

Research Review
Architecture and the Built Environment
Delft University of Technology

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Preface

Immediately upon stepping inside the rather stern, dark brick, hyper-institutional former chemistry building that now houses the TU Delft Architecture and the Built Environment Faculty, one is struck by evidence of the fascinating work that is being produced inside. Browsing exhibited building details, chair designs, delicate architectural models, regional plans and posters from international conferences and exhibitions, graphically eye-catching books on display behind glass, it is fair to suspect one has landed in one of the most dynamic and creative research and education environments in the field. The building itself, named BK City, provides not only a unique backdrop, but seems indeed to serve as a crucial framing device and spatial precondition to the research that comes out of it - the object of this report's evaluation.

Architecture, planning and the built environment are as such remarkable, dynamic and indeed rather slippery research subjects. Empirical evidence may vary from built work, to drawings, to spatial configurations, to regulatory frameworks, to newspaper articles, to interviews with stakeholders, to observations of users etc. Research questions may concern building performance, digitalisation, social effects, cultural significance, power relations, historical conditions, climate effects and further beyond. Methodologically a full faculty teaching and researching in these fields will engage with arts and humanities, social sciences, technology and natural sciences, all likely to be framed more or less in a design perspective. The TU Delft BK Faculty appears to successfully keep this amoeba-like creature in its place, well enough to manage to produce remarkable academic and societal impact. It might be that the actual building plays a role in this achievement.

Over the three days that our site-visit lasted we met with many of the key people who inhabit this building and without whom not many of the strong qualities we could identify had been in place. We were received in a remarkably positive and collegial spirit and experienced a very open-minded and critically constructive discussion climate. This in itself is an important key to success. We now hope that our evaluation report, our assessment grades and our recommendations will be received in the same spirit: as collegial advice, from a duly impressed committee.

Prof. Katja Grillner
Chair of the Committee

1. Introduction

1.1 The scope of the assessment

The quality assessment of research in Architecture and the Built Environment is part of an assessment system as specified in the Standard Evaluation Protocol For Public Research Organizations of 2015 by the Association of Universities in The Netherlands (VSNU), the Netherlands Organization for Scientific Research (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW).

The review committee was asked to assess the quality and relevance to society of the research conducted by the faculty as a whole and the nine research programmes as well as its strategic targets and the extent to which it is equipped to achieve them. It was asked to do so by judging its performance on the three assessment criteria outlined in the Standard Evaluation Protocol (SEP).

This report describes findings, conclusions and recommendations of this external assessment of Architecture and the Built Environment.

1.2 The Review Committee

The board of the university has appointed the following members of the committee for the research review:

- Katja Tollmar Grillner (chair)
- Koen van Balen
- Anne Beim
- Albert Chan
- Paulo Cruz
- Zorica Nedovic-Budic
- Anne Vernez-Moudon
- Frank Witlox

More detailed information about the members of the committee can be found in Appendix A. The Board has appointed dr. Annemarie Venemans as the committee secretary.

1.3 Independence

All members of the committee signed a declaration and disclosure form to safeguard that the panel members judge without bias, personal preference or personal interest, and the judgment is made without undue influence from the faculty, the programmes or other stakeholders. Any existing professional relationships between committee members and programmes under review were reported. The committee concluded that there was no risk in terms of bias or undue influence.

1.4 Data provided to the Committee

The committee received detailed documentation consisting of the following parts:

- Self-evaluation report
- Standard Evaluation Protocol 2015-2021
- Key publications

1.5 Procedures followed by the Committee

The final assessment is based on the documentation provided by the faculty and the interviews with the management and with the leaders of the programmes. The interviews took place on 14 to 16 December 2016 (see appendix B).

The texts for the assessment report were finalised through email exchanges. The final version was presented to the faculty for factual corrections and comments.

2. Assessment of the faculty

Assessments:	Research quality:	2
	Relevance to society:	1
	Viability:	2

2.1 Research area

The faculty of architecture and the built environment covers a wide range of research on architecture, planning and the built environment. The faculty is composed of five departments and nine research programmes. Methodologically the research programmes are diverse and broad in scope. They range from, and sometimes combine, arts- and humanities based enquiries, design- and technology driven and social science-oriented research, to applications of research methodologies based in the natural sciences.

This relative breadth is to be applauded as a particular strength of the research unit, particularly in view of current societal challenges and demands for interdisciplinary knowledge development in the fields of architecture, planning and the built environment. The research unit appears to be efficiently held together by its shared field of application, strong societal relevance and high quality educational programmes which draw upon a combination of departments and research programmes.

The current research programme structure appears well suited to produce overall high level results. However, since the structure does not strictly follow other administrative boundaries, the committee noted some challenges in terms of strategic management, staffing and recruitment and external communication. The committee was informed about some planned changes to this structure.

2.2 Site visit

During the site visit interviews were conducted with each of the nine research programmes as well as with the management team, and the research council. Two meetings were arranged with PhD-students and a mix of faculty and researchers respectively. The latter provided opportunities for individual interviews (see appendix B). In addition, a tour of the facilities was provided. Two exhibitions had been set up to offer the committee a comprehensive overview of the research output: adjacent to the interview room collected publications from all programmes in the research unit, and in the department of architecture an exhibition of architectural design and exhibition outputs from the research programme APF.

2.3 Research quality

The BK faculty is an internationally recognised institute. It is clear that the faculty is doing research of very high quality based on key indicators, such as quality and quantity of research publications, citation levels, project and individual grant capture, hosting and curating of international conferences and design exhibitions as well as active participation by faculty members in these contexts. The research unit ranks impressively high in the QS by subject ranking for architecture (#4). The research quality is generally very good across all research programmes and outstanding in some. The faculty has overall been successful in keeping the research unit together in spite of its broad methodological scope. It shows good evidence of interdisciplinary collaboration within and between the nine programmes. Across the research programmes there is further evidence of good linkage to strong educational programmes as well as to industry and public authorities outside of the university.

During the review period the number of refereed articles increased from 112 in 2010 to 170 in 2015. On the other hand, the number of books decreased from 94 in 2010 to 33 in 2015. The faculty explained that there has been a shift from book publications to journal publications. This is partly due to a change in the financial incentives structure designed to promote journal publication and discourage self-publishing of books. The committee recognises this shift as important and regards the current balance between these types of publications as highly improved. To strategically assess the relative value of different forms of scientific and scholarly publishing is however crucial. It is further important to distinguish between the different research programmes and to recognise the particular values of slightly different publication patterns. The committee applauds the open access PhD series.

The percentage of funding based on contract research has been stable in the review period 2010-2015 (35% in 2015) while the percentage of funding based on research grants has increased significantly, albeit from a very low level (1% in 2010, 10% in 2015). The faculty was awarded with four personal grants (1 ERC, 1 VENI and 2 VIDI). Although these grants are personal, it helps a programme in building on their success to help other members of the group to achieve success in turn.

2.4 Relevance to society

Following a set of valorisation indicators, the BK faculty has adopted the most relevant ones to pursue its work that could lead to important economic, social and cultural impact. A high degree of staff members (especially in architecture and urbanism) maintain double affiliations between university and industry, government agencies or other public authorities. Further, the educational programmes in architecture and the built environment typically offer ample opportunities to examine current societal challenges such as for example climate change, smart cities, migration and urban growth. The faculty appears well-equipped by management and organisation to take proper advantage of these conditions to properly further advances also on a research level relating to these challenges.

Several research products were highlighted in the report and at the site visit, such as the Amsterdam Metropolitan Institute, Climate Proof Cities and 4TU.BOUW Lighthouse projects. The committee was impressed by these products and several other demonstrated outcomes including direct influence on public policy, standards and regulations as well as important contributions to major international architecture exhibitions like the Venice Biennale. The number of joint research projects, joint appointments, and joint PhD candidates with the other universities and institutes is very impressive.

With the limited number of architectural faculties in the country and thanks to the size and quality of the research and education output of its architectural faculty, the TU Delft manages to fill up great part of the opportunities the authorities are creating to develop innovation in architectural and planning policies and practices.

2.5 Viability

Overall, the committee was impressed by the faculty in terms of a strong sense of coherence, unity and strategic management. Steady signs of quality improvement could be observed across the review period, a fact that is particularly impressive given that the faculty faced substantial budget-cuts in 2013-2015. However, the committee faced some challenges to understand properly the research programme structure. It does not follow administrative boundaries such as departments, and it was not clear from the report, nor from the web-site, which chairs or other teaching and research staff belonged to which programme and how 1st

stream funding was allocated between the programmes. These questions were clarified on request during the site-visit.

During the interviews, the committee identified strong arguments for maintaining the current research programme structure from both programme directors and staff. Its capacity to cut across departments and educational programmes was regarded an important advantage as well as its relative flexibility and informality compared to the departmental structure. Further, the structure appears to offer a valuable counterpoint to the formal management structure. It supports the integration of articulated research perspectives into the faculty's strategic decisions. The faculty research council, formed by the directors of the research programmes, was argued to have an important role in this respect.

The committee recommends that the faculty carefully considers the above identified qualities, while still working towards a relative clarification of the research programme structure in terms of management and external visibility. This should further strengthen the potential for increased international and interdisciplinary collaboration. Critical attention should further be given to assess whether some key sub-research areas in the unit are properly highlighted and addressed in the current structure. For example this may concern digital technology-based research as well as cultural historical research that today is distributed across research programmes.

The committee noticed that there is a large difference in the capacity to obtain second and third stream funding between programmes. Although the committee is aware of the strong competition for personal grants, it recommends the faculty to make more effort overall to get second stream funding and, in particular, to develop strategies for those programmes that have a history of low grant capture capacity.

The facilities of the institute have a very high standard, and workshop spaces for students and researchers alike appear to be generous and well equipped. The adapted reuse of the historic building which hosts the faculty is an exemplary and inspiring environment for students and researchers in architecture. However, experimental research labs for full-scale building construction and testing are currently lacking. Additional spaces are currently being planned and funding is sought in response to this.

