

Report mid-term Research Review Civil Engineering
2018-2020
Delft University of Technology

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November 2021

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Preface

Within the framework of the Standard Evaluation Protocol (SEP), every six years a full research assessment has to be carried out for university faculties and departments, and a mid-term halfway. This report reflects the findings of the mid-term assessment committee, who has been assigned the task to evaluate the research and the corresponding Civil Engineering programmes of the Faculty of Civil Engineering and Geosciences (CEG) of Delft University of Technology during the period 2018-2020.

The faculty invited seven experts from three different countries, covering the various disciplines in the research, to join the committee. Information was provided by the faculty in the form of a comprehensive self-evaluation and some underlying data. On 1 September, a site visit was organised that could, despite the Covid pandemic, be held on campus, allowing the committee to also 'feel and smell' the atmosphere at the faculty. The very concise one-day programme consisted of interview meetings with the dean, heads of the staff and department heads. In addition, informal meetings with PhDs and junior staff members provided additional and valuable insights. At the end of the day, all participants in the day were invited to attend a closing meeting in which we communicated our first observations. In this report, we elaborate on our experiences during the visit.

As a committee, our approach was qualitative. Taking into account the expertise of the individual committee members, we formed pairs to assess the departments. We also assessed the general themes, both at the faculty level and at the department level, and paid special interest to the additional questions formulated by CEG. The main questions were discussed in the committee during a preparatory meeting, and all meetings were attended by the entire committee. In this way, we could make optimal use of the background and expertise of the individual members and safeguard a common assessment framework.

In the previous assessment (2018), several recommendations were made. In our opinion, CEG worked hard and, in almost all cases, was successful in acting on these recommendations. We regard research carried out by CEG as of high quality, highly societal relevant and viable.

On behalf of the committee, I would like to thank CEG for giving us as committee members the opportunity to participate in this mid-term assessment, the thorough preparations and the very pleasant and inspiring site visit.

Henrike Branderhorst MSc
Chair

1. General remarks and themes

1.1 General

In general, the connections between groups within the faculty are strengthened. The main driver is the redesign of the Civil Engineering master programme, which took and still takes a lot of effort, but inevitably also brings a lot of energy to the departments. The redesign is both a top-down and bottom-up process in which, especially bottom-up, many young staff members are involved. This is giving them the opportunity to become familiar with colleagues from other disciplines, but, perhaps more important, to be involved in a major strategic process. Surprisingly, the committee only became aware of the growing cross-departmental collaborations and links during the site visit, and this could definitely be better documented in the next self-assessment. Topics such as growing interconnectivity through shared use of laboratories (less seen as 'personal assets' but 'departmental assets' or even 'common assets') and the importance of the Delft Artificial Intelligence (DAI)-labs could be much more emphasised. The faculty is internationally renowned, has a vast number of excellent research groups, and is firmly embedded in national and international networks.

A number of questions were asked to the committee:

- Can the committee identify research topics that are currently missed in the portfolio?
- Can the committee identify research topics that could be considered for termination?
- How does the committee see the balance between the respective sources of research funding?
- How does the committee assess the organisational model of the individual departments?

Unfortunately, we had little time to elaborate on these questions. At the department level, we see a growth to more thematic and cross-disciplinary research, strongly linked to societal relevance and, of course, research funders requesting more and more cross-linkages. In general, we did not identify missing topics or topics that could ultimately be terminated.

With respect to funding, we experienced a shift from more short-term financing to long-term financing in some departments (Engineering Structures), where other departments (Water Management) tend to keep the current funding scheme, which is dominated by short-term and smaller assignments. Such a small but diverse collection of projects is not perceived as risky, as there is a large flexibility in both funding and research staff to move along with varying opportunities and also depends on the discipline where funding emerges. We see a higher risk in the growth of staff members without a consistently clear indication of growing resources for research funding, which increases mutual competition for grants.

It seems to us that all departments are developing tailor-made organisation models, of course within the boundaries of the TU-system, depending on their culture. Some tend to be rather classical and hierarchical (3MD), others flat (T&P, ES and lab structure). We suggest increasing mutual learning by sharing the pros and cons of each type of organisation and the lessons learned from it, to ensure that departments can benefit from each other's experiences.

In line with these positive qualifications, the committee has a few recommendations for further development:

- CEG could identify in a more structured way its strengths, reputation and network, and actualise more agenda-setting
- The recommendation to install an external board in relation to research topics was not carried out due to Covid and other priorities (MSc-redesign)
- In the previous assessment, strengthening the link with the universities of applied sciences was recommended. For the same reasons (Covid) this has not been done so far, but we still think that a strengthened link is fruitful for both CEG and the universities of applied sciences in order to promote knowledge transfer to societal applications
- We also are of the opinion that cross-departmental collaboration can benefit much more from possibilities for cross-cutting staff appointments, e.g., double appointments, and strongly recommend CEG to actively look for positions where these appointments can be applied
- Define a clear policy on the growing influx of staff related to stable possibilities of (external) research funding

1.2 Human Resources

On paper, CEG is promoting its talent through careful guidance and supervision. However, during the informal meetings, it appeared that the tenure trackers themselves do not experience a systematic procedure to determine the requirements to get tenure, let alone consistency in those requirements. Demands are high, observed is that CEG assistant professors are sometimes of the same level as associate professors at other universities. In addition, the requirements for part-time tenure positions are not clearly scaled to the part-time fraction. We suggest including achievements collected in the non-TU time of the candidate when these overlap with the tenure criteria (such as acquisition of funding, publication, supervision of junior staff). It is recommended to examine whether the current implementation of the tenure track strategy really adds to the ambition of TU Delft to be an excellent university, or, on the contrary, brings TU Delft disadvantages in acquiring new staff, who can get better (paid) positions elsewhere, also internationally.

