ENGINEERING AND POLICY ANALYSIS

FACULTY OF TECHNOLOGY, POLICY AND MANAGEMENT,

DELFT UNIVERSITY OF TECHNOLOGY

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This report was finalised on 28 March 2017

REPORT ON THE MASTER'S PROGRAMME ENGINEERING AND POLICY ANALYSIS OF DELFT UNIVERSITY OF TECHNOLOGY

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point (19 December 2014).

ADMINISTRATIVE DATA REGARDING THE PROGRAMME

Master's programme Engineering and Policy Analysis

Name of the programme:	Engineering and Policy Analysis
CROHO number:	60179
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Location(s):	Delft
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	31-12-2017

The visit of the assessment panel Technische bedrijfs- en bestuurskunde to the Faculty of Technology, Policy and Management of Delft University of Technology took place on 12 and 13 December 2016.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

Name of the institution:	Delft University of Technology
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

COMPOSITION OF THE ASSESSMENT PANEL

The panel that assessed the master's programme Systems Engineering, Policy Analysis and Management consisted of:

- Prof.dr ir. Rob van der Heijden, Radboud University Nijmegen [chair];
- Prof.dr. Harrie Eijkelhof, Utrecht University;
- Prof.dr. Arthur Petersen, University College London, United Kingdom;
- Prof.dr. Marcel Veenswijk, VU University Amsterdam;
- Prof.dr. Hens Runhaar, Wageningen University and Research & Utrecht University
- Maarten van Ruitenbeek, BSc, University of Groningen [student member].

The panel was supported by dr. Barbara van Balen, who acted as secretary. Appendix 1 contains the curricula vitae of the panel members.

WORKING METHOD OF THE ASSESSMENT PANEL

Cluster
The master's programme Systems Engineering, Policy Analysis and Management at the Delft University of Technology (hereafter: TU Delft) was assessed as part of the Industrial Engineering and Management and Systems Engineering, Policy Analysis & Management cluster. This cluster encompasses eleven programmes at four universities: Delft University of Technology, University of Groningen, Twente University of Technology and Eindhoven University of Technology. TU Delft served as the first point of contact and secretary on behalf of all four universities. Dr. E. Schröder, project manager at QANU, assisted the cluster with organisational and practical matters.

The project manager approached independent panel members based on the programmes' recommendations, taking into account the specialised tracks at the four institutions. The NVAO approved the panel composition on 10 October 2016. The cluster panel consisted of the following members:

- Prof.dr.ir. Rob van der Heijden, Radboud University Nijmegen [chair];
- Prof.dr. Harrie Eijkelhof, Utrecht University;
- Prof dr. Erik Demeulemeester, KU Leuven, Belgium;
- Prof.dr. Jan Kratzer, Technische Universität Berlin, Germany;
- Prof.dr. Arthur Petersen, University College London, United Kingdom;
- Prof.dr. Marcel Veenswijk, VU University Amsterdam;
- Prof.dr Hens Runhaar, Wageningen University and Research & Utrecht University;
- Prof.dr. Emmo Meijer, Eindhoven University of Technology;
- Dr. Margriet Nip, Tata Steel;
- Dr. Hector Ramirez Estay, Université de Franche-Comté, France;
- Maarten van Ruitenbeek, BSc, University of Groningen [student member];
- Sofie Vreriks, BSc, University of Twente [student member].

Prof. dr ir. Rob van der Heijden acted as panel chair during all four site visits. Prof.dr. Harrie Eijkelhof, an education expert with a long-standing academic career in the teaching of science, also agreed to partake in all four assessments. Two QANU secretaries were appointed to assist the panel during site visits: QANU project manager dr. Els Schröder and dr. Barbara van Balen, independent NVAO-certified secretary. Calibration meetings took place on 15 December 2016 and 22 March 2017 between prof.dr.ir. Van der Heijden, prof.dr. Eijkelhof and both secretaries to attune the panels' findings to assure consistency of the assessments within the cluster.

Site visit TU Delft

Preparation
To prepare for the assessment, the management provided a critical reflection on each master's programme. In them, the management described the current state of affairs and provided useful information for the assessment of its programmes. The project manager checked the report for completeness of information before sending it to the panel members. In consultation with the chair, the secretary also selected 15 master's theses, covering the full range of marks given, a range of thesis subjects, and representing the various examiners and master's tracks.

Site visit
A site visit to the Faculty of Technology, Policy and Management at TU Delft took place on 12 and 13 December 2016 in the presence of all six panel members, assisted by an NVAO-certified secretary. Prior to the site visit, the panel asked the programme to select representative interview partners. It met during the site visit with the programme management, current students, staff, alumni, members of the examination board and members of the programme committee of the programme. For the timetable of the site visit, see Appendix 5.

The panel also examined relevant study material, assessment forms and additional material during the site visit. This material is listed in Appendix 6. The panel provided students and lecturers with an opportunity to meet informally during a consultation hour outside the set interviews. No requests were received for this option. The panel used the final part of the visit for an internal meeting to discuss its findings. The visit concluded with an oral presentation of the preliminary impressions and general observations by the chair of the panel. This presentation was open to all.

Report
Based on the panel's findings, a draft report was prepared by the secretary. All panel members commented upon the draft report, and their comments were incorporated accordingly. Subsequently, the programme checked it for factual irregularities. Comments by the programme were discussed by the secretary and chair and, where necessary, other panel members before the report was finalised.

Decision rules
In accordance with the NVAO's Assessment framework for limited programme assessments, the panel used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standard.

Excellent
The programme systematically well surpasses the current generic quality standard and is regarded as an international example.

SUMMARY JUDGEMENT

Standard 1
The master's programme Engineering and Policy Analysis (EPA) is an international programme, which focuses on supporting decision-making processes regarding large-scale, socio-technical systems. It aims to produce engineers, analysts and modellers who are able to work in international and interdisciplinary teams, who are aware of the political and policy environment they are operating in, and who can contribute to solving the Grand Challenges the world is facing in this century, as described in the EU programme H2020. The panel considers it very positive that the master's programme EPA is a truly international and interdisciplinary programme. It greatly appreciates that the programme objectives are elaborated in well-defined, detailed learning outcomes.

The panel does advise the programme management, however, to ensure that the programme is clearly distinguished from the SEPAM programme and that this profile is evident in the master's theses.

The panel concluded that the intended learning outcomes meet the Dutch qualifications framework and tie in with the international perspective of the requirements set by the professional field and the discipline. They fit the Domain-Specific Framework of Reference developed by the Dutch programmes for Industrial Engineering and Management.

Standard 2
The curriculum is structured along two learning lines: a series of courses with a focus on policy analysis and political decision-making and a series of courses leaning towards more quantitative methods, ranging from data analytics to advanced modelling and simulation courses. The common focus is on facing the Grand Challenges of a rapidly developing and changing world. The panel established that the content and structure of the master's programme EPA enable the students to achieve the intended learning outcomes. The curriculum is well-structured, coherent and attractive, while also offering ample opportunity for creating an individual profile based on electives and specialisation tracks. Nonetheless, the panel recommends closely monitoring the translation of the new take on the curriculum at thesis level to communicate the programme design effectively and clearly.