2.6 PhD programme

The BK faculty has its own graduate school. The graduate school ensures that doctoral candidates receive skills training, supervision and mentoring and deliver dissertations. The school uses a monitoring system that keeps track of candidates' progress.

The committee has spoken to a very enthusiastic, international group of PhD students. PhD students appear to be well embedded into the research programmes. The committee found out that there was a good supervising structure both intellectually and procedurally (e.g., the weekly and bi-weekly meetings with supervisors and the annual checkpoints) and a good process towards career goals.

In terms of education, PhD students are required to follow a tailored doctoral education programme of 45 credit points, so that they will acquire skills and knowledge related to their discipline, to scientific research in general and to their overall personal development. In general, the PhD candidates the committee has spoken with were satisfied with the course programme. However, in their opinion, the number of discipline related courses was small, so it is hard to get the necessary number of credits. The committee advises the faculty to critically look at the course programme.

Based upon numbers in the self-evaluation report the time for completing a PhD thesis appears to be too long. Considering a thesis finished ≤ 5 years to be successful, the success rate was 27%. During the site visit the faculty explained that measures already have been taken place to increase this success rate, such as monitoring the progress and a more strict attraction procedure. The committee recommends to keep monitoring the success rate and, if necessary, to take further measures that lead to a substantial increase.

The committee has noted an on-going shift towards PhD-dissertations based on publications and recognises important benefits of this in terms of peer review based quality control and decreased completion time. However, in view of this shift, the committee recommends the PhD-programme and the research programmes to pay particular attention to safe-guarding the development of the PhD-candidate's scientific and scholarly integrity and independence, and the quality and contribution to original research and scholarship by PhD-dissertations. These are quality aspects that may be argued to be easier to control and assess in monograph-style dissertations.

2.7 Research integrity

Faculty and staff of the faculty are subject to the TU Delft rules regarding academic integrity. The University assumes that all staff involved in research and education take personal responsibility in matters concerning academic and scientific integrity within the organisation. Here, two policy frameworks offer binding guidance: The Netherlands Code of Conduct for Academic Practice (version 2014), which is laid down by the Association of Universities in the Netherlands (VSNU), and TU Delft's own Code of Ethics, which formulates ideals, responsibilities and rights that should be taken as guidelines for everyone who is part of TU Delft.

In the opinion of the committee, the faculty is well aware of the ethical dimension of science. In addition, in the reporting period, no irregularities or plagiarism have been found. However, the committee recommends that the faculty develops its own research integrity strategy and PhD-programme seminars along the general lines issued by the university, but with a focus on particular concerns connected to its own research and application areas.

2.8 Diversity

The composition of the faculty and academic staff as a whole reflects a rather high level of diversity in terms of both gender and nationalities, but it is still not gender balanced. In 2015, 71% of the scientific staff was a male compared with 75% in 2010. The committee was pleased by the large group of international PhD students. Nevertheless, the management team of the faculty was presented to the committee as all male. This radically imbalanced composition appears to be a direct function of the current gender imbalance among faculty leadership positions such as department heads. In some of the research programmes there is a notable gender imbalance on either professor level or among other staff. This is a factor which should be taken into consideration when contemplating potential mergers or moves of specific research programmes.

In the report to the committee the faculty mentions a university wide initiative at TU Delft, which promotes female scientists and scholars for well-funded tenure track faculty positions. The architecture faculty has so far two of these positions. On faculty level a new feminist group has recently been created, which also has a strong support among students who also have initiated such an initiative. The committee applauds these initiatives.

The committee strongly recommends the faculty to take further action to promote more gender balanced and diverse environments, teams and committees, and further to raise the

awareness and improve the knowledge of discriminatory mechanisms in academic environments and how to consciously counteract these.

2.9 Further aspects

During the site visit the committee observed that the teaching load appears to be unevenly distributed over the research programmes. Some research programmes (in particular some related to OTB) has the desire to do more teaching. The committee is of the opinion that it is important to achieve a good balance between research and education and suggests to take stock of the teaching load of all research programmes.

The committee found that the relationships and overlaps between chairs, sections, research themes and projects were difficult to untangle from the report as well as from the faculty website. The committee recommends that faculty take action to achieve a more transparent communication of its current research capacity in terms of human resources (chairs, other faculty, researchers, students), environments (research programmes and sub-programmes) as well as on-going research projects (large and small).

2.10 Assessment of the research programmes

The Committee assessed the nine research programmes of the faculty of architecture and the built environment at the TU Delft, and assigned a rating to each programme for each of the three assessment criteria.

	Research quality	Societal Relevance	Viability
Innovations in Management in the Built Environment	2	2	2
Housing in a Changing Society	2	1	2
Urban and Regional Studies	1	1	2
Geo-Information Governance and Technology	2	1	3
Urbanism	1	1	2
Architectural Project and its Foundations	1	2	2
Design and History	2	2	3
Computation and Performance	2	2	3
Green Building Information	2	1	2
Faculty level	2	1	2

The detailed assessment per programme follows in chapters 3-11 of this report.

2.11 Summary and recommendations

As noted above, there is generally a very good level of research quality and societal relevance across all research programmes and notably outstanding in some. Since the last evaluation the faculty has improved its academic output by increasing the rate of scientific publications as well as improving competitive grant capture from 2nd stream funding. Further the quality of the PhD-programme has improved in terms of its basic curriculum, structure and attention towards individual student's time to completion.

Research activities across the nine research programmes continue to demonstrate an excellent degree of societal relevance spanning from curating and participating in large international exhibitions, strong collaborations with the industry, participation in the development of public policy and regulations as well as national and international standards, and frequent appearances on public radio and television.

The committee was struck by the generous and collegial atmosphere that characterised all meetings with faculty and students across the site-visit. Staff members and students express both pride and great enthusiasm concerning the faculty's research and education programmes.

The committee recommends the university leadership to:

1. Acknowledge and embrace the great importance of this faculty to the whole university in particular in view of its capacity to bridge and combine technical and design oriented research with social-science, arts- and humanities based research and scholarship;
2. Further to recognise that, as a consequence of this broad and interdisciplinary scope, particular attention needs to be paid to ensure that appropriate indicators are applied by the university when assessing the quality of current research programmes and staff members;
3. Recognise the expressed needs for increased experimental workshop facilities for full scale testing of building constructions, materials and design details, and to support the faculty in realising these ambitions;
4. Applaud the rate of improvement from this faculty since the last evaluation in terms of increase of research publications, improved grant capture and improved structure of the PhD-programme.

The committee recommends the faculty leadership to:

1. Maintain with some exceptions the current research programme structure in terms of thematic divisions and responsible chairs. One exception being the already planned merger between C&P and GBI. See further section 2.5;
2. Review and clarify the management structure of individual research programmes, including relations between department management, chair responsibilities, and research programme management. This in order to improve an institutional structure that caters to strategic agency, capacity for national and international collaboration, grant capture and external visibility. See further section 2.5;
3. Further improve the quality and quantity of research publications, in particular peer review journal publications;
4. Maintain the particular attention by some programmes to other forms of output from experimental design practice, research and education, such as exhibitions and other events, design and planning projects and books, but clarify the research relevance of these practices;
5. Increase the efforts to attract second stream funding and in particular to develop strategies for those programmes that have a history of low grant capture capacity;
6. Improve experimental workshop facilities in line with the presented plan;
7. Further improve the conditions for PhD-research. Completion rates need to be monitored. Available funding schemes need to be assessed and efforts made to expand these. By asserting that accepted PhD-students have appropriate funding conditions their possibility to complete the studies within the expected time should improve. See further section 2.6;
8. Actively promote more gender balanced and diverse environments, teams and committees, raise the awareness and improve the knowledge of discriminatory mechanisms in academic environments and how to consciously counteract these;
9. Develop a faculty specific research integrity strategy and PhD-programme seminars with a focus on particular concerns connected to its own research and application areas;

10. Assess the distribution of the teaching load across the research programmes and make efforts to improve the balance between research and education where it is called for;
11. Improve the external communication of the faculty's current research capacity in terms of presenting its human resources (chairs, other faculty, researchers, students), its environments (research programmes and sub-programmes) as well as its on-going research projects (large and small).

3. Assessment of the programme ‘Innovations in Management in the Built Environment’

Assessments:	Research quality:	2
	Relevance to society:	2
	Viability:	2

3.1 Research area

The programme stimulates and evaluates innovation in management in the built environment by supporting decision making and interaction between all stakeholders and actors involved in the initiation, design, construction, and development or redevelopment of the built environment. Innovations in Management in the Built Environment (IMBE) is a cross disciplinary research area and promotes an integrated view of management processes in the built environment.

3.2 Submitted data and publications

A research portfolio providing an overview of research data and policies, together with a selection of IMBE’s research results: activities, organizations, facilities/assets, output, including indications of their use and recognition was submitted. Major changes have been made over the past 6 years. There are significant increases in refereed articles (0 in 2010 to 26 in 2015); and research grants (0% in 2010 to 7% in 2014, and 4% in 2015). However, in terms of PhD candidates, a downward trend is observed (13 in 2010, and 10 in 2015).

3.3 Research quality

There was a significant jump in publication of refereed articles, from 0 to 26 in the last six years. The Faculty’s 1:1:1 policy by asking each faculty member to produce 1 refereed paper each year actually helped boost up the publication number of IMBE. IMBE is making good progress in increasing the international mix of PhD candidates. IMBE is searching for more interaction and collaboration with international research groups from within EU and outside EU (e.g. UCL, NTNU, Tongji, Hong Kong University), through visiting PhD's and (ass.) professors, and through the organisation of international events (seminars, conferences, etc.). In addition, it works closely with the industry to further increase the number of PhD candidates. IMBE started to secure 7% and 4% research grants (EU research funding) in 2014 and 2015 respectively. These are good evidence to demonstrate that the research programme conducts very good internationally recognised research. They have established an international network that supports their activities and gained useful experience in coordinating large projects.

