-43</b>

Source: Financial system

Figure 24

## Outcome for research and education at third cycle

(msek)	2021	2020	2019
<b>Operating revenues</b>			
Government grants	1,406	1,341	1,229
Revenues from tuition fees and other charges	411	390	366
Revenues from grants	1,847	1,752	1,807
Financial income	4	1	2
<b>Total operating revenues</b>	<b>3,668</b>	<b>3,484</b>	<b>3,405</b>
<b>Operating costs</b>			
Staff costs	2,356	2,229	2,151
Costs for premises	606	592	547
Other operational costs	454	461	581
Financial costs	3	1	3
Depreciation	146	155	150
<b>Total operating costs</b>	<b>3,564</b>	<b>3,437</b>	<b>3,433</b>
<b>Total operating outcome</b>	<b>103</b>	<b>47</b>	<b>-28</b>

Source: Financial system

# Management of foundations

KTH currently manages 98 foundations governed by private law through affiliated management.

The foundations were formed through various donations to KTH. The oldest foundations have their origins in two gifts from 1874 that were donated to KTH's predecessor, Kongliga Teknologiska Institutet (Royal Technical College). The purpose of the Hultqvist Foundation is to award scholarships to students from poor backgrounds or less well-off students, as well as diligent students at the university, who, through hard work and good behaviour, have earned a scholarship. The purpose of the Samuel Owen's Scholarship Foundation is also to award scholarships to students at KTH, and both foundations still award scholarships to students at KTH.

In 2021, the following foundations distributed the entire foundation capital to their respective purposes and were wound up: The Borgarståndet Riksdagen 1866 Foundation, the Georg Elfving Foundation and the L. I. Wahlman's Scholarship Fund.

Many activities have been cancelled or carried out digitally as a consequence of the pandemic, which has affected the utilization rate of the scholarships awarded.

## Purpose-driven management

The purpose of each foundation is stated in each foundation's charter. In 2021, foundations affiliated with KTH distributed SEK 16 (14) million.

A large proportion of the KTH-affiliated foundations, 43 in total, provide scholarships to first-cycle and second-cycle level students. Just over SEK seven million was awarded through 310 scholarships, of which just over SEK three million from the largest of the foundations managed by KTH, the Henrik Göransson Sandviken Scholarship Foundation Fund. The Foundation has SEK 250 million in capital.

Travel grants to teachers, researchers and doctoral students are awarded from 30 foundations. From these, in 2021, grants of almost SEK 3 million were distributed through 117 scholarships.

The other 25 foundations contribute to the research activities at KTH, among other things. During the year, a decision was taken to distribute grants of just over SEK six million, divided into 62 scholarships for such activities.

The second-largest foundation managed by KTH is the KTH Great Prize Foundation from a donation made in 1944. The donor stipulated that the prize should go to a Swedish citizen who, for example through groundbreaking discoveries, ingenious applications or artistic endeavours, has been of great significance to Sweden. The prize this year amounted to SEK 1.2 million and will be awarded in conjunction with KTH's ceremony for the inauguration of new professors on March 31, 2022. The recipient of the prize in

2021 was Johan Rockström. The University Board's motivation was as follows: "With his solid knowledge and boundless commitment, climate researcher Johan Rockström is showing the way to a possible and sustainable future, both scientifically and in everyday life. Through his scientific achievement, he has built a robust framework for social and economic development on this planet. He has succeeded with the feat of both instilling hope and urging action – now. Johan Rockström is a very worthy recipient of the KTH Great Prize."

KTH receives compensation from the foundations for the costs that arise in connection with their management. Remuneration in 2021 amounted to SEK 2.6 million.

## Asset management

The capital of the affiliated foundations is managed in a discretionary fashion by two external asset managers. This means that the asset managers have the right to make reallocations in the portfolio, within the framework specified in the University Board's guidelines for capital allocation for KTH's affiliated foundations.

The total amount of the assets belonging to the foundations amounted to SEK 1,135 (940) million at year-end.

Figure 25

Size and number of foundations  
Capital, MSEK at end of December 2021

	Number	Capital, MSEK
Foundations, 15-250 MSEK	18	810
Foundations, 5-15 MSEK	24	208
Foundations, 1-5 MSEK	49	114
Foundations, up to 1 MSEK	5	3
<b>Total</b>	<b>96</b>	<b>1,135</b>

Source: Bank statements of the foundations

# Financial Statement

	2021	2020	2019	2018	2017
<b>Operating revenues</b>					
Government grants	2,801,712	2,556,455	2,409,564	2,367,083	2,264,457
Revenues from tuition fees and other charges	678,842	674,633	670,376	645,225	581,022
Revenues from grants	1,923,698	1,840,929	1,878,724	1,769,529	1,698,050
Financial income	4,075	1,738	2,908	4,001	5,161
<b>Total operating revenues</b>	<b>5,408,328</b>	<b>5,073,756</b>	<b>4,961,571</b>	<b>4,785,838</b>	<b>4,548,690</b>
<b>Operating costs</b>					
Staff costs	3,325,956	3,173,160	3,027,200	2,839,754	2,727,105
Costs for premises	972,857	963,441	944,574	880,878	836,017
Other operational costs	724,670	704,745	845,588	772,464	745,230
Financial costs	2,963	834	4,754	7,623	7,566
Depreciation	211,212	220,945	210,442	206,842	219,432
<b>Total operating costs</b>	<b>5,237,658</b>	<b>5,063,126</b>	<b>5,032,557</b>	<b>4,707,562</b>	<b>4,535,350</b>
<b>Total operating outcome</b>	<b>170,670</b>	<b>10,630</b>	<b>-70,986</b>	<b>78,276</b>	<b>13,340</b>
<b>Outcome from shares of subsidiary companies and other interests</b>	<b>0</b>	<b>0</b>	<b>2,072</b>	<b>9,491</b>	<b>229</b>
<b>Transfers</b>					
Funds allocated from government budget for financing of grants	427,799	372,472	353,460	339,865	317,409
Funds allocated from government agencies for financing of grants	169,998	153,025	158,431	150,459	143,103
Other funds received for financing of grants	152,036	83,370	92,664	89,621	66,412
Grants made	-749,833	-608,867	-604,555	-579,945	-526,925
<b>Outcome of transfers</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Changes to capital for year</b>	<b>170,670</b>	<b>10,630</b>	<b>-68,914</b>	<b>87,767</b>	<b>13,569</b>