The underlying didactical principle of the EPA curriculum is 'learning by doing', with practical application of the theory offered. This learning by doing principle is supported by a blended learning approach. The panel appreciates the efforts to implement blended learning in the programme, which adds to the stimulating learning environment. It encourages the programme to proceed further in this direction. The panel verified that students of the programme take the offered opportunities and partake in international exchange, both in Delft and abroad, and that therefore EPA enjoys the advantages of being a truly international community. The programme has succeeded in building an international, stimulating learning environment supported by an enthusiastic, involved, accessible and highly qualified teaching staff.

Standard 3
The Faculty of Technology, Policy and Management (TPM) described its assessment policy in the Assessment Policy 2013-2014 document. The panel studied a selection of test dossiers and master's theses and the accompanying assessment forms. Furthermore, it held a meeting with the Board of Examiners during the site visit. It verified that the programme has an adequate assessment system. The assessments are valid, transparent and reliable. The Board of Examiners is performing its legally mandated tasks adequately.

Standard 4
The panel studied 15 master's theses to establish whether the graduates had achieved the intended learning outcomes of the programme. It was impressed by the high level of the theses.

They demonstrated clearly that the graduates had achieved the intended learning outcomes. The conclusions that the programme stimulates the students to perform at a high level and that its graduates are highly appreciated is confirmed by the data about the employability of the alumni, as well as by the presentation and evaluation of the alumni themselves.

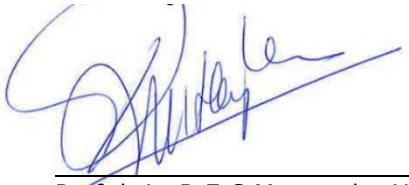
The panel assessed the standards from the *Assessment framework for limited programme assessments* in the following way:

Master's programme Engineering and Policy Analysis:

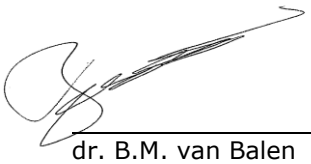
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

The chair and the secretary of the panel hereby declare that all panel members have studied this report and that they agree with the judgements laid down in it. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 28 March 2017



Prof.dr.ir. R.E.C.M. van der Heijden



dr. B.M. van Balen

DESCRIPTION OF THE STANDARDS FROM THE ASSESSMENT FRAMEWORK FOR LIMITED PROGRAMME ASSESSMENTS

The master's programme Engineering and Policy Analysis (EPA) is offered by the Faculty of Technology, Policy and Management at Delft University of Technology. EPA is an international, two-year engineering master's degree programme. Previously, the programme aimed at students with a monodisciplinary engineering or natural sciences background. From 2016 onwards, EPA is also accessible for students with a bachelor's degree in Technische bestuurskunde. In 2016 the programme implemented a new curriculum. Although according the NVAO rules the panel assessed the programme on past performance, which means the former curriculum, it has also taken the new curriculum into consideration. The curriculum described in this report – to avoid confusion - concerns the new curriculum.

The Faculty also offers the bachelor's programme Technische bestuurskunde and two other master's programmes: Systems Engineering, Policy Analysis and Management (SEPAM) and Management of Technology (MOT). The assessments of these programmes are described in separate reports.

Standard 1: Intended learning outcomes
The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme. Insofar as is applicable, the intended learning outcomes are in accordance with relevant legislation and regulations.

Findings
The master's programme EPA is an international programme, which focuses on supporting decision-making processes regarding large-scale, socio-technical systems, in particular infrastructures for transport, ICT, energy, water, waste and natural resources. Explicit reference is made to the Grand Challenges as described by the EU in the H2020 programme. The aim of the programme is to educate policy advisors for a wide range of technology sectors, with the ultimate objective to improve the quality of policy-making. The programme aims to produce engineers, analysts and modellers who are able to work in international and interdisciplinary teams, who are aware of the political and policy environment they are operating in, and who contribute to solving the Grand Challenges the world is facing in this century.

According to the critical reflection, EPA graduates are able to analyse, model and simulate complex socio-technical problems. They master a number of modelling techniques and can design and implement problem-solving strategies and adaptive policies. The critical reflection states that the intended learning outcomes are fully covered by the course objectives. This is indeed demonstrated in the Appendix to the critical reflection, which contains an overview of how the course objectives are related and contribute to the intended learning outcomes.

The following objectives are summarised in the critical reflection:

'The EPA programme is intended to enable students:
1. To acquire scientific knowledge, understanding and methodological, technical and communication skills for addressing the Grand Challenges

2. To acquire an academic mind-set, with a critical, scientific and creative way of thinking, awareness of ethical and social aspects in relation to their own research and an understanding of the professional field and of the consequences of their own actions in that field
3. To acquire and appraise data, model and simulate complex dynamic systems
4. To work in an international and interdisciplinary working environment and manage intercultural teams
5. To prepare for an academic career and further education, in particular a PhD programme to prepare for a career in society.'

These general learning outcomes have been elaborated in detailed intended learning outcomes (Appendix 3). The panel was impressed by the thorough translation of the mission and objectives of the programme into the intended learning outcomes. The intended learning outcomes are transparent and informative and indicate what can be expected from a master's level programme.

The panel ascertained that the intended learning outcomes meet the internationally accepted standards for academic master's programmes, the Dublin descriptors. The programme management specified in the critical reflection that the learning outcomes were formulated in accordance with the Meijers Criteria[1], which are used by degree programmes of universities of technology in the Netherlands to indicate the academic level to be achieved. The programme's mission is obviously attractive to foreign students. The panel learnt during the site visit that students from all over the world choose this programme. The students reported during the site visit that they had made a deliberate choice for the EPA programme instead of EPA programmes at well-known institutes such as University College London and Georgetown University (USA). The panel was very satisfied with the benchmark presented in the critical reflection. The programme can be compared to several highly esteemed degree programmes in the UK and the United States and nevertheless has its own focus on the EU's Grand Challenges, which is highly appreciated by the panel.

To the interviewed students, the difference in profile between the master's programmes EPA and SEPAM was clear enough to allow them to make a deliberate choice. To the panel, however, the difference was not obvious after studying master's theses from both programmes. Some master's theses from one programme could have been written by students from the other programme. In discussion with the management and the teachers, it became clear that the distinction between the two programmes could be articulated better. The necessity to distinguish became prominent only recently. In previous years, the programmes were aiming at different audiences, as SEPAM was originally the transfer master's programme for the bachelor Technische bestuurskunde graduates and EPA aimed at graduates from international monodisciplinary engineering and natural sciences bachelor's programmes. EPA is focused on policy discourses at the national or even international level. It only recently became possible for bachelor's graduates of *Technische bestuurskunde* to choose EPA, which the panel finds very positive given the increasing separation between bachelor's and master's programmes. The panel recommends developing a clear, distinctive profile for both programmes and ensuring that this profile is also evident in the master's theses.

The programme has a balanced combination of engineering and social/political sciences. The objectives of the programme are very well translated in the intended learning outcomes and in the courses on offer.