3.4 Relevance to society

IMBE continued to do well in societal relevance. They maintained a high societal impact through strong relations with relevant stakeholders such as clients, professional bodies, and companies. Outputs of IMBE have resulted in changing the legislation in the Netherlands, and producing practical toolboxes with actual application in the industry. IMBE has managed to develop highly relevant research topics (e.g. circular economy) as part of their own research area, methodologies and theories. Through these efforts IMBE managed to solicit support from the industry to provide in-kind and cash contributions in bidding for competitive research grants. IMBE is getting more internationalised by having visiting academics spending their sabbatical leave in TU Delft. A visiting professors programme funded by the faculty has been launched, which will lead to the visit of the highly esteemed prof. Fulong

WU from UCL in 2017 and scholars from NTNU and UCL funded by established research projects. Likewise, IMBE staff are actively pursuing the opportunity to work in overseas universities to extend their network internationally.

3.5 Viability

Being the only management research programme within the School of Architecture and the Built Environment, there are great education and research opportunities both nationally and internationally. Architecture, engineering, construction and operation practices need to enhance their business approaches constantly to maintain their competitive advantages with clients, end users and the general public. These provide great viability to IMBE in decades and beyond. Perhaps IMBE should take advantage of the high QS subject ranking in architecture and the built environment to attract more PhD candidates, solicit support from the industry, and secure more competitive research grants both nationally and internationally.

3.6 Further aspects

It is noted from the self-evaluation report that, although the research staff is relatively stable, scientific staff of IMBE decreased from 31 to 27, PhD candidates decreased from 13 to 10, and the visiting fellows from 28 to 19. This may have an impact on future development of IMBE. A critical mass, especially those scientific staff, PhD candidates and visiting fellows, as well as attractive internationally oriented research environment should be established and maintained to continue the momentum and excel.

3.7 Recommendations

1. Strike a right balance to encourage IMBE staff to produce peer-reviewed journal papers and other forms of publications, here also encourage PhD's to publish in journals to enhance further career opportunities;
2. Continue to define and refine strategies for new research topics and collaborations with relevant industry and societal/governmental partners;
3. Continue to develop the core research area, methodologies and theories to strengthen main activities;
4. Take advantage of the high QS subject ranking in architecture and the built environment to attract more PhD candidates, visiting fellows and external network collaborations;
5. Solicit support from the industry to secure more competitive research grants both nationally and internationally;
6. Maintain a critical mass of staff members (scientific staff, research staff, and PhD candidates) to continue the research momentum and excel;
7. Maintain a strong communication platform and continue to enhance the important connection to societal relevance.

4. Assessment of the programme ‘Housing in a Changing Society’

Assessments:	Research quality:	2
	Relevance to society:	1
	Viability:	2

4.1 Research area

The research group Housing in a Changing Society (HCS) deals with the question of how to achieve sufficient, sustainable and affordable housing in changing societal contexts. The objective of HCS is to increase the knowledge of the role of housing in changing societies and to contribute to scientific and societal debates, solutions and education. HCS has four interrelated disciplines: market dynamics, governance, organisational strategies and housing quality.

4.2 Submitted data and publications

A research portfolio providing an overview of research data and policies, together with a selection of HCE's research results: activities, organizations, facilities/assets, output, including indications of their use and recognition was submitted. Changes have been made over the past 6 years. There are significant increases in PhD candidates (12 in 2010 to 20 in 2015); and research personnel (44 in 2010 to 48 in 2015). A fairly constant research output in terms of refereed articles (average of 28) is maintained over the 6 years.

4.3 Research quality

In the last six years HCS made a significant increase in the number of PhD candidates, from 12 to 20, which is commendable. However, it is noted that there is a relatively small number of PhD theses (less than three each year). In terms of publication of refereed articles HCS maintained a fairly constant level of research output (annual output of around 30 in the last six years). It is remarkable to note that HCS secured a significant portion of contract research (42-75%), which enabled HCS to recruit more PhD candidates in the research programme. This is again commendable and important to build up a critical mass of research personnel. Many members of HCS serve in editorial boards of peer-reviewed journals and hold visiting positions in overseas universities. The quality of HCS and its members is widely recognised.

4.4 Relevance to society

Adequate housing is important for the quality of life of occupants and in terms of economic assets. HCS is a combination of policy, finance, management and technology dimensions that aligns professional debates and innovations with consumer preferences and behaviour. HCS achieved the highest publicity amongst all research programmes, notably in radio and television. The group has participated in events and projects that put housing in the context of energy efficiency, resilient cities, ageing and new concepts of welfare. Constant openness and creativity is of paramount importance to stay as a key player in the field. Since housing is an important issue, which affects the general public across all walks of life, HCS should take advantage of its ability of capturing public attention to enhance their national and international standing.

4.5 Viability

HCS is doing well in securing research funding and PhD students, notably in winning EU research grants and attracting overseas scholarship holders from their home countries to enrol PhD study in TU Delft. HCS is also able to attract high profile, tenure-track female scientists to join them as faculty members through Delft Technology Fellowship. With a high level of research grants, HCS should make the best use of these research incomes to attract and train more PhD candidates to build up a critical mass of research staff. These provide very good grounds for future viability and sustainability.

4.6 Further aspects

HCS is led by four chairs with excellent international standing and network. They will meet together with other team members on a regular basis to review and formulate new direction for future research endeavours.

4.7 Recommendations

1. While HCS has maintained a fairly constant level of research outputs, they should capitalise on their good research credential to produce more impactful peer-reviewed papers, both in terms of quality and quantity;
2. With a high level of research grants, HCS should make the best use of these research incomes to train more PhD candidates to build up a critical mass of research staff;
3. HCS may consider enhancing their collaboration with international universities to secure large scale research grants and establish joint PhD programmes;
4. HCS should exercise more stringent control to ensure that their PhD students can complete their study within the normal period of four years.

5. Assessment of the programme ‘Urban and regional studies’

Assessments:	Research quality:	1
	Relevance to society:	1
	Viability:	2

5.1 Research area

The Urban and Regional Studies (URS) research programme focuses on the interrelationships and growing complexities between daily social and spatial patterns, and the governance of neighbourhoods, cities and regions. It seeks a greater understanding of competitive, sustainable and liveable cities and regions, territories and neighbourhoods, with a clear relation to governance and spatial planning. The programme has five distinctive sub-programmes, each headed by a leading academic in the field: Governance of Land Development, Territorial Governance, Urban and Neighbourhood Change, Urban Systems and Transport, and Urban Systems and Dynamics. These five sub-programmes are all typical in and by themselves, and taken together form a logical set of topics connected to urban and regional studies. The programme’s scope is well thought through and ties in neatly with current leading research strands put forward by for instance the EU Framework Programme for Research and Innovation Horizon 2020.

5.2 Submitted data and publications

The panel was given a selection of articles to review (Transactions of the Institute of British Geographers, Transport Reviews, Journal of Transport Geography, Journal of Planning Literature, International Journal of Urban and Regional Research). This selection clearly must have been a difficult task, given the very long list of peer-reviewed international journals to choose from in which URS key researchers and members have published. This list is very impressive, both in terms of quantity and quality. With respect to the former, nearly every single journal in the different, relevant research disciplines is mentioned. With respect to the latter the selected articles to review can be referred as seminal papers that have found their way to the scientific community (evidenced by high citations and downloads).

5.3 Research quality

The ambition with regard to research quality is very high, as shown by abundant publications in forums such as Progress in Human Geography, Journal of Economic Geography, Landscape and Urban Geography, Economic Geography, Regional Studies, Urban Studies, and many others; and a series of books published with Springer, Ashgate, and Edward Elgar.

The key staff members are internationally renowned scholars, who collaborate with other leading scholars from around the world. The research is well-integrated and articulate. Much of it is frequently cited in international outlets, leading to high H-indices of the key staff members. The group’s international network and academic reputation is outstanding, and can be considered as world-leading. Evidence of the programme’s outstanding reputation is also found in the participation of its staff members (tenured and non-tenured) as keynote speakers and/or invited speakers at international conferences, editorial board memberships, foreign research affiliations, and experts at parliamentary hearings. The programme was very successful in attracting external research funds (research grants and contract research), with funding from ERC, EU FP7, ESPON, Interreg, Marie Curie, NWO, and others. Two academics succeeded in obtaining important personal research grants (ERC Consolidator Grant and a VENI/VIDI).

Although productivity is no longer a SEP criteria, considering all measures of productivity along with the productivity strategy, the URS programme can be judged as outstanding. Over the review period (2010-2015), a total of 1310 publications were produced (862 publications and 448 so-called other research outputs). In 2015, 267 publications were produced (a yearly average of 24 per FTE total research staff), 139 of which were academic publications (a yearly average of 12.5 per FTE total research staff). The number of refereed articles in journals is 52 (a yearly average of 4.7 per FTE total research staff). There is a clear focus and strategy to publish in international journals, as this number increased substantially from 33 in 2010 to 52 in 2015. Over the review period, a total of 32 books were published and 141 book chapters. Over the last five years 9 PhD theses were defended. This number is considered by group is as a relative weakness. URS members have no problem in reaching the 1-1-1 publication strategy target.

5.4 Relevance to society

The research themes are very socially and policy relevant, with large impacts at the national and international level. The research results have been disseminated through various channels and targeted to various audiences. This includes the public sector, the private sector and the wider community. Key staff members have been consulted frequently by cities, regional development agencies, provinces, governments, and other societal stakeholders. Their scientific knowledge and policy recommendations have been implemented in a number of public and private bodies in and outside the Netherlands. In respect to the latter, important contacts exist with the OECD's International Transport Forum, and the European Commission. Senior staff is engaged in national and international academic and professional networks (NETHUR). The organization of the World Symposium on Transport and Land Use (WSTLUR) is also important to mention. The WSTLUR promotes the understanding and analysis of the interdisciplinary interactions of transport and land use, offers a forum for debate, and provides a mechanism for the dissemination of information. In sum, the body of scholarly work has an impact nationally and internationally, which goes beyond academia.

