Science and Innovation Management

Faculty of Geosciences,
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This report was finalized on 16 November 2012.

Report on the bachelor's programme Natuurwetenschap en Innovatiemanagement and the master's programme Science and Innovation Management of Utrecht University

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point.

Administrative data regarding the programmes

Bachelor's programme Natuurwetenschap en Innovatiemanagement

Name of the programme:	Natuurwetenschap en Innovatiemanagement
CROHO number:	56982
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Speecializations or tracks:	
Location(s):	Utrecht
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master's programme Science and Innovation Management

Name of the programme:	Science and Innovation Management
CROHO number:	60709
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	
Location(s):	Utrecht
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Science and Innovation Management to Utrecht University took place on June 7 and 8, 2012.

Administrative data regarding the institution

Name of the institution:	Utrecht University
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	Utrecht University has passed the institutional assessment.

Quantitative data regarding the programme

The required quantitative data regarding the programme are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the bachelor's programme Natuurwetenschap en Innovatiemanagement and the master's programme Science and Innovation Management consisted of:

- Prof. Paul Wouters (chair), director of the Centre for Science and Technology Studies (CWTS) and professor of Scientometrics, Leiden University;
- Prof. John Grin, professor of Policy Science, especially System Innovation, University of Amsterdam;
- Prof. Volker Hoffmann, associate professor of Sustainability and Technology, ETH Zurich (Swiss Federal Institute of Technology), Switzerland;
- Prof. Cees Leeuwis, professor of Communication and Innovation Studies, Wageningen University;
- Ms. Aniek Berendsen, BSc, master student of System Engineering, Policy Analysis & Management, Delft University of Technology.

The committee was supported by Daan de Lange, MA, who acted as secretary.

Appendix 1 contains the CVs of the members of the committee.

Working method of the assessment committee

Preparation
QANU received the self-evaluation reports of the bachelor's and master's programme. After having established that the reports fulfilled the criteria of relevance and completeness, the project leader distributed them along with additional information to the members of the assessment committee. The committee members were asked to formulate their comments and questions on this material prior to the site visit. The project leader combined these questions and remarks into a document which was used during the site visit.

In addition, the committee members selected and read a total of 15 theses for each programme (see Appendix 7). They also received QANU's checklist for the assessment of theses to ensure that their assessments were comparable. Since the committee had to evaluate programmes leading to a scientific degree, it paid specific attention to the scientific level of the theses, the requirements, the accuracy of the reviewer's judgment and the assessment procedure.

The project leader drafted a programme for the site visit. This was discussed with the chair of the committee and the coordinator of the programmes. During the site visit, the original programme for the second day was adapted slightly (see Appendix 6). As requested by QANU, the coordinator of the programmes carefully composed representative panels for the interviews. Before the site visit, both staff members and students were informed about the opportunity to speak to the committee confidentially during the 'consultation hour'. No requests were received for an appointment.

Site visit
The site visit took place on June 7 and 8, 2012. It started with a preparatory meeting, in which the committee members were instructed about their task, the structure of the accreditation

system and the NVAO Assessment Framework for Limited Programme Assessments. The committee members discussed their findings based on the self-evaluation report. They also debated their task, the working methods, and the questions and issues to be raised in the interviews. During the site visit, the committee conducted interviews with the programme management, students, staff members, graduates, members of the Education Committee, the Board of Examiners and student advisors. They also inspected further materials made available by the programme, including study material, exams, assignments and assessments.

After the concluding meeting with the management on the second day of the site visit, the committee members extensively discussed their assessment of the programme and prepared a preliminary report. The site visit concluded with a presentation of the preliminary findings by the chairman. It included a general assessment and several specific findings and impressions of the programme, as well as some recommendations.

Report
After the site visit, the secretary produced a draft version of the report on the programme and presented it to the members of the committee. Subsequently, he processed their corrections, remarks and suggestions for improvement to produce the revised report. This was then sent to Utrecht University to check for factual errors, inaccuracies and inconsistencies. Comments and suggestions provided by the university were discussed with the chair of the assessment committee and, where necessary, with the other committee members. Based on the committee's decisions to incorporate or ignore comments and suggestions, the secretary compiled the final version of the programme report.

Decision rules
In accordance with the NVAO Assessment Framework for Limited Programme Assessments (dated November 22, 2011), the committee 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 bachelor's or 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 standards across its entire spectrum.

Excellent
The programme systematically surpasses the current generic quality standards well across its entire spectrum and is regarded as a national/international example.

Summary judgement

This report reflects the assessment committee's findings and considerations on the bachelor's programme Natuurwetenschap en Innovatiemanagement and the master's programme Science and Innovation Management of Utrecht University. The evaluation is based on information provided in the self-evaluation reports, the selected theses, additional documentation provided during the site visit, and interviews conducted with staff, students and graduates of the programme. The committee found positive aspects as well as aspects that could be improved. Taking these aspects into consideration, the committee concluded that the programmes fulfil the requirements set by the NVAO for accreditation.

Standard 1: Intended learning outcomes
Science and Innovation Management is concerned with an interdisciplinary understanding of societal problems and innovation processes. Students need to understand science and technology development as well as the way society influences the direction, success and impact of new knowledge and technology. The bachelor's programme focuses on two fields of application: Energy & Transport, and Life Sciences. The committee is positive about this focus, since the faculty conducts research in these areas. The goals have been concretized into twelve learning outcomes. The committee established that they meet the demands of a university-level bachelor's programme. They have a logical connection with the requirements resulting from the domain-specific reference framework. They are, however, rather generic. They could be elaborated further: integration of different theories and disciplines could be one of the learning outcomes, as well as reflection on the multidisciplinary character of the field of Innovations Studies.

The committee feels that the mission of the master's programme is better articulated than is the case with the bachelor's programme. Graduates should be able to analyse the complex dynamics of emerging technology, to identify strategies for improvement and thereby contribute to solving societal problems. Students are trained to analyse innovation issues that emerge when new technologies are developed, to solve societal problems. The committee established that the intended learning outcomes correspond to internationally accepted descriptions of what an Innovation Studies programme should look like. The requirements derived from the domain-specific reference framework are very well translated into a set of qualifications that cover the Dublin descriptors and produce a profile which is both state of the art scientifically and professionally relevant. Compared with other master's programmes, the focus of SIM is unique and ambitious. The initiatives taken by the programme management to develop a programme with a professional orientation, and to critically review the current programme illustrate the dedicated and self-conscious outlook in the department.

Standard 2: Teaching-learning environment
The bachelor's programme combines knowledge from the natural and social sciences. The curriculum consists of five main course streams: natural sciences courses, social sciences and innovation studies courses, research methodology courses, courses related to an application context, and integration courses. It concludes with a thesis. The committee established that the programme provides students with a multidisciplinary curriculum which has a sufficient scientific orientation and enables them to fulfil the final qualifications. In general, the committee was satisfied with the level of the course material, although it judges the workload of year 1 could be intensified. It established that the final qualifications had been structurally translated into specific learning outcomes for each course. It could also confirm that the design of the curriculum is cohesive. The course tracks build up in level and complexity and have been designed to lead to progressive integration.

In general, the committee is positive about the design, implementation and organisation of the teaching-learning environment. The didactical approach and the amount of support provided are adequate, as are the facilities and the didactical skills and scientific quality of the staff. The committee noticed, however, a difficulty in covering a wide range of disciplines and two fundamentally different epistemological approaches. It therefore recommends focussing even more explicitly on innovation paradigms in all courses. Although it is positive about the coming together of the different course tracks, it thinks the build up may benefit from some changes. The bachelor thesis is not as much of an integrative end point as it could be. According to the committee, this has to do with its scheduling as well as with its limited size (7.5 EC). The programme management could consider having students submit their research proposals earlier, or combine the thesis with the second innovation project. The integrative element of the curriculum could also be improved by scheduling an integration course already in the year 1. The changes may also improve the performance rates and representativeness of year 1.

The master's programme has a workload of 120 EC. In the first year students take seven compulsory courses that make up the general part of the programme. They comprise theoretical, methodological and practical knowledge and skills. The programme teaches a 'canon' of Innovation Studies theories: classic readings on technological change from economic, management and social science perspectives. Students learn to compare, judge and carefully select theories for a particular research question and to combine and improve theories. The second year focuses increasingly on independently analysing and influencing innovation processes in a chosen area. Students write a thesis (45 EC), which may be combined with an internship.

The committee greatly appreciates the design, implementation and organisation of the teaching-learning environment. It concludes that the programme demonstrates a good balance between theoretical, methodological and practical training and research. The programme has made a clear choice for educating multidisciplinary innovation specialists who have a broad theoretical knowledge basis and the analytical and methodological skills to reflect on the various options and approaches they have when confronted with a problem of innovation. Students really learn what is required in order to become a professional researcher. The committee could confirm that the compulsory courses have a good level, which should enable students to achieve the intended learning outcomes. The design of the curriculum is clear and cohesive, the working methods meet the objectives of the programme components, the staff is scientifically and didactically qualified and creates a dedicated intellectual community together with the students.