Considerations
The panel considers it very positive that the master's programme EPA is a truly international and interdisciplinary programme with a focus on supporting decision-making processes regarding large-scale socio-technical systems. The theme of the programme, defined as the Grand Challenges,

[1] The Meijers Criteria were specifically developed for degree programmes of the universities of technology to supplement the Dublin descriptors. Meijers, A.W.M., C.W.AM. van Overveld & J.C. Perrenet (2005), Academic Criteria for Bachelor and Master Curricula, TU Delft, TU/e & University of Twente.

adds to its international attractiveness and topicality. The panel greatly appreciates that the programme objectives are elaborated in well-defined, detailed learning outcomes. However, the panel advises ensuring that the programme is clearly distinguished from the SEPAM programme and that this profile is also evident in the master's theses.

The panel concluded that the intended learning outcomes meet the Dutch qualifications framework and tie in with the international perspective of the requirements set by the professional field and the discipline. They fit the Domain-Specific Framework of Reference developed by the Dutch programmes for Industrial Engineering and Management.

Conclusion
The panel assesses Standard 1 as 'good'.

Standard 2: Teaching-learning environment
The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings
The EPA programme has an intake of 30-35 students per year, of whom not more than a third is Dutch. The curriculum has an obligatory fixed package of 60 EC of course work in the first year. In the third semester, students may study abroad or take specialisation programmes and electives in TU Delft. In the fourth semester, the students work on their thesis project (30 EC).

In the old curriculum, the obligatory programme in the first and second semesters had four interconnected learning lines, a policy analysis line (20 EC), a modelling line (15 EC), a cross-cultural management line (15 EC) and an economics line (10 EC). The new curriculum, which started in September 2016, is structured along two learning lines: a series of courses with a focus on policy analysis and political decision-making and a series of courses leaning towards more quantitative methods, ranging from data analytics to advanced modelling and simulation courses. The common focus is on facing the Grand Challenges of a rapidly developing and changing world. The panel highly appreciates this focus, but noticed that is not yet evident in all of the master's theses. It recommends monitoring this aspect in the future.

The first year of the EPA programme focuses on acquiring the basic knowledge and skills of a professional policy analyst. In the third semester, a number of 15 EC specialisation packages are available for the students. The fourth semester is dedicated to the master's thesis. The panel appreciates that students have ample opportunity to diversify their studies in their second year based on their interests and thesis research project, creating an individual profile within the field. In its eyes, the curriculum design enables students to meet the intended learning outcomes.

The students see policy analysis as the core characteristic of the programme. The basic skill they 50% of the students spend at least one semester abroad as an exchange Almost 50% of the EPA students spend at least one semester abroad (usually the third semester. Students confirmed that the programme strongly supports international exchange. In addition, many international students enrol into the EPA programme, both for exchange and for the complete programme. This results in an international classroom), which is considered a strong feature of the programme by the panel. The EPA programme is therefore a truly international programme with a substantial intake of foreign students in the panel's eyes.

The underlying didactical principle of the EPA curriculum is 'learning by doing', with practical application of the theory offered. This learning by doing principle is supported by the blended learning approach, facilitated by online materials, which can be studied anytime, anywhere. On campus, students are engaged in highly interactive workshops and projects to apply the theory, concepts and modelling tools in practice. They confirmed that almost every course combines video, discussion and books. They told the panel during the site visit that a good example of a blended learning project is a case study on Kerala in India. They were provided with videos of the stakeholders, and their assignment was to select five videos and make an analysis of the situation. They mentioned that there is a lot of interaction with the teachers in class. Usually, there is a question and answer session and a discussion session. They are of the opinion that there is a good mixture of ordinary lectures and interactive lectures in the programme. The panel appreciates the clear focus on innovative teaching methods in the programme and praises the initiatives with blended learning.

The panel noted that the study yield of the programme varies considerably (from 66.7% to 100%). The data presented in the critical reflection show that the drop-out percentages of cohorts 2011 and 2013 are high, 20% and 33.3%, respectively. The programme management explained that part of these figures can be explained by data about students taking a double degree programme. These students do not enrol in the second master year, but cannot be counted as 'drop out' .

According to the critical reflection, since all staff members of the Faculty are involved in all degree programmes, it is not possible to give a student-staff ratio for one of the programmes. The critical reflection presents a student-staff ratio of 21.3 for the whole Faculty. The critical reflection of the EPA programme mentions that the current student-staff ratio for EPA is about 21:1. In the eyes of the panel, the quantity of staff is sufficient to create a stimulating learning environment for students.

The panel met with very enthusiastic and dedicated teachers of the EPA programme. The students were also very positive about the quality and involvement of the teachers. Their doors are open, and staff and students are frequently present in the Faculty building. The quantity and quality of the staff in general are sufficient. All EPA staff is engaged in research and education. Members of the teaching staff hold a UTQ (University Teaching Qualification) or are taking the courses needed for the qualification. Almost all core staff with a teaching obligation have a PhD. All staff members fulfil the English language proficiency requirements of TU Delft. The quality of the teaching is regularly monitored. An essential component of this monitoring is to ask students their opinions after all courses. After each evaluation, the teachers reflect on the outcomes and propose improvement measures to the programme management. The panel considers the staff qualified and well-prepared for their teaching responsibilities.

The panel toured the Faculty building and established that the study environment is very stimulating. Students have ample room and facilities to study, to cooperate in study groups and to meet each other and their teachers. They are actively involved in the programme. Each degree programme of the TPM Faculty has its own Board of Studies (BoS), on which both teachers and students participate. The BoS monitors the quality of the teaching and advises on matters relevant to the programme. Members of the faculty-wide study association participate on the Faculty board and the BoS and actively contribute to the process of evaluation and improvement of the programme. The study association also organises excursions to industry and lectures by representatives of the work field.

The panel learnt that the EPA programme is moving to Den Haag to improve its contacts with government and governmental organisations. The teaching staff is very enthusiastic about this move and sees many advantages. Although the students will be located at a distance from the TU Delft campus community, they did not foresee any problems. The programme will be housed in a building with 2000 other students (mainly from Leiden University), and the travel time to the Delft

campus by train is only 30 minutes. Considering the positive attitude of the teachers and the students, the panel endorses the decision to move to Den Haag, but advises monitoring closely whether or not the objectives of the movement, such as closer cooperation with international organisations, are achieved. The panel also advises guaranteeing that the EPA students have enough possibilities to participate in TU Delft events and activities.

Considerations
The panel established that the content and structure of the master's programme EPA enable the students to achieve the intended learning outcomes, while also offering ample opportunity for creating an individual profile based on electives and specialisation tracks.. It assessed the content, the coherence, the teaching methods and the feasibility of the programme, as well as the quantity and quality of the teaching staff. The curriculum is well-structured, coherent and attractive. Nonetheless, the panel recommends closely monitoring the translation of the new take on the curriculum at thesis level to communicate the programme design effectively and clearly.

With the EPA programme, TU Delft offers an attractive master's programme with a focus on the analysis of large-scale problems, summarised under the label Grand Challenges. The programme has succeeded in building an international, stimulating learning environment supported by an enthusiastic, involved, accessible and highly qualified teaching staff. The panel verified that students of the programme take the offered opportunities and partake in international exchange, both in Delft and abroad, and that therefore EPA enjoys the advantages of being a truly international community. The panel appreciates the efforts to implement blended learning in the programme, which adds to the stimulating learning environment, and encourages the programme to continue progress in this direction.

