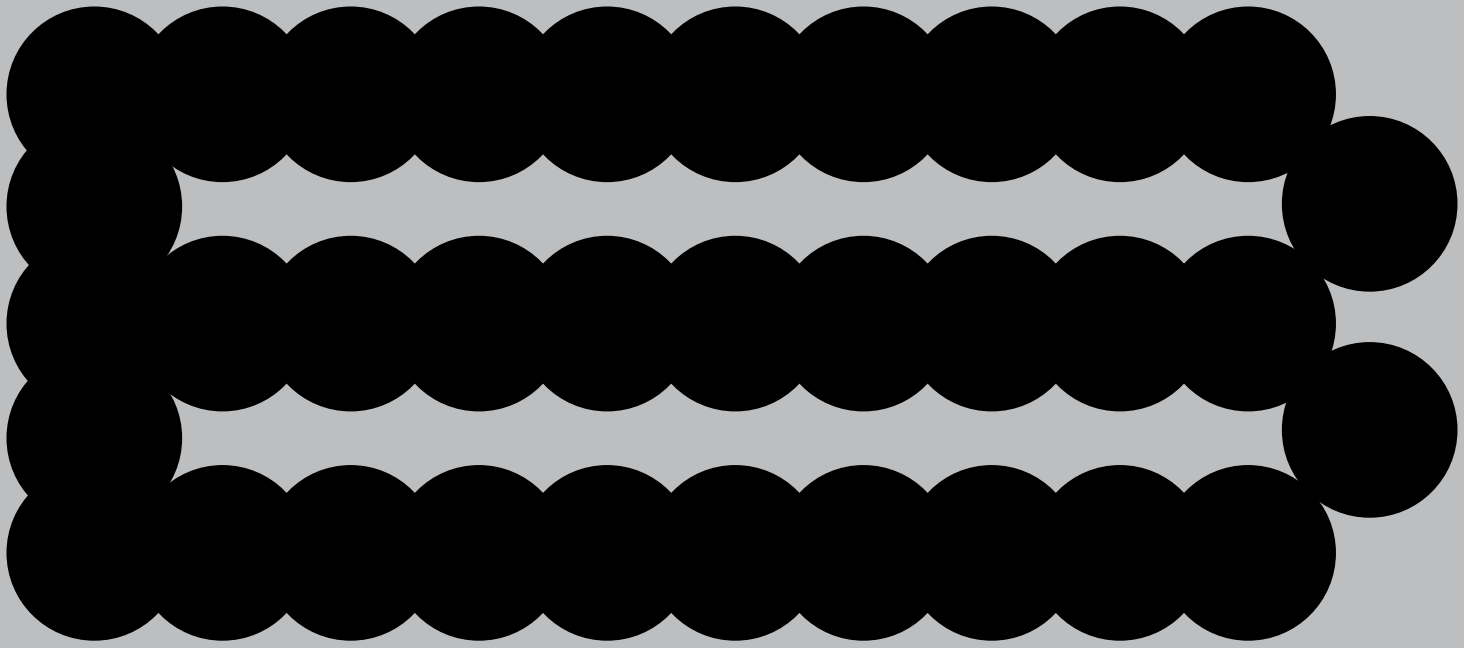
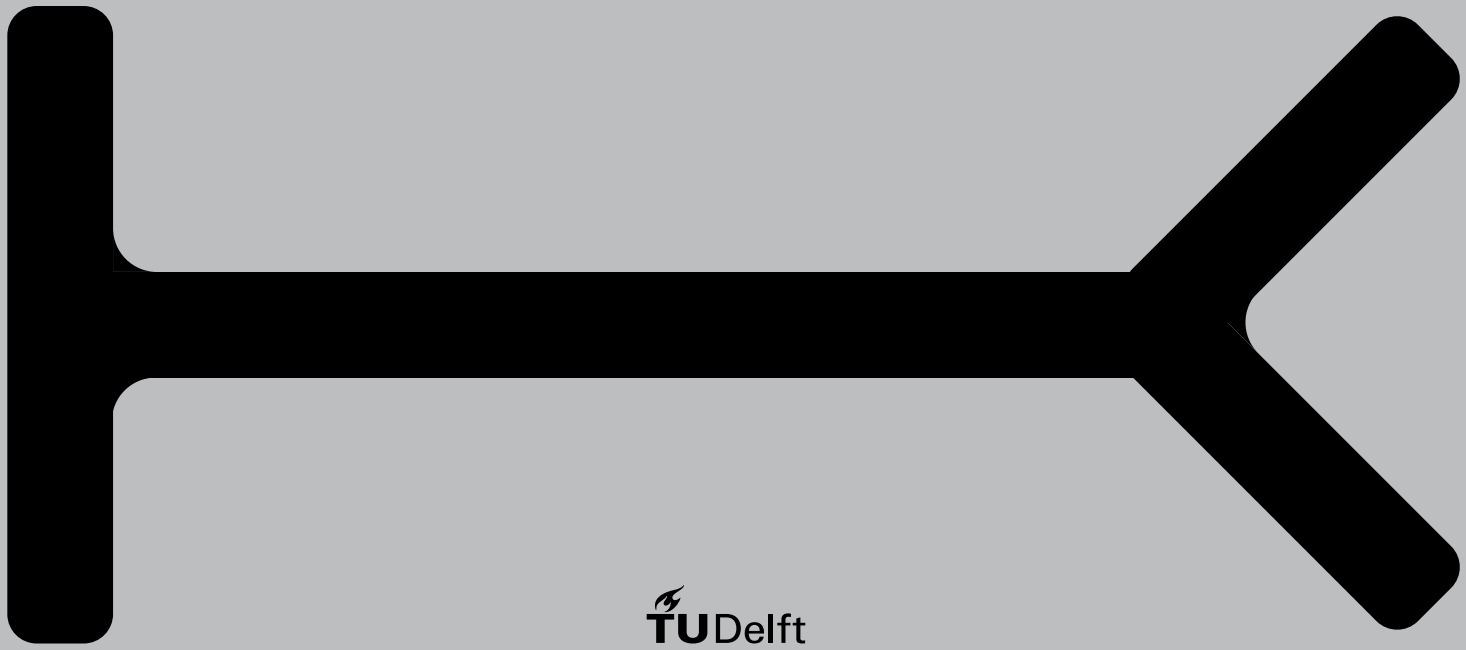


BOUWKUNDE 2021-2025

MULTI ANNUAL PLAN



TU Delft

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PREFACE BY THE DEAN

Worldwide, the Faculty of Architecture and the Built Environment of the Delft University of Technology has a great reputation as a leading educational and research institute in the fields of architecture, urban planning, landscape design, structural engineering and management of the built environment. This reputation is the result of the continuous efforts and dedication of all staff and students who together give content, colour and energy to the faculty.

It is our common ambition to maintain and improve this reputation. Naturally, this demands that we always look at our work with an open mind and continue to make plans for the future. Our position can only be maintained through critical reflection, change and innovation.

All sections of the faculty, the student representative organs, the four departments, the services and the management team were asked to help think about the perspective for our research and education activities in the coming years. The results were compiled in this long term strategic plan for Architecture and the Built Environment. It concerns a vision in broad terms, a guideline for the plans and initiatives that are currently being developed or will emerge in the foreseeable future.

The future is unpredictable, as the past year has clearly shown. But what also became apparent was the resilience and resourcefulness of our faculty community. With the same commitment, we can continue to build our great faculty in the years to come and contribute to the major challenges that lie ahead. This document aims to provide a good and hopefully inspiring start.

Dick van Gameren, dean
May 2021

INTRODUCTION

Throughout the world, we are facing unprecedented urban challenges, which will only increase in the decades to come. While in the mid-twentieth century about 10% of the world's population lived in an urban environment, today that figure has risen to 50% and is expected to rise to 75% by 2050. Due to this development, all major social themes are brought together in the faculty's research programme and curriculum. The challenge not only involves long-term goals, it must also be addressed in the here and now, where interaction with real-life situations plays an essential role.

Some three thousand students and hundreds of staff from 42 countries study, research and teach at the Faculty of Architecture and the Built Environment in a dynamic, unique and internationally oriented environment. The faculty's scientists and students are creative and unconventional thinkers who effortlessly combine academic skills with practical knowledge.

In its field, the Faculty of Architecture and the Built Environment wants to offer education and conduct research at an internationally recognised excellent level. We train the socially aware structural engineers of the future: they develop new knowledge that allows them to come up with innovative design-centred solutions for the major spatial planning issues of our time. Quality of life in buildings, cities and regions is the starting point.