The committee established that the programme has taken significant measures to improve its quality and feasibility, e.g. stricter admission rules and time management and the flexible way in which the internship can be combined with the master thesis research. The committee recommends considering how internships can be promoted and facilitated even more. The overall picture of the teaching-learning environment suggests it exceeds the quality of the bachelor's. The committee feels the curriculum, staff and facilities constitute a coherent teaching-learning environment which exceeds the generic quality.

Standard 3: Assessment and achieved learning outcomes

The committee concludes that both programmes use a reasonable mix of assessments that match the intended learning outcomes. Various instruments are used to guarantee the quality of the examinations. The committee noted that the assessment procedures have recently been streamlined and urges the programme to apply its assessment policies strictly. The bachelor's theses in particular could indeed benefit from more supervision and strictly applied assessment forms.

The committee concludes that the intended learning outcomes of the bachelor's programme are achieved. There is evidence that graduates successfully continue their studies in different master's programmes and find work within the professional field of Innovation Studies. The assessments and theses also demonstrate that students achieve the final qualifications. However, the level of the theses studied by the committee could be higher. The committee is of the opinion that the programme should think of ways to make the theses more important. Ideally, the thesis should be the integrative endpoint in which students show that they have achieved all the learning outcomes. Most of the ingredients are already there, but the programme may benefit from some changes in its structure and schedule.

The intended learning outcomes of the master's programme are achieved, too. The level of the theses is good and exceeds the generic quality. Both staff and students show contagious enthusiasm about the research projects. Students get sufficient supervision. The committee supports the recommendation made by alumni to upgrade the thesis presentation to a defence ceremony. It also thinks the second reader should be present at this ceremony. The positive conclusions about the achieved learning outcomes are confirmed by the presented evidence that graduates easily find work within the professional field and that they perform to everyone's satisfaction.

Bachelor's programme Natuurwetenschap en Innovatiemanagement

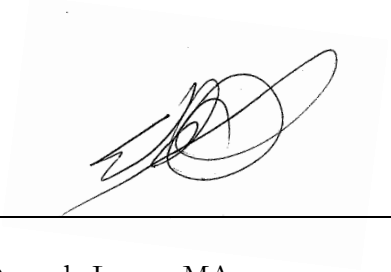
Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Science and Innovation Management

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

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

Date: 16 November 2012



Prof. Paul Wouters

Daan de Lange, MA

Description of the standards from the Assessment Framework for Limited Programme Assessments

Chapter 1: Bachelor's programme

Organizational context
The bachelor's programme Science and Innovation Management (in Dutch: Natuurwetenschap en Innovatiemanagement, NW&I) is offered by the Department of Innovation and Environmental Sciences (IES) of the Faculty of Geosciences. The Board of Studies of the Undergraduate School of Geosciences is responsible for the organization, coordination and quality assurance of the faculties' undergraduate programmes. All directors of education of the Faculty of Geosciences are members of this board, together with a student from one of the BSc programmes.

The IES director of education is responsible for both the bachelor's and master's programmes. The programme management is organised by the Bachelor Management Team, which is in charge of the content-related and day-to-day management of both the NW&I programme and the other two bachelor's programmes: Environmental Studies and Environmental Sciences. The Bachelor Management Team receives recommendations concerning the academic content and teaching methods from the Bachelor Education Committee. This committee consists of a lecturer and a student from each of the three bachelor's programmes. It regularly consults the student body.

Consultations between the teaching staff members, the programme leader and other staff take place during bi-weekly meetings of the Innovation Studies group and at the annual Innovation Studies one-day teaching seminar. In addition, the Bachelor Management Team stays in touch with individual external lecturers. Contact and consultation between the various boards, councils and other bodies involved in the NW&I programme take place on the basis of individual responsibility in an open and informal atmosphere. During the site visit the committee was able to confirm this atmosphere.

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.

1.1 Findings
Science and Innovation Management is concerned with an interdisciplinary understanding of societal problems and innovation processes. The NW&I programme aims at bridging the worlds of technology and society by providing students with a combination of natural sciences courses (mathematics, physics, chemistry, biology), social sciences courses, courses related to an application context, research methodology courses and integrative courses. NW&I students need to understand science and technology development as well as the way society influences the direction, success and impact of new knowledge and technology. They are trained to analyse innovation processes and formulate appropriate measures and actions to increase the efficiency of innovation processes and safeguard the intended outcomes of

innovation. The self-evaluation report stresses the demand for academically trained professionals who possess these skills. Innovation is at the heart of economic progress and is increasingly seen as crucial for effectively meeting the great challenges that the world's economies are facing. This is further elaborated in the domain-specific reference framework, which also outlines the international development of the field of Innovation Studies and the implications for academic IS programmes that want to be state of the art (see Appendix 2).

According to the programme management, many stakeholders tend to have a relatively limited view: economists, engineers, environmental scientists, etc. usually do not cover all areas which are relevant to understand the complex phenomenon of innovation, such as economics, science, and societal and political issues. The objective of the programme is to educate students to have a wider overview. In one of the panel meetings, this was illustrated with the case of solar energy: a promising perspective, but also touching on many different problems. In order to successfully develop and implement new technologies, we need to have a broad understanding of both scientific and societal circumstances. Students have to be able to analyse the dynamics of technological change and innovation as well as the factors that influence the speed, direction and success of technological innovations. Some of these factors are related to technological characteristics while other factors are related to a wide range of societal processes. The programme therefore has a multidisciplinary character. Students need to acquire skills to approach issues using different theories and methodologies.

The self-evaluation report formulates the mission as follows:

- Students are able to contribute to innovation processes at the **interface** of natural science and technology on the one hand, and organizations and society as a whole on the other.
- Students are encouraged to gain **insight** into the course of innovation processes in business and industry and administrative processes in public authorities and other societal organizations, in order to develop strategies to influence these processes.

These objectives can be called ambitious, since they resemble those of the master's programme. During the site visit the programme management confirmed that the aims appear to be challenging for bachelor students and explained that the main goal is for students to learn to do proper research under supervision. Whereas the master's programme aims at a more complex understanding and the ability to conduct independent scientific research, the bachelor's programme aims to acquaint students with research and academic skills and impart fundamental knowledge. NW&I graduates are supposed to be able to apply selected innovation theories under supervision. The programme focuses on two fields of application: Energy & Transport (ET) and Life Sciences (LS). This fits with the research focus of the Innovation Studies section: sustainable development, climate change, energy, and health and ageing.

The goals have been concretized into twelve learning outcomes, listed in the Teaching and Examination Regulations and the self-evaluation report. The NW&I programme has arranged its intended learning outcomes along the lines of the Dublin descriptors (Appendix 3). The committee established that the learning outcomes are related to the multidisciplinary character the NW&I programme is aiming at. It also established that they reflect both the professional and scientific orientation of the programme, although during the site visit the programme management stated that the focus is mainly on the latter: the bachelor's programme is considered to be preparation for the master's level.
One of the topics discussed during the site visit was the integration of different theories and perspectives, which is implied by the mission statement of the bachelor's programme and

implemented in some programme components, but not explicitly mentioned as a learning outcome. In the panel meetings the committee raised the question of what kind of integration the programme is aiming at. The programme management stated that it uses a very broad interpretation and that the kind of integration depends on what the student wants to do after graduation. This can be research, management or design. The committee noticed a tension between the breadth and the depth that is implied by the learning outcomes: breadth seems to be promoted at the expense of depth. The self-evaluation report also mentions this. Alumni stated, however, that they highly valued the broad character of the bachelor's programme, as it had made them experts in multidisciplinary approaches to innovation problems. They considered the need to combine theories and methodologies to be well embedded in the programme.

1.2 Considerations

The committee established that the intended learning outcomes meet the demands of a university-level bachelor's programme. They are academic in nature and cover the five Dublin descriptors. Their level corresponds to general, internationally accepted descriptions. The committee confirmed that the domain-specific reference framework is a clearly recognisable description of the IS field and a suitable starting point for the design of a bachelor's programme in Science and Innovation Management. The final qualifications are geared towards this domain-specific framework.

Although the intended learning outcomes have a logical connection with the requirements resulting from the domain-specific reference framework, the committee found them rather generic. They could be elaborated further: integration of different theories and disciplines could be one of the learning outcomes, as well as reflection on the multidisciplinary character of the field of Innovations Studies. The committee feels that the mission of the bachelor's programme is less well articulated than is the case with the master's programme (see Chapter 2). During the site visit it encountered conflicting statements about the orientation of the programme. There is a lot of emphasis on research, while the professional orientation is less clear.

However, the committee is positive about the way the profile of the programme focuses on two fields of application in which the faculty conducts research. Applying the interdisciplinary learning outcomes within the areas of Energy & Transport and Life Sciences not only provides students with the necessary thematic focus, it also addresses relevant contemporary innovation issues, thus contributing to the chances of graduates (both bachelor and master) on the labour market.

Overall, the committee has established that the level of the intended learning outcomes of the programme matches the bachelor's degree level and the expected generic quality. It therefore assesses the Standard 1 as 'satisfactory'.