Conclusion

The panel assesses Standard 2 as 'good'.

Standard 3: Assessment
The programme has an adequate assessment system in place.

Explanation:
The tests and assessments are valid, reliable and transparent to the students. The programme's examining board safeguards the quality of the interim and final tests administered.

Findings
The Faculty of Technology, Policy and Management (TPM) has described its assessment policy in the Assessment Policy 2013-2014 document. The document describes the current and the desired situation with regard to the roles and tasks of several bodies in the Faculty. The Faculty's assessment policy has evolved during the assessment period and now includes measures concerning the transparency, validity and reliability of assessment.

Transparency of assessment is achieved by course guides providing the necessary information about examinations, a Master Thesis Assessment Guide, and the availability of examples of earlier exams. The validity is achieved by peer-reviewed preparation of exams and the use of assessment plans for each module. Reliability is achieved by having a graduation committee of three staff members assess the theses and by using plagiarism detection programmes.

The panel studied a selection of test dossiers and of master's theses and the accompanying assessment forms. It met with the Board of Examiners during the site visit. It established that the Faculty has an adequate assessment policy in place.

According to the panel, the Board of Examiners (BoE) is performing its legally mandated tasks adequately. During the site visit the BoE presented a clear vision of its role to the panel. The BoE chair explained that the BoE does not have the ambition to check every examiner and every teacher, but prefers to take an advisory position. The panel sees some risks in this position and recommends the BoE to pay attention to the prescribed independence of the BoE.

The students reported that the testing and assessment procedures are transparent; they know in advance how they will be tested and what the criteria are. The quality of tests and examinations is included in the regular student evaluation procedure. In general, the students were satisfied with the tests and the examinations.

Master's thesis research projects are always assessed by a committee of at least three academic staff members. The committee meets at least four times during the project: kick-off, mid-term, green light, and thesis defence. The process is administered using prescribed forms. The thesis examiners use a grading scheme (rubric) to ensure that the grades are balanced and the intended learning outcomes are achieved.

As of 2011, two thesis reviews are performed annually. One of the reviews is performed by the BoE. This review focusses on the reliability of the assessment of the theses. The second review is performed by the Director of Studies, at the request of the BoE, and concerns the extent the theses fit the intended learning outcomes. Furthermore, every two years an independent committee is appointed by the BoE to assess and benchmark the grading of masters' theses of the Faculty's three master's programmes.

Considerations
The panel established that the Faculty of Technology, Policy and Management of TU Delft has an adequate assessment system. The assessments are valid, transparent and reliable. The Board of Examiners is performing its legally mandated tasks adequately

Conclusion
The panel assesses Standard 3 as 'satisfactory'.

Standard 4: Achieved learning outcomes
The programme demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes.

Findings
The master's thesis project comprises 30 EC. Students can find all the information, rules and regulations concerning the thesis work on the online Graduation Portal. The panel received an overview of the grading of all master's theses of the last two academic years and was impressed by the high grades and the number of students who were awarded cum laude. The critical reflection mentions that the EPA students were distinguished for their research skills: several groups of students won prizes in modelling competitions and best paper awards at scientific conferences.

The panel studied 15 master's theses to establish whether the graduates had achieved the intended learning outcomes of the programme and could confirm that they performed at the high level indicated by the grading of the theses. The panel was impressed by the high quality of the theses and read them with great appreciation, although it noticed that they tended to rather elaborated. Several of the theses significantly exceeded 100 pages. The master's theses clearly and systematically demonstrated that the students formulated research questions on complex issues, used multi-method approaches and various theories, models and domain knowledge. The panel

was impressed by the high quality of the analyses and presentation of the research results. The theses demonstrated that the graduates contributed to the body of science through independent work. In some cases, the work resulted in conference papers or even journal publications, in collaboration with their supervisors. As already mentioned, the topics chosen for the theses were not all distinctive for the EPA programme; some of them could also have been chosen by SEPAM students. This remark, however, refers to the earlier mentioned issue of distinction between the profiles of these programmes and has no consequences for the assessment of the quality of the theses.

The programme prepares the students for a broad range of opportunities in the labour market. The alumni data demonstrate that EPA graduates very easily find jobs in their field of expertise. Some 75% of the alumni is employed in the private sector. Most graduates find a job in industry, in international consulting or the strategy departments of energy companies, multinationals and the banking sector. According to the critical reflection, over 90% of the graduates find a job within six months, and the average time to find a job is less than two months. Alumni are doing work they are trained for and expressed their gratitude for the good training they received in the programme. They confirmed that the analytical skills of EPA graduates are very good. They were all very positive about the level they had achieved in the EPA programme. The only critical remark made is that it is sometimes difficult to explain to foreign employers what the EPA programme is.

Considerations
The panel was impressed by the high level of the master's theses. The ones studied demonstrated that the graduates achieved the intended learning outcomes and performed at a high level. The conclusion that the programme stimulates the students to perform at a high level and that the graduates are highly appreciated is confirmed by the data about the employability of the alumni, as well as by the presentation and evaluation of the alumni themselves.

Conclusion
The panel assesses Standard 4 as 'good'.

GENERAL CONCLUSION

The master's programme EPA is an international programme focused on supporting decision-making processes regarding large-scale, socio-technical systems, in particular infrastructures for transport, ICT, energy, water, waste and natural resources, with reference to the EU's Grand Challenges. The panel assessed standard 1, Intended learning outcomes, as good. The intended learning outcomes have been made more specific in terms of content, level and orientation; they meet international requirements. The panel greatly appreciates that the general learning outcomes are elaborated in well-defined, detailed learning outcomes. Standard 2, Teaching-learning environment, was assessed as good. The panel established that the curriculum, staff and programme-specific services and facilities enable the students to achieve the intended learning outcomes. The panel assessed standard 3, Assessment system, as satisfactory. The Faculty has an adequate assessment policy, and the Board of Examiners is performing its legally mandated tasks. Standard 4, Achieved learning outcomes, was assessed as good. The panel was impressed by the quality of the master's theses and the level achieved by the graduates.

Considering the assessments of standard 1 and standard 4 and the panel's general impression of the EPA programme as a very attractive programme in a stimulating, international learning environment, the panel assesses the master's programme Engineering and Policy Analysis as good.

Conclusion
The panel assesses the *master's programme Engineering and Policy Analysis* as 'good'.

APPENDICES

APPENDIX 1: CURRICULA VITAE OF THE MEMBERS OF THE ASSESSMENT PANEL

Panel chair

Professor Rob Van der Heijden graduated in 1981 from Eindhoven University of Technology as a building engineer. He received his PhD in Building Engineering from the same university in 1986. From 1987-1993 he worked as Associate Professor at the Faculty of Civil Engineering of TU Delft. In 1994, he was appointed Full Professor in Transport and Logistics at TU Delft. Radboud University Nijmegen offered him a position as Full Professor in Urban and Regional Planning in 2001. Between 2008-2010, he was Scientific Director of the Institute of Management Research and Vice-Dean of Research at the Nijmegen School of Management (NSM). He was Dean of the Nijmegen School of Management from 2011-2016. Since June 2016, he has been Professor in Innovate Planning Methods within the NSM. His research is in the fields of spatial planning, decision making and governance with a special focus on issues of transport, logistics and infrastructure development.