5.5 Viability

The programme's viability is considered to be good because of its internationally leading role, its involvement in cutting-edge research ideas, its flexibility in adjusting as new ideas and expertise emerge, and its competent leadership. The URS group received a strong boost from the ERC Consolidator Grant and NWO/VIDI Grant. As with all the other research programmes, cuts in direct funding and increased reliance on external funding have increased its vulnerability and the time and effort that needs to be devoted to applying for funds.

5.6 Recommendations

The URS programme is judged to be excellent with respect to the quality of the research conducted, the quantity of output, and its relevance to society. It is judged to be very good with respect to its viability. The key staff members are international leaders in the field who have made highly significant contributions to a number of areas of research.

In terms of recommendations to even further strengthen the URS, the panel suggests the following:

1. Stronger research collaboration between the different URS staff members;

2. More crossovers between URS sub-disciplines to create new and important synergies. Collaboration already exists at the level of teaching; joint research collaboration could be equally worthwhile;
3. A potential weakness (threat) is the limited number of PhD candidates in relation to the number of permanent staff. Putting emphasis on targeting larger research project proposals will lead to an increase in the number of pre-doc positions. This issue is also linked to giving postdocs more opportunities to stay (longer) in academia;
4. In relation to other programmes, URS has only a limited number of academic staff in the rank of professor. The committee would therefore recommend to increase the number of professor positions.

6. Assessment of the programme ‘Geo-information Governance and Technology’

Assessments:	Research quality:	2
	Relevance to society:	1
	Viability:	3

6.1 Research area

The Geo-information Technology and Governance (Geo-TG) programme is situated within OTB (the Research Institute for the Built Environment) and consists of 2 sections: GIS Technology and Geo-information & Land Development. The programme employs a comprehensive take on geo-information science by engaging in both the technical and institutional aspects of technology development and application with implementation and policy. Under the broad umbrella of geo-spatial information infrastructure (GII), the programme engages in two distinct areas of research: real-time geo-information and land administration, and two key topics: open data and n-dimensional and multi-scalar data modelling. Respectively, these two areas correspond to decision-making and operational activities, which are practised on daily basis as well as under special circumstances (e.g., crises) at various levels of government, by international institutions and private sector organisations. The programme is uniquely positioned at an intersection of computing, geography, geodesy, management, and law to address urban, rural, environmental and other issues at a variety of scales. The synergy between fundamental research and applications is essential for the success and relevance of this programme.

6.2 Submitted data and publications

As presented in the report, the programme’s output has fluctuated and seen some decrease in the period 2010-2015. However, except for 2012, the average number of peer-reviewed articles has been excellent at 2-3 per FTE per year (above the expected min of 1 / year / FTE). The publications submitted for review are representative of the technological and societally-relevant output and are of high quality. The programme’s research impact as measured by Scopus, Scholar and WoS, is significant, especially that by senior scientists, including two staff who have relocated.

6.3 Research quality

Geo-TG provides scientific advancements in fundamental and applied fields of geospatial technology. Research on 3D cadaster, point cloud data, and vario-scale data structures on the technical side, and re-use of public sector information, shared data licensing and big open linked data (BOLD) is cutting edge and in line with both European and national (Dutch) scientific agendas. Invited editorship of special issues of Computers, Environment and Urban Systems and Land Use Policy testifies to the timeliness and importance of the research in which Geo-TG programme’s staff partakes in a leadership role. Publications in prestigious outlets such as the International Journal of Geographical Information Science, Environment and Planning B and Computers & Graphics affirms the value of contributions by the Geo-TG programme. Citations and H-Index are high. The theoretical work on data structures and models and an innovative approach of seeing ‘scale as a dimension’ are well recognised and has already seen integration into other research projects at the European level and in China. In addition, keynote engagements, receipt of national and international awards, international cooperation (China, Russia, Malaysia, Israel, USA) and visitors as well as the development of a Joint Research Centre with Wuhan University affirm the quality of research produced by the Geo-TG.

6.4 Relevance to society

This is the area in which Geo-TG has made outstanding achievements. Adoption of an output of academic work as an international standard (Land Administration Domain Model ISO 19152); as a patent (US patent 107051-0029 on 'Indoor Localization based on Ultrasound Sensors') obtained jointly with an industry leader (Bentley); applied as new technology by spatial database companies such as Oracle; and provided as open source software code for a variety of users and developers, are examples of direct transfer of knowledge and technology (e.g., point cloud 3-D web viewer and other software tools). Development of a point cloud 3-D web-based viewer for research on data access and provision has been equally effective in reaching the user base, in the context of Dutch institutions in particular (e.g., the report on the impact of the new EU data protection regulation on geo-information and monitoring of Dutch spatial data infrastructure). The partnership formed around the Open Data Knowledge Centre is indicative of the interest of Dutch national and local organisations to source the expertise from Geo-TG. Over 20 reports were provided since the Open Data Knowledge Centre was founded in 2012. Internationally, in addition to industry partners (e.g., Oracle and Bentley), partnerships are established with institutions such as Chinese Mapping Agency. Members of the Geo-TG programme also work closely and are visible within the International Surveying / Geodetic Federation (FIG), including an organization of joint events. In sum, Geo-TG is committed to contribute to advancing the tools and access to public spatial data through cooperation with industry and practice.

6.5 Viability

Geo-GT is performing well, but is by FTE count the smallest one in the Faculty, experiencing a decrease in scientific staff to below 2 FTE. The recent relocation of two female scientific staff in the areas of urban data (3-D) visualization and crisis management to another department and programme has affected the staff composition both in terms of research profile and diversity, particularly at the senior (professorial) level. The FTEs in GIS Technology area now dominate the staff profile. The balance between tenured and untenured scientific and research staff is in line with the average values across the programmes. The programme is experiencing high demand for its Masters level courses and seems to be under-staffed, particularly in the area of governance. Due to the recent staff changes the programme may face difficulties to align with the Dutch government's research priority to 'move from static to dynamic data' (including real-time). Pursuing the stated goal of integrating outdoor and indoor spatial information would also require additional resources and external cooperation. Geo-TG has demonstrated to be effective in attracting research funding and pursuing fundamental and applied research. An evolving landscape of research priorities as well the changing staffing situation would warrant revisiting of the research strategy and its implementation. The funding has somewhat decreased in the most recent year, but has been significant from all sources, and on a par with the Faculty's programmes with larger staffing. While the external funding is dependent on proposal and project cycles, it may also have been affected by the recent movement of staff.

6.6 Further aspects

The PhD programme is well structured and has resulted in a good yield of graduates over the 2010-15 period at a rate of approximately 2/3rd of students completing their studies. The pool of students has now diminished and there is a need for substantial attention to recruitment of new students with internal and external funds. The joint PhD programme with Wuhan University is an opportunity to be further exploited and enhanced. Attracting Dutch students into the PhD programme will require special efforts. The number of master's students has been steadily increasing in all three degree courses: Geomatics (TU Delft),

Geo-information Management and Applications (UU, WUR, UT and TUD) and the National GI Minor (VU, UU, WUR, UT and TUD).

Geo-TG scientific and research staff is well involved in teaching. The integration between teaching and research is pursued in an effective manner. Although teaching loads may take way from research activities, master's students are engaged in research. Teaching popularity measured by downloads of the textbook 'Geo-information, Technologies, Applications and the Environment' published by Springer (2011) asserts to the programme's internationally recognised role in education.

6.7 Recommendations

Geo-TG's performance is impressive. Its staff are ambitious and productive academically, in education and in interfacing with society. The programme is internationally connected and recognised. It has made improvements as it responded to the feedback from the previous review. Based on the current review, the following suggestions are proposed for further advancements:

1. Structurally, opportunities for change might arise by facilitating cooperation both internally to the programme and externally with other programmes. Internally the two present sections may be reconsidered in the interest of a more integrated research portfolio. Externally, collaborations with other programmes such as Urban & Regional Studies and Urbanism, as well as Computation & Performance may increase. The latter could offer interesting opportunities in relation to synergies for research on indoor-outdoor environments as promoted by the national research agenda. The shortage of scientific staff might further be effectively addressed by furthering the coordination with colleagues in the geo-disciplines in the Faculty of Technology, Policy and Management;
2. Following the relocation of two prominent scientists, some refocusing (and re-titling) of the research objectives would be in order. The replacement / addition of a senior staff in the area of governance would benefit the programme as a whole;
3. The partnership with Wuhan University and the establishment of the Joint Research Centre presents an excellent opportunity, which could be further exploited. Further strengthening of joint activities promises to yield excellent mutual benefits. An alignment of research strategies by focusing on exchanges activities would be helpful;
4. As recognised in the report, the recruitment of PhD students is of immediate importance and requires action. An established goal of 3 new PhD students per year is a desirable and realistic target.

7. Assessment of the programme ‘Urbanism’

Assessments:	Research quality:	1
	Relevance to society:	1
	Viability:	2

7.1 Research area

The Urbanism research programme is a large programme housed in a department which had in 2016 93 research staff (out of 279 at TU Delft BK), representing 21 FTE; and 39 PhD (out of 155 at TU Delft BK). The programme showcases four discipline “sections”: Urban Design, Spatial Planning, Landscape Architecture, and Environmental Modelling. The sections have been identified in order to allow chairs to work collaboratively within a clear discipline-based conceptual and methodological framework. Sections help explain how Chairs work together. Eight research themes are spelled out in the programme: Delta Urbanism, Design of the Urban Fabric, Metropolitan Spatial Structure, Regional Design, International Planning and Developing Regions, 3D Geoinformation, Smart Cities and Urban Metabolism, and History and Heritage Vector.