1.3 Conclusion

Bachelor's programme Natuurwetenschap en Innovatiemanagement: the committee assesses Standard 1 as **satisfactory**.

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.

2.1 Findings

This standard describes the findings, considerations and conclusions of the committee regarding the teaching-learning environment. It begins with the contents and structure of the curriculum and the cohesion of the programme, followed by the scientific and professional orientation. After sections on didactics, feasibility and student intake and performance, the quality and quantity of the staff are assessed. It concludes with a section about the internationalisation.

Curriculum

The NW&I programme combines knowledge from the natural and social sciences. The curriculum consists of five main course streams:

- **natural sciences** courses;
- **social sciences** and innovation studies courses;
- **research methodology** courses;
- courses related to an **application context**: Energy & Transport or Life Sciences;
- **integration** courses and the bachelor's thesis.

The self-evaluation report states that because of the fundamental differences between the social and natural sciences, it is difficult to combine them successfully. Thus, the programme only teaches natural sciences courses that are directly linked to the application context. The social sciences are dealt with in direct relation to Innovation Studies. This implies a multidisciplinary approach that builds on sociology, heterodox economics, and technology and society studies. The committee established that with this programme design, focusing on an innovation system framework and a limited number of application areas, the programme has tried consciously to make improvements to the curriculum that were suggested by the assessment panel in 2005.

The curriculum consists of compulsory courses (75 EC), electives (45 EC), and major-specific electives (60 EC). After reading the self-evaluation report, the order of the components was not immediately clear to the committee members. An overview of the courses is shown in Appendix 4. The compulsory programme components include introduction courses on technology and innovation, mathematics, and micro-economics, as well as the research methodology courses, innovation projects and the bachelor thesis. The major-specific electives are either within the domain of Life Science (e.g. human biology, organic chemistry) or of Energy and Transport (e.g. thermodynamics, energy analysis). Students choose one domain and have a considerable amount of choice within the programme. Some of the electives the programme strongly recommends, like 'The microscope and the elephant' (science philosophy and ethics). The committee wondered why this course is not compulsory. Especially in a multidisciplinary programme like NW&I, one would expect explicit reflection on the different epistemicological approaches encountered – explicitly and implicitly – in the curriculum. The self-evaluation report states that the course

is scheduled in such a way that many students opt to include it. During the site visit it was confirmed that most of the students actually do take the course.

The cohesion of the programme is supported by several elements. First of all, students follow the same compulsory core programme, which shows a steady increase in level and complexity. Second, students focus on a specific domain through their choice of electives, which increase in level and complexity, too. The third element that makes the programme cohesive involves the integration parts. In the final period of both year 2 and year 3, students carry out a project about a real-life case in which they are supposed to integrate previously gained knowledge and make recommendations about the application of a certain technology. During their panel meeting, students stated that they found the design of the programme adequate and logical, and that they liked the combination of natural and social sciences. They found the integration part the crucial element of the curriculum, and evidently the most difficult part, but also suggested some improvements (see paragraph 2.2 Considerations).

In order to be able to judge the content and level of the different programme components, the committee studied the available information, like course descriptions in the study guides, course material, assignments, and blackboard sites. It established that the level of the **natural sciences** courses is adequate. The courses provide students with a solid knowledge base that sufficiently matches the domain-specific requirements. The fact that NW&I students follow minors at the Faculty of Science also indicates that the level of the natural sciences courses is sufficiently high. The programme starts with the basic concepts, including mathematics at the bachelor-1 level. These courses teach knowledge related to later courses in the two application domains.

After the first year, the natural sciences topics are integrated in the **application domain** courses, and understanding of the natural sciences is geared towards the important technologies employed in the application domains. According to the self-evaluation report, the level of these natural sciences courses is similar to the level of the courses in the Faculty of Science. During the site visit, this claim was repeated by the students and verified by the committee. The students commented on the fact that they have to make the decision for one of the domains (LS or ET) rather early. Since the first ET course is already scheduled in the second period of year 1 (unlike the first LS course), many students choose ET for safety's sake, after which they often do not switch.

Students gain fundamental knowledge and understanding of innovation processes in three compulsory **innovation** courses. The 'Introduction to technology and innovation' course gives a general introduction to innovation processes at the bachelor-1 level. The compulsory 'Microeconomics of innovation' course (B-1) teaches the basics of supply and demand, firms and markets, and consumer behaviour. The 'Innovation systems' course in the first period of year 2 (B-2 level) teaches a meso/macro-systems' perspective on innovation. After the introductory courses, students deepen their knowledge on innovation theory in at least three courses chosen from among six options. There is a constant tension between breadth and depth in the theories and disciplines that can be studied. In the self-evaluation report 'Innovation systems' is presented as a unifying concept to tackle this problem. In practice, however, it appears to be difficult to use this framework consistently. The committee found that most of the theses they studied did not use the term. A more explicit relation between the courses and innovation paradigms seems desirable.

The programme's objective of an interdisciplinary understanding of technological development and societal problems is translated into the **integration** components of the curriculum. The first 'Innovation Project' (15 EC) is scheduled at the end of year 2. Students make recommendations about the application of a certain technology for solving a real-life

problem related to one of the domains. One of the students explained how his group had researched the investment options in tuberculosis medicines, for which both technological developments and the position of the pharmaceutical industry needed to be investigated. Like the first Innovation Project, the second one (7.5 EC) is also carried out in small groups. It has a more independent character: it requires more planning by the students themselves and has a description which is more open to interpretation. Students enjoy these courses, because many things come together. The committee established that real integration is difficult to accomplish, however. Some students suggested scheduling an integration part earlier in the curriculum is indicated. The education committee was positive about this suggestion. Students are clearly more satisfied with the second and third year of the curriculum than with the first.

Theoretically, the integrative conclusion of the programme is the bachelor's thesis. The board of examiners stated that integration also takes place more implicitly in the course of the curriculum, but admitted it is too ambitious an objective to make the thesis an exercise in integration. The committee concluded that this is partly related to the fact that the thesis amounts to 7.5 EC and is scheduled as a course (in 10 weeks) parallel to another course students need to finish ('Innovation Project 2').

Students learn how to gather and interpret data in two **research methodology** courses. The first one (B-2 level) introduces the basic concepts of theory and research. The second one (also at B-2 level) focuses on gaining knowledge of and applying statistical methods related to the testing and evaluation phases of research. This latter course focusses on quantitative aspects of doing research. Judging from the relatively weak methodology sections in the theses, the committee was worried about the methodology course. Some theses paid little attention to research design. After studying the course materials, however, the committee concluded that these programme components are satisfactory. It seems that all of the necessary ingredients are there to enable students to realise the intended learning outcomes. The programme may benefit, however, from some adjustments in its structure and schedule (see paragraph 2.2 Considerations).

Scientific and professional orientation
The NW&I curriculum focuses on the scientific orientation of the programme. It emphasises 'doing research'. The content of the courses reflects the intended learning outcomes concerning designing and conducting a pre-structured academic research project. This implies going through all the steps of the empirical research cycle, including reflection on relevant social, scientific and ethical issues. A general understanding of the roles of science, knowledge and universities is taught in the introductory course 'Introduction to technology and innovation' and in the first research methods course. There is also the optional science philosophy course, which many students take. The committee verified that within the programme students get to examine real research and results. They study academic articles in which they look critically at the different sections of the research process. The self-evaluation report mentions the early stage at which students learn to read scientific articles explicitly as one of the strengths of the programme.

The self-evaluation report also stresses the importance of various other academic skills and lists the way they are anchored within the programme. Students are trained in giving peer feedback in several courses. Understanding the societal and scientific relevance of their work is part of the training in writing research papers. They learn to gather and interpret data with research methods which they apply in the innovation project courses and bachelor's thesis. They learn to communicate and inform specialist and non-specialist audiences throughout the programme. Each student is provided with a reader on academic and communication skills at the beginning of the programme. The reader instructs them on the principles of communication, and it is systematically used as a reference book throughout the programme.

Writing skills include writing a research paper and texts for general, non-specialist audiences. Students practise oral presentations, poster presentations, debating and acting as a discussant.

A schematic overview of the relation between the five main course streams and the intended learning outcomes shows how the Dublin descriptors of acquiring and applying knowledge, gathering and interpreting data, and communicating academically are implemented within the curriculum (see Appendix 3). The committee studied this matrix and found it satisfactorily convincing. Knowledge is acquired in the natural sciences courses, the social sciences courses and in the courses in the application domain. The acquired knowledge is applied in the innovation courses, the application domain courses, the integrative courses and the bachelor's thesis. The committee confirmed that the programme relates well to the intended learning outcomes in this respect.