Workload is a serious issue and was raised as such by the faculty. Universities are prone to self-inflicting stress due to their competitive nature and ambitious people. Therefore, the requirements should be balanced, and supervisors should be aware of their positions as role models.

CEG also put much effort into improving gender balance. At the level of assistant professors, these efforts indeed resulted in a changed gender balance. In the higher ranks (associate and full professor) CEG is definitely still lagging behind, with only 8% of its professors being female. The TU Delft average is now 16%, with the goal of reaching 25% by 2025. Although the number of available female scientists will vary by discipline, we think that the faculty can improve on this aspect. Non-bias training for hiring committees is recommended. This is necessary, especially since gender balance will become more and more a criterion for funding. Not only the formal arrangements (such as criteria for gender balance in job candidate shortlists) but also informal actions (identify and promote/support male and female role models; be aware of gender balance in formal and non-formal committees, promote female spearheads in internal and external communications etc.). Diversity in staff can also bring about new perspectives and skills. We also suggest, given the differences between departments, to take more advantage of each other's best practices.

We thus recommend the following:

- Requirements for obtaining tenure should be agreed in a systematic and transparent way for all tenure trackers to ensure that the implemented tenure track process is transparent and balanced at all levels of the faculty
- Workload and hiring of new staff members should be seen in a wider perspective; hiring also might lead to more competition, both internal, but definitely in the perspective of the available research funding, and does not always contribute to reducing workload
- Formulate a policy on increasing tenured staff related to stable research funding
- With respect to gender balance, the faculty should also think of a strategy to increase the number of female staff members in the higher ranks, other than hiring assistant professors and waiting for them to grow but always in careful consideration of the available talents in a certain field of expertise

1.3 PhD Candidates

TU Delft implemented a Graduate School (GS) for all PhDs, with the aim of strengthening the education component of the PhD and improving the monitoring of the PhD process, also to reduce the duration of the PhD period. This Graduate School has local branches, including the Faculty Graduate School (FGS) CEG. The system of guiding, supervision and training seems solid. When implemented correctly, PhDs get first signals about their functioning when submitting their PhD agreement after six months, get a clearer picture during the 9-month meeting (in which they, if necessary, can improve) before the final go/no-go meeting after 12 months. The selection procedure was sharpened, but department chairs are, especially in larger departments, not systematically involved. Half-yearly meetings are held with the departments heads (HYPPR) to discuss issues as PhD-yield, but also to discuss individual bottlenecks and circumstances.

However, in a discussion with the PhDs, the picture became a bit more unclear. PhDs are content about the atmosphere and, although during the Covid pandemic much less, social contacts. However, requirements are not always clear, terms not always met, meetings with supervisor are primarily about content, not other aspects of being a PhD, and not always are planning and PhD agreement adapted to changed circumstances. Some PhDs also feel that the lack of postdoc positions at CEG is influencing their career perspectives. PhDs also find it hard to find the right channel in case of difficulties; some of them seem hardly aware of the possibility to contact their mentor or how to contact a confidential advisor. The director of the FGS receives some complaints from PhDs. He has proactive contact with communities and individuals to stay informed about special issues that PhDs are experiencing.

As a committee, we recommend the following:

- Make expectations more clear from the start of a PhD, using the tools developed by the Graduate School
- Pay more attention to other issues than only discussing the content of the research project during (official) meetings with the PhD candidate, e.g., planning, impact of change of scope for the planning from the PhD's perspective, social issues, etc.
- Also pay more attention to cultural differences and other factors influencing the PhD process in order to avoid delays

1.4 Open Data

CEG showed good initiatives on this aspect, leading to impressive results with respect to open-access publications. However, the number of open data sets seems low at this time, although the figures are somewhat unclear. Not clear is how scientists benefit from publishing their data in view of their own career. CEG appointed a data steward, which in itself could mean a good step to support researchers in handling and publishing their data. However, it became clear that the role of this data steward was unclear to junior staff members in particular. Especially for software, CEG should balance the benefits of publishing as open data against the option of protecting the IP in patents and/or for spin-off creation (which offers at the same time interesting career options for PhDs and postdocs).