Panel members

Professor Harrie Eijkelhof has specialised knowledge of didactics and teaching methods in science education. Until his retirement in 2014, he was Director of the Freudenthal Institute for Science and Mathematics Education at the Faculty of Science at Utrecht University (2011-2014). Previously, he was Professor of Physics Education at the Faculty of Physics and Astronomy at the same institution (1997-2011). Professor Eijkelhof has ample experience in teaching, educational models, didactics, assessment and the professional development of executives in university education. From 2005 to 2010, he was Vice-Dean of Undergraduate Studies at the Faculty of Science, Chairman of the Board of Studies of the Undergraduate School, member of the Examination Board of Liberal Arts and Sciences and a member of the Advisory Board of Education at Utrecht University.

Professor Arthur Petersen joined the Department of Science, Technology, Engineering and Public Policy at University College London full-time in September 2014 after more than thirteen years' work as scientific adviser on environment and infrastructure policy with the Dutch government. Additionally, he is Professorial Fellow at the Dutch National Institute for Public Health and the Environment – RIVM (since April 2016) and Research Affiliate at the Massachusetts Institute of Technology (since 2009). From 2011-2016, he was Adjunct Professor of Science and Environmental Public Policy at VU University Amsterdam. Professor Petersen studied Physics and Philosophy, obtained doctorate degrees in Atmospheric Sciences at Utrecht University (1999) and in the Philosophy of Science at VU University Amsterdam (2006). He now conducts research in Anthropology and Political Science. Most of his research focuses on managing uncertainty.

Maarten van Ruitenbeek, BSc (student member) is a first-year master's student in Industrial Engineering and Management at the University of Groningen. Besides his studies, he follows the High Tech Systems and Materials Honours Programme in collaboration with Royal Philips Drachten and tutors first-year bachelor students in Industrial Engineering and Management. He completed his bachelor in Industrial Engineering and Management Science at the University of Groningen in 2016. In 2015-2016, he was president of TBV Lugus, the student association of Industrial Engineering and Management in Groningen.

Professor Hens Runhaar is a Special Professor of Management of Biodiversity in Agricultural Landscapes at Wageningen University and Research and an Associate Professor of Environmental Governance at the Copernicus Institute of Sustainable Development at Utrecht University. The integration of environmental objectives into sectoral policies, planning and practices is his main area of interest. Dr Runhaar has researched this subject in various domains – such as transport, urban planning, natural resource management and, more recently, agriculture – encompassing environmental themes such as climate change mitigation and adaptation, environmental health and

biodiversity. Other subjects addressed in his research are science-policy interactions, the framing of environmental problems and the consequences of these framings – including governance practice, effectiveness, and controversies. He has published over fifty scientific papers and (co)edited three special journal issues, most recently a special issue on coastal management for *Environmental Science and Policy*.

Professor Marcel Veenswijk is Full Professor in Management of Cultural Change at VU University Amsterdam. Professor Veenwijk graduated from the University of Leiden with a degree in Public Administration and holds a PhD from Erasmus University Rotterdam. He has worked as a researcher, lecturer and research manager. He has published widely on cultural change, institutional transformation and innovation processes, especially in the context of public sector organisations. The work of his current research group addresses the tensions between institutionalised structures and individual agency, the changing norms in institutional fields, the establishment of newly emerging fields, the breakdown or cut across institutionalised boundaries, and the micro-processes of conflict and identity formation. In addition to his scientific work, he has extensive experience as a consultant. Prior assignments included projects for ABN AMRO, Rijkswaterstaat, ProRail, the City of Amsterdam, Enexis, ING, KLM and several ministries.

APPENDIX 2: DOMAIN-SPECIFIC FRAMEWORK OF REFERENCE

Domain-Specific Frame of Reference Industrial Engineering and Systems Engineering
(As confirmed in Utrecht on 10 March 2016)

This document has been written as a short summary of views on the field of Industrial Engineering and Systems Engineering (IE&SE). These views have been gathered from organizations that focus on the professional development and application of the field http://esd.mit.edu/;http://www.abet.org/). In addition, SE engineers (http://www.iienet.org; http://msom.society.informs.org; http://www.informs.org; http://www.incose.org) and leading academic programs in the field (http://ieor.berkeley.edu/; http://www.isye.gatech.edu/; http://www.cesun.org; http://www.stanford.edu/dept/MSandE/; http://www.epp.cmu.edu/; http://esd.mit.edu/; http://www.seor.gmu.edu/). A few excerpts from these texts are included in the separate text box.

Although there are some clearly common elements in these descriptions, we observe that the various different emphases of these organizations' IE&SE programs have necessitated each of them to formulate their own view of what the field of Industrial Engineering and Systems Engineering represents in education, application, and research. The same also holds for the IE&SE programs at UG, TUD, TUe, and UT. This document gathers the overarching elements of these programs, but we emphasize that each of these IE&SE programs has unique elements that will be highlighted in the self-assessments.

1. Common elements of the field of IE&SE
These common elements concern: (a) the common basis, (b) the focus: (re-)design, implementation, installation, and improvement of products, processes and systems, (c) broadly applied in private and public domains and within and between organisations, (d) the application of quantitative methods (and combination with qualitative methods), and (e) complex problem solving with a scientific and a pragmatic multidisciplinary approach.

(a) The common basis
Industrial Engineering (IE) and Systems Engineering (SE) are interrelated.[2] IE is concerned with the design, improvement, implementation and installation of integrated systems of people, information, materials, equipment and energy. It focuses on the analysis, design and control of (innovative) processes, products and systems in an industrial and/or societal environment, both at the level of individual organisations and supply networks as well as strategic issues. It involves the use of new processes, materials and production- and manufacturing techniques in innovative ways. SE mainly focuses on inter-organisational questions that involve the use of technology and the interests of multiple stakeholders, typically linking public and private organisations. As a consequence the common basis of IE en SE draws upon specialised knowledge and skills in the mathematical, physical, chemical and social sciences together with the principles and methods of engineering analysis and design in order to specify, predict, and evaluate the results to be obtained from the systems involved.

(b) The focus: analysis, design, implementation, and performance improvement of processes, critical infrastructures, and systems
IE&SE is concerned with the design and improvement of operational and/or strategic processes and integrated systems. These processes or systems provide products or services to customers or to the society at large. As such both private and public organisations are concerned. The design and improvement of products, processes and systems considers multiple goals and the availability of limited resources, such as time, money, materials, energy and other resources. Several organizations and multiple stakeholders may be involved (supply chains, alliances, public-private

[2] "Industrial Engineering" refers to the programmes at TU/e and UT, while the term "Systems Engineering" better fits most programmes at TUD.

partnerships) and governance structures can be part of design and improvement initiatives. The scope of design thus may include supply chain networks, production and manufacturing techniques, products, control of systems, implementation, installation and validation. The multidisciplinary, integrated design approach including the design context distinguishes IE and SE's from specialized engineering disciplines. In summary, IE's and SE's may be considered Productivity and Efficiency Professionals.