Apart from the scientific orientation, the programme also has a professional orientation. Several components relate the programme to the professional context of science and innovation management. Firstly, the innovation projects use real cases to introduce students to the kind of problem analysis and recommendations graduates are likely to encounter in their careers. Secondly, there are guest lectures in which students get an impression of the possibilities for Science and Innovation Management in the labour market. Thirdly, the study association NWSV Helix organizes study trips, career months, alumni events and visits to relevant firms and organizations. During the site visit, the committee asked how the objective of teaching students to be 'the glue' in innovation processes is to be interpreted, since no organizing or management skills are trained in the programme. The management emphasised that the NW&I programme focuses on its scientific orientation instead of these professional skills. It expects most students to continue their studies at a master's level. Furthermore, it considers academic training to be indirectly a professional preparation for students. Most alumni do not become managers, but rather analysts and policy advisors. Only when larger numbers of students do not continue studying in a master's programme will the management consider fine-tuning or repositioning its bachelor's programme in order to anticipate the labour market opportunities more directly. Alumni indicate that they are not very satisfied with the preparation for the labour market that is offered by the bachelor's programme.

Didactics

The self-evaluation report states that the mission of the NW&I programme is to embed teaching in an 'intellectual community' of students and staff. During each course, knowledge acquisition and skills are taught and supported by face-to-face contact with the lecturers. Consistent with the university's vision on didactics, the programme strives to enable students to reach their maximum potential by offering a personal, activating and small-group learning environment with good supervision and support. In return, students are asked to engage with their studies, are expected to meet the work requirements and are required to participate in all learning activities. During the site visit, students and staff confirmed that the learning environment creates this atmosphere of engagement. The committee looked at the outline of the curriculum and working methods described in the study guide and established that the programme adequately implements the concept of an 'activating learning environment', for instance by making attendance obligatory in specific (parts of) courses.

The average intake of 80 students means the cohorts are relatively small. Students stated that they quickly feel 'at home'. On the other hand, course evaluations show that students do not feel stimulated to do their best. This suggests that the workload for students could be increased. On average, the amount of face-to-face contact in NW&I starts at 31 percent in year 1 and decreases to 19 percent in year 3. The educational concept is supported by regular assessments and a restriction on the number of resits. The course evaluations indicate that students appreciate the level of the NW&I courses and the didactic quality of the teachers.

Feasibility
NW&I students are supposed to complete the 180 EC workload within a three-year period. Not all students succeed in doing so (see *Intake and performance*), but this should not necessarily be taken as an indication that the programme is not feasible. During the site visit, the programme management and education committee explained how the structure of the programme contributes to its feasibility. Its components are scheduled in such a way that the five course streams have a logical build up and gradual integration. Courses offered in the same period are scheduled in different time slots to leave the students as much choice as possible.

Apart from the structure of the programme, other factors that contribute to its feasibility were mentioned during the site visit. The study association plays an important role in the NW&I programme and positively influences the atmosphere for both students and staff. The fact that groups are relatively small enables the programme to create the activating learning environment described in the didactical concept. In addition, the self-evaluation report describes programme-specific facilities and services contributing to a feasible teaching-learning environment:

- **Matching activities** (information days, lectures, etc. prior to the enrolment of new students) to make sure students entering the programme have a better understanding of the programme and know what to expect. In addition, there is a 'Binding Study Recommendation' (BSA). Students who fail to get 45 EC in the first year (unless there are exceptional circumstances) receive a negative BSA.
- Sufficient computer **facilities** and places to study. The National Students Survey (NSE, 2011) shows that NW&I students are satisfied with these facilities, the digital education environment, and the suitability and availability of workplaces.
- Efficient **communication channels**, like websites, Blackboard and digital student accounts to track study progress and to enrol for courses. In preparation for the assessment and during the site visit, the committee verified that the website and Blackboard site were informative.
- **Study coaching** and student tracking. The individual study coaching is carried out by the study advisor, who identifies general problems with the organization of the programme at an early stage, which are then raised with the programme management. The tracking system enables the study advisor to address specific groups, for example all first-year bachelor students. During the first week of the programme in September, he meets the new students during a plenary meeting and explains the set-up and objective of the student advisory service in the NW&I programme. In 2010-2011 all bachelor students were offered a short course in academic learning and planning. The aim was to support them in developing a successful study strategy and to ease the transition from studying at secondary school to studying at university. A reader and assignments were developed within the Sprint II project, 'Academic study skills first year NW&I and MNW'. First-year students are very satisfied with study coaching but less satisfied with the frequency of the tutor meetings.
- Two complementary **tutoring systems.** All first-year bachelor students have a tutor who invites them five times a year on a plenary basis to discuss issues such as the structure of the programme, study planning, registering for courses, choosing electives, studying abroad, etc. Students are also invited to an individual meeting in September or October. Secondly, after consultation with the bachelor management, the student association set up a student tutoring system. The aim is not only to give first-year bachelor students information about the programme but also to advise them on the basis of the experience of older students. In this tutoring system, a senior student will form a tutoring group with 10 students at the start of the academic year.

These meetings will be about ambitions and possibilities for long-term planning. After a first year of running this tutoring system, NWSV Helix evaluated it and decided to continue the system with just a few changes.

In the panel meeting with the education committee, the measures taken to improve the feasibility of the programme were discussed. One of them was the bachelor thesis, which is scheduled as a course (in which research proposals are discussed, etc.) to prevent delay. Recently, students have been given the opportunity to redo the thesis in the second period. According to the students, this is an improvement. They did not, however, think that delay had much to do with the structure of the programme. They stated that many students just take time out to do other things. They did not consider the workload too heavy, especially in year 1, although the individual experiences differed. The self-evaluation report states that students do not observe the nominal study load of 20 hours per course per week: for only three out of nine obligatory major courses and one out of 16 optional major courses did students indicate that they spent more than15 hours per week on the course. According to the education committee, these figures could be biased since they are based on evaluation forms filled in right after exams, which make them not wholly representative.

One structural characteristic of the programme that does seem to have a negative impact on its feasibility and possible study delay is that it is very complicated for students to plan a minor within one semester, since all semesters are packed with compulsory courses and major dependent electives. This can also hinder studying abroad. According to the students, it is their own responsibility to fit in a minor. The education committee explained that they had discussed it, but that it is hard to improve this situation since NW&I shares courses with other programmes.

Intake and performance

The admission requirements of the NW&I programme are laid down in the Teaching and Examination Regulations. The self-evaluation report states that the programme aims to educate students who have successfully completed pre-university-level secondary education in the Netherlands (vwo) to an academic bachelor level. To guarantee the right entrance level to the natural sciences courses, only secondary school graduates with either a 'nature and health' profile or a 'nature and technology' profile are admitted. During the last panel meeting, the management stated that it is thinking about dropping physics as an entry requirement for the Life Science part of the programme. This will allow the programme to attract more students, especially female ones. On average, only 20 percent of the NW&I students are female.

The quantitative data of the programme are shown in Appendix 5. Around 70 percent of the incoming students proceed to the next year. Of the other 30 percent, nearly two-thirds leave the programme after receiving a negative BSA. This drop-out rate in the first year is relatively high. It may be partly explained by the fact that NW&I also attracts students for whom the programme is a second choice (after failing to get into Medicine, for instance). The programme stimulates students who do not fit in to leave early on the basis of the BSA. All bachelor students at Utrecht University receive this BSA. Students cannot continue their studies if they have not gained at least 37.5 EC (63 percent) of the courses in their first year. As of September 2011, this minimum limit was increased to 45 EC (75 percent) in the Faculty of Geosciences. Partly because of this measure, the drop-out rate after the first year is low. To be able to use the didactic methods, staff members the committee met during the site visit, prefer a maximum of 80 students per year.

In the table below, the number of graduates is shown as a percentage of the total intake in a certain year group (cohort). The 2005-2006 and 2006-2007 cohorts show a nearly 100 percent graduation after 6 years of study time, relative to the number of students remaining after the

first year. Of the students that continue on in the second year, 75% graduate within four years, which is comparable to the average figure for Utrecht University. During the site visit, students mentioned another possible reason for the drop-out rate: NW&I students generally have very broad interests. This means that relatively many of them keep looking at other study possibilities.

Cohort	Transfer	Total # graduates	After 1 year	After 2 years	After 3 years	After 4 years	After 5 years	After 6 years
2005-06	75	74	9%	11%	40%	73%	90%	98%
2006-07	93	93	12%	12%	53%	87%	100%	
2007-08	62	39	0%	0%	11%	63%		
2008-09	53	12	0%	0%	23%			
2009-10	71	0	0%	0%				
2010-11	66	0	0%					

Efficacy of the programme (graduates) pertaining to the last six cohorts

Staff

The self-evaluation report states that high-quality teaching staff are essential for realizing the intended learning outcomes. The NW&I staff appointment policy focuses on both research skills and teaching skills. Staff members have a combined research and teaching post, and lecturers are required to have a relevant PhD or must finalize their PhD within a certain time period. Teaching staff are thus involved in the development of the field of Science and Innovation Management. Professionalization of the teaching staff is part of the university's policy. This involves the Basic Teaching Qualification (BKO) trajectory – almost all lecturers in the programme have at least that qualification. There is a teacher's manual for new lecturers, and some senior staff members have followed an intensive course series on educational leadership. Students evaluate the teaching quality of the staff positively.

During the site visit the committee became convinced that the staff are very approachable and dedicated. Students thought them motivated to bring in their own research examples, although they had the impression that a greater part of the staff's enthusiasm is geared towards the master's programme. The committee had this impression too. The committee was happy to establish that all associate and full professors are involved in the bachelor's programme. The 'Introduction to technology and innovation' course, for example, is taught by the professor of Innovation Studies. The self-evaluation report claims that students appreciate being taught by a professor, and it improves their motivation and enthusiasm.