7.2 Submitted data and publications

Major changes have been made over the past 5 years, which by-and-large follow the goals set in 2010 to reorient research in Urbanism. There are significant increases in refereed articles (6 in year 1 to 34 in year 5); PhD theses (1 to 6); internal reports, lectures, posters, and datasets (28 to 134). The number of books and book chapters has decreased (13 to 8 and 44 to 27), while that of conference papers and professional publications has remained stable (45 to 34). There has been a 50% increase in direct funding and a twenty-fold increase in research grants since 2010. Contract research has almost doubled during the same period. Doctoral students are now mostly supported not by the programme but by research grants and scholarships. There has been a decrease in the number of doctoral students in the programme, yet that decrease has been accompanied by an increase in the numbers of PhD theses produced. Of a total of 1,548 publications over the 5 years, about half (743) can be classified as academic publications (143 refereed journals articles, 62 books, 249 book chapters, 35 PhD dissertations).

7.3 Research quality

The programme houses several enduring, multiyear projects that have brought national and international recognition and have led to the rise of what has been called the “Dutch model of Urbanism.” Specifically, delta and lowlands planning, design, and management are at the core of research activity and development, which have brought international prominence to the programme. Over the years, these research topics have been addressed comprehensively from multiple perspectives to include environmental quality/efficiency, landscape design, planning policy and regulations, thus engaging the support of multiple sectors such as environment, transport, and cultural heritage. In addition, the Urban Metabolism and Smart Cities theme has gained significant importance with some of its members now leading two Horizon 2020 projects. The recent integration of the Geoinformation chair and a professor of the Urban and Regional Studies programme into the Urbanism programme provides considerable added activity and competence in needed and state-of-the-art geospatial research methods as well as planning and governance. Overall, activities contributing to the programme research mission have been consistently high in quality and they have significantly increased in number over the past five years, attesting to the productivity of the programme. Specific outputs attesting to the quality of the research include the fact that the majority of peer-reviewed articles are published in influential

international journals. As well, there are numerous book downloads and personal and book citations. Furthermore, several major multi-year grants have been awarded from international and national institutions. Final proof of the programme's prominence lies in the high number of awards received, keynote speeches given, and advisory positions held by several individuals.

7.4 Relevance to society

Urbanism is a broad field that encompasses a large number of societal issues, spanning from quality of life to urban infrastructure efficiency. The field therefore permits to raise many questions affecting many sectors of society, which in turn offer many avenues for research. The Urbanism programme has actively pursued research areas that are of interest beyond academia. The programme team has been savvy in seeking new research opportunities and very successful in getting corresponding support.

The detailed account of activities under three of the programme's themes show consistent past support from a variety of public and private agencies, including the Ministry of Infrastructure and Environment, The Dutch National Delta Programme, the EFL Foundation. This support attests to the societal relevance of the research. Also, the team operating under the Delta Urbanism theme has worked with several municipalities in the Netherlands and in New Orleans, USA. It has been active in UN Habitat as well. The team in the Smart Cities and Urban Metabolism theme has received several EU grants (e.g., REPAiR and UrBAN-WASTE) and has worked with the cities of Amsterdam and Rotterdam. The team in the Landscape Architecture and the Lowlands theme have produced publications in partnership with Nieuw Land museum and has received support from the Dutch Agency for Cultural Heritage and the Ministry for Infrastructure and Mobility. In addition, with the goal of disseminating knowledge, the Urbanism programme has actively sponsored an impressive number of conferences and seminars and has curated several exhibits. They are also influential in policy development—working with cities and local provinces to produce plans and development regulations. Internationally, the Urbanism programme has had several important projects involving cities in Europe. Members participate in many international academic and professional networks. They have also led projects in Asia, and China in particular.

7.5 Viability

The programme acknowledges that on-going societal changes can threaten its viability. It notes that the rise of neoliberalism has resulted in reduced interest in urban design and planning, especially on the part of the public sector. However, the programme has been successful in expanding its boundaries beyond those of traditional design and planning by addressing the many engineering, information technology, ecologic, and economic issues related to urban development.

As documented in the self-evaluation report, the acquisition of large national and international projects heralds a new phase in the evolution of the programme. This needs to be followed by “doing the job.” Thus the success obtained in getting grants and contracts not only needs to be sustained, but the programme needs to maintain an organisational structure that both carries out the research and that generates new research.

Carrying out research in urbanism is a complex task, because most of the projects require contributions from multiple disciplines. The programme has been successful in sharing projects with other research programmes, attesting to the dynamic and synergetic relationships that exist between programmes. Joint projects with Urban and Regional Studies and Design and History, among others, add quality and relevance to the research and avoid duplication. There are collaborations with units outside the Faculty of Architecture and the Built Environment (e.g., with the Faculty of Civil Engineering and Geosciences). The organisational structure is fluid and allows staff to be shared with units outside Urbanism. Indeed, the Urbanism research programme appears to be an attractive place to do research

since, as mentioned, two professors recently moved into the department, bringing high quality research in the increasingly relevant and essential area of geospatial planning analyses. The Delta project is another good example of a cross-unit theme—projects exist in Engineering as well as Architecture. It follows that the University is now opening a new Chair of “Delta Urbanism”, which will involve trying to find a common language across the disciplines working on the Delta project. There have been several faculty retirements. While some of the retirees are still active, they will eventually need to be replaced. Two chairs need to be filled in addition to the chair of Delta Urbanism and the hope is to have women candidates.

7.6 Further aspects

The eight defined research themes provide a structure to organise the necessarily broad scope of research in Urbanism. However, the current themes seem to be the result of a gradual accretion of research activities, some of which may not be very different from the long-term legacy activities. For example, it might be possible to consolidate Design of the Urban Fabric, Metropolitan Spatial Structure, and Regional Design into two themes. Also, the theme names are not consistently used, creating confusion (e.g., “Landscape Architecture and the Lowlands” is not mentioned as part of the programme’s eight themes, yet it is listed as an example of a theme that is “relevant to society”).

7.7 Recommendations

The committee has the following recommendations:

1. Reconsider the research themes, and try to streamline/consolidate them. This would help to prioritise efforts to get more grants and to communicate priorities and interests to the outside world of sponsors as well as students. It would also help identify gaps and new areas of research that could be filled by the new individual faculty to be hired;
2. Continue to explore ways to engage the University in hiring women for chair positions;
3. Continue training and redirecting middle level staff in new and existing areas of research, along with developing new mechanisms and structure to guide doctoral student work;
4. Continue to be proactive. The committee entirely supports the stated goal to strengthen research management, because a sustainable research programme requires both forward thinking leadership in grant capture and consistent monitoring and tutoring in existing research development. The programme should consider adding the goal of fostering creative thinking with regard to directions for future research. This should be doable, because it appears that in spite of the programme size and the complexity of the research areas, the programme governance is able to take place in an apparent seamless way (it uses regularly scheduled research programme meetings and amongst others coordinates research within the Faculty Research Council).

8. Assessment of the programme ‘Architectural Project and its Foundations’

Assessments:	Research quality:	1
	Relevance to society:	2
	Viability:	2

8.1 Research area

The programme focuses explicitly on architecture as a field of expertise, a field in which making and thinking are inextricably linked. The programme regards the ‘architectural project’ as the cornerstone of architectural practice and reflection. It consists of two sub-programmes, which hold a total of six research groups; the ‘Architectural Project’ (4,) and ‘Foundations’ (2). The topics ranges from the dimensions of the objects in question; the building scale, the scale of the city and territorial aspects – to ideological dimensions of the architectural discipline, its positions and instruments.

8.2 Submitted data and publications

A research portfolio was submitted providing an overview of research data and policies, together with a selection of APF’s research results: activities, organizations, facilities/assets, output, including indications of their use and recognition. Particularly, the scientific journals produced or co-produced by the programme (DASH: Delft Architectural Studies on Housing, OASE: Architectural journal) and series of books on aesthetics, urban development and topics; (e.g. Colonial Modern: Aesthetics of the past, Rebellions of the future, Alison & Peter Smithson: a critical anthology, and Aesthetics of sustainable architecture) can be highlighted as important contributions.

8.3 Research quality

Over the last six years there was an increase of peer reviewed publications from 7 to 13 and a peak of twelve finished PhD theses in 2014, whereas the average annual number of PhD theses in the period has been about 2,8. However, the general number of PhD candidates is quite steady (ca. 13). There has been a general high publication rate of conference papers (average ca. 20 per year) and professional publications (average ca. 21 per year), also the editorship of books has significantly increased in the period from 11 to 38 (2015), also the number of visiting fellows has doubled. APF has strengthened their research foci and critical mass by integrating researches across departments (in particular Urbanism and Design & History), which also has led to joint tenders. APF increased their external research funding from 0% to 11% in the period. This shows good evidence that the research programme holds resources to conduct research that is highly recognised internationally.

8.4 Relevance to society

APF has developed a strong network of partners from practice, and academia both within The Netherlands and internationally over the years. The present organisation and foci of the research groups that both hold long term and short term research agendas allow for agile and relevant collaborations that respond to societal challenges. Due to a large number of high-profile practitioners in this group, relations with stakeholders in contemporary architectural practice (and the building industry) are continuously activated. Also, the presence in the architectural debate through exhibitions, participation in conferences, and collaboration with the Jaap Bakema Study Center shows the outreach of the research area.

The significantly increasing number of visiting fellows (50%) proofs the potentials for further internationalisation.

8.5 Viability

Due to the reputation of Dutch architecture and its strong design traditions the APF research programme holds an imperative international position in the field of design research that relates to the architectural design practice. They have developed clearly defined research methodologies and broad areas of knowledge that have been fruitfully included in the education (masters level) and which form part of both fundamental and applied research. These hold elements that can be developed further in order to attract international PhD's and collaborative partners across industry and academia.

8.6 Further aspects

The self-evaluation report shows that scientific staff of APF has decreased from 36 to 29 and researchers from 19 to 14 over the six-year period. This may have an impact on the on-going development of APF and the programme's ability to sustain a critical mass across focus areas that can attract relevant external partnerships and funding opportunities. The support of a research secretary in the department has evidently helped to direct and enhance applications for external funding. In the selection and support of PhD candidates the committee was told that there has been an improvement; through thematic calls, interviews and a three-fold system of support (a general support system across programmes).