(c) Broadly applied, both in private and public domains and both within and between organizations
IE&SE is used in a variety of fields. It applies along all steps in the product life cycle, from research and development over design, manufacturing, distribution and disposal. And it applies in all phases of the value chain. Whereas initial applications were mainly limited to industrial settings, we now witness more and more applications in the service industry. Its principles apply as well in all fields of the private as in the public sector. Today there is a fast growth of applications in banking, healthcare, transportation, and the like.

Therefore the term "industrial" can be misleading; this does not mean just manufacturing. It encompasses service industries as well. It has long been known that industrial engineers have the technical training to make improvements in a manufacturing setting. However, many of the same techniques can be used to evaluate and improve productivity and quality in a wide variety of service industries, as well as in the public sector. The term "Systems Engineering" emphasizes this broader scope for design, improvement, and problem solving.

(d) The application of quantitative and qualitative methods
IE&SE is a field of engineering and one important element of its approach to the design and improvement of products, processes and systems is the use of data analytics and quantitative modelling methods. These are derived from fields such as operations research, management science, mathematics, natural sciences, economics, data analysis and statistics, information systems, game theory (gaming, simulation and Q-methods), engineering and social science methods such as interviews and questionnaires.

(e) Complex problem solving with a scientific and pragmatic multidisciplinary approach
Complex problems where value systems may clash and the status of knowledge claims may be disputed are central to IE&SE. In order to be able to solve these kinds of problems, it is necessary to synthesize knowledge from different disciplines (e.g., engineering, natural sciences, (institutional) economics, mathematics, organizational behaviour, law, psychology, although not all disciplines are equally important in all problem domains). IE&SE draws upon specialized knowledge and (analytical) skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design. Unlike traditional disciplines in engineering, IE&SE addresses the role of human decision-makers and other stakeholders as key contributors to the inherent complexity of systems. The programmes offer the relevant knowledge and skills from different disciplines and provide a framework for the application and integration of this knowledge in analysing a problem situation and in designing and implementing solutions. In brief, IE's and SE's might support (scientific) decision making.

Besides scientific IE&SE people also ought to be pragmatic people. They work to understand and resolve real problems from society and hence - as stated above - need to combine the knowledge and experience from many disciplines to develop project and process-management expertise and communication skills. They choose their method so as to fit the problem, which means that they combine the quantitative and problem-solving approach of engineers with research methods and qualitative insights from the social sciences.

2. Generic competences
Taking into account the before mentioned common elements of the field generic competencies for industrial and systems engineering are listed below:

- Sufficient understanding of science, technology and technological innovation;
- Keen analytic mind-set combined with a drive to synthesize towards a solution;
- Competent in translating complex issues in workable models and design and execute appropriate research programmes;
- Adequate mathematics skills for modelling and executing research activities;
- Able to conduct standard experiments, tests and measurements, and to analyse and interpret and apply the results in order to improve products, processes and systems;
- Able to (re)design products, processes and systems in an IE&SE context;
- Adequate understanding and competences in a number of technical, economic and social disciplines to underpin research programmes;
- An adequate understanding of the drivers of socio-,economic and political organizations in society;
- Able to assess the impact of IE&SE products, processes and systems in a business, societal and global context;
- Able to organize and drive for efficiency and effectiveness;
- Resourcefulness and creative problem solving;
- Excellent communication, listening, and negotiation skills;
- Ability to adapt to many environments, interact with a diverse group of individuals and understand the roles of various stakeholders in the processes;
- Experience in working in an interdisciplinary and international environment;
- Able to identify the arising ethical dilemma and to reflect on this dilemmas.

3. BSc and MSc levels

The specific blend of competencies varies per programme and is laid down more specifically in the final qualifications of each programme. Although the emphasis varies among the programmes, there is a differentiation between the BSc and MSc levels regarding to

- Complexity of the problem situations (in terms of technical and/or stakeholder complexity and/or the number of disciplines involved);
- The amount of information necessary, known, and available from the practical problem situation;
- The level of autonomy.

Bachelors receive a sound general education in basic fields of IE&SE, like Natural Sciences, technology, engineering, optimisation, production- and process techniques, engineering economy, business economy, organisational theory, social sciences, etc...) However, specific choices in these basic fields, varies per programme. They should be able to continue studies on a more in depth and specialised Master's track or they may fill appropriate positions in business.

Master programs in IE&SE generally offer different fields of study in which students can specialise. Examples of such fields are operations management, operations research and management science, CIT, product design and logistics, policy analysis, man-machine systems, performance analysis, supply chain management, process- or production techniques, innovation processes, control engineering, etc.

Whereas bachelors are mainly involved in analysis (as the initial step in the design cycle), Masters typically deal with design questions. Above that they should also be exposed to research questions. Masters should be able to formulate and carry out independent research projects.

The IE&SE Bachelor programs provide an excellent basis for one of the IE & SE Master programs, but students in IE&SE Master programs also can have various undergraduate backgrounds in engineering and other quantitative fields. Graduates of a Master's programme will typically start their career as engineers, project or planning managers, functional managers, policy analysts/advisers, engineering consultants and the like. But they may as well start an academic track through further involvement in research (e.g. PhD and academic positions). They should be

able to move later on to managerial positions (e.g. as CTO). Some may prefer to become private entrepreneurs. Excerpts from: http://www.iienet.org/Details.aspx?id=282

Institute of Industrial Engineers (IIE) **Definition of Industrial Engineering:**

'IE is concerned with the design, improvement and installation of integrated systems of people, materials, information, equipment and energy. It draws upon specialised knowledge and skill in mathematical, physical and social sciences together with the principles and methods of engineering analysis and design, to specify, predict and evaluate the results to be obtained from such systems'

Excerpts from http://www.stanford.edu/dept/MSandE/about/MSandE-5yr.pdf

Stanford Engineering established the Department of Management Science and Engineering five years ago with a logic and a purpose: engineers know how to analyze and solve problems and they thoroughly understand technology. With this quantitative background and additional training, for example in social sciences or finance, engineers should therefore be leaders in management and public policy.

The department's eight research areas [are]: organizations, technology management and entrepreneurship; production and operations management; decision analysis and risk analysis; economics and finance; optimization and the analytical tools of systems analysis; probability and stochastic systems; information science and technology; and strategy and policy. MS&E also includes several centres and programs such as the Energy Modelling Forum and the Centre for Work, Technology and Organization. In addition, it hosts the Stanford Technology Ventures Program. The department's strengths are also manifest in the talents of students and alums who work in investment banking, management consulting, and other fields that have not been closely associated with engineering in the past. These fields will be in the future because a deep understanding of technology has become critical to their operations. "For example, a growing number of people address finance problems using methods that have been traditionally associated with engineering systems analysis," says Paté-Cornell, referring to the fast-growing specialty of financial engineering. Paté-Cornell's hope is that more engineers will also join the ranks of government and use their skills to shape and implement policies.

MS&E students gain the training that they need to be leaders in finance, industry, policy, or other specialties by completing a core engineering curriculum, followed by a concentration in an area such as finance, operations research, production, or public policy.