Although the programme management considers the teaching staff sufficient to ensure the quality of the curriculum, resignations and illness could change this situation rapidly. The multidisciplinary character of the programme makes it more difficult for lecturers to switch courses. The ET domain has a big capacity, but the LS domain seems more vulnerable because of the low number of teachers involved. The management explained that it considers its domains as just 'topics'. The core business of NW&I is to train innovation specialists. Some courses are 'bought in' from other departments. The committee looked at the information about the staff provided by the self-evaluation report and established that they possess the multidisciplinary character the programme requires. Innovation Studies has developed into a mature research group. Since the previous assessment key professors have been appointed to improve the expertise and embedding of the application fields and regarding micro-levels of innovation and the harmonization of the science components in the programme.

The NW&I programme is taught by 18 IS staff members, five staff members from other

groups of the IES department, and five external lecturers who teach natural sciences courses (mainly). The staff-student ratio is 1:46, which compares positively with the ratio in the previous assessment (1:63). During the site visit, the committee got the impression that some staff members seemed to be overburdened. This especially applied to staff supervising bachelor theses and integration projects. The programme management is aware of this situation, mainly in period 4, and stated that the burden is spread by allowing delayed students to write their theses in the second period. Furthermore, students choose their thesis topics from ones the supervisors feel comfortable with.

Internationalization
The NW&I programme aims at connecting its education to international scientific research (standards). The programme is designed to meet both Dutch and international requirements. The committee has verified that international literature (state of the art) is used in the courses. None of the compulsory courses is taught in English, but for the bachelor thesis the ability to communicate in English is assessed: students have to write an English thesis summary, give an English poster presentation and a written English co-referate. There are some courses which are taught in English, but the staff agreed that this may be intensified. To make the programme more international, one should start at the bachelor's level, they stated.

Students who want to go abroad, can turn to the International Office. In most cases this is an initiative of the individual student. There are exchange programmes, but the programme management admitted that NW&I has to do more to stimulate students to conduct part of their programme in a foreign country. One of things that need to be improved is the website informing students about the various possibilities. The interviewed students mentioned the fact that studying abroad almost automatically implies a delay, since there is no semester without a compulsory course. On the other hand, they spoke enthusiastically about the study association, which organizes an annual international study trip.

2.2 Considerations
On the basis of the information given in the self-evaluation report, study guide, the course material studied and the meetings held during the site visit, the committee concludes that the NW&I programme provides students with a curriculum which has a sufficient scientific orientation and enables them to fulfil the final qualifications related to the acquisition and application of knowledge and academic skills. A bachelor's programme in Innovation Science requires a curriculum in which students learn to understand science and technology development as well as societal processes. NW&I has succeeded in providing a multidisciplinary programme in which students do so, combining natural sciences with social sciences. In general, the committee was satisfied with the level of the course material, although partly judging from the student evaluations, it judges that the workload of year 1 could be intensified. It established that the final qualifications had been structurally translated into specific learning outcomes for each course. It could also confirm that the design of the curriculum is cohesive. The course tracks build up in level and complexity and have been designed to lead to progressive integration.

As was stated in the domain-specific reference framework, the wide scope of Innovation Studies necessitates that academic programmes make choices. The NW&I programme highlights innovation as a complex and dynamic phenomenon, focusing on the areas of Energy & Transport and Life Science. Natural sciences courses are taught that are directly linked to one of the two application domains. The committee thinks the programme management has made it sufficiently clear why this choice was made and values the focus on the academically oriented training of 'innovation specialists'. The social sciences are dealt with in direct relation to innovation studies, implying a multidisciplinary approach. The committee found that an inherent problem of this multi-/interdisciplinary approach at the bachelor's

level is that breadth comes at the expense of depth. Expanding the curriculum with a course on macro-economics seems desirable, but there is only limited room. As the management pointed out, one of the most important objectives of the programme is to teach students to 'carry out proper research'. The committee agrees with this statement, but felt that the difficulty remains in covering a wide range of disciplines and two fundamentally different epistemics. It would recommend focussing even more explicitly on innovation paradigms in all courses.

In general, the committee is positive about the design, implementation and organisation of the teaching-learning environment. The didactical approach of the programme and the working methods of the courses match the objectives and intended learning outcomes. Evaluations indicate that the students are satisfied with the amount of support provided, the didactical skills of the staff, and the facilities offered by the faculty and university. Academic skills are trained well, research is embedded in the programme, and the staff-student ratio has improved sufficiently to ensure enough support and face-to-face contact. The committee recognises the staff's scientific quality and teaching experience. It noticed that recent scientific developments are brought into the courses and that all associate and full professors are involved in the bachelor's programme. The atmosphere of NW&I, as well as of SIM, can be called ambitious and dedicated. The teaching staff and programme management know what they are doing.

Although the NW&I management has a clear vision about the structure of the programme and the coming together of the different course tracks, the committee thinks the build up may benefit from some changes. The bachelor thesis is not as much of an integrative end point as it could be. According to the committee, this has to do with the scheduling in the last period of year 3, as well as with its limited size (7.5 EC). The programme management could consider having students submit their research proposals earlier, or combine the thesis with the second innovation project. Another possibility is to move the second innovation project to spread the workload. The integrative element of the NW&I curriculum could also be improved by scheduling an integration course already in the first year. This may be difficult, but could lead to a better balanced structure of the programme and a more representative year 1. Students would like to know earlier in the programme how the courses are related. Another option could be to use the same cases in different courses.

Apart from improving the amount of integration within the programme, reconsidering the scheduling of some programme components may also have a positive effect on the performance rates. The committee established that the study delay of NW&I students is relatively high. It recommends that the programme management investigate how this fact is related to the structure of the programme. It could also improve the opportunities for bachelor's students to choose minors and study abroad. The education committee should take a proactive role in this process.

In spite of these points of concern, the overall picture of the teaching-learning environment is very positive. The programme has the right academic level, is feasible and enables the students to achieve the final qualifications. The committee found that the programme is able to take action to improve itself, and it is confident that the above-mentioned points will be taken up.

2.3 Conclusion

Bachelor's programme Natuurwetenschap en Innovatiemanagement: the committee assesses Standard 2 as **satisfactory**.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and 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. The tests and assessments are valid, reliable and transparent to the students.

3.1 Findings

The assessment modes for all course components are described in the course descriptions in the study guides. The committee studied these descriptions and found that a mix of examinations is used, such as written exams, research papers, posters, written assignments and oral presentations. During the site visit, the committee looked at some of the written assignments, including ones from the methodology courses, and established that the level was appropriate. Students were asked whether they thought the assessments were representative. They stated that the exams mostly matched their expectations. They were also satisfied with the amount of feedback on their work and the balance between individual and group assignments. This confirmed the conclusions drawn from the course evaluations.

The NW&I programme follows the university's educational model regarding the organization of examinations. Early feedback during the course is one of its important features, as well as limited opportunities for resits. Students can 'fix' an unsatisfactory mark within five weeks, otherwise they have to redo the course the next year. The idea is to stimulate students to 'do it now'.

The self-evaluation report claims that the faculty has been very active in implementing an adequate system of assessment. Since 2012 there has been a faculty-wide assessment policy, which requires each course coordinator to submit an examination matrix describing how the different forms of examination contribute to each of the intended learning outcomes. In addition to the examination matrix, the teacher is required to submit the actual examinations and grading models. The course coordinator has the primary responsibility for the quality of the examinations. The self-evaluation report states that this quality is ensured by the organization of the examinations within the programme and by the assessment of the examinations by the Board of Examiners. The committee found, however, that the Board still has to develop routine in this practice. Assessment quality is also assured by the policy that all exams are reviewed by a colleague beforehand. Furthermore, the development of assessment skills is part of the professionalization track for the teaching staff.

Theses and achieved learning outcomes

The bachelor's thesis is the final product of the programme, in which students show their ability to work their way through the full research cycle. All students individually write a research proposal, which has to be approved by the supervisor. Then the research is performed, after which students write a research or review paper about a particular innovation problem. The final paper has to be presented in English.

The assessment is performed by the supervisor and an independent second reader (as of 2011-2012), both NW&I staff members. The self-evaluation report states that the quality of the theses can be judged by the extent to which students are capable of achieving the final qualifications of the NW&I programme and the objectives of the course:

- writing a research paper;

- presenting the research performed;
- writing a review;
- communicating in English (summary, poster presentation, review).

The committee assessed the achieved learning outcomes by inspecting a selection of the theses from the two most recent cohorts of the programme. This selection was done by the committee at random, while considering a range of grades. The committee found that the theses did indeed focus on specific innovation problems. Some theses could be considered excellent (and were graded as such), but most of them were less impressive. What struck the committee was that the methodology sections were relatively weak, and little attention was paid to research design: the methods were explained but often not motivated or discussed in comparison with alternatives so the theoretical foundations were partly implicit. The repertoire of research designs seemed limited, while 'analysing complex and ill-defined innovation questions' can take place in a wide variety of ways. The research was not very deep, which can be explained by the fact that a thesis only amounts to 7.5 EC.