8.7 Recommendations

1. Further strengthening of collaboration (defining research topics) across departments – beyond Urbanism and Design & History;
2. To gain external funding must be highly prioritized – strong ambitions in terms of attracting external funding must be kept through clearly defined strategies, general support of research activities and securing tenure positions;
3. Further clarification and development of research areas/topics in regard of securing societal relevance and to sustain research quality through critical mass (size of research groups) ought to be pursued;
4. Take advantage of the strong network of partners from practice and academia in the Netherlands in order to extend and strengthen the international research collaboration.

9. Assessment of the programme ‘Design and History’

Assessments:	Research quality:	2
	Relevance to society:	2
	Viability:	3

9.1 Research area

This research programme explores a wide range of knowledge and instruments relating to the origins, restoration, conservation, revitalisation and transformation of built heritage. This complex task requires an integrated approach. The Design & History programme brings together specialised expertise in diverse fields ranging from materials science to design, history and theory. The perspective is that preserving building materials, transforming heritage structures and landscapes, and designing new buildings in existing surroundings is inextricably bound with the context of the location as well as the history, the place and the materiality of the building. The D&H programme is multidisciplinary. Researchers from three departments: Architecture, Architectural Engineering + Technology (AE+T) and Urbanism collaborate to take on this challenge from the varied perspectives of their own disciplines, times and scale levels.

9.2 Submitted data and publications

The research output presented in the overview is reasonable in quality and quantity. The information provided in the self-evaluation report and the discussions during the visit do not clarify or justify the transition from the former Design and History (run by the department @MIT and the Institute of History of Art, Architecture and Urbanism (IHAAU) programme to the actual research D&H programme in which researchers collaborate from the departments of Architecture, Architectural Engineering + Technology (AE+T) and Urbanism. It seems that this transition did not follow the recommendations to improve coherence and cooperation that was expressed in the previous evaluation.

9.3 Research quality

The research quality is high and content wise seems dispersed, with a focus on the urban scale, material conservation. There is a strong relation with education as staff members of the programme are responsible for human sciences courses and input in the training. It seems that the size of the group has difficulties tackling the wide-spread list of topics that the integrated conservation approach requires. Focussing towards more integration in the topics and synergy between researchers could help to create a critical mass on a more focussed approach. Recent input enhances the interest for preservation and adaptive re-use of more recent heritage buildings linking research with design. The continuity between the various topics is challenged by the replacement of two chair holders. It is crucial that the above-mentioned need for focus and integration is monitored in the process of the appointment of new chairs.

9.4 Relevance to society

The members of the programme have a significant impact on the heritage and architectural and urban history field in the Netherlands, including the (historic) valuable urban landscapes. Their contribution is relevant and addresses the study of important “producers” of what is considered heritage today (e.g.: Rietveld). Research clarifies and contributes to the

preservation of important heritage buildings as the Rijksmuseum. The programme is well connected to various international networks in the field of architecture, history and heritage.

9.5 Viability

There seems to be a lack of critical mass of the (sub)group(s), a challenge with the coherence which may be partially due to the connection with three different departments, resulting in very partial research appointments to the programme of various individuals. The importance of human sciences (history, art-history, heritage studies) into the research and educational activities justifies the attention the faculty should give to support the related researchers and programmes as to assure research support to evolving educational needs. Proper balance between availability for educational versus research activities from the staff involved in this research group is needed to assure the viability of the research group.

9.6 Recommendations

1. Critical attention could be given to assess whether key sub-research areas in the unit are properly highlighted and addressed in the current structure. This concerns cultural historical research that today appears spread across research programmes;
2. The continuity between the various topics dealt within the research group is challenged by the on-going replacement of two chair holders;
3. To assure the above-mentioned need for focus and integration the process of the appointment of new chairs should be carefully monitored in view of the required need for synergy;
4. Proper balance between availability for educational versus research activities from the staff involved in this research group should be clarified and monitored.

10. Assessment of the programme ‘Computation and Performance’

Assessments:	Research quality:	2
	Relevance to society:	2
	Viability:	3

10.1 Research area

The Computation and Performance research programme deals with improving the design and performance of buildings and the built environment through scientific inquiry into novel ways of conceptualising, mapping, modelling, evaluating, optimising and operating building performance at multi-scalar levels. In this context, performance refers to both technical and qualitative performance, which concern both hard and soft aspects of architectural design and the built environment. Under this umbrella, the programme develops three interrelated research directions: digitally-driven architecture; performative architecture via computation; structures. Despite an overall increase of staff members from 29 to 36, research FTE’s reduced from 6.4 to 5.6. The report is not clear about the organisation and management structure of the group and how it ensures timely qualitative achievement of research results and implements adequate corrective actions.

10.2 Submitted data and publications

A research portfolio providing an overview of research data and policies, together with a selection of C&P’s research results: activities, organizations, facilities/assets, output. This information was complemented with an autonomous report delivered during the site visit. Particularly, the international scientific journals and special issues produced or co-produced by the programme (e.g. Glass Structures & Engineering, Digitally-Driven Architecture and Dynamics of Data-Driven Design) and series of books on interactive Architecture and Glass Structures (e.g. Interactive Architecture, Interactive Corporate Environments, Robotics in Architecture and Challenging Glass Proceedings) can be highlighted as important contributions.

10.3 Research quality

The annual output of conference papers is extremely high, taking into account the small dimension of the group (around 28 in the last six years). This tendency was already pointed out in the former evaluation exercise. In the last six years C&P made a significant increase in the number of refereed articles (annual output of around 7, still far from the target of one per researcher). However, it is noted that the annual output of books, book chapters, professional publications, publications aimed at the general public, appearances on radio or television and external reports is relatively low. From the PhD students that started the programme in 2006 or after, too few have already graduated. C&P should implement measure to ensure that their PhD students can complete their studies within the period of 4 years. The report evidences a tendency for a negative balance between income and expenditure.

10.4 Relevance to society

The activities carried out and developed with relevance to society could be explained further. The table of selected output indicators of the self-assessment report is too concise (e.g. there is no distinction in the contents of the Quality Domains “Research Quality” and “Relevance to Society”). However, during the site visit, the committee got the opportunity to

verify a tendency to significantly increase the impact in the society, triggered by the media impact of the Crystal House project and by the societal expectations related with 3D/4D printing.

10.5 Viability

The committee is convinced that the C&P research programme will be further empowered and benefit with the expected merger with GBI and by the construction of new laboratorial facilities at TU Delft BK. Both developments undoubtedly have potential to mature the research performance of C&P's staff in terms of structure, finances and output.

10.6 Further aspects

Some of the research topics addressed by the group have become acknowledged as key priorities at outstanding universities worldwide, offering the group good prospects for playing an important role in this arena. The aligned with the recently announced TU Delft BK's agenda on automation is auspicious.

10.7 Recommendations

1. The structure and organisation of C&P can be enhanced;
2. C&P should pay more attention in obtaining external funds;
3. C&P may improve the relevance to society indicators;
4. C&P should concentrate efforts in producing more impactful peer-reviewed papers;
5. C&P may significantly reduce the average time necessary to complete the PhD studies;
6. C&P is needy of own laboratorial facilities, namely in the fields of structural and life-cycle analysis.

11. Assessment of the programme ‘Green Building Innovation’

Assessments:	Research quality:	2
	Relevance to society:	1
	Viability:	2

11.1 Research area

Research in this programme design and detailing that covers indoor and out-door climate, the façade as skin between both environments. It investigates the different flows as energy, water, materials. It focuses in the “green” aspects considering closing cycles, energy, renovation, carbon neutrality (at scales from building to region) and climate adaptation.

11.2 Submitted data and publications

The programme produces a substantial number of PhD dissertations (13%) and a considerable number of books and professional publications. Recently, extra efforts were devoted to increase the visibility of the output by focusing on scientific papers in international peer-reviewed journals. However, the average number of referred articles in the period under review is nine, still far from the target of one per researcher, and far from which is mentioned in the self-evaluation report, i.e. that since 2012 GBI publishes around 20 peer-reviewed journal articles per year. The number of publications seems to lower lightly recently as well.

11.3 Research quality

The Green Building Innovation group (GBI) has a clear and ambitious vision of being recognised by the building industry and by the research funding institutes as the foremost partner for research involving sustainability and innovation. It has a clear vision dealing with a timely topic. A merging with the Computation & Performance group is foreseen in order to facilitate research within the shared department and to be able to respond amongst others to the fast advances in the “Internet of Things”.

11.4 Relevance to society

The topics addressed by the programme are highly relevant today considering the discussion on reducing the risks for climate change by reducing our carbon footprint. This is also evidenced through the good external funding of the programme.

11.5 Viability

There is a strong leadership in the group active in the programme and a good understanding with the leadership of the programme “Computation and Performance”. The programme is effective, relevant and well embedded in the construction and building policy sector in The Netherlands. It benefits from the overall impact and historical reputation of the faculty and the University in the construction sector. It also benefits from the interaction with the students who are involved in some ways in the research carried out, to the benefit of research and education.

GBI has managed to acquire a lot of funded research projects and aims to initiate and implement viable and research projects worth €220,000 or more. In contrast, the constant complexity of handling budgets and employing scientific staff is said to be challenging. Support for administrative handling of research projects is sought at a supra-research group

level, which could be the faculty of services within the TU Delft. GBI is interested in real world results at various scales: real built houses; prototypes and mock-ups. However, it is said that, in general, GBI is not equipped with laboratories nor with a large amount of equipment. The group cooperates with partners in the university to secure physical testing, if needed. The need for additional space for (large scale) testing has been expressed.

11.6 Further aspects

In the self-evaluation report and during the discussions the important contribution to education of members of the programme –also due to the intrinsically driven students and staff- was mentioned. Education and research were presented as clearly connected vessels, which seems to be productive. For example master thesis students are involved in research activities, which is motivating for the students but also contributes to scientific output. The research group refers to the unbalanced availability of resources. There may be sufficient resources for education but insufficient compared to the research output created. The members of the group argue that their research efforts are supported less compared to other departments. There may be a potential for further increase of output if faculty resources for research were to improve.