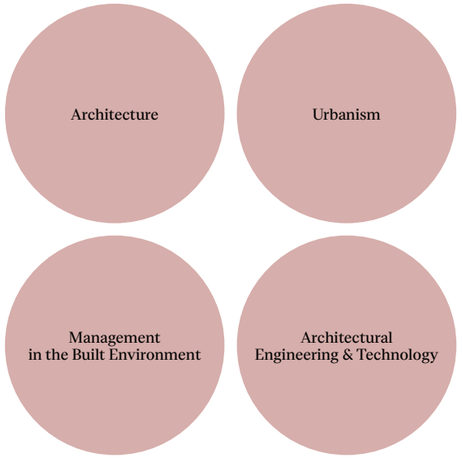
The scope of the field of Architecture and the Built Environment and the way in which the faculty gives expression in its education and research to the interweaving of design, construction and management that is typical for that field, are the essential characteristics of the Faculty of Architecture and the Built Environment. Education and research are also closely intertwined.

The faculty explicitly opts for the continued development of its internationally unique broad bachelor's programme, as the basis for the five graduation tracks within one integrated Architecture, Urbanism & Building Sciences master's programme, or for a specialisation via the Geomatics programme, the joint degree Metropolitan Analysis,

Design and Engineering (MADE) master's programme in cooperation with Wageningen University & Research or, at a later stage, the postmaster's programme of The Berlage.

The key to sustainable innovation within the faculty is cooperation. This cooperation takes shape among the faculty's disciplines, with other TU Delft faculties, in close cooperation with a large number of strategically chosen partners at home and abroad, and last but not least with representatives from the professional practice.

THE SCIENTIFIC DEPARTMENTS



The Faculty of Architecture and the Built Environment is organised into four academic departments with an average of 100 FTE staff: Architecture, Urbanism, Management in the Built Environment, and Architectural Engineering and Technology.

ARCHITECTURE

The department of Architecture focuses on the 'architectural project': the junction where a complex combination of cultural, social, functional, economic and ecological factors is translated into a concrete spatial proposal. In both research and education, the focus is on the combination of thinking and creating. After all, the architect of the future is not only a designer, but above all a translator and connector. In the coming years, the focus will be on what it takes to become the architect of the future.

The department considers the 'architectural project' to be the cornerstone of architectural practice and reflection. It therefore cherishes the strong connection the department has with architectural practice. Through a large number of practitioners in this group, relationships with stakeholders in contemporary architectural practice (and the building industry) are continuously activated. As a result, education is structurally enriched by a largely flexible shell of so-called practical teachers. They contribute their practical experience with minor appointments (maximum 0.2 FTE). These teachers have their own architectural firm or work at a renowned firm that has a proven understanding of the design task and design practice of the future. Moreover, after the academic reinforcement that has recently taken place, at least two (young) design practice professors will be appointed in the next few years to ensure the continuity of this relationship with the architectural practice. In research, the relationship with design practice is strengthened, among other things, by

expanding design-centred PhD research. After a recent small-scale start, this will be developed further in the coming years.

In our view, the architect is a connector of data and knowledge, and designing is an integrating activity. Architects do not need to have extensive or detailed knowledge of all factors, but must be able to understand them broadly and put themselves in the shoes of stakeholders in order to be able to bring the parties that contribute this knowledge together. This requires a design process in which the various disciplines are linked in time and interests can be assessed integrally. The use of big data, for example, gives the aforementioned cultural, social, functional, economic and ecological factors a great boost, but it can play an even greater role in the department's education and research. In addition, more priority will be given to cooperation with the other faculty departments, in order to strengthen the above.

Digital shift

In addition to the aforementioned fundamental research, the 'digital shift' is one of the spearheads of both research and education. New technology and developments in the digital domain influence the challenge that architects face. Society is changing rapidly and so is the built environment. The processes by which these changes take shape change accordingly, and the same can be said of the roles of the stakeholders and the resources that are available to the architect. The built environment is becoming interactive and the consequences of that are finding their way into education and research.

Designing in and with artificial intelligence (AI) is seen as a key theme, as evidenced by the faculty-wide cooperation that has been set up in this field. A professor for digital culture and an assistant professor for AI/Machine Learning were recently appointed. In the coming years, the department hopes to establish a group that will be able to integrate the digital field further into its research and education.

The department has a large share in the Architecture, Urbanism and Building Sciences Master's degree programme and is continuously working on improving quality, efficiency and organisational preconditions. This process will certainly take several more years. Topics on the agenda include: further perfecting the annual education plans, evaluating the recently amended master's degree programme and improving the input into the Architecture, Urbanism and Building Sciences Bachelor's degree programme.

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In summary, the focus of the department of Architecture in the coming years will be on training the architects of the future and on the corresponding framework for research and education.

URBANISM

The department of Urbanism sees urbanism as a planning and design activity for creating, innovating and improving urban landscapes. The department's mission is to promote, share and apply knowledge on how the built environment can be adapted to social and environmental changes. But also: how design, planning and technical interventions can be applied to meet human needs in a better way.

The core of Urbanism in Delft is formed by the sections Urban Design, Landscape Architecture, Spatial Planning & Strategy, Urban Studies, Urban Data Sciences and Environmental Modelling & Design. These sections form the basis for inter- and transdisciplinary, context-driven and problem/solution-oriented research and education. Urbanism includes technical, social and environmental methods and techniques as operational tools, but also: the development and application of advanced urban data sciences and spatial information technologies. In addition to the development of the disciplines themselves, there is a strong emphasis on the interaction of these fields in terms of theories, methods and techniques, and their application through concepts, strategies and spatial interventions. This integrated approach to urban planning and landscape architecture is known as the unique Delft Approach to Urbanism.

Design, policy and research

The Urbanism research programme is one of the few research centres in the world that brings this expertise together in design, policy and research. There is also a high level of involvement in international networks, stemming from a long history of successful collaborations mainly in Asia and Latin America, with an expansion to North America.

Urbanism has traditionally had a good relationship with urban planning practice. However, due to considerable growth, and in particular the arrival of several sections with a more research-oriented focus, this relationship has become less strong. For that reason, in the coming years, the department will strongly strengthen the ties again between

urban planning practice and (design) education. To this end, we are going to recruit professors of practice for the department who, in addition to their own practice, will engage in education and social debate. In addition, the department will continue to focus on excellent research, as it has been developed in recent years.

MANAGEMENT IN THE BUILT ENVIRONMENT

The Management in the Built Environment (MBE) department strives for a sustainable built environment in which the interests of the end user and other parties involved are the starting point. MBE focuses on solutions for developing and managing buildings, portfolios and urban areas and training the next generation of managers in the built environment. The department has the ambition to offer an inspiring place to students and PhD students and to contribute to excellent education in the BSc, MSc and post-master programmes of the faculty. MBE also aims to increase its social impact by strengthening intervention-oriented scientific research and its relationship with the design disciplines in the faculty.

The research performed by the MBE department aims to develop and test scientific theories and tools that guide and support an optimal match between the supply of real estate and the dynamic demand for housing and other functions. The user's perspective is usually leading.

Emphasis on faculty research themes and 'design'

MBE's research programme includes, on the one hand, research on market analyses, performance requirements and cost and quality of real estate (the product side). On the other hand, it includes research on the initiation, information, development, design, construction and use of real estate at different spatial scales: from buildings to urban areas (the process side). In the coming years, the focus will mainly be on actively contributing to the faculty's research themes, with the following spearheads: circularity, energy efficiency, urban and housing issues and digitalisation. Strengthening the relationship with the designing disciplines in the faculty is also a priority. We do this by inviting design-centred researchers to work together on design-centred research projects.

The ambition for valorisation is to increase the real (direct) impact on society. This can be done by developing solutions for the major challenges, together with social partners (e.g. through action research, co-creation, living labs, etc.).

The department is currently critically reviewing how the MSc programme can be even better aligned with today's challenges in the built environment. It also introduces a specialisation in 'Sustainable Human Habitats', specifically aimed at international students, in close cooperation with other departments and with Erasmus University (mainly the Institute for Housing and Urban Studies). This specialisation may form a basis for a new educational programme developed within the Convergence initiative (for scientific cooperation). The department is also emphasising more 'blended' education, with real estate and building economy as priorities.

ARCHITECTURAL ENGINEERING AND TECHNOLOGY

The department of Architectural Engineering and Technology (AE&T) is at the forefront of one of the most important challenges of the 21st century: meeting the demand for better buildings within the limited resources of our planet. This major challenge requires a fundamental shift in the way the built environment is valued, designed, built, exploited, maintained, transformed and dismantled.

Our mission is therefore to contribute to a built environment with positive value for people and the environment in an ingenious way, through knowledge, experiment and design. By positive value we mean: based on renewable resources, sustainable, circular, healthy and digitally elaborated. We do this through an integrated approach that is inspired by and based on innovation in building technology, installation technology, construction, architectural and spatial informatics and design. This is combined with a keen eye for the more aesthetic, comfort- and health-related characteristics of the built environment.