During the site visit, the place of the thesis in the bachelor's curriculum was discussed with the staff and management of the programme. The kind of research and integration one would expect of a thesis, as the culmination of the learning outcomes, seems difficult to realise within such a short period of time, squeezed between other compulsory programme components (see Standard 2). The staff agreed that the level of the thesis could be improved and its position reconsidered. Making it 15 EC is an option, as well as scheduling it in another period than the innovation project. The staff argued that this would not be easy to accomplish since it could imply changes in guidelines for majors, minors, and electives which are part of the university's model. According to the management, doubling the size of the thesis would not double its quality. Another way to improve the level of the thesis is to use the assessment forms more strictly. The committee members found that not all theses had such a form. The staff indicated that a rubric is being developed, and a second-reader system has been introduced.

In the self-evaluation report, several other observations are listed to support the claim that the intended learning outcomes are achieved. It states that graduates have developed those learning skills that are necessary to undertake a higher education programme at the graduate level. A large proportion of the graduates does continue in a master's degree programme, and successfully so. Many of them take the 'Science and Innovation Management' (SIM) programme, but some shift to programmes like 'Sustainable Development', 'Energy Science' or 'Drug Innovation'. Recent labour market research, conducted for bachelor and master SIM alumni, indicated that the main job tasks of NW&I graduates are analysis and assessment of technological solutions and advising/helping with implementation.

3.2 Considerations

The committee concludes that the programme uses a reasonable mix of assessments that demonstrate a good balance between individual assignments and group work and match the intended learning outcomes of the courses. The programme uses different instruments to guarantee the quality of the examinations. The committee noted that assessment procedures have recently been streamlined and urges the programme to put all of its plans into practice. The theses in particular could indeed benefit from more supervision and strictly applied assessment forms.

The committee concludes that the intended learning outcomes are achieved. There is evidence that graduates successfully continue their studies in different master's programmes and find work within the professional field of Innovation Studies. The assessments and theses

also demonstrate that students achieve the final qualifications. However, the level of the theses studied by the committee could be higher. The committee is of the opinion that the programme should think of ways to make the theses more important. Ideally, the thesis should be the integrative endpoint in which students show that they have achieved all the learning outcomes. As described under Standard 2, most of the ingredients are already there, but the programme may benefit from some changes in its structure and schedule.

3.3 Conclusion

Bachelor's programme Natuurwetenschap en Innovatiemanagement: the committee assesses Standard 3 as **satisfactory**.

General conclusion

The committee concludes that the intended learning outcomes of the bachelor's programme have been implemented well in terms of content, level and orientation. They fully meet the international requirements. It also concludes that the content and structure of the curriculum, staff and facilities constitute a coherent teaching-learning environment for the students. The programme should consider rearranging some of the curriculum components, to achieve a higher level of integration, prevent delay and facilitate studying abroad. The programme has an adequate assessment system and demonstrates sufficiently that the intended learning outcomes are achieved, although the level of the theses could be improved.

Conclusion

The committee assesses the *bachelor's programme Natuurwetenschap en Innovatiemanagement* as **satisfactory**.

Chapter 2: Master's programme

Like the bachelor's programme, the master's programme Science and Innovation Management (SIM) is offered by the Department of Innovation and Environmental Sciences of the Faculty of Geosciences. The responsibility for the master's and PhD programmes lies with the Board of Studies of the Graduate School of Geosciences. All directors of education and directors of research of the faculty are members of this board, together with a PhD student and a student from one of the master's programmes. The director of education of the IES Department is responsible for the management of the SIM programme and has organized the programme management through the Master Management Team. Most teaching staff are employed in Innovation Studies (IS), a section within the IES Department.

The Director of Education receives recommendations from the Master Education Committee, which consists of a lecturer and a student from each master's programme. The Master Management Team and the Master Education Committee each hold meetings five times a year, more often if and when the need arises. The SIM student member of the Master Education Committee regularly consults the student body. Discussions between the teaching staff members, the programme leader and other IS staff take place during the weekly meetings of the IS group and at the annual IS Education Day.

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.

1.1. Findings

The master's programme in Science and Innovation Management is concerned with the same area of study as the bachelor's: an interdisciplinary understanding of societal problems and innovation processes and bridging the gap between technology and society. Its mission, as stated in the self-evaluation report, is to contribute to the solution of societal challenges through rigorous academic analysis of emerging technologies. Graduates should be able not only to analyse the complex dynamics of emerging technology, but also to identify strategies for improvement and thereby contribute to solving societal problems. Students are trained to analyse innovation issues that emerge when new technologies are developed to solve societal problems. They acquire the academic skills to recognize the nature of innovation issues, to select and apply relevant theories of technology and innovation, to design and perform independent research, and to report properly. According to the self-evaluation report, the SIM programme aims to create an intellectual community of students and teachers in which innovation problems are studied in close interaction with the research programme of the Innovation Studies group. In this community, students are inspired to use theories of technology and innovation, to employ qualitative and quantitative methods to analyse innovation issues, and to design strategies for stakeholders.

The programme's mission has been translated into three sets of intended learning outcomes: degree qualifications for all graduates of the Graduate School, degree qualifications at the CROHO (label) level, and SIM-specific degree qualifications (see Appendix 3). The committee established that the learning outcomes have a very clear connection to the key

challenge of the SIM programme: integrate science and social sciences in the analysis of complex, multidisciplinary problems in order to support innovation management. They cover in-depth knowledge and the ability to analyse and integrate examples which show the interaction between scientific developments and organizational and social developments. They also stress the ability of graduates to perform an independent analysis and to apply knowledge and problem-solving strategies in a professional context. The committee studied the documents in which the final qualifications are elaborated and linked to both the Dublin descriptors and the programme components. It found that the intended learning outcomes are rather detailed, but very concrete and relevant. Master students appear to be conscious of the qualifications and competences they are expected to acquire in the course of the programme.

The domain-specific reference framework in which the mission and intended learning outcomes of the programme are embedded, is the same as the bachelor's (see Appendix 2). Innovation is considered to be a critical process in modern knowledge-based economies. It is a complex and systemic phenomenon, which has to be studied as a co-evolutionary interaction between technology and society. Five dimensions of the relatively new field of Innovation Studies are identified: natural sciences, technologies, social sciences, institutional structures, and levels of aggregation. As mentioned before, the committee found the description of the emerging field of Innovation Studies sufficiently recognisable.

Since the scope of Innovation Studies is very wide, there cannot be a generally accepted blueprint for academic IS programmes. The committee established that the programme management has been able to make clear choices for the master's programme. It is research oriented and interdisciplinary in nature. The site visit was able to answer some initial questions of the committee members regarding its interdisciplinarity and focus. The central object of study is innovation as a complex socio-cultural and technological process. The SIM programme focuses on the analysis of innovation processes, rather than the business and management of innovation. Graduates can become high-level analysts in consultancy and policy, as well as academic researchers. The panel meeting with the alumni confirmed that this research and analysis-based profile is very relevant and a good basis for future careers.

Considering the research-oriented nature of the SIM programme, the word 'management' in the title can be a bit misleading. The self-evaluation report mentions this, too: students sometimes assume they are to be trained as project leaders or managers and tend to appreciate the theoretical focus only in later stages of their studies and career. According to some students, 'Technology and Innovation Studies' would be a better title. During the site visit, some recent developments related to this topic were discussed. The IES Department is developing an academic programme with an explicit professional orientation, in which students gain professional experience by doing internships, case studies etcetera. This initiative has been awarded start-up funding by the university board in an internal competition for new academic programmes. The programme is supposed to start in 2013 and builds upon the experience of IES and Business Sustainability. Other groups will participate, too. The programme management is considering changing the name of the overarching CROHO label into 'Science and Innovation', containing the vocational (Sustainable Business and Innovation) programme, an Energy Science programme, and the research-oriented (SIM) programme: Science and Innovation Management Research. In a letter sent before the site visit, the programme management had asked the committee for additional advice on this matter. When this topic was discussed during one of the panel meetings, the committee showed its appreciation of this idea.

1.2 Considerations

The committee established that the intended learning outcomes meet the demands of a university-level master's programme and correspond to internationally accepted descriptions of what an IS programme should look like. The domain-specific reference framework satisfactorily describes the societal and scholarly background and need for academically trained experts in the complex field of technological innovations. The requirements derived from the framework are very well translated into a set of qualifications that cover the five Dublin descriptors and produce a profile which is both state of the art scientifically and professionally relevant. The committee concludes that the level and orientation of the SIM programme are well thought out and described in a useful, detailed way. Its approach could be considered a best practice.

The committee established that the mission of the master's programme is well articulated. In comparison to the bachelor's programme, which understandably focuses on mainly getting students acquainted with research, fundamental knowledge and an academic outlook, the master's programme strives to let students contribute to the solution of societal problems by stimulating independently conducted scientific research. It has made a clear choice to focus on interdisciplinary research abilities, which constitute a set of professional competences at the intended academic master's level that is very relevant. Compared with other master's programmes, the focus of SIM is unique and ambitious. According to the committee, the initiatives taken by the programme management to develop a vocational programme and to critically review the current master's programme and its name illustrate the dedicated and self-conscious outlook in the department.