11.7 Recommendations

1. The research group should cherish its relevant relationship and collaboration with the construction and building policy sector in The Netherlands. Also the benefits from the interaction with the students who are involved in some ways in the research should be cherished, as it is a valuable way to contribute to the proper mindset of students.
2. The proposed merger with the programme “Computation and Performance” may help to consolidate efforts within the department Architectural Engineering & Technology but should be monitored carefully in assuring the continuity of the strength of each of the programmes aside generating benefit from the synergy. Clear strategic research aims ought to be developed to manage the merger for the benefit of both programmes. There seems to be an advantage in dynamics and research outcome to keep (temporary) alliances which’ boundaries do not match with those of the departments.
3. The use of large scale models for technological and architectural design experiment justifies the claim from the research group for sufficient large scale laboratory space.

Appendix A: Curricula vitae of the Committee members

Katja Grillner is professor of Critical Studies in Architecture (2009-) and currently serves as the Dean of Faculty at KTH (2015-). Her previous engagements as academic leader include the role of Vice-Dean at the KTH School of Architecture and the Built Environment, ABE (2009-2011), Director of Research at the KTH School of Architecture (2006-2009, 2013-2015), and Chair of Faculty Recruitment ABE (2011-2015). Grillner's research on architecture and landscape combines theoretical, historical and literary strategies for spatial exploration. Grillner was the director of Architecture in Effect (2011-2015), a national initiative for a strong research environment funded by Formas 2011--2017, and co--founded the feminist architecture teaching and research group FATALE in 2007.

Koen Van Balen is an engineer-architect, full professor at the KU Leuven, the department of civil engineering within the construction materials and construction technologies division. He is the director of the Raymond Lemaire International Centre for Conservation at the KU Leuven. He holds the UNESCO chair on Preventive Conservation, Monitoring and Maintenance and is a renowned expert in technical aspects of conservation and their embedment in conservation philosophy and practice. He is also member of various national and international organizations and scientific committees in the field of conservation. He coordinates the course "Building Materials and Conservation Techniques" of the Master of Conservation of Monuments and Sites at the Raymond Lemaire International Centre for Conservation at the KU Leuven.

Anne Beim Anne Beim is Full Professor in Architecture at the Royal Danish Academy of Fine Arts School of Architecture (KADK). She holds a PhD in Architecture from KADK and has studied under Professor Marco Frascari at University of Pennsylvania. She chairs the research center CINARK - Centre for Industrialized Architecture, which serves to bridge the gap between the architectural education, the construction industry, and the architectural profession. Also, she co-chairs the Graduate Program; Settlement, Ecology and Tectonics. She Chaired the Architecture Committee of the Danish Arts Foundation (2008-2010) and since 2013 she has chaired the Admission Board of the Architects Association in Denmark. Her research focuses at how architectural ideas translate into the world of constructions; defined as building culture and tectonics. The research concern; the ecological dimension, the challenges of construction industry, and the qualities of materials, construction principles and detailing.

Albert Chan joined the Department of Building and Real Estate of the Hong Kong Polytechnic University in 1996 and was Associate Head (Teaching) from 2005 to 2011; Associate Dean and Interim Dean of the Faculty of Construction and Environment from 2011 to 2013, and from 2013 to 2014 respectively. He is currently Head of Department of Building and Real Estate. Albert Chan's research and teaching interests include project management and project success, construction procurement and relational contracting, construction management and economics, construction health and safety, and construction industry development. Ir Prof. Chan holds an MSc in Construction Management and Economics from the University of Aston in Birmingham, and a PhD in Project Management from the University of South Australia.

Paulo Cruz is Full Professor of Construction and Technology in the School of Architecture of the University of Minho, President of UMCidades (2016-...), President of IDEGUI - Design Institute of Guimarães (2015- ...) and Director of Lab2PT - Landscape, Heritage and Territory Laboratory, Head of studies on Product Design (2013-...). He was President of the School of Architecture of the University of Minho (2004 - 2011) and Head of the Civil Engineering Department of the University of Minho (2003 & 2004).

Zorica Nedović-Budić is Professor Chair of spatial planning and technology in the School of Architecture, Planning and Environmental Policy at University College Dublin. She spent 15 years as faculty at the University of Illinois. Nedović-Budić's main areas of interest are in implementation of GIS in local government settings, GIS applications in urban planning, development of spatial data infrastructures (SDI) and evaluation of impact of GIS and SDI on local planning process and decisions. She has served on the Board of Directors of the Urban and Regional Information Systems Association (URISA) and the University Consortium for Geographic Information Science (UCGIS). She is currently an editorial board member of URISA Journal, International Journal of Spatial Data Infrastructure, Journal of Urban Development and Planning, Journal of Urban Management and Territorium and serves on the Executive Committee of the Association of European Schools of Planning (AESOP).

Anne Vernez Moudon is Professor Emerita of Architecture, Landscape Architecture, and Urban Design and Planning; Adjunct Professor of Epidemiology and Civil and Environmental Engineering at the University of Washington, Seattle, where she also directs the Urban Form Lab (UFL). Dr. Moudon holds a B.Arch. (Honors) from the University of California, Berkeley, and a Doctor ès Science from the École Polytechnique Fédérale of Lausanne, Switzerland. She was the President of the International Seminar on Urban Morphology (ISUF) and a National Advisor to the Robert Wood Johnson Foundation program on Active Living Research. She is Professeur des Universités and Chercheur Associé with the Nemesis team of the Pierre Louis Institute of Epidemiology and Public Health at the University Pierre et Marie Curie in Paris.

Frank Witlox holds a PhD in Urban Planning (Eindhoven University of Technology), a Master's Degree in Applied Economics and a Master's Degree in Maritime Sciences (both University of Antwerp). Currently, he is Senior Full Professor of Economic Geography at the Geography Department. He is also a Visiting Professor at the Geography Department of the University of Tartu, Associate Director of the Globalization and World Cities (GaWC) Research Network and Director of the Doctoral School of Natural Sciences (UGent).

Appendix B: Programme of the site visit

Tuesday 13 December		
Time	Part	Collocutors
18.00	Meet & greet	Committee only

Wednesday 14 December		
Time	Part	Collocutors
09.00 – 10.15	Preparatory meeting	Committee only
10.15 – 10.30	Break	
10.30 – 11.15	Management Team Faculty of Architecture and the Built Environment	Prof. Peter Russell, dean Ir. Kenneth Heijns, faculty secretary Prof.dr.ir. Hans Wamelink, chair department Management in the Built Environment Dr.ir. Machiel van Dorst, chair department Urbanism Prof.dr. Peter Boelhouwer, chair department OTB, research for the Built Environment Prof.dr.ir. Andy van den Dobbelsteen, chair department Architectural Engineering + Technology Prof.ir. Dick van Gameren, chair department Architecture Dr.ir. Roberto Cavallo, director Education Dr.ir. Frank van der Hoeven, director Research
11.15 – 11.30	Break	
11.30 – 12.15	Research council, also Board of Graduate School	Dr.ir. Klaske Havik, research leader APF Prof.dr.ing. Carola Hein, research leader D&H Prof.dr.ing. Ulrich Knaack, research leader GBI Dr. Michela Turrin, research leader C&P Prof.dr. Wil Zonneveld, research leader URB Prof.dr. Ellen van Bueren, research leader IMBE Prof.dr.ir. Marja Elsinga, research leader HCS Prof.dr.ir. Henk Visscher, director Graduate School ABE Prof.dr.ir. Peter van Oosterom, research leader GeoTG Prof.dr. Willem Korthals Altes, research leader URS Ir. Marina Bos – de Vos, chair PhD council Dr.ir. Frank van der Hoeven, director Research/chair RC
12.15 – 12.30	Committee meeting	Committee only
12.30 – 13.30	Lunch	Committee only
13.30 – 14.15	Innovations in the Management of the Built Environment	Prof.dr.ir. Hans Wamelink, Design and Construction Management Prof.dr. Ellen van Bueren, Urban Development Management Dr.ir. Alexander Koutamanis, Design and Construction Management Dr.ir. Alexandra den Heijer, Real Estate Management Dr.ir. Leentje Volker, Public Commissioning
14.15 – 14.30	Committee meeting	Committee only
14.30 – 15.15	Housing in a Changing Society	Prof. Marja Elsinga, Leader HCS/Leader of subprogramme Housing Governance Prof. Peter Boelhouwer: Leader of subprogramme Market Dynamics Prof. Henk Visscher: Leader of subprogramme Housing Quality Prof. Vincent Gruis: Leader of subprogramme Organisational Strategies Dr. Darinka Czischke: Assistant professor,

		Organisational Strategies, Delft Technology Fellow Dr. Joris Hoekstra: Senior researcher, Housing Governance/Market Dynamics Dr. Ad Straub: Associate professor, Organisational Strategies/Housing Quality
15.15 – 15.30	Committee meeting	Committee only
15.30 – 16.00	Break	Committee only
16.00 – 16.45	Urban and Regional Studies	Prof.dr. Willem Korthals Altes: research leader URS, Geo-information and Land Development Prof.dr. Maarten van Ham: Urban Renewal and Housing Dr. Kees Maat: Urban and Regional Development Dr. Dominic Stead; Urban and Regional Development Dr. Evert Meijers: Urban and Regional Development Vitnarae Kang, MSc.: Geo-Information and Land Development Dena Kasraian Moghaddam Msc.: Urban and Regional Development
16.45 – 17.00	Committee meeting	Committee only
17.00 – 17.45	Geo-information Governance and Technology	Prof.dr.ir. Peter van Oosterom: research leader GeoTG/GIS Technology Prof.mr.dr. Hendrik Ploeger: Geo-information and Land Development Ir. Edward Verbree: GIS Technology Dr. Glenn Vancauwenberghe: Geo-information and Land Development Agung Indrajit MSc.: GIS Technology Dr.ir. Bastiaan van Loenen: Geo-information and Land Development
17.45 – 18.00	Committee meeting	Committee only
18.00 – 19.00	Tour	Guided by Peter Russell
19.15	Dinner	Committee only