Our recommendations:

- Embed open science, both open-access publications and open data in the yearly R&D cycle and assessment procedure of the CEG Career Development Committee (CDC)
- Make the role of the data steward more clear and ensure the visibility of the data steward

1.5 Academic Culture

We are very pleased to see that CEG installed an Academic Culture Committee (ACC). One of the spearheads of this ACC was diversity and, therefore, has strong connections with HR (see also that paragraph), focussing on gender balance. The ACC is under development, and we encourage CEG to continue this committee. Diversity is an umbrella term, and many diversity topics can be addressed (sexual orientation, religious and cultural background, etc.). The issue of undesirable behaviour was also discussed, also the lack of clear routing for victims.

In this respect, we would like to recommend the following:

- To continue this committee, providing proposals to contribute to an even better academic climate
- To broaden the scope of the ACC from diversity to inclusivity, leading to improved self-development and use of the diverse population
- Make sure that a clear routing is available for persons experiencing undesirable behaviour; a faculty confidential advisor would be a good step forward

2. Departments

2.1 Hydraulic Engineering (HE)

This department has a very good starting point: the quality of the research was assessed as excellent in 2018, HE department is well settled in the field, (internationally) recognised and the recommendations by the previous assessment committee had a good follow-up. The department looks very well organised. Scientific staff has increased and new research projects have been initiated and executed, some large grants were awarded. In the described research projects, the combination of experiments in the laboratory, field observations and numerical modelling is very apparent, which is in line with faculty strategy.

HE is making a transition to new themes (energy transition, climate change etc.) while the underlying fundamentals are unaffected. Given the challenges that the department is working on, this is a wise strategy. Steering into this direction takes place via profiling of new staff, establishing new research lines, and by appointing part-time staff, also working at Deltares, Rijkswaterstaat (RWS) or industry. Bringing in external (part-time) staff proves to be challenging, given the performance criteria for academic staff, according to which staff have to combine a high level of performance on both research and education in order to become tenured, which can hardly be achieved in a part-time position. Therefore, hiring more senior researchers with connections has a greater impact on building strong relationships with industry and related institutions. The joint benefits of both associations are crucial to achieving success. It helps CEG connect to the outside world, as can also be done by means of sabbaticals, etc. In our view, the intensive interaction of HE with external parties is highly valued; the department has strong connections with society and is able to respond quickly to changing research themes. Despite this focus on applications, a high scientific level is also maintained, leading to a very balanced range of activities.

Coherence and focus are created by working in large programmes, in which in-depth scientists collaborate on larger topics (e.g., the field labs). In addition, the HE-laboratory plays a vital role in connecting groups and researchers, since all groups are involved in this lab. Younger staff is represented in the department organisation (including MT) and via the HE PhD council. Two associate professors are also on the board of HE. Attention is paid to gender balance in this MT. Also, in general, HE made good progress in gender balance. Collaboration is improved by steering towards competences in communication skills (listening) and working in teams.

Societal relevance is very present: climate change, transition to renewable energy systems and enabling of safe and sustainable urbanisation and infrastructure in delta areas are major issues and are the main driver of HE's research. Impact can be distilled from results of scientific research brought to practice, e.g., models developed by HE are being used in applications in practice, which is seen as key element, but also from the large number of graduates that find jobs in societal organisations, having the biggest impact on change. Relevant topics are kept alive by starting from societal impact, e.g., in courses, leading to the fundamentals necessary to provide the solutions, instead of teaching the fundamentals and afterwards attaching the challenges which can be solved with the theory. The underlying technologies like monitoring, sensing, etc., are connected within the MSc-redesign in a specific module, on which is elaborated later on in the programme in the respective learning lines.

The 2018 assessment was 'excellent' in viability. This status seems only further strengthened, based on the relevance of the research themes and regular cooperation with other parties (universities, applied universities, government and industry).

The workload of the staff and especially the assistant professors in tenure track is high, but during the interview regarded as doable. The educational load of tenure trackers is reduced from the average 40% to 30% of their time. Managing expectations during the tenure track is crucial; after all, not everyone will become a full professor. Outflow is often seen as failure, which should not be the case. Outflow in general is not measured or analysed. The department (and faculty) could take lessons from this, for instance, why people leave and if they will recommend HE to their relations.

A working group of staff and PhDs on PhD-delays is developing best practices to ensure successful completion of the PhD research on time. Mental health and personal well-being should be integrated into the PhD evaluation cycle.

We suggest the following for HE:

- Underpin the changes in topics in the next self-assessment with examples, making it much more clear how the transition to larger themes is done in practice, and include a clear societal impact assessment
- Monitor and analyse outflow, preferably at the faculty level

2.2 Water Management (WM)

WM has a clear profile, proved to have a strong drive and made a happy impression during the meetings. However, the relation between Strategic Development Goals (SDGs) and the overall profile and goals reported in the self-assessment was fairly nonspecific, as was the research strategy section. The societal relevance of the section is undisputed, but can be demonstrated much more clearly by documenting the concrete project results and impacts, rather than a fairly generic link to the SDGs. The examples mentioned during the interview were very convincing; societal relevance is therefore beyond doubt. The way the research is now aligned with the SDGs, via translating global ambitions into SDGs and linking these to more fundamental principles of research (e.g., water cycle) could also be much better described. Linking the SDGs better to strategy and societal challenges in a clear and self-conscious way will lead to improved impact, both in society and for TU Delft.