The committee has established that the level of the intended learning outcomes of the programme is equivalent to a master's and surpasses the current generic quality standards. It therefore assesses Standard 1 as 'good'.

1.3 Conclusion

Master's programme Science and Innovation Management: the committee 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.

2.1 Findings

This standard describes the findings, considerations and conclusions of the committee regarding the teaching-learning environment. It begins with the contents and structure of the curriculum and the cohesion of the programme, followed by the scientific and professional orientation. After sections on didactics and feasibility and performance rates, the quality and quantity of the staff are assessed. It concludes with a section about internationalization.

Curriculum

The Science and Innovation Management (SIM) programme has a workload of 120 EC spread over two years. In the first year students take seven compulsory courses that make up the general part of the programme. In these courses they acquire generic theoretical and methodological knowledge and skills. The final course of this first year is called 'Project

Innovation Management' (15 EC). Like the integration courses in the NW&I programme, in this course students are supposed to apply previously gained knowledge in a minor research project.

The second year focuses increasingly on independently analysing and influencing innovation processes in a chosen area. Students take two electives and carry out thesis research, thus following an individual specialization. The various components of the programme are shown in the table below, derived from the study guide. The course schedule is shown in Appendix 4. Students are trained in applying theories and methods of innovation analysis. Three blocks of training are provided:

		EC
1	**Generic theoretical knowledge and skills**	**22.5**
	Innovation & Organizations (present title: Technology Related Venturing)	7.5
	Mastering Theories of Technology and Innovation I	7.5
	Mastering Theories of Technology and Innovation II	7.5
2	**Generic methodological knowledge and skills**	**22.5**
	Measuring & Modelling Innovation I	7.5
	Measuring & Modelling Innovation II	7.5
	Designing Innovation Research	7.5
3	**Practical training**	**60**
	Project Innovation Management	15
	Master's thesis	45
	Electives	***15***
	Total	**120**

Curriculum components of the Science and Innovation Management programme

Since the previous assessment of the SIM programme in 2005, the curriculum has been revised. According to the self-evaluation report, this was done in order to 'prepare students for independent high-quality analysis of the complex and often ill-defined innovation questions of emerging technologies'. Such a programme requires an overview of the theories of technology and innovation, as well as an intensive and coherent training in research methods. This focus has been realized at the expense of 'specialization courses'. The idea is that students are not trained as specialists in a specific technological area, but rather as specialists in analysing innovation questions.

The time previously spent on natural sciences courses is now spent on research methods. During the site visit, the programme management stated that SIM students already have sufficient knowledge of natural sciences when they enter the programme. If needed, specific knowledge can be added on a tailor-made, individual basis. The committee established that with this curriculum, the programme has made a clear choice for a research orientation. 'Science management', for example, is not a compulsory programme component, but rather one of the options for individual specialization. The first year guarantees a common foundation, after which students specialize. The only restriction on the choice of electives in the second year is that their relevance for the field of SIM must be made clear.

The courses on **theoretical knowledge** acquaint students with a canon of IS theories: classic readings on technological change from economic, management and social science perspectives. The purpose of these courses is for students to be able to compare, judge and carefully select theories for a particular research question and to combine and improve theories. During the 'Mastering Theories of Technology and Innovation 1' and 'Innovation and Organization' courses, students acquire knowledge of original scientific contributions to the field of technology-based innovation and its management. Twelve theoretical strands are taught, ranging from evolutionary economics to the co-evolution of technological change and networks of firms and stakeholders. Students become familiar with the intellectual landscape of approaches and are trained in understanding, comparing and integrating the various theoretical insights by writing reports.

The committee is positive about the idea of a 'canon'. It looked at the twelve theoretical strands and established that they cover a adequate range of perspectives. It also established that the literature used in the theoretical courses has an ambitious level, consisting to a significant part of seminal research articles on these strands. It wondered, however, in what depth each of the theories can really be treated, since a quick calculation shows that only 1.5 week per theory can be scheduled. During the site visit, staff and students explained that they experienced that it is enough to grasp a theory and compare it to the other approaches. According to them, this is one of the main objectives of the master's programme. Students may then choose to study a theory more thoroughly. Obviously, this is required when they choose to apply it in their theses.

Students stated that in comparison with the NW&I (bachelor's) programme, much more literature has to be studied in the master's programme. The committee was able to confirm this claim. Students write reports in which they compare the studied theories. During the 'Mastering Theories of Technology and Innovation 2' course, they have to reflect on the role of theory in knowledge production. Instead of 'slaves', they become 'masters' of the theories, the staff explained. The student panel stated that these courses are intense and motivating, and really teach a lot new. They also felt challenged to integrate theories and to explore other disciplines and methodologies.

Students take three compulsory **methodology** courses, in which they are taught how to translate theoretical insights into analytical models and how to measure and analyse the variables in these models on the basis of data. The first methodology course focuses on the use of quantitative data and appropriate methods of data analysis. Attention is paid to typical databases on science and technology indicators, such as patents and science citations and their analysis by means of statistical and social networking methods. The second course focuses on qualitative data and appropriate methods of data analysis. Attention is paid to data collection from primary sources (interviews, documents) and their analysis by means of event data analysis and discourse analysis. In both courses, students learn to interpret the results of analyses and evaluate both their scientific and practical implications (i.e. for management and policy). Effective communication about the research activities carried out is part of each course.

The third methodology course is 'Designing Innovation Research'. In this course students tackle a new and unfamiliar innovation issue. The central question is how to structure a research project according to the successive phases of the empirical cycle and how to make sensible and consistent theoretical and methodological choices. A large part of the course consists of assignments: writing parts of the research proposal on the subject chosen by each student and discussing them during tutorials.

The self-evaluation report divides the research components of the SIM programme into the training of skills in groups and individually. In the 'Project Innovation Management' course, students work in groups of three. Each group designs and executes a research project concerning an actual innovation problem. The students the committee interviewed considered this course challenging. There are meetings every week, in which three groups discuss each other's work, progress and problems encountered together with one of the supervisors. The supervisors reflect on common issues encountered in the work of the groups. In addition to the weekly meetings, they held consultation meetings with individual students. At the end of the course, the final research report is graded on the basis of the thesis evaluation form.

In the second year, students focus on one of the research themes and develop their own research project. This can take place in organizations other than the university (e.g. firms, institutes), depending on the data needed to answer the research question. Students thus may include one or more internships when this is a useful ingredient of the graduation trajectory (45 EC). The thesis project trains students to perform research independently as innovation analysts, to specialize in a particular innovation topic and to communicate effectively about it. The committee studied 15 theses and was impressed by their average level. The students had truly succeeded in achieving the intended learning outcomes (see also Standard 3).

Scientific and professional orientation
Like the NW&I curriculum, the SIM programme focuses on its scientific orientation, emphasizing interdisciplinary research skills. As became clear in the previous section, the structure of the programme is designed to acquaint students with a common theoretical and methodological framework, which they use in the specialization part to independently analyse innovation processes in a specific area. The committee established that the science-oriented learning outcomes have been translated well into the various course components. The natural and social sciences are integrated in the analysis of complex, multidisciplinary problems. Students learn to communicate academically about their research results.

The theses studied by the committee showed that the scientific objectives of the programme are being fulfilled, thus strengthening the link between the master's programme and the academic field of Innovation Studies. The self-evaluation report states that selected ambitious students can choose an optional course in 'Publishing your research' or 'Writing a competitive PhD proposal' after completion of their thesis.

The link with research is also guaranteed by the teaching staff, who manage to integrate their own research in the courses. During the site visit, the teachers claimed that they succeed in achieving the right balance between the use of their own research agendas and letting students choose independently among topics and theoretical approaches. They explained that if you bind students too much to your own research, you may restrict them from presenting their own ideas. The research components of the curriculum are always problem-oriented, and intriguing questions can arise as a result, giving the programme a more open-minded character.

Apart from the scientific orientation, the programme also trains professional competences. In fact, during the site visit, the committee became convinced that scientific and professional learning outcomes blend together well in the SIM programme. The training of innovation specialists at a master's level partly requires a professional orientation, while the professional context implies scientific working methods and theoretical knowledge. For instance, graduates who work as policy advisors and consultants need analytical and reflection skills directly related to the level and character of the courses. Alumni concluded that they had been prepared well for the labour market, at least in terms of knowledge and skills. However, the

activities organized by the study association had proven to be a better way of getting a picture of the 'real world' than most of the courses. They recommended introducing more guest lecturers and a better promotion of internships. They were positive about the possibility to incorporate an internship within the graduation trajectory, as were the students. The self-evaluation report claims that the graduation trajectory is of help in getting a clearer picture of the professional field.