Thursday 15 December		
Time	Part	Collocutors
09.00 – 9.30	Preparatory meeting	Committee only
9.30 – 10.15	PhD council	Sanne Granneman: D&H Alejandro Prieto Hoces: GBI Seyed Sedighi: APF Foteini Setaki: URB Nurul Azlan: URB Luz Vergara d'Alencon: HCS Marina Bos-de Vos: IMBE Raquel Viula: GBI Phoebus Panigyrikis: D&H Duco de Vos: URS Michiel Smits: APF Jelle Koolwijk: IMBE Job Taiwo Gbadegesin: HCS Antoine Peris: URS Flavia Curvelo Magdaniel
10.30 – 11.15	Tenured/Non tenured staff	Drs. Wilko Quak: researcher GIS Technology / GeoTG Dr.ir. Wido Quist: Assistant Professor Heritage & Technology / D&H Dr.ing. Herdis Heinemann: Researcher Heritage & Technology / D&H Dr.ir. Ad Straub: Associate Professor Housing Quality and Process Innovation / HCS Dr. Joris Hoekstra: Researcher Housing Systems / HCS

		<p>Dr. Regina Bokel: Assistant Professor Building Physics / GBI</p> <p>Dr. Erik Louw: Researcher Urban and Regional Development / URS</p> <p>Tom Kleinepiet: Researcher Urban Renewal and Housing / U&RS</p> <p>Dr.ir. Esther Gramsbergen: Assistant Professor Complex Projects / APF</p> <p>Ir. Monique Arkesteijn: Assistant Professor Real Estate Management / IMBE</p> <p>Dr.ir. Tom Daamen: Assistant Professor Urban Development Management / IMBE</p> <p>Dr. John Heintz: Associate Professor Design & Construction Management / IMBE</p> <p>Dr. Marcin Dabrowski: Spatial Planning and Strategy / URB</p> <p>Dipl.ing. Alexander Wandl: Researcher Environmental Technology and Design / URB</p> <p>Dr.ir. Stefan van der Spek: Associate Professor Urban Design / URB</p> <p>Ir. Verena Balz: Teacher Spatial Planning and Strategy / URB</p> <p>Dr. Reinout Kleinhans: Associate Professor Urban Renewal and Housing / U&RS</p> <p>Ir. Juan Azcarate Aguerre: Researcher Design of Construction / GBI</p> <p>Dr.ir. Fred Veer: Associate Professor Structural Mechanics / C&P</p>
11.15 – 11.30	Break	
11.30 – 12.15	Urbanism	<p>Prof.dr. Wil Zonneveld: research leader URB / Spatial Planning and Strategy</p> <p>Prof. Vincent Nadin: Spatial Planning and Strategy</p> <p>Prof.dr. Jantien Stoter: 3D Geo-Information</p> <p>Dr.ir. Taneha Kuzniecowa Bacchin: Urban Compositions</p> <p>Dr.ing. Steffen Nijhuis: Landscape Architecture</p>
12.15 – 12.30	Committee meeting	Committee only
12.30 – 13.30	Lunch	Committee only
13.30 – 14.15	Architectural Project and its Foundations	<p>Dr.ir. Klaske Havik: research leader / Methods & Analysis</p> <p>Prof.dr. Tom Avermaete: research leader / Methods & Analysis</p> <p>Dr.ir. Susanne Komossa: Public Building</p> <p>Dr.ir. Marc Schoonderbeek: Public Building</p> <p>Dr.ir. Esther Gramsbergen: Complex Projects</p>
14.15 – 14.30	Committee meeting	Committee only
14.30 – 15.15	Computation and Performance	<p>Prof.dr.ir. Andy van den Dobbelsteen: chair department AE+T</p> <p>Prof.dr.ir. Sevil Sariyildiz: Design Informatics</p> <p>Dr. Michela Turrin: research leader C&P/ Design Informatics</p> <p>Dr.ir. Pirouz Nourian Ghadi Kolae: Design Informatics</p> <p>Dr.ir. Christian Louter: Structural Design</p> <p>Faidra Oikonomopoulou MSc.: Structural Mechanics</p> <p>Sina Mostafavi MSc.: Hyperbody</p>
15.15 – 15.30	Committee meeting	Committee only
15.30 – 16.00	Break	Committee only
16.00 – 16.45	Design and History	<p>Prof.dr.ing. Carola Hein, research leader D&H/History of Architecture & Urban Planning</p> <p>Dr. Marie-Therese van Thoor: Heritage & Cultural Value</p> <p>Dr.ir. Wido Quist: Heritage & Technology</p>

		Dr.mr. Everhard Korthals Altes: History of Architecture & Urban Planning Ir. Gerdy Verschuure – Stuij: Landscape Architecture Ir. Barbara Lubelli: Heritage & Technology
16.45 – 17.00	Committee meeting	Committee only
17.00 – 17.45	Green Building Information	Prof.dr.ing. Ulrich Knaack: research leader GBI/Design of Construction Prof.dr.ir. Andy van den Dobbelaar: Climate Design & Sustainability Prof.dr.ir. Philomena Bluyssen: Indoor Environment Dr.ir. Tillmann Klein: Design of Construction Dr. Truus Hordijk: Building Physics Dr.ir. Martin Tenpierik: Building Physics Alejandro Prieto Hoces Msc.: Design of Construction
17.45 – 18.00	Committee meeting	Committee only
19.00	Dinner	Committee only

Friday 16 December		
Time	Part	Collocutors
09.00 – 12.15	Discussion of the findings	Committee only
12.15 – 12.30	First impression feedback to the faculty	public
12.30 – 13.30	Lunch	public

Appendix C: Quantitative data

Table 1 Research staff in fte

	2010		2011		2012		2013		2014		2015	
	#	fte										
Scientific staff	181	53	176	52	170	51	170	50	166	48	168	51
Researchers	118	60	120	57	126	56	124	55	117	52	111	52
PhD students	146		148		153		153		150		155	
Total research staff	445	113	444	109	449	107	447	106	433	100	434	102
Visiting fellows	162		148		171		170		179		179	
Total staff	607	113	592	109	620	107	617	106	612	100	613	102

Table 2 Main categories of research output

	2010	2011	2012	2013	2014	2015
Refereed articles	112	107	129	146	160	170
Non-refereed articles	32	26	14	8	5	7
Books	94	71	62	43	40	33
Book chapters	271	233	267	215	216	156
PhD theses	23	23	23	28	34	19
Conference papers	346	289	255	215	253	181
Professional publications (295	264	235	251	214	189
Publications aimed at the general public	97	68	115	63	83	96
<i>Other research output</i>						
Book reviews	21	10	21	18	11	16
Appearance on radio or television	65	56	128	115	72	102
Internal reports, lectures, posters, datasets	115	131	249	291	465	555
External reports	58	97	92	87	127	88
Editorships of books	65	33	41	39	62	66
Editorships of journals	39	41	50	54	62	75
Total other research output	363	368	581	604	799	902
Total	1633	1449	1681	1573	1804	1753

Table 3 Funding

	2010		2011		2012		2013		2014		2015	
Funding:	k€	%										
Direct funding	8,431	58	8,903	56	7,881	56	8,003	54	8,533	50	8,493	54
Research grants	182	1	381	2	833	6	1,303	9	1,844	11	1,531	10
Contract grants	5,139	35	5,235	33	4,643	33	4,365	30	7,091	42	5,401	34
Own contribution	-996	-7	-185	-1	-608	-4	-643	-4	-2,149	-13	-1,623	-10
Other	1,826	13	1,472	9	1,248	9	1,662	11	1,738	10	1,933	12
Total funding	14,583	100	15,807	100	13,998	100	14,689	100	17,057	100	15,736	100
Expenditure:	M€	%										
Personnel costs	-12,026	84	-12,168	86	-11,680	85	-11,579	85	-12,629	78	-12,064	85
Other Costs	-2,312	16	-2,054	14	-2,111	15	-2,022	15	-3,495	22	-2,191	15
Total expenditure	-14,338	100	-14,221	100	-13,792	100	-13,601	100	-16,124	100	-14,255	100
Result	245		1,585		206		1,089		933		1,481	

Table 4 PhD candidates

Enrollment				Finished								Total graduated		Not yet finished		Discontinued	
Starting year	M	F	total	≤ 4y		≤ 5y		≤ 6y		≤ 7y		#	%	#	%	#	%
				#	%	#	%	#	%	#	%						
2006	2	12	14	0	0	2	14	4	29	8	57	8	57	3	21	3	21
2007	13	11	24	4	17	9	38	14	58	17	71	17	71	5	21	2	8
2008	11	11	22	2	9	4	18	9	41	11	50	11	50	9	41	2	9
2009	11	16	27	4	15	7	26	8	30	9	33	9	33	13	48	5	19
2010	17	8	25	4	16	9	36	10	40	10	40	10	40	13	52	2	8
2011	14	9	23	3	13	6	26	6	26	6	26	6	26	10	43	7	30
total	68	67	135	17	13	37	27	51	38	61	45	61	45	53	39	21	16

Appendix D: Explanation of the SEP scores

Category	Meaning	Research quality	Relevance to society	Viability
1	World leading/ excellent	The research unit has been shown to be one of the few most influential research groups in the world in its particular field	The research unit makes an outstanding contribution to society	The research unit is excellently equipped for the future
2	Very good	The research unit conducts very good. internationally recognised research	The research unit makes a very good contribution to society	The research unit is very well equipped for the future
3	Good	The research unit conducts good research	The research unit makes a good contribution to society	The research unit makes responsible strategic decisions and is therefore well equipped for the future
4	Unsatisfactory	The research unit does not achieve satisfactory results in its field	The research unit does not make a satisfactory contribution to society	The research unit is not adequately equipped for the future