The department is well connected with companies and institutions in the field, as well as with other faculties (Technology, Policy and Management, Applied Sciences). WM also has outreach to the Southern Hemisphere. This important aspect deserves better visibility in the self-assessment.

We appreciate the awareness of WM that scientific knowledge should be translated into adopted technology, perhaps especially in developing countries. Although examples of attempts to increase the impact via local African politics were mentioned, which in itself is praiseworthy, the impact is, however, not systematically measured.

From a viability point of view, we see WM having a large network, doing consultancy projects, but always with a longer term goal. This seems unsecure, compared to longer projects, but in practice this proved to be sustainable since 2000, although the money stream via consultancy firms is more volatile. An interesting connection with the faculty of Applied Sciences (AP) exists, where joint projects are connected to consultancy firms. It takes, however, a lot of effort to keep this funding going, which might be a risk in the long term. WM is also aiming at other types of funding (NWO, personal grants, EU, industry).

In the past, there have been personal changes in staff. The current group looks happy, atmosphere is good, making collaboration easier and reducing silo-ing. Tenure trackers, however, experience a high workload that requires careful monitoring.

We see a strong operating department doing highly societal relevant work with major impact, but recommend the following:

- Improve the framework and presentation of the department, not by overstating the importance of the SDGs
- Also improve on describing the societal and hydro-sociological impact of the research groups
- Periodically review the long-term funding position and respond proactively to trends in the funding landscape

2.3 Transport & Planning (T&P)

In the previous assessment, the statement was made that the research was rather academic. We are very pleased to experience that T&P is indeed making a shift and broadening its focus, e.g., smart public infrastructure and cycling, without losing academic depth.

To enable this shift, a structure of labs was set up, intended to help focussing within large projects, connecting mono-disciplines to larger pervasive teams, for instance on climate change topics. The other important driver was the desire to encourage younger staff to make use of their entrepreneurial skills and connect better with the sector. Labs also collaborate in writing proposals. The lab structure also contributes to aligning the department's perspectives with other parties, improving the clarity of the T&P's own role. An organisational change was anyhow necessary because the T&P-section was too big, but splitting up into separate sections would have had, more than organising in labs, the risk of scattering the department in small bits and pieces. Strategic decisions are taken at the departmental board level. The lab structure has proven its flexibility during the Covid crisis: research about the impact of Covid on mobility emerged in several labs, and collaboration was rapidly established. Not only did this put T&P in pole position internationally for socially relevant Covid research, it also stimulated collaboration and avoided isolation of researchers during the lockdown. It also led to a middle up/down strategy, of which the staff also seems very enthusiastic. We would like to add that a proper reflection of the lab structure on the website is necessary, as well as a better description of the lab structure in the next self-assessment. Finally, the strong focus on internal organisation in the report left insufficient room to discuss how collaborations with other departments, faculties, and external organisations like other universities, RTI's and corporate R&D are strategically organised.

Although the research is without doubt very socially relevant, this did not become directly clear to us. Also, the societal impact did not become very clear from the self-assessment (e.g., what is the Social Impact Factory?). During the interviews, some quite impactful examples were given that underscored the societal relevance and impact of the research. In our view, this could be much better described in a self-assessment, and best practices could be shared more within the faculty.

We are of opinion that the SWOT as presented (especially the threats) is very generic and could be applied to every department. From a viability perspective, we mention that a careful consideration of China links is needed in a rapidly changing world. Also, the dependence on externally financed research projects and the energy required to keep the portfolio at the current level might become quite a burden.

Open science/open data is work in progress and needs a cultural change, a mentality change to share 'my' work / data with other researchers. Training of students and (fellow) PhDs is necessary. Open data is used in the labs, but also in connection with the Amsterdam Institute for Advanced Metropolitan Solution (AMS). T&P does not believe in patents as a useful way to disseminate knowledge. From one lab a start-up company arose, capitalising software.

We would like to recommend for the next assessment the following:

- Make clearer in the self-assessment the successes of the department and how these were achieved
- Make it clearer how coordination of the labs is arranged
- Formulate a clear vision on the collaboration with China
- Formulate a policy on how open science can lead to further development and valorisation of the research carried out

2.4 Engineering Structures (ES)

Since the split of the Department of Structural Engineering, evaluated in the previous full research assessment, ES has made an impressive development. The department defined a broad mission, breaking down into four, bottom-up defined themes, linked to the themes of the faculty. Every member of the staff has a link to one or more themes. The themes are assessed every five years to ensure sufficient flexibility. The type of activity changed due to the themes, from more consultancy-like projects to more long-term projects and programmes. With this transition, ES left the path of defining its research along the classical lines (concrete, steel, timber, railway, etc.), but focuses more on end terms related to the themes and strengthening its research. However, from the self-assessment, this did not become clear to us, nor did it become clear how the themes relate to the more classical disciplines. On the basis of the self-report, the question arose as to what extent the central needs of scientific support in innovative structural engineering, e.g., in solid or metal construction, could be compromised by the new way to set the focus. There was also the question of how the more traditional major fields of civil engineering would be dealt with or whether they would be pushed back under a larger paradigm shift. The examples given during the interview were, however, very convincing and deserve to be documented in the self-assessment.