At AE&T we specifically tackle this challenge by:

- developing and exploring new design and manufacturing methods, tools and new technologies for the sustainable buildings of the future, and innovative solutions for the large numbers of ageing buildings;
- equipping the next generation of construction and design professionals and architects with the latest technological knowledge, skills and solutions needed to meet the challenge;
- helping to develop and deliver technology-based innovative solutions to social challenges, through cooperation with leading national and international partners.

Four major themes

In line with our vision and mission, AE&T's research is centred on four major themes, which are also aligned with the six strategic faculty research themes:

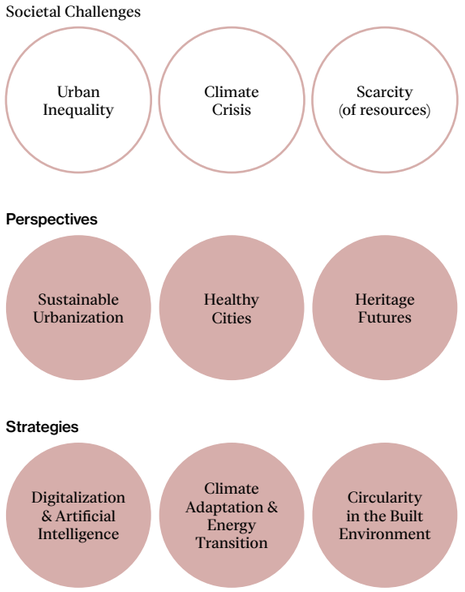
1. A sustainable built environment, for new and existing buildings, with attention to climate adaptation, resilience, climate mitigation, energy based on renewable energy sources and nature inclusion;
2. A circular built environment, focusing on efficient use of materials and resources, product design, manufacturing and new product service systems;
3. A safe, healthy and comfortable built environment;
4. Digitalisation as a tool for decision-making in all built environment processes - supporting data, information and implicit knowledge in all phases of design, manufacturing, construction and use.

Our students are design-driven, but also technically well informed. They are focused on innovation in design and construction, and data-driven. The input of our department to various programmes of the faculty involves the more technical and computational side of architecture and urban planning. Educational programmes led by the department have a focus on the same themes as mentioned under research, innovation in design and construction and/or heritage. Our graduates become architects with substantial technological expertise and designers, planners and analysts with a focus on technical innovation, digitalisation, health and sustainability for the built environment.

The department has a strong track record in applying new technologies and innovative approaches in buildings

and cities. These include low-carbon materials, circular building products, conservation materials and strategies, efficient structural and climate design strategies, new computational methods and digital technologies. In doing so, we cooperate with numerous stakeholders in science, government, society and business. AE&T is thus actively contributing to eight of the seventeen Sustainable Development Goals of the United Nations.

RELEVANT SOCIAL THEMES IN EDUCATION AND RESEARCH



The research of the Faculty of Architecture and the Built Environment is organised and evaluated on the basis of the departmental structure. The four departments have a disciplinary structure. Education in the master's phase is also organised on a disciplinary basis. However, major social challenges such as urban inequality, the climate crisis and resource scarcity do not adhere to such disciplinary boundaries.

Therefore, the faculty encourages interdepartmental cooperation and the exchange of ideas, knowledge and projects that respond to the three urgent social challenges mentioned above. The faculty has formulated six perspectives and strategies along which teaching and research are categorised, three of each:

PERSPECTIVES

Sustainable Urbanisation

The development of new concepts for the ongoing urbanisation worldwide, including the so-called Global South.

There are large social and economic differences within Dutch cities, while the pressure to build new houses is disproportionately high with a demand of 1 million houses. In the Global South, we see such problems to a more extreme degree. We need urbanisation concepts that address many issues simultaneously and in an integrated way: CO_2 reduction, climate adaptation, inclusiveness, liveability, health, combating sprawl and protecting heritage.

Healthy Cities

Designing buildings and urban environments that contribute to a healthier and longer life for residents and communities.

The quality of the air we breathe in buildings, the extent to which an urban environment motivates us to take physical exercise, and the design and property management of health buildings are all important building blocks for a healthy urban environment. The fact that residents in some neighbourhoods (Rotterdam South, for example) lead shorter (healthy) lives (on average up to seven years shorter) is a clear indication that this is an important challenge.

Heritage Futures

Sustainable use of built heritage, including its conservation, preservation and management.

The number of ageing buildings in the Netherlands is increasing dramatically. The policy of no longer producing (demolition) waste helps to take a critical look at the latest architecture (1960s to the present). This raises entirely new questions about authenticity, use of materials, spatial quality and reuse.

STRATEGIES

Digitalisation

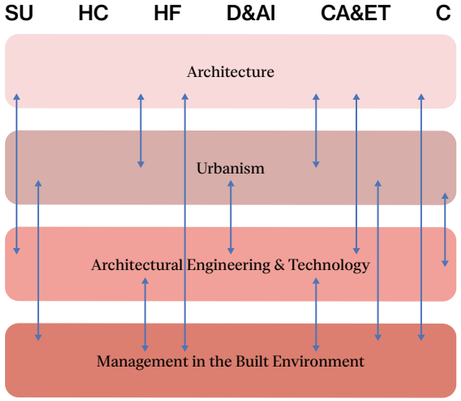
The transition from analogue to data-driven processes in the design, production and management of the built environment.

Designing and making choices is traditionally done by people, using existing knowledge and experience. The development of digital methods and tools, together with investments in artificial intelligence, raises the question of how these techniques can be integrated into the complex practice of designers, building technicians, users, investors, developers and policy makers.

Climate Adaptation and Energy Transition

Adapting the built environment for a CO_2 neutral future in which we can respond to the consequences of a changing climate.

The built environment is a bulk consumer of fossil fuels for heating and cooling buildings, moving people and goods, and not least: the building process itself. When developing new concepts for that built environment, we will at the same time have to respond to the issues raised by the climate crisis: flooding, water nuisance, drought and heat.



Circularity in the Built Environment

A transdisciplinary and systemic approach that covers the different levels of scale, from city to building, component and material.

For centuries, we have been demolishing buildings to make way for new ones. We renovated neighbourhoods when they were 'used up' and were becoming a source of social problems. We could dispose of the waste on rubble heaps elsewhere or use it to fill in canals and rivers. When we are no longer allowed to produce waste and have to deal with the youngest heritage in a considerate way, how do we do it?

As a first step in the implementation of the strategies and perspectives, the faculty has made available part of its budget, supplemented with strategic resources from the Executive Board, to appoint 12 PhD students. With these PhD research projects, we initiate cross-departmental collaborations around the six themes. The PhD students are supervised on a daily basis by a diverse group of associate/assistant professors who started at the faculty in recent years and professors from other departments. Work is also being done to embed the themes in the curriculum of both the Bachelor's and Master's programmes.

Digitalisation

The key question for future architects at the beginning of the 21st century is: what does it mean to design and build in a society that is balancing artificial intelligence and the datafication of all spheres of life, ever-accelerating global migration and urgent environmental issues?

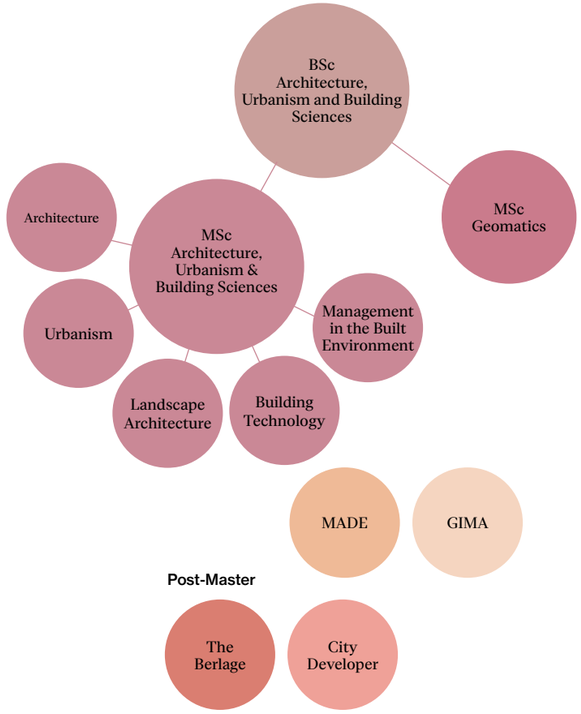
AI related knowledge is indispensable for the future generation of engineers, architects and scientists in technology. For that reason, research and education in the field of AI, data science and digitalisation in relation to the built environment will be strengthened. The faculty faces the challenge of intellectually stimulating the debate on this issue, academically deepening it and historically contextualising it.

We will do this by establishing a new Chair of Digital Culture within the department of Architecture (professor Georg Vrachliotis will be appointed in early 2021), by attracting additional teaching staff with an affinity for recent developments in design practice, and by investing more in the digitalisation of the faculty's research programme. In 2020 and 2021, two so-called TU Delft Artificial Intel-

ligence Labs were started, where new associate/assistant professors and a few PhD students work on relevant research questions.