## Financial Statement per operational area

	Total	Education at first and second cycle		Research and education at third cycle		
		First and second level studies	Purchased education	Commissioned education	Research and doctoral studies	Commissioned research
<b>Operating revenues</b>						
Government grants	2,801,712	1,395,364	0	0	1,406,349	0
Revenues from tuition fees and other charges	678,842	245,233	8,108	14,747	272,975	137,779
Revenues from grants	1,923,698	77,137	0	0	1,846,561	0
Financial income	4,075	156	0	1	3,869	49
<b>Total operating revenues</b>	<b>5,408,328</b>	<b>1,717,890</b>	<b>8,108</b>	<b>14,749</b>	<b>3,529,754</b>	<b>137,828</b>
<b>Operating costs</b>						
Staff costs	3,325,956	961,386	2,516	6,312	2,309,744	45,998
Costs for premises	972,857	365,890	382	940	595,515	10,130
Other operational costs	724,670	256,858	5,514	8,435	381,732	72,131
Financial costs	2,963	140	0	18	2,691	114
Depreciation	211,212	64,957	30	9	143,293	2,923
<b>Total operating costs</b>	<b>5,237,658</b>	<b>1,649,231</b>	<b>8,443</b>	<b>15,715</b>	<b>3,432,973</b>	<b>131,296</b>
<b>Total operating outcome</b>	<b>170,670</b>	<b>68,659</b>	<b>-335</b>	<b>-966</b>	<b>96,780</b>	<b>6,532</b>
<b>Outcome from shares of subsidiary companies and other interests</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Transfers</b>						
Funds allocated from government budget for financing of grants	427,799	130	0	0	427,668	0
Funds allocated from government agencies for financing of grants	169,998	24,112	0	0	145,887	0
Other funds received for financing of grants	152,036	1,700	0	0	150,336	0
Grants made	-749,833	-25,942	0	0	-723,892	0
<b>Outcome of transfers</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Changes to capital for year</b>	<b>170,670</b>	<b>68,659</b>	<b>-335</b>	<b>-966</b>	<b>96,780</b>	<b>6,532</b>

# Balance Sheet

	2021-12-31	2020-12-31
<b>ASSETS</b>		
<b>I. Intangible fixed assets</b>	<b>111</b>	<b>0</b>
Capitalised expenditure for development	111	0
Intellectual rights and other intangible assets	0	0
<b>II. Tangible fixed assets</b>	<b>754,432</b>	<b>762,998</b>
Improvements to non-owned real estate	300,146	338,016
Machines, inventory items, installation etc.	428,290	411,794
Construction in progress	23,800	13,188
Advance payments for tangible fixed assets	2,196	0
<b>III. Financial fixed assets</b>	<b>28,014</b>	<b>27,014</b>
Interests in wholly and partially owned companies	27,925	26,925
Other investments held as fixed assets	90	90
<b>VI. Receivables</b>	<b>109,991</b>	<b>137,251</b>
Receivables – customers	25,225	28,346
Receivables – other government agencies	84,467	108,319
Other receivables	299	586
<b>VII. Cut of items</b>	<b>936,744</b>	<b>840,102</b>
Prepaid expenses	276,907	267,387
Accrued grant revenues	609,418	552,277
Other accrued revenues	50,420	20,438
<b>VIII. Settlement with Government</b>	<b>-17</b>	<b>0</b>
Settlement with Government	-17	0
<b>X. Cash and cash equivalents</b>	<b>1,947,091</b>	<b>1,627,336</b>
Balance and interest-bearing account at Swedish National Debt Office	1,885,041	1,512,682
Other credit balances at Swedish National Debt Office	62,050	0
Cash and cash equivalents	0	114,653
<b>TOTAL ASSETS</b>	<b>3,776,367</b>	<b>3,394,700</b>
<b>CAPITAL AND LIABILITIES</b>		
<b>I. Agency capital</b>	<b>967,993</b>	<b>796,297</b>
Government Capital	29,255	28,230
Changes to capital brought forward	768,067	757,437
Changes to capital according to Financial Statement	170,670	10,630
<b>III. Provisions</b>	<b>44,551</b>	<b>43,684</b>
Provisions for pensions and similar commitments	9,445	10,541
Other provisions	35,106	33,143
<b>IV. Liabilities etc.</b>	<b>1,177,567</b>	<b>1,010,243</b>
Loans from Swedish National Debt Office	610,034	649,349
Accounts payable - other government agencies	76,957	73,629
Accounts payable - suppliers	294,981	60,196
Other accounts payable	196,114	227,225
Deposits	-519	-155
<b>V. Cut-off items</b>	<b>1,586,257</b>	<b>1,544,476</b>
Accrued expenses	102,426	104,683
Unutilised grants	1,468,862	1,424,447
Other prepaid revenues	14,969	15,345
<b>TOTAL CAPITAL AND LIABILITIES</b>	<b>3,776,367</b>	<b>3,394,700</b>
<b>CONTINGENT LIABILITIES</b>		
Government guarantees for loan and credits	none	none
Other contingents liabilities	13,300	none