The themes are of high social relevance with different aspects: They range, e.g., from dealing with existing infrastructure and construction, aspects of circular economy over biobased or recycled materials, to the field of energy production. The topics address current challenges and fit the mission of the faculty.

The viability of the department is beyond any doubt. The Stevin 2 laboratory has for a long time set the international standard and is an important asset of the department. This is also recognised by the department in the assessment. With financial resources becoming available, junior staff made a future-proof plan to invest in the laboratory, which contributes significantly to the viability of the department.

The department worked hard on coherence, involving junior staff and changing gender balance, and with success. There has been a marked increase in female staff members: 25% of the staff is female. ES has implemented an innovative policy to define positions without a predefined embedding in a certain section. Once appointed, the right embedding is identified, which is a refreshing approach. In addition, the involvement of junior staff through the so-called 'Young MT' seems to work well, speeding up the department's transition.

Three out of four sector plan positions were taken by female scientists. Decisions on appointing permanent staff are taken on faculty level and are discussed within the departmental board.

Young staff members are also involved in management tasks in an early stage of their career in order to develop their management skills, but also to challenge them to look for funding opportunities without looking at limitations of the section boundaries. In the department, a PhD council is active. The chair of this council also participates in the young MT.

The various approaches to involve and benefit from younger staff members and scientists deserve a big compliment. They will promote the agility of the departments.

ES is in favour of institutional instruments as double appointment, Delft Research Institutes, etc., to connect and to unite people with different expertise. For example, it was the Railway Institute, which also connected to other faculties and established an interfaculty railway curriculum. There are also connections with other departments, for instance, 3MD. To further improve collaboration, every three weeks a seminar is held, having a good showing.

When ES was established, the educational workload was spread quite unevenly and partly experienced as high. To handle this situation, Metrikine has developed a metric for this, whose principles are adapted by CEG.

We are of opinion that ES did an excellent job on the transition process, bringing groups together, measuring and distributing educational workload. This was done using creative thinking and unconventional approaches. However, this became not directly clear from the self-assessment on paper.

We would like to recommend ES to do the following:

- describe the self-assessment in a way that others can profit, since the chosen models and solutions are very interesting and to continue the current process
- avoid possible misunderstandings about the role of strong science fields that are losing some of their traditional visibility by focussing more on end terms than on individual topics

2.5 Materials, Mechanics, Management & Design (3MD)

The concise self-assessment provides a clear and well-structured vision and strategy and is reflective of the high quality of this department. 3MD appears to be a coherent department, organised in three sections, along three levels of scale, and with a series of selected overarching themes. This results in a solid framework that has all the ingredients for successful scientific research, ground-breaking technologies and excellent education. 3MD combines the more traditional disciplinary section structure with internal collaboration on societal topics to provide clearer external visibility and to give identity to people.

Serious efforts have been made to improve the research lines within the (design) groups, which, until now, hardly had a research portfolio, by attracting new research staff with a more sharp research profile, without becoming too academic by also appointing (part-time) lecturers from practice, and also to induce cross-fertilisation. 3MD should team up with Engineering Structures on design, which seems to be the easiest way to collaborate and remain in the specific strengths of the departments.

The research portfolio is broad and deep, and horizontal links are growing, both within the department (e.g., with the group Integral Design and Management) or with other faculties (e.g., Electrical Engineering, Mathematics & Computer Science by means of the DAI-labs). Cohesion was further established by defining research themes, the multiscale approach, assembling the entire department on one floor, and also by staff meetings and social events.

3MD has selected three topics within the sustainability theme. Research on each topic is systematically discussed in the self-assessment, resulting in a series of impactful initiatives with innovative ideas. The broad topics, themes and monodisciplinary strengths will be brought into the renewed educational programme (the track civil engineering materials and new MSc Environmental Engineering). Obviously, this requires careful selection of topics that prove to remain important in the long run.

3MD connects to many other groups, also through education. Given the strength of the monodisciplinary research groups, we, however, think that 3MD should not be too modest and should look for a more pivotal and agenda-setting position, both within the faculty, where the disciplines of 3MD very well connect to other departments, as to national and international stakeholders. The department can also benefit from new key technologies at other faculties, and other departments, e.g. Engineering Structures, can benefit in turn again from 3MD. Sharing of lab facilities more proactively could also stimulate more collaboration within the university.

The main criteria in the selection procedures for young staff are expertise and a strong research profile, which should be embedded somewhere in the department. But also, a clear vision on how to connect with other researchers and disciplines is a main criterion. Tenure trackers experience a high workload, and the overall load could even increase due to educational redesign. This issue is given attention.

Diversity is an issue within the department. 3MD hired external help to look for female candidates and did much more than in the past to identify female talents. However, the results so far have been rather disappointing. Especially in the higher ranks, 3MD is lagging behind compared to other departments and diversity is certainly an issue which has to be given high priority.