Goals for the coming years are:
— developing a historical and theoretical framework for digital technologies;
— bridging the gap between design and technology by linking research and education;
— increasing the visibility of AI topics in architecture;
— conceptualising a cross-sectional and cross-departmental digital culture programme, which will be a strong ‘unique selling point’ for TU Delft.

EDUCATION



The Faculty of Architecture and the Built Environment offers bachelor’s, master’s and post-master’s programmes in the fields of architecture, urban planning, landscape architecture, construction management and building technology. Students can also take various minors and electives, and participate in an international exchange programme.

The bachelor’s programme is a so-called broad bachelor’s programme that covers all aspects of the field.

In the Architecture, Urbanism and Building Sciences master’s programme, students can specialise in one of five tracks that all train in one of the aspects of the built environment. The Geomatics Master’s programme explores a relatively new field: the analysis and acquisition, management and visualisation of geographical data that are used to study and understand the natural and built environment.

The Berlage Center for Advanced Studies in Architecture and Urban Design offers a renowned post-master’s programme. The faculty is also active in the MSc programme with Wageningen University (MSc Metropolitan Analysis, Design and Engineering (MADE)) and the post-master programme City Developer with Erasmus University.

The faculty is closely linked to the design industry, with renowned professionals from home and abroad as professors, visiting professors, guest teachers or lecturers. Professionals from other parts of the building industry are also involved in the programme, so that students are optimally prepared for a career as an architect, interior designer, urban designer, or as an employee at a (local) government, property developer, real estate investor, housing corporation or consulting firm. Graduates can also opt for an academic career and continue their studies by doing doctoral research.

CONTINUING WITH THE BACHELOR'S DEGREE PROGRAMME IN ARCHITECTURE, URBANISM AND BUILDING SCIENCES

In 2013-2014, the renewed Bachelor's degree programme in Architecture, Urbanism and Building Sciences started. The most important change at the time was the transformation of a multitude of small subjects into six coherent learning trajectories consisting of three to six modules of five or ten credit points (ECTS).

Since then, the 24 modules and the free elective courses in the fifth semester make up the three-year 'broad bachelor'. Broad, because the curriculum covers all fields of Architecture and the Built Environment. This includes architecture, urban planning, landscape architecture, building technology and management in the built environment. The bachelor's degree of Architecture, Urbanism and Building Sciences thus prepares students for the various tracks of the master's programme.

Due to the clear curriculum structure with quarters of two or three modules, students follow a maximum of two modules at a time. The educational feasibility has been further improved by aligning learning objectives, teaching methods and testing formats per module, learning trajectory and quarter.

The ambition of the bachelor's programme of Architecture, Urbanism and Building Sciences was – and still is – to train students to become competent, academic and context-aware architectural designers. Since 2013, however, there have been major changes in the social context, in academic research and teaching methods, and in how we view the inter- and transdisciplinary nature of the subject of structural engineering itself. Moreover, due to the corona crisis, there has been a shift from physical to online education since 2020 – which is now followed by a reverse shift. This makes the year 2021 undeniably a benchmark for determining the extent to which the bachelor's programme of Architecture, Urbanism and Building Sciences can and must adapt to current developments.

Based on student evaluations and discussions with the staff involved, the Dean, the Faculty Student Council and the Board of Studies, these developments have been translated into five spearheads: refreshing, deepening and broadening the content, and strengthening and clarifying the structure.

Refreshing the content

We are investigating how the six faculty themes (sustainable urbanisation, healthy living environment, future of heritage, climate adaptation and energy transition, circularity, and digitalisation of society) can be embedded in existing modules.

Where necessary, we update and 'de-duplicate' the learning objectives (related to the revised attainment targets) and the teaching methods (based on the content, for example by using blended learning).

Deepening the content

We are investigating how we can offer students more freedom of choice, especially in the design modules, in order to deepen their position as designers.

We focus more on an academic attitude and the skills of reflection and presentation, also to better prepare students for the master's phase.

Broadening the content

We introduce a broad (system-based) approach, especially at the beginning of each learning trajectory: first the big picture, followed by a more in-depth approach.

We improve the position of Architecture and the Built Environment in the changing practice of construction and inclusive society and as a science.

Strengthening the structure

We encourage mixed learning trajectory teams, with coordinators from different departments, and involve the learning trajectory, module and new professors more in the bachelor's programme. A greater commitment of academic staff in the bachelor's programme is also needed to achieve a better balance in the deployment of permanent and temporary teachers.

We train, monitor and assess (practical) teachers better, also through courses and through input from module coordinators and learning trajectory and module professors.

Clarifying the structure

We are improving testing and assessment, both in terms of planning (creating a test calendar) and transparency (creating rubrics for all modules).

We optimise the links between learning trajectories and the links with the master's phase.

The focal points are discussed in meetings with the learning trajectory teams. In this way, we look from the bottom up at how they can be incorporated into the learning trajectories and modules. In addition, project groups are active on some essential or cross-curricular themes: circularity, digitalisation of society, design assessment and updating of teaching methods (including blended learning). Project groups are also set up for the topics of diversity and inclusion, updating of learning objectives and academic attitude.

The duration of the implementation is estimated to be two years, with an introduction of first adjustments in academic year 2022-2023 and a second adjustment in 2023-2024.

In this way, we aim to further renew the bachelor's programme of Architecture, Urbanism and Building Sciences, which is strongly linked to the design practice, well grounded in the academic world and innovating in contact with society.

DEVELOPMENTS IN THE MSC PROGRAMME

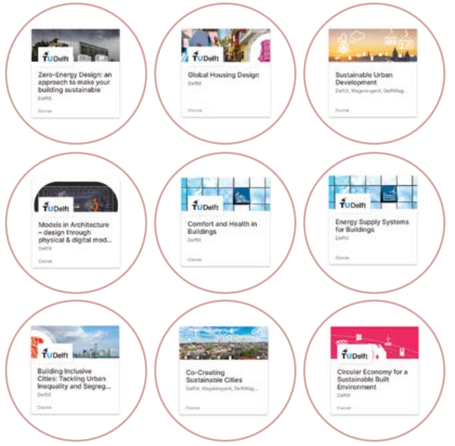
Interdisciplinary coordination and exchange

The Faculty's master's programme of Architecture, Urbanism and Building Sciences is divided into five majors, each with its own programme and domain-specific attainment targets: Architecture, Urbanism, Landscape Architecture, Building Technology and Management in the Built Environment.

In order to strengthen organisational coherence within the Master's programme as well as the exchange of content between tracks, we are working to align the programmes and programme components more closely. This should make it easier for students to make interdisciplinary choices.

The following steps will be worked on in the coming years:

- Equalising the scope of teaching modules (maximum of three variants: 5-10-15 ECTS), so that they are more easily interchangeable.
- Aligning the elective modules in the programmes, so that students can make easier and broader choices when it comes to elective modules offered by or in cooperation with other tracks. The possibility of participation in Joint Interdisciplinary Projects (JIPs) is also being considered.



- Broader facilitation of interdisciplinary (design) research for graduation students. Options that are being explored include increasing the choice of graduation mentors from other disciplines and offering more interdisciplinary graduation studios.

Embedding faculty themes in the MSc programme

Whereas the bachelor's programme will actively seek opportunities for the aforementioned faculty themes, the master's programme will do so more organically. In the coming years, it will be determined per programme and per theme in which Master's track and where in the curriculum these themes can best be addressed. The aim is to do this as much as possible by means of a 'bottom-up' approach, i.e. by connecting to the themes or developing them further on the basis of existing education.

New specialisation in Management in the Built Environment

In order to extend the number of educational programmes and increase the appeal to foreign students, the MBE department is developing a new specialisation: Sustainable Human Habitats. The specialisation combines technical knowledge with international housing issues in order to achieve sustainable solutions.

ONLINE EDUCATION

Blended Learning

With the appointment of a staff member for Blended Learning at the faculty, thinking about Blended Learning and its further introduction in education will be firmly on the agenda in the coming years. During the corona crisis, there were many lessons learned - both positive and negative - from the switch to fully online education. These insights will be taken into account, as far as relevant, when further exploring the possibilities of using more digital tools in education to improve the quality and effectiveness of lessons.

MOOCs

The Faculty of Architecture and the Built Environment also invests in online education by developing and offering various MOOCs (Massive Open Online Courses). Through these MOOCs, our knowledge is accessible to professionals and other interested parties from all over the world. We

already offer several successful programmes on circular, sustainable and energy-efficient design and construction. In the coming years, this offer will be expanded with more programmes on, for example, digitalisation of the design and construction process.

BK-LAUNCH - PLATFORM FOR INNOVATION AND ENCOURAGEMENT OF ENTREPRENEURSHIP

Many of today's social challenges have a strong relationship to the built environment (energy transition, the circular economy, scarcity of raw materials, etc.). Solving these complex problems requires a creative, entrepreneurial, interdisciplinary approach.