Excerpts from www.isye.gatech.edu

Georgia Tech: Industrial engineering (IE), operations research (OR), and systems engineering (SE) are fields of study intended for individuals who are interested in analyzing and formulating abstract models of complex systems with the intention of improving system performance. Unlike traditional disciplines in engineering and the mathematical sciences, the fields address the role of the human decision-maker as key contributor to the inherent complexity of systems and primary benefactor of the analyses. In short, as practitioners and researchers in IE/OR/SE, we consider ourselves to be technical problem solvers. We are typically motivated by problems arising in virtually any setting where outcomes are influenced by often complicated and uncertain interactions, involving a variety of attributes that affect system performance. Against this backdrop, students have historically been attracted to our academic programmes with a variety of career objectives and from a host of disciplines and academic interests.

APPENDIX 3: INTENDED LEARNING OUTCOMES

Master's programme Engineering and Policy Analysis

A EPA graduate

1) Is competent in one or more scientific disciplines
   a) An EPA graduate has a thorough mastery of policy and politics, is skilled and experienced in intercultural management, and has a basic understanding of economic theories.
   b) An EPA graduate is skilled in (both quantitative and qualitative) modelling and simulation methods aimed at addressing global societal challenges following engineering principles and a multi-actor perspective.
   c) An EPA graduate apprehends the relationship of science and technology with governance and societal values.
2) Is competent in doing research
   a) An EPA graduate is able to formulate research questions on complex issues at the interface between natural and engineered systems, institutionalised values and social behaviour.
   b) An EPA graduate is proficient in the application of modelling and simulation methodologies in scientific research.
   c) An EPA graduate can design multi-methodological approaches to research that is fit for purpose.
   d) An EPA graduate can evaluate research within their discipline and identify threats to the validity of scientific research, suggest how these threats may confound the application of the research, and suggest possible remedies to address these threats.
   e) An EPA graduate can contribute to the body of scientific knowledge through independent work that has the potential for scientific publication.
3) Is competent in design
   a) An EPA graduate is able to develop engaging, innovative, integrative and adaptive, problem solving strategies and policies on the interface between natural and engineered systems, institutionalised values and social behaviour.
   b) An EPA graduate is able to structure and redefine complex societal issues from a multi-actor systems perspective.
   c) An EPA graduate is able to design and develop models and simulations for a wide range of engineering and societal challenges.
   d) An EPA graduate is able to design and develop strategic policy advices on the basis of analy tical and modelling information
4) Has a scientific approach
   a) An EPA graduate has a systematic, multimethod approach characterised by the development and use of theories, models and domain knowledge.
   b) An EPA graduate knows the possibilities and limitations of a range of analysis and modelling techniques, and is able to select the appropriate methods for the problem.
   c) An EPA graduate has insight into the nature of science and technology, and their interrelations with governance and societal values.
   d) An EPA graduate is a reflective practitioner able to review and evaluate both theory and practice and able to learn and improve upon his or her own practice.
5) Possesses basic intellectual skills
   a) An EPA graduate is able to ask adequate questions and take a critical-constructive attitude when presented with complex real-life problems in the socio-technical realm.
   b) An EPA graduate can deconstruct policy arguments, thereby revealing the frames and assumptions that shape public debate.
   c) An EPA graduate is familiar with argumentation structuring techniques and can apply these for building convincing argumentations.
6) Is competent in co-operating and communicating
   a) An EPA graduate is a catalyst of change and is able to work with and for others. He or she creates commitment for action, has a sense of responsibility, and demonstrates leadership.

b) An EPA graduate is able to participate effectively in the scientific and public debate.
c) An EPA graduate is able to work in an international, intercultural and interdisciplinary environment.
d) An EPA graduate is capable in translating disciplinary and technical knowledge into actionable findings, practical policy advises and social understanding.

7) Takes account of the temporal and the social context
a) An EPA graduate is familiar with the Grand Challenges that shape the future of our natural and built environments.
b) An EPA graduate is familiar with the cultural and institutional factors that structure engineering and policy outcomes, and understands how these factors differ across the world.
c) An EPA graduate is able to analyse the ethical and societal consequences of scientific and technological developments, and integrates this knowledge into their own work.

APPENDIX 4: OVERVIEW OF THE CURRICULUM

Master's programme Engineering and Policy Analysis 2016-2018

First semester		Second semester	
First period	Second period	Third period	Fourth period
Data analytics & Visualisation Technical writing 1	Actor and Strategy models	Advanced system Dynamics	Model-based decision-making
Understanding International Grand Challenges	Intercultural Relations and Project Management Technical writing 2	Political Decision-Making	Ethics and Impacts of Global interventions Oral presentation
Policy Analysis of Multi- Actor Systems	Introduction to Modelling	Advanced Discrete Simulation	Macro Economics for Policy Analysis
of	of		
Computer Engineering for Simulations	Technology		

Third semester		Fourth semester	
First period	Second period	Third period	Fourth period
Specialization elective	Preparation Master Thesis Professional networking	Master Thesis EPA	
Spezialization elective	Specialization elective		
Societal Challenge Project (or electives) Debating techniques			

APPENDIX 5: PROGRAMME OF THE SITE VISIT

Programme site visit degree programmes 12 and 13 December 2016

Location: Faculty of TPM Jaffalaan 5 2628 BX Delft

Monday 12 December 2016

8.15 Arrival of audit committee

8.15-8.30 Welcome

Mr Prof.dr. T.S. (Theun) Baller	Dean TPM
Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM

8.30-9.00 Preparatory meeting committee

09.00-10.00 Education management team (EMT)

Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM
Mr Dr.ir. I. (Ivo) Bouwmans	Director of Studies TB
Ms Dr.ir. Z. (Zofia) Lukszo	Director of Studies SEPAM
Mr Dr.ir. B. (Bert) Enserink	Director of Studies EPA
Mr Dr. R.M. (Robert) Verburg	Director of Studies MOT
Ms Drs. J.K. (Jenny) Brakels	Manager Education &Student Affairs
Mr M.A. (Mathijs) Bijkerk BSc	Commissioner MSc Curius
Ms C.A. (Elsemiek) Smilde	Commissioner BSc Curius

10.00-10.30 Meeting audit committee (incl. break)

10.30-11.00 Students B Technische bestuurskunde (TB)

Ms M.M.G.C. (Menghua) Prisse	1st year
Mr P.X. (Pepijn) Thijssen	2nd year; Commissioner Bachelor Education FSC TPM 2016-2017
Ms A.C. (Claire) Post	2nd year
Ms M. (Mira) Groot	3rd year
Mr. J.B. (Jelle) van der Lugt	3rd year
Mr A.P. (Toon) Jansen	4th year

11.00-11.30 Students M Systems Engineering, Policy Analysis and Management (SEPAM)

Ms I. (Inés) Martínez Bustamante	1st year; BSc international
Mr J. (Joris) Zwijnenburg	1st year; BSc TB
Ms. L. (Leonie) Vogelsang	1st year; BSc TB
Mr Á.A. (Álvaro) Papic González	2nd year, BSc International
Mr S.F. (Stephan) Kool	3rd year; BSc TB
Ms F.C. (Fransje) Oudshoorn	3rd year; BSc TB