3MD also mentions social safety as a serious issue. During the interview, it appeared that the department takes this issue very seriously and approaches this at various levels: by direct feedback to individual sources, by discussing the topic and trying to create a safe environment. Some actions have already been taken, while others are in preparation. In practice, it is still difficult for people, especially from other cultures, to find the courage to speak out. The committee greatly appreciates the courage to raise this topic, which will definitely not only be an issue within 3MD.

Some PhDs experience tension as well. 3MD has, in addition to the HYPPR meetings with the Graduate School, a biannual review of all PhDs with the promotors, to discuss progress and issues in supervision and also to discuss improvements in supervision. Additionally, a sharpened set of guidelines was defined to select and guide PhDs, and clear and doable schedules are a spearhead to avoid delays.

Our recommendations:

- 3MD should feel obliged to take the lead to connect with other departments within CEG and beyond, becoming a strong pivotal department on university scale, since the knowledge on the disciplinary level is very strong and strongly links to other topics in the university
- Look at best practices to improve gender balance

Appendices

Appendix A: Curricula vitae of the committee members

Henrike Branderhorst MSc

Henrike Branderhorst is since 2018 CEO of TAUW Group, an international firm of consulting engineers with branches in the Netherlands, Belgium, Germany, France, Spain and Italy with over 1,200 employees. TAUW supports clients in a responsible way with clear recommendations taking into account all aspects in the field of the environment, safety, energy, water and the living environment. During her studies at Wageningen University, Henrike specialised in soil-water-ecosystems. After her graduation she joined the Ministry of Transport, Public Works and Water Management and the water authority Hoogheemraadschap Hollands Noorderkwartier, before starting her career at TAUW. Henrike is, amongst others, also member of the Topteam of the Topsector Water and Maritime, board member of the 'Stichting Wateropleidingen", and member of the innovation board of the water authority Vechtstromen.

Dr.ir. Anneke Hibma

Anneke Hibma studied civil engineering at TU Delft and started her career with a PhD in coastal morphodynamics. In 2014 she joined marine contractor Van Oord, putting research into practice in the field of coastal and environmental engineering. In 2019 she became program manager for EcoShape, a consortium of dredging organisations, consultants, universities, research institutes, industry and government. EcoShape's Building with Nature I programme was a research and innovation programme aiming at developing a new approach towards the design of marine infrastructure, which balances development of economic and environmental values. In 2012 Anneke returned to the operational business of Van Oord and moved to Australia for 2 years to work as Engineering and Environmental Manager for the Darwin Harbour Dredging Works as part of the Ichthys LNG project. Upon successful completion of this challenging project with very strict environmental requirements, Anneke returned to The Netherlands and started in the role of Manager Engineering. The engineers within this department are specialised in Coastal Engineering, Geotechnical Engineering, Environmental Engineering, Data Management, CAD and Engineering/Design Management. Recently, Anneke switched to operation again, and transferred to contractor Dura Vermeer as project director for infrastructure projects. In addition, Anneke is member of various committees in which research, industry and government cooperate.

Prof.dr. Bart van den Hurk

Bart van den Hurk is an expert in the field of weather and climate information. Prior to his affiliation to Deltares he spent ~23 years at the Dutch Meteorological Institute, working on climate change scenarios, land-atmosphere interaction, and leading a research team on weather and climate modelling. He has been engaged in many activities in which complex climate information was aggregated and tailored to societal sectors and problems yet remaining engaged in the physical modelling of weather and climate phenomena in complex numerical models. He is Professor in the field of Interaction between Climate and the Socio-ecological system at VU University Amsterdam, and Lead Author of the 6th Assessment report of IPCC. He coordinated European research projects on soil moisture data assimilation, climate services for the water sector, and effects of global climate features on European socio-economical impacts. He joined international expert teams on land-atmosphere interaction, on the development of storylines to communicate climate change information, the analysis of compound events, and the application of forecast based financing of preventive disaster relief measures in developing countries. He has a large national and international

scientific and public network and has had frequent media performances on climate and extreme weather topics.

Prof.dr. David Keyson

David Keyson is a distinguished Antoni van Leeuwenhoek professor in Smart Products and Environments in the Department of Industrial Design at the Faculty of Industrial Design Engineering. He leads research in the area of sustainable living and work. His research aims to foster wellbeing combined with energy and CO2 reduction in the built environment while contributing to living lab design methods. His educational work focuses on applications for interactive technology for societal impactful designs. Over the past decade he has acquired and led multiple EU and NWO projects and is active in the Climate Knowledge Innovation Community.

Prior to joining TU Delft, David worked at Philips Research as a Senior Research Scientist in media and multimodal interaction and prior to that as a human factors engineer at Xerox in California. He holds a PhD from the Technical University of Eindhoven in Perception and Technology and a Masters of Science in Ergonomics from Loughborough University.

David co-founded the TU Delft spinoff Office Vitae in late 2016. The start-up focuses on vitality at work in the context of sustainability. He heads the section Design Conceptualisation and Communication in the department of Industrial Design.