To facilitate entrepreneurship among students and at the same time stimulate innovation in the built environment, the faculty initiated the 'BK-Launch' platform. The aim of this platform is to create a community for students who want to make an impact as future entrepreneurs in the built environment. The platform is facilitated by the faculty and external partners whose knowledge, expertise and investments form the basis. In addition, a large part of this platform consists of the constantly growing network of alumni from the Faculty, experts and other external companies.

The BK-Launch platform is also linked to education in the master's phase. Some entrepreneurship courses have been developed and are accessible to students of all MSc tracks. This education not only intends to educate students about the importance of entrepreneurship, but also serves as a place to work out ideas and test their feasibility. From the classroom, students can automatically move on to the BK-Launch platform, where they are supported in setting up their businesses. Support consists of coaching by teachers and partners. A voucher system provides financial support. Startups are linked to the research of the scientists as much as possible.

In due course, BK-Launch will also be a visible, physical place in the building. We are currently examining the best way to do this.

RESEARCH

The research portfolio of the Faculty of Architecture and the Built Environment comprises the research carried out by the four departments and is accordingly divided into four research programmes.

Architecture and the Built Environment research specifically focuses on improving the design and performance of buildings, neighbourhoods, cities and regions in order to meet the requirements and expectations of their users and communities in a better way. From that perspective, much of the research undertaken can be understood as applied science: responding to the curiosity and needs of other researchers, practitioners and the wider public. The research combines technical sciences with social sciences and humanities.

Although the research programme is organised according to disciplinary departments, interdisciplinary cooperation is actively encouraged through, for example, the six social themes. We also actively cooperate with other faculties in various TU-wide research institutes and form alliances with important external parties.

Open Science

Open Science creates new forms of scientific interaction that were not possible or conceivable before. Making scientific research more open will have an increasing impact on the core academic processes of research, education and innovation. In the coming years, the Faculty of Architecture and the Built Environment will approach Open Science from four angles:

Read it

For a long time, scientific publications were hidden behind pay walls. However, from the point of view of fairness, it is desirable that research paid for with public funds should also be publicly available. The faculty's research has a broad field of potential users: other researchers, policy makers, designers and the general public. For many of them, it is sufficient when most of our publications (books, articles, videos) can be viewed online without restrictions.

Our aim is to have 95% of our publications available through an open access platform by 2025.

Check it

In a critical society where scientists' conclusions are more than ever questioned, it is important to be open. Particularly in the context of new insights, we want to make the research results on which they are based available for critical review.

In the next four years, we aim for more than 80% of our research results to be available via a research repository (database) with an unambiguous 'Digital Object Identifier' (DOI, unique number). A prerequisite is that we can guarantee that the rights to characteristic results or data for Architecture and the Built Environment (such as analysis drawings or photos) are respected and that their use can be measured by means of 'metadata harvesting'.

Learn it

Sometimes, however, the value lies in the methods that we develop and the tools or software that we use. In an average publication, there is limited space for writing procedures or protocols in such a way that they can be easily implemented by third parties in new areas of application. We are aiming for a breakthrough in this area.

In the coming years, we will develop the facilities needed to publish 'narratives' for describing methods, procedures and practices.

Develop it

Finally, more than before, the faculty wants to build on the research results and methods that are increasingly freely available. The accelerated development of new applications is the essence of Open Science.

New applications will be shared in the coming period through so-called impact case studies.

STRATEGIC RESEARCH QUALITY

Recently, the San Francisco Declaration on Research Assessment (DORA) was published and signed by the Association of Universities in the Netherlands (VSNU), the Dutch Research Council (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW). The translation of

the DORA philosophy into the new Strategy Evaluation Protocol sets important benchmarks for how science is conducted. These days, the focus is no longer on quantitative performance ('field impact factor' or the so-called H-index), but on quality. It is no longer about which journal we publish in, but about the quality of what we publish.

This transition allows us to take a new approach when it comes to impact. After all, we can apply the same way of thinking to obtaining research grants. It is no longer important in which programme we acquire resources or how many, but what we manage to achieve with these resources.

The Rathenau Institute (2019) distinguishes a number of so-called impact pathways in this regard:

- Training people (MSc + PhD) who create impact in professional practice and science;
- Consultancy, contract research and PPP;
- Developing new tools and methods;
- Developing new networks through campuses, science parks, etc.

In the research proposals that the departments will develop in the coming years, we will focus more strongly than before on output that connects with such 'pathways'. By means of narratives or so-called impact case studies, we interpret the impact of our research. As there is still little experience with such tools, the faculty is organising a development programme in which staff members can familiarise themselves with this new form of publication.

GRADUATE SCHOOL / PHD POLICY AND TRAINING

The Graduate School of Architecture and the Built Environment (A+BE) has firmly established itself within the faculty as the faculty vehicle for conducting doctoral research and providing doctoral education. The faculty has more than 200 active PhD students from all over the world. We welcome an average of forty new PhD students each year, almost half of whom are women.

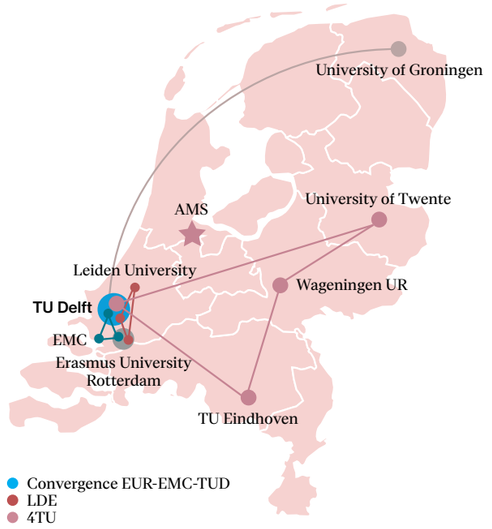
In the coming years, we will focus on increasing the study completion rate. In order to obtain useful input for this, a survey was conducted among current PhD students, supervisors and recent alumni in early 2021. Recommendations from the report include optimising candidate selection,

improving process guidance, training supervisors and incorporating an additional calibration moment.

By 2025, the A+BE Graduate School aims to have achieved the following objectives:

- increase the percentage of timely completed theses (within 5 years) to 60%;
- maintain the current level of recruitment and inflow of PhD students;
- attracting PhD students who share an interest in the faculty's research themes;
- develop new doctoral education courses that meet the discipline-related needs of PhD researchers;
- encourage cooperation between different departments (and with other faculties) in offering doctoral education.

EXTERNAL PROFILING AND PARTNERSHIPS



In the coming years, the Faculty of Architecture and the Built Environment will focus on cooperation with important partners in various contexts. The most important existing partnerships are:

4TU.BOUW

On a national level, the Faculty of Architecture is part of 4TU.BOUW, the research centre of 4TU.Federatie, i.e. the federation of the four universities of technology in the Netherlands: TU Delft, TU Eindhoven, University of Twente and Wageningen University.

4TU contributes to welfare in the Netherlands by strengthening, combining and making maximum use of knowledge and creativity in the technology sector. For that purpose, the four Dutch universities of technology are jointly committed to strengthening and combining their technological knowledge. Their aim is to provide sufficient and well-trained engineers and technological designers, to conduct internationally leading and socially relevant research and to promote cooperation between research institutions and companies.

BTIC

With BTIC (the Building and Technology Innovation Centre), a strategic cooperation has been established between TNO, 4TU.BOUW, the colleges of professional education, the industry organization in the field of technology and construction, and three ministries (Economic Affairs, the Interior and Kingdom Relations, and Infrastructure and Water Management).

BTIC is the flywheel for innovation in building, design and technology. The centre bundles innovation questions from the government, innovation needs from the market and research projects from knowledge institutions in public-private, multi-year knowledge and innovation programmes. Through a more efficient, bundled innovation process, innovations can be accelerated and implemented on a large scale to solve major social challenges. The faculty is active in the board of BTIC and various major projects.

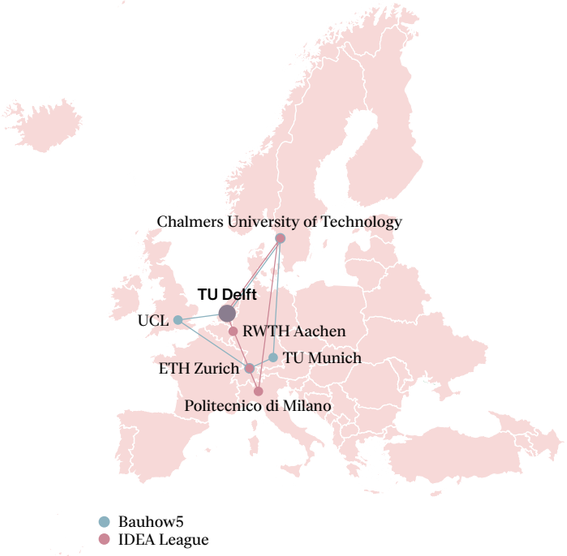
SECTOR OUTLOOK DESIGN ENGINEERING SCIENCES

During the last coalition period, the Ministry of Education, Culture and Science gave a major impetus to the funding of specific sectors within the Dutch knowledge domain. The basis for this is created by the so-called sector plans, a document that is preceded by an analysis of the field: the sector outlook. However, the domain of Architecture and the Built Environment has been left out of the Technology Sector Plan, as have Industrial Design Engineering and Technology, Policy and Management.