11.30-12.15 Lecturers B TB and M SEPAM

Ms Dr.ir. C. (Els) van Daalen	Associate professor, Systems Dynamics and Systems Modelling
Mr Dr. J.A. (Jan Anne) Annema	Assistant professor, Transport Policy
Ms Dr.ir. P.W. (Petra) Heijnen	Assistant professor, Energy & Industry
Mr Dr.ir. L.J. (Laurens) de Vries	Associate professor, Energy economics and regulations
Dhr. Dr. S (Stephan) Lukosch	Associate professor, Design Methodologies, requirements engineering, collaboration
Dhr. Dr. H. (Haiko) van der Voort	Assistant professor, Organisation science, process management, regulation
Mr Ir. H.W. (Herman) de Wolff	Assistant professor, Land development
Mr Prof.dr.ir. M.F.W.H.A. (Marijn) Janssen	Full professor, ICT

12.15-14.30 Meeting audit committee (incl. lunch)

14.30-15.00 Students M Management of Technology

Ms. A.F. (Lieke) van den Eijnden	1st year, BSc Life Science & Technology
Ms S. (Silvia) Fernandez Gelonch	1st year, BSc Industrial Technologies Engineering
Mr A.D.B. (Abe) Scholte	1st year; BSc Industrial Design Engineering
Ms P.D.L.A. (Pamela) Nunez Araya	2nd year; BSc Electromechanical Engineering
Mr J.A. (Juan) Carvajal Rodriguez	2nd year; BSc international
Mr M.A. (Misha) Grift	2nd year; BSc HBO, Commissioner MOT education FSC TPM 2016-2017

15.00-15.30 Lecturers M Management of Technology

Mr Prof.dr.ir. M.F.W.H.A. (Marijn) Janssen	Full professor, e-government, business processes
Ms Dr. H.K. (Heide) Lukosch	Assistant professor, Participatory systems, augmented reality
Mr Dr. J.R. (Roland) Ortt	Associate professor, Breakthrough technologies, innovation management
Mr Prof.dr. C.P. (Cees) van Beers	Full professor, Frugal innovations, developmental economics, innovation management
Mr Dr. G. (Geerten) van de Kaa	Assistant professor, Business strategy, standardisation

15.30-17.00 Meeting audit committee (incl. break)

17.00- 17.30 Alumni

Ms J.E.L. (Joke) Blom BSc	BSc TB, student MSc Transport, Information and Logistics

Mr T.T. (Tim) Romijn BSc	BSc TB, student MSc Engineering and Policy Analysis
Mr Y. (Yi) Yin MSc	MSc SEPAM, PhD student at ICT, VRE4EIC project
Ms ir. D.M. (Diana) Vonk Noordegraaf	MSc SEPAM, PhD TRAIL, Consultant at TNO
Ms ir. K.K. (Kaveri) Iychettira	MSc EPA, PhD student at SETS Joint Doctorate on Energy Policy at TU Delft, KTH Stockholm and Comillas, Madrid
Mr J. (Jerome) Vincendon MSc	MSc MOT; Technical Consultant at Gen25
Mr A. (Amir) Piltan MSc	MSc MOT; PTech B.V., Owner and Director

19.00-21.30 Diner audit committee

Tuesday 13 December 2016

8.15 Arrival of audit committee

8.30-9.00 Preparatory meeting committee (optional: walk-in hour)

9.00-9.30 Students M Engineering and Policy Analysis

Ms I.M. (Isabelle) van Schilt	1st year; BSc TB, Commissioner EPA education FSC TPM 2016-2017
Ms M.B.C. (Marijne) Kramer	1st year, BSc TB
Mr J.C. (Jasper) Meijering	1st year, BSc TB
Mr G.P.S. (Gurvinder) Arora	1st year, Bachelor of Technology in Mechanical Engineering
Mr J.P. (Juan Pablo) Nieto	2nd year, Telecommunication Engineer

09.30-10.00 Lecturers M Engineering and policy Analysis

Mr Prof.dr. W.M. (Martin) de Jong	Full professor, Urban and infrastructure development in China
Mr Dr. E. (Erik) Pruyt	Associate professor, System Dynamics Modelling, Exploratory Modelling and Analysis
Mr S. (Scott) Cunningham	Associate professor, Operations research, data science, tech policy
Mr Prof.dr.ir. A. (Alexander) Verbraeck	Full professor, Large-scale models, discrete event simulation, data analysis
Mr Dr.ir. L.M. (Leon) Hermans	Assistant professor, Actor models, policy analysis, water governance
Mr Dr. S.T.H. (Servaas) Storm	Assistant professor, Macroeconomics and development economics, CGE modelling

10.00-11.00 Meeting audit committee (incl. break)

11.00-12.00 Members Boards of Studies

Ms Dr.ir. M.P.M. (Tineke) Ruijgh - van der Ploeg	Chair Board of Studies TB
Mr Dr. P.W.G. (Pieter) Bots	Chair Board of Studies SEPAM

Mr Dr. J.A. (Jan Anne) Annema	Chair Board of Studies EPA
Mr Dr. M.P.M. (Maarten) Franssen	Chair Board of Studies MOT
Mr M. (Mike) Band	Student member Board of Studies TB
Mr M.E. (Martijn) Cligge	Student member Board of Studies SEPAM
Ms R. (Rhythima) Shinde	Student member Board of Studies EPA
Mr T. (Tim) Joosten	Student member Board of Studies MOT

11.00-11.30 Tour Faculty

12.00-13.00 Meeting audit committee (incl. lunch)

13.00-14.00 Members Board of Examiners

Mr Prof.dr. R.W. (Rolf) Künneke	Chair Board of Examiners TPM
Mr Prof.dr. W.K. (Willem) Korthals Altes	Member Board of Examiners TPM
Ms Drs. J. (Jolien) Ubacht	Chair Meeting of Graduation coordinators

14.00-14.30 Preparation final meeting management (incl. break)

14.30-15.30 Final meeting management

Mr Prof.dr. T.S. (Theun) Baller	Dean TPM
Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM
Mr Dr.ir. I. (Ivo) Bouwmans	Director of Studies TB
Ms Dr.ir. Z. (Zofia) Lukszo	Director of Studies SEPAM
Mr Dr.ir. B. (Bert) Enserink	Director of Studies EPA
Mr Dr. R.M. (Robert) Verburg	Director of Studies MOT
Ms Drs. J.K. (Jenny) Brakels	Manager Education &Student Affairs

15.30-17.30 Meeting audit committee – first findings

17.30-17.45 Plenary presentation first findings – ENG

17.45 Drinks TB-café

APPENDIX 6: THESES AND DOCUMENTS STUDIED BY THE PANEL

Prior to the site visit, the panel studied the theses of the students with the following student numbers:

1307207	1371827	4411315
4257774	4243579	4312813
4319737	4123220	4256891
4297237	4180046	4180216
4311868	4060687	4323270
4417100		

During the site visit, the panel studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Annual report Board of Examiners 2014-2015;
- Minutes of the Programme Committee;
- Course dossiers, including the tests of a selection of master's courses;