Prof. Dr.-Ing. Gerhard Müller

Gerhard Müller conducts research into structural dynamics and vibroacoustics. This covers vibrations and their interactions and the radiation of air-borne or structure-borne sound. Problems are examined at different scales in the low, mid and high frequency ranges. In the low-frequency range, typical for structural dynamics, the Chair's researchers examine the dynamic soil-structure interaction by applying hybrid approaches. These combine simple analytic studies that are closely connected to the physical phenomena with current numerical models. In the mid and high frequency range, which is relevant for sound radiation within structures, statistical approaches are also used. A special focus is placed on modeling realistic boundary conditions, as they would occur in buildings or vehicles.

After studying civil engineering at TUM, Prof. Müller obtained his doctorate in 1989. He did his lecturer qualification in engineering mechanics (1993). From 1992 to 2004, he worked at a large engineering firm. While there, he was involved in all aspects of sound installation and vibration control as well as air pollution control. Covering a wide range of engineering disciplines, he managed the company for nine years. Prof. Müller is President of the European Association for Structural Dynamics (EASD). In 2009/10, he was Chairman of the Association for Civil Engineering and Geodesy (FTBG) and the umbrella association of Faculty Associations for Engineering and Computer Science (4ING e.V.). Prof. Müller is Chairman of the Education Committee of the Bavarian Chamber of Engineers – Civil and is actively involved in the Cusanuswerk Catholic scholarship body.

Prof.dr.ir. Theo Salet

Theo Salet is currently a full Professor at the Faculty of the Built Environment of Eindhoven University of Technology (TU/e) in the Netherlands. His area of expertise is structural design of concrete structures. Before joining the university, he was employed at first at SGS Intron and thereafter at Witteveen+Bos. From his position in these companies, he worked for many years at large scale infrastructural projects world-wide, amongst the fixed link between Denmark and Sweden and the North South metro line in the city of Amsterdam, the later in a leading position. His academic research is focused on the opportunities of a digital transition in the Architecture, Engineering and Construction Industry. He is a specialist on 3D printing of structural concrete structures by extrusion technology and the leader of the 3D Concrete Printing (3DCP) research group at his university. The

group closely collaborates with governmental agencies and industry to realize printed residential houses and prestressed bridges to demonstrate the state of the art of the technology. In June 2019 he became the Dean of the faculty at TU/e, a function that he now combines with leading his research group.

Prof.dr.ir. Chris Tampère

Chris Tampère was born in Antwerp, Belgium on June 5, 1973. He holds a Masters' degree in Structural and Civil Engineering at the Katholieke Universiteit Leuven (Belgium). He received the title of PhD from the Delft University of Technology (The Netherlands) in December 2004. From August 1997 until December 2003 he worked at the Division of Traffic and Transport of TNO Inro, Delft, The Netherlands. From September 2003 onwards he is working as a Postdoc Researcher at the Traffic and Transportation Engineering Section of the Katholieke Universiteit Leuven. His key qualifications are traffic flow characteristics (like travel times) and the modeling and simulation of traffic flows. He contributed to the development and the application of MIXIC, a microscopic simulation model of traffic flows in the presence of a variety of Automated Driver Assistance Systems (ADAS). He developed several travel time estimation algorithms for freeway and urban networks. Between 2000 and 2004 he conducted a PhD research into the modeling of traffic flows during congestion in co-operation with TRAIL research school, resulting in a dissertation titled "Human-kinetic multiclass traffic flow theory and modeling, with application to Advanced Driver Assistance Systems in congestion". Recently, he obtained a grant by the Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT) to develop real time models for estimation and prediction of urban traffic conditions.

Appendix B: Programme

Evaluation Period:	2017-2020
SEP-protocol:	SEP 2021-2027
Research units:	Department of Transport & Planning (T&P) Department of Water management (WM) Department of Hydraulic Engineering (HE) Department of Engineering Structures (ES) Department of Materials, Mechanics, Management & Design (3MD)

The departments ES and 3MD were formed after previous research assessment had taken place. Its predecessor, the former Department of Structural Engineering was the assessed unit at that time. The midterm will be carried out with the departments as a whole to be evaluated as one unit each.

Objectives

The midterm is primarily a moment of reflection on the follow up of the research assessment. In this reflection we will focus on a qualitative approach and limited on the quantitative output. This midterm marks the transition from the former SEP towards the new SEP, in which 4 themes are introduced in the self-assessment. The evaluation has two objectives:

- A. Assess the state of affairs regarding the recommendations of the previous assessment committee
- B. Assess the strategy development for the following assessment.

The committee is asked to give a qualitative evaluation.

Self-assessment

The self-assessment will review all recommendations made in the research assessment on department and faculty level. The review of the recommendation will be done in 4 thematic chapters (Open Science, PhD policy & training, Academic culture and HR policy) and 5 specific department chapters. Additional information can be found using Surfdrive.

Documentation for objective A comprises of:

- an extensive table presenting recommendations and actions taken/results achieved so far
- a reflection on the achievements
- an outlook to actions to be taken within the next years.