In the spring of 2021, these faculties of TU Delft, together with TU Eindhoven, the University of Twente, Wageningen University and the University of Groningen, drew up a specific sector outlook for the Design Engineering Sciences. This partnership will develop this sector outlook into a sector plan in the expectation that this will release financial resources for the design engineering sciences and strengthen their position and recognition within the Netherlands.

BAUHOW5

The Faculty of Architecture and the Built Environment is a founding partner of the BauHow5 alliance between TU Delft, UCL Bartlett, Chalmers, TU Munich and ETH Zurich, with active groups on topics such as circularity, inclusion, diversity and equality (IDE), and doctoral education. UCL Bartlett, TU Delft and ETH Zurich are the highest ranked institutions in Europe in the QS Field Specific ranking for Architecture | Built Environment. TU Munich and Chalmers are leading institutes in Germany and Sweden. The partners strive to work together strategically and to learn from each other. Over the next four years they will focus, among other things, on the EU's New European Bauhaus initiative and on setting up a joint doctoral study programme for their PhD students.



AMSTERDAM INSTITUTE FOR
ADVANCED METROPOLITAN SOLUTIONS

AMSTERDAM INSTITUTE FOR ADVANCED METROPOLITAN SOLUTIONS (AMS INSTITUTE)

The Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute) was founded seven years ago by TU Delft, WUR and MIT and has matured. In this institute, science, education, government, business and social organizations work closely together to find solutions for the complex challenges facing a metropolitan region such as Amsterdam. The main activities of AMS Institute concern its research & innovation, education, entrepreneurship and partnerships.

Together with WUR and MIT, TU Delft forms the academic heart of the institute. The Faculty of Architecture and the Built Environment works closely with AMS Institute in various research projects and in the educational program MADE. Every two years, various academic staff members from the participating universities are appointed as Principal Investigator (PI) for AMS Institute. They participate in the research agenda and act as important ambassadors for the institute. In addition, several Research Fellows (RF) have been appointed who work as researchers on the various themes of the institute. Recently, new faculty employees have once again been appointed as PIs and RFs. Moreover, the focus is on active collaboration with existing design studios of the faculty.

The connection between AMS Institute and the city of Amsterdam is deeply rooted. Based on its focus on developing (technological) solutions for metropolitan issues, AMS Institute works for, with and in the city. The city of Amsterdam is not only home to the institute, but also its living lab for developing, implementing and scaling up innovations.

Jaap Bakema Study Centre

JAAP BAKEMA STUDY CENTRE

The Jaap Bakema Study Centre represents the strategic research collaboration of the Faculty of Architecture and the Built Environment and Het Nieuwe Instituut in Rotterdam. The centre was founded in 2013 as an experiment and has since grown into a well established international research centre. The potential of a public institution for cultural heritage with museum facilities and the prominent National Collection for Dutch Architecture and Urbanism is combined with our faculty in a unique way.

The National Collection is the starting point for a research programme at the intersection of advanced historical and theoretical research and urgent contemporary social issues. This in relation to the notions of an open society, diversity and inclusion. Research projects result in exhibitions, publications and public events, often in cooperation with third parties and within international networks, such as the Venice Biennale of Architecture.

CONVERGENCE

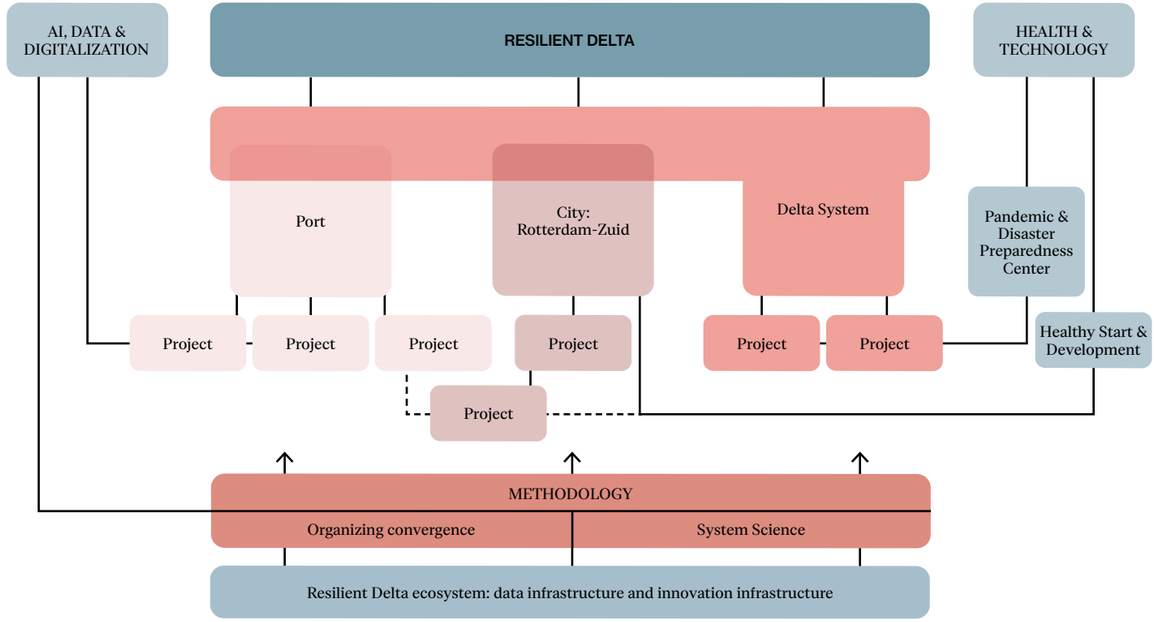
A major new development for the coming years is the so-called 'convergence' (cooperation in research and education) between Delft University of Technology, Erasmus University Rotterdam and the Erasmus Medical Centre. The main focus is on the connection and cooperation of the various disciplines represented in the three institutes in ambitious research and education projects that address the major social challenges of our time.

In the current pioneering phase, three initial initiatives have been established, respectively Health & Technology, Resilient Delta and Artificial Intelligence (the latter also with Leiden University).

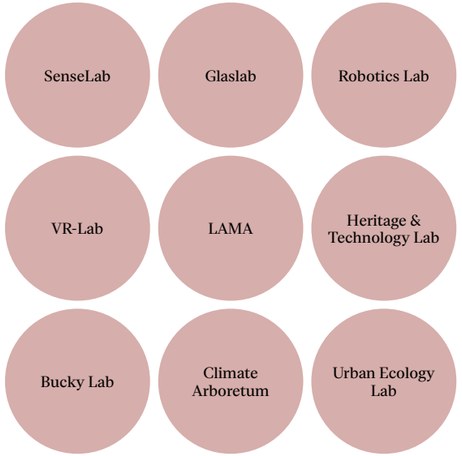
The Faculty of Architecture and the Built Environment will be involved in all three initiatives, but at this stage plays a leading role in the Resilient Delta Initiative.

The Resilient Delta programme focuses on addressing the key challenges of profound changes in the areas of climate, energy, economy, mobility, demography, health, equity and inclusion. The issue of urban inequality is addressed in projects in which Rotterdam-South is a Living Lab, in cooperation with the city of Rotterdam and the National Programme Rotterdam South. Other areas of research are the port and the far-reaching consequences of energy transition and changing mobility. The delta as a whole is being tackled, also as a major spatial design challenge for the coming decades. The methodological aspects of convergence are an overarching topic of research. Resilient Delta is also directly linked to the proposed Pandemic and Disaster Preparedness Centre.

In addition to these partnerships, faculty members are active in a wide range of specialist partnerships. But also in various interdisciplinary TU Delft institutes, such as the Design for Values institute, Robotics institute, Safety & Security Institute Delft Global and Urban Energy Institute. Within the framework of LDE (Leiden, Delft, Erasmus), our scientists are active in the Bold Cities, Governance of Migration and Diversity, Sustainability, Port City Futures and Global Heritage and Development research centres.



BK LABS



In recent years, several research labs have been established within the faculty, often through successful initiatives by staff members who were able to acquire resources through research and teaching projects. These labs include the SenseLab, LAMA, Robotics Lab, VR Lab, Heritage & Technology Lab, Glass Design Test Lab, Bucky Lab, the Climate Arboretum and the Urban Ecology Lab.