Documentation for objective B comprises of:

- Developments: Presentation of major changes in the last four years, including a reflection on the ongoing MSc redesign for the research strategy
- Outlook: Strategic choices expected in the coming years; research vision for the future
- if applicable, a SWOT analysis.

Programme site visit

24 august

#	Time	Topic	attendants
1	15.00-17.00	Preparatory meeting (online)	Assessment committee (AC)

31 August

#	Time	Topic	attendants
1	18.30-21.00	Dinner and kick-off	(AC)

1 september

#	Time	Topic	attendants
1	08.00-09.00	Preparatory meeting	AC
2	09.00-09.30	Welcome by Dean – general topics	AC, MT CEG
3	09.30-10.30	Themes	AC, dean, man. HR, Faculty secretary, dir. Graduate School, chair ac. Culture committee
4	10.30-11.15	Interview Dept. Hydraulic Engineering	AC, chair HE, max 2 add. members HE
5	11.30-12.15	Interview Dept. Water Management	AC, chair WM, max 2 add. members WM
6	12.30-13.15	Interviews Dept. Transport & Planning	AC, chair T&P, max 2 add. members T&P
7	13.15-14.15	Lunch break with PhD's	AC, PhD's (PhD council)
8	14.15-15.00	Dept. Engineering Structures	AC, chair ES, max 2 add. members ES
9	15.15-16.00	Dept. Materials, Mechanics, Management & Design (3MD)	AC, chair 3MD, max 2 add. members 3MD
10	16.00-16.45	Break, drinks with tenure trackers	AC, tenure trackers
11	16.45-17.45	Wrap-up, preliminary conclusions	AC
12	17.45-18.15	oral presentation first observations	AC, all attendants
12	18.00-21.00	Dinner	AC

Main questions at faculty level:

- How does the committee assess the follow up of the recommendations of the 2018 assessment committee
- Is the faculty on track in achieving its goals related the ambition and strategy
- How does the committee reflect on the special topics:
 - o Achievements in the field of open science:
 - Stakeholder involvement
 - Application of FAIR principles (Findability, Accessibility, Interoperability, and Reuse of digital assets
 - How does the unit makes research data, methods and materials available, including use of open science
 - FAIR data storage
 - o The policy with respect to PhD's:
 - PhD training, mentoring and coaching, also supervision and instruction of PhD's, incl. PhD education (institutional graduate school, research school)
 - The quality assurance system
 - o Academic culture:
 - Openness, (social) safety and inclusivity of the research environment
 - Research integrity, also connected to the relevant actions and requirements of the Netherland Code of Conduct for Research Integrity

- HR – policy and measures;
 - To which extent is diversity (including gender, age, ethnic and cultural background and disciplines) is a concern, including action plans for the future
 - Talent management: selection and development in relation to organizational aims and strategy: recruitment policy, opportunities for training and development, coaching and mentoring, career perspectives.

Main questions at department level

- How does the committee assess the follow up of the recommendations of the 2018 assessment committee, to improve quality, societal relevance and viability of their research strategy;
- Is the department on track in achieving its goals related the ambition and strategy;
- In what sense is there a clear relation between faculty policy and developments at department level.

Special attention points as mentioned by de faculty:

- Can the committee identify research topics which are currently missed by the faculty;
- Can the committee identify research topics on which the faculty is currently working of which termination might be considered;
- How does the committee asses the balance between the respective sources of research financing: NWO, European and industry;
- How does the committee assess the organisational models of the individual departments.

Process:

We suggest that all committee members screen the self-evaluation. Each committee member is asked to screen particular chapters in depth, one of those is asked to lead the Q&A of the respective department. Proposal for the in-depth screening:

Name	affiliation	Department*
Mrs. H. (Henrike) Branderhorst MSc (chair)	CEO Tauw	CEG general
Prof.dr. D. (David) Keyson	professor in Smart Products and Environments, faculty of Industrial Design TU Delft,	T&P/themes
Prof.dr.ir. T.A.M. (Theo) Salet	Professor of Structural Design / Concrete Structures TU Eindhoven, Dean of the Department of the Built Environment and Full Professor of Structural Design / Concrete Structures	ES/3MD
Dr.ir. A. (Anneke) Hibma	Project Director DuraVermeer,	WM/HE
Prof.dr. B. (Bart) van den Hurk	Professor Climate-Socioecology Interactions, VU Amsterdam, Strategic Research Manager Deltares	WM/HE
Prof.dr.ir. C.M.J. (Chris) Tampère	Associate professor Industrial Management/Traffic and Infrastructure	T&P/themes
Prof.Dr.-Ing. G. (Gerhard) Müller	Professor of Structural Mechanics, TU München	ES/3MD

- In bold: lead assessor

One week prior to the site visit the committee will meet to share their opinion on the self-evaluation, discuss questions, etc. At the start of the site visit a short preparatory meeting will be scheduled. The day will be concluded by a wrap-up of the entire day. The secretary will subsequently make a first draft of the assessment report, which will be shared with the committee.