The size and professionalism of the labs is now at a point where they would benefit from structural embedding in the faculty organisation, and continuity of support.

Therefore, in 2021 the faculty will start the new 'Lab support' service, which will take on tasks such as maintenance, replacement, management, insurance and safety. This support is combined with the support organised for the student facilities in the model hall. We see added value, particularly in relation to management, logistics and visibility.

The control of education and research remains secured in the education and research programmes of the scientific departments involved.

SenseLab

Research has shown that staying indoors is not good for our health. People are spending more and more time indoors. Therefore, providing a healthy and comfortable indoor climate is of great importance. The SenseLab of Professor Philomena Bluyssen and her group is a laboratory for testing and experiencing individual indoor environmental conditions as well as combinations of these conditions. It contributes to understanding and dealing with the indoor environment.

Students, teachers, researchers and schoolchildren can experience and test different combinations of environmental conditions.

The research conducted in the SenseLab contributes to the development of a new assessment approach, which takes into account the combined effects of stress factors in buildings on both people (patterns) and their individual profiles. It can be used to define requirements

(to avoid negative effects) and preferences (to encourage positive experiences) for the (re)design of healthy and comfortable buildings.

The SenseLab is built around the four IEQ factors (air, heat, light and acoustic quality) in a faculty lab space. The lab includes a fully equipped experience room, four test rooms and two air handling units.

Below the lab is a facility room that is fully equipped with climate control and measuring equipment. The lighting and sound system are located upstairs. Together with changeable walls, floors and ceilings, it is possible to adjust the air flows and temperature in the lab, change light and mimic sound with infallible precision.

The TU Delft glass laboratory (Glaslab)

Glass is a unique material providing the critical combination of transparency, durable weather resistance and stiffness which most materials cannot provide. As such, the study of glass intertwines critical fields such as architecture, structural engineering, sustainable energy and materials science.

It is this combination of unique properties that has made glass a fundamental material in the evolution of architecture in its capacity to bring light into our buildings. Although glass has a millennia old history of critical use in building, think of the great rose windows of medieval cathedrals, only since the 1950s has the material become available in large panels at low cost through the industrialization of its fabrication. Through this development, the crucial role of glass in modernism can be considered a critical development in architecture and a determining factor for the design, appearance and technical performance of contemporary buildings.

The qualities and benefits of glass are clear, however it has some specific physical qualities that can make it challenging to engineer; for example, it is the most brittle of common engineering materials. In recent years the use of glass for structural purposes has become increasingly ambitious and today we impose significant demands on the energy performance of glass to ensure it plays its part in meeting the climate energy goals within the built environment.

At TU Delft, research on glass in architecture has been a key interest since the mid 1990s. To further this research, the Faculty has created a glass laboratory in

2021, with financial support from the University Funds. The laboratory contains two unique pieces of equipment, a 5-axis water jet to process glass and a high-resolution 3D Keyence vhx-7000 digital microscope to study the edges and meso-structure of glass.

The 5-axis water jet enables the TU Delft team to prepare prototypes for testing, explore new connection concepts for structural glass systems as well as work with non-orthogonal glass plates and blocks in order to extend glass research into new dimensions. The 3D microscope opens up opportunities for refined research in relation to precision 3D fractography of glass as well as studies of the meso-structure in both floated and cast glass, which are critical scientific fields being pioneered at TU Delft. The new 3D digital microscope is also an essential tool for assessing the properties of novel recycled glass products that are currently being prototyped at TU Delft.

In order to support these tools, a workshop has been developed that allows the Delft team to carry out various aspects of prototyping on site.

DIVERSITY AND INCLUSION

The Faculty of Architecture and the Built Environment has a very diverse student and staff population, and strives for an inclusive culture where everyone feels comfortable. Already 30% of the professors are female, giving this faculty the highest ratio of all TU Delft faculties. Of the total academic staff (professor, assistant professor, associate professor) already 37.5% are women. The objective is to increase this proportion to 50% in the coming years. For this purpose, an active diversity policy is pursued.

In early 2021, the Dean appointed a member of the academic staff as 'Diversity and Inclusion Officer' for the Faculty of Architecture and the Built Environment for a period of four years. Under the leadership of this officer, a steering group on diversity and inclusion was formed, in which students as well as academic and support staff are involved. The steering committee will advise the management team, help shape faculty policy and propose actions on inclusion and diversity. The goals are to raise awareness about inclusion, to find ways to weave diversity into the curriculum and to give advice on emerging issues in the faculty's community. The D&I Officer is in close contact with the Dean, the Education Director and the academic departments in order to organise discussion and education on diversity and inclusion.

From 2022 onwards, a visiting professor from the field of architecture with special experience in and a vision on diversity and inclusion will be appointed every year.

"As an outsider, I have experienced issues of inclusion and diversity very personally in my time at TU Delft, and not always in a positive way. This has given me the tools, the curiosity and the ideas to see diversity and inclusion as positive assets and opportunities rather than 'problems'. I often bring up diversity in the courses and activities that I organise, because I believe that diversity and

inclusion can be taught and acquired. We are all learners in an ever-changing world and we must be patient and open to frank discussions. Furthermore, I would like to place the discussion on diversity within the framework of Architecture and the Built Environment as a Dutch, but especially as an international academic programme. The Faculty of Architecture and the Built Environment is a model for educational institutions all over the world. This allows us to take the debate on diversity and inclusion in building science education much further. There is a unique opportunity to discuss the enormous social challenges that we face as architects, designers, planners and managers of the built environment. ”

Roberto Rocco de Campos Peirera,
D&I officer

SUSTAINABILITY

Sustainability is a common thread in everything that happens at the faculty: chairs have been established with a special focus on sustainable construction at all scales and it is woven into all levels of our education programme. In doing so, we are guided by the Sustainable Development Goals (SDGs) of the United Nations.

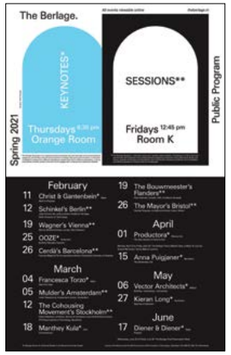
Of course, we cannot achieve sustainability on our own. That is why we share our knowledge with governments, businesses and educational and research institutions in the Netherlands and abroad. Of course, the new generations of engineers that we train will make an important contribution to a sustainable society.

At the end of 2021, a new ‘Wood Construction’ chair will be installed within the Architectural Engineering & Technology department. The use of wood in design and construction is of great value for the transition to an energy-neutral built environment. The chair will focus on the increasing use of wood in building construction.

In the coming years, the faculty will also focus on making its operational processes more sustainable. We actively participate in discussions at institute level on printing paper use, waste separation, etc. We will also have the first faculty canteen of the TU Delft to start with an entirely meat- and fish-free range in 2021. A collective of students and teachers is active within the faculty, under the name of BK Green. They are in constant dialogue with the dean about further sustainability of operations and educational support within the Faculty of Architecture and the Built Environment.

Andy van den Dobbelsteen, Professor of Climate Design & Sustainability at the Faculty of Architecture and the Built Environment, has been appointed TU Delft Sustainability Coordinator for two days a week as of 2021. In this role, he will develop a sustainability vision and programme for the entire TU Delft campus in the coming period.

BK PUBLIC PROGRAMS



Since 2020, the faculty has appointed Javier Arpa as curator of a faculty public program: BK Public Programs. It is a platform for the exchange of ideas and opinions among faculty members and with relevant external parties. The aim is to bring knowledge and people together in a program that addresses the challenges and urgent issues of our time.

Part of BK Public Programs are the so-called BK Talks and The Berlage Keynotes (organised and presented by The Berlage), as well as exhibitions, workshops, seminars and colloquia. The BK Talks and The Berlage Keynotes take place every Thursday evening during the academic year. BK Public Programs are open to everyone, both inside and outside the faculty. The events are broadcast live and can be found in the play list on the faculty's YouTube channel.

ORGANISATION

HEALTHY OPERATIONS/ STRATEGIC STAFF PLAN

At present, the faculty's fixed expenses exceed its fixed income. Our goal is to be able to finance the entire permanent staff and the temporary teachers from the state budget within four years. We ask ourselves the following question: what should our future organisation look like in order to be able to maintain or acquire the right knowledge and experience that allows us to perpetuate the quality of our education and research and at the same time creates the space to respond to new developments and collaborations?

With this in mind, we are currently working on a strategic staff plan. In it, the contours of the multi-year budget are being developed into a staff plan for the coming years. In the plans, we look at the department's vision for the future, the current occupation of the department, the development of employees and their potential and the need for new vacancies in the future.

RECRUITMENT AND CAREER POLICY

For the filling of vacancies, recruitment is further professionalised at TU level. This is done by means of a new recruitment system and the deployment of a professional recruiter. There will also be increasingly active scouting for talent in the outside world.

Internal discussions about the Tenure Track system, the Recognition and Appreciation report and publications such as DORA have led to the realisation that the focus in career policy should not so much be on the quantity of publications and externally funded research projects, but rather on the quality of the work.

We are keen to invest in all employees who want to apply their talents to the faculty's broad range of tasks, both in education in the bachelor's and master's programmes and in research. We also want them to be able to develop into leaders for the future: professionals who focus on the

broad development of their PhD students and postdoctoral researchers and who also contribute to the organisation of the department, faculty and university. To this end, employees must receive regular feedback from their managers and from peers in the faculty, for example in the MT of the department, the Career Committee or through intervision. We also encourage employees to take training courses for their personal development.

The Result & Development (R&D) interviews, in whatever form, will focus more than before on desired developments in the future. Retrospection and feedback are part of this, but the focus will be much more on the future.

We consider the recent changes in career policy (much greater involvement and responsibility of the departments themselves) regarding promotion issues to be positive. The career committee and internal professorial committees are involved in promotions to Associate Professor and Professor.

WORKLOAD

Dealing with workload is high on the faculty agenda and is a complex issue. In the Action Plan for the Employee Monitor, we have described the leverage points that we can see for reducing the workload. A good distribution of resources and tasks is important. In the coming period, we will work on a better distribution and spread of educational efforts. In addition, both managers and employees can make more conscious choices about their ambitions, how they plan their ambitions and how they work. Keeping this issue on the agenda, also outside the R&R, is essential, so that together we continue to adapt the priorities

INTEGRAL DEPLOYMENT PLANNING EDUCATION

The experienced high workload is also related to a concrete capacity problem in education. An internal survey in 2019 showed a significant shortage in capacity. This shortage had consequences for the manageability of education and the welfare of education staff. In 2020, the faculty launched a programme to optimise the educational input within Architecture and the Built Environment. It is a multidisciplinary programme, consisting of several projects, with issues regarding educational structure and planning and

the distribution of educational tasks between and within the departments. It also deals with determining the optimal balance in the deployment of permanent and flexible staff as well as with making the process of appointing and hiring practical teachers more efficient.

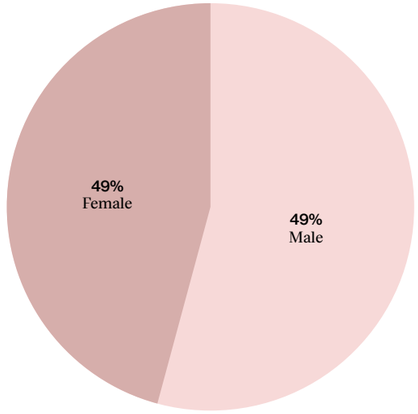
Meanwhile, the staff has been expanded with a number of newly recruited assistant/associate professors, extra teachers have been appointed out of the so-called Van Rijn resources and education managers have been appointed in the departments to optimise deployment planning. The process of hiring practical teachers was also optimised.

In the coming period, efforts will be made to optimise deployment planning further and to balance deployment between the various departments. Faculty-wide coordination, especially for the BSc programme, is essential here.

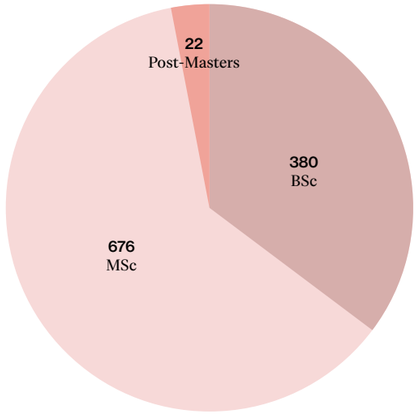
DECISION-MAKING AND EMPLOYEE AND STUDENT PARTICIPATION

The Faculty of Architecture and the Built Environment attaches great importance to clear and transparent decision-making processes, and input from the Architecture community is indispensable. When developing concrete plans for the aforementioned tackling the workload, the well-being of students and employees, the renewal of the curriculum, the internal distribution of resources and the expenditure of extra strategic resources, we are in constant dialogue with the employees council, with the faculty student council and with the so-called study program committee, which members include both students and lecturers. We also regularly speak with study association Stylos and with the various professional associations, which play an important social role in the student community.

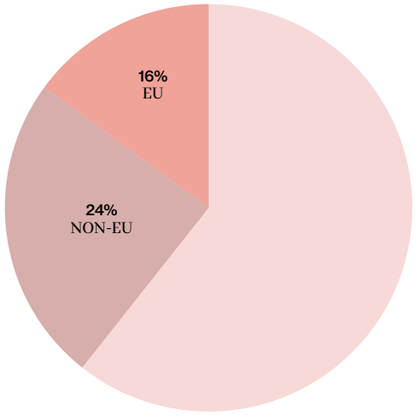
FACTS & FIGURES 2021



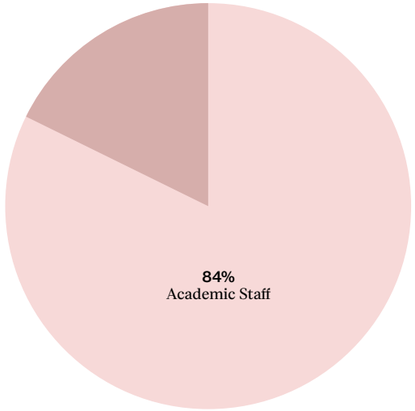
Gender Balance
Total Students



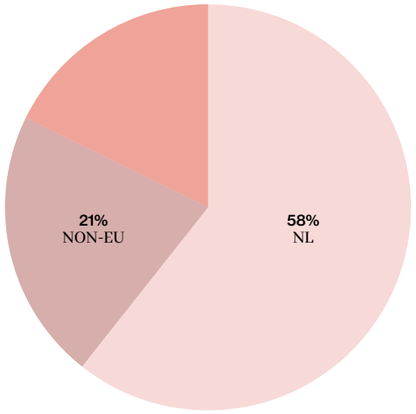
Number of
Incoming Students



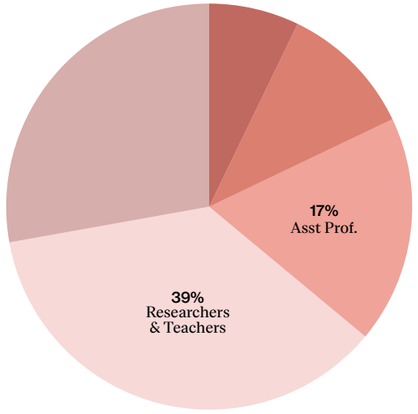
Nationality
MSc Students



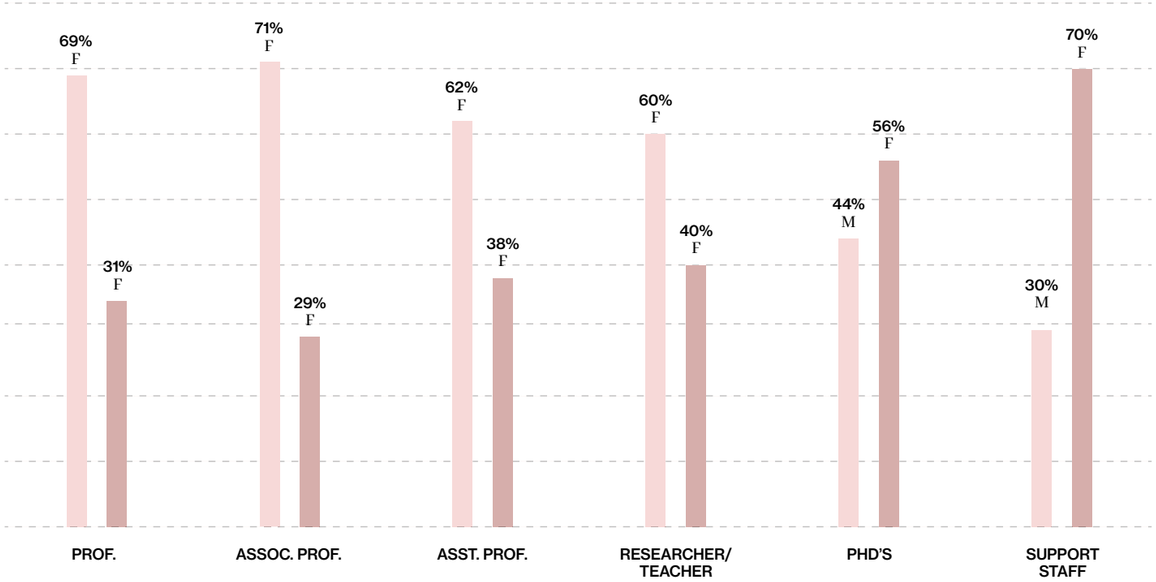
Division
Support (OBP) / Academic (WP)



Nationality Staff



Academic Staff per Profile



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