Internships have to be arranged by the students themselves. It can be difficult to combine academic and professional requirements within one project, but the students also feel that internships should be promoted. The self-evaluation report states that students find it difficult to appreciate the needs of the professional field and that the programme intends to point out these needs more explicitly within the courses and extracurricular activities. On the other hand, during the site visit students did show their appreciation of the scientific focus of SIM. For example, they considered management skills more of a by-product than a main objective ('otherwise you should go to Rotterdam') and were confident that they were being trained the way the labour market demands.

With regard to the professional orientation of SIM, the self-evaluation report also mentions the Advisory Board. This was set up in 2011 to advise on how to align the SIM programme with the needs of various professional fields in which SIM graduates find jobs. Members of the Advisory Board are partners from industry, business consultancies, government and knowledge institutes. They confirm employers' appreciation of the virtues of SIM graduates as reported in the alumni survey. The committee established that by involving the professional field in aligning the SIM programme with its needs, the recommendation of the previous assessment committee has been implemented.

Didactics
Embedding teaching in an intellectual community of students and staff is the educational concept of the master's programme. The small number of students (around 30 per cohort) makes it easy to create this community. The programme provides face-to-face contact between students and lecturers, as well as sufficient supervision and support. On average, the students meet their lecturers for 6.4 hours each week in the theoretical courses. In addition to these scheduled contact hours, students have to work on assignments, research proposals and papers in groups as well as individually. They consult their supervisors regularly and receive feedback on their work during short appointments. These consultation meetings are focused on the individual learning problems of the students. During the site visit, the students were positive about the amount of supervision. The committee confirmed that the learning environment creates the atmosphere of engagement described in the university's didactic concept. Students spend more hours on their studies (32 per week) than was the case during the previous programme assessment, while the staff-student ratio has improved. The ratio is now 1:34 (see Appendix 5).

The committee established that the working methods described in the study guide match the intended learning outcomes of the courses. For example, the composition and supervision of the group meetings in the Project Innovation Management course change every week in order to stimulate inter-group learning. The educational concept is supported by regular assessments and a restriction on the number of resits. The course evaluations indicate that students appreciate the level of the SIM courses and feel stimulated to do their best. Students are given considerable responsibility for their own individual achievements. This also prepares them for their thesis research project.

Feasibility and performance rates
The SIM programme has a study load of 120 EC. However, most students do not manage to graduate within two years. On average, students have a six-month delay. The performance itself is high: almost 90 percent of the students ultimately graduates. The quantitative data of the SIM programme are shown in Appendix 5. During the site visit the committee discussed whether the performance rates could be linked to the feasibility of the programme. It established that the programme has taken serious measures to improve the feasibility.

On average, students spend 32 hours per week on their studies. The committee confirms the claim that this reflects the more demanding approach recommended by the previous assessment committee. The courses seem challenging, but feasible. The decrease from about 65 students per teaching fte to 34 reflects an improvement in the attention paid to individual students, which seems to have improved the feasibility of the programme. During the site visit, the programme management and education committee explained that in order to improve the feasibility and performance of the SIM programme further, a stricter time schedule has been implemented. Previously, students could go 'off the radar' and suddenly show up again.

Most of the delay builds up during the second year of the programme, when students write their thesis. Students confirmed that it can be difficult to stay motivated and showed their appreciation of the measures taken. They may start to design and execute their individual final research project only after completion of the first-year courses. In order to optimize the thesis period, a flowchart has been developed that illustrates the various phases of the thesis process: orientation, specification, proposal, research, presentation. This flowchart includes important points ('milestones'), which should be in the student's research proposal. After approval of this proposal, students have seven months to complete their project. The self-evaluation report claims that the formalized procedure has contributed to a 54 percent reduction of delay in the study progress of SIM students.

Students may perform their master thesis research at an external company. During the site visit, students and alumni indicated that they value an external research as something from which they can learn a lot, and which is also a good preparation for their professional careers. The committee found, however, that external thesis projects are not performed very often. It seems hard to match the university's assessment criteria with those of the particular company.

The feasibility of the programme has been improved by making the admission criteria more stringent for students holding a technology-oriented HBO degree. Since HBO students with an average grade between 6.0 and 7.0 were found to encounter severe difficulties and serious delays with completing the SIM programme, now only the more talented students are selected. The intake of HBO students has dropped considerably. Furthermore, since 2008-2009 students holding a bachelor's degree other than NW&I, and lacking the additional criterion of having a demonstrable interest in either the social or natural sciences, have had to complete a pre-master programme of 30 EC. They must be properly qualified for direct admittance to SIM. Since 2010-2011, students admitted to the SIM programme in February instead of September have been allowed to complete the obligatory courses in a slightly different sequence so as to reduce the built-in delay in study progress.

The committee confirmed that the content and structure of the curriculum make the SIM programme sufficiently feasible. Students and alumni stated that they feel challenged and have to work hard, but that the amount of support and feedback is good. They experience a good balance between the flexibility of the programme and the stricter rules regarding the schedule. Other factors that contribute to the feasibility were also mentioned in the section on the NW&I programme: the study association Helix plays an important role and positively

influences the atmosphere for both students and staff. The relatively small groups enable the programme to create the activating learning environment described in the didactical concept. This environment is supported by adequate programme-specific facilities and services, like individual student counselling and coaching.

Staff
The self-evaluation report states that the quality of the teaching staff is ensured by an appointment policy that focuses both on research and teaching skills. In line with the university's policy, staff members hold combined research and teaching appointments. They are actively involved in the development of the scientific field of Science and Innovation Management in their role as researchers. Their central research theme is the dynamics of emerging technologies that are relevant from the perspective of major societal challenges, especially sustainable energy and life sciences. The group, part of the Copernicus Institute of Sustainable Development, has a high research output and tries to integrate its results into various programme components. The committee confirmed that many SIM teachers are involved in high-quality research. The information about the staff provided by the self-evaluation report shows that they possess the multidisciplinary character the programme requires. It has indeed developed into a mature research group.

With respect to teaching skills, the SIM department follows the university's policy of continued professionalization of the teaching staff by requiring a Basic Teaching Qualification (BKO) from all tenured teaching staff at the assistant professor level and a Senior Teaching Qualification (SKO) from all associate and full professors. The compulsory courses of the SIM programme are taught by six staff members with either a BKO or a SKO. The supervision of the thesis projects involves 15 staff members, all but one with a PhD and a teaching qualification. In addition to the faculty requirements, the IES department also encourages its temporary teaching staff to take part in the BKO trajectory in order to improve their labour market position. Furthermore, it has developed a teacher's manual for new lecturers.

The committee is convinced that the staff members of the NW&I section were very approachable and dedicated. Students thought them motivated to bring in their own research examples. This applies to the master's programme to a greater extent. The relatively small groups make it possible to guarantee sufficient face-to-face contact and support on an individual as well as group basis. The quality of the courses is systematically evaluated by both students and staff. The programme claims that the current size of the teaching staff is sufficient to ensure the quality of the curriculum, with intensive lecturer-student contact in relatively small groups. The committee could confirm that since the previous assessment, the staff-student ratio had improved: from over 61.4 students per teaching fte to 34. This is also reflected in the evaluations by the students, who awarded the staff an average score of 3.9 (out of 5) for their didactic qualities.

Internationalization
The SIM programme believes an international orientation is important, since solving innovation problems is not only a national issue, it has effects on a global scale. Like the NW&I programme, the SIM curriculum has been designed to meet both Dutch and international requirements. The official language of the programme is English. The committee has verified that international literature is used in the courses.

Students can choose to do part of the programme abroad, which a small (but growing) number actually does. In order to take courses at foreign universities, students have to plan their study programme in the second year, to prevent delay. Students are informed about this in the first year, but according to the self-evaluation report, this must be made even clearer.

Currently, students going abroad could suffer from an unnecessary delay in their study progress because of poor planning. A website has been developed to provide students with an overview of innovation-related master's degree programmes offered by foreign universities with which Utrecht University has exchange programmes. It is also possible to do research for the thesis abroad. In this case, one of the SIM lecturers acts as the first supervisor.

Since the SIM programme is taught in English, it could easily welcome international students. The data provided in the self-evaluation report, however, illustrate that the number of foreign students participating in the SIM programme is limited: only one or two per year on average. The programme considers this a weak point and promises to improve its website to inform foreign students about the SIM programme and about the possibilities to apply for a scholarship. It will also continue to offer a summer school called 'Innovations for a Sustainable Future' for advanced bachelor students. The committee is positive about this self-critical approach and encourages the programme to improve the support for students to go abroad. It also recommends not only improving the website, but also stimulating the study association to provide information in English.

2.2 Considerations

The committee greatly appreciates the design, implementation and organisation of the teaching-learning environment. It concludes that the programme demonstrates a good balance between theoretical, methodological and practical training and research. The SIM programme has made a clear choice for educating multidisciplinary innovation specialists who have a broad theoretical knowledge basis and the analytical and methodological skills to reflect on the various options and approaches they have when confronted with a problem of innovation. From the perspective of the professional field, as well as the academic field of IS, this is exactly the sort of knowledge and skills graduates need. The committee concludes that students really learn what is required in order to become a professional researcher. Additionally, the optional courses and graduation trajectory offer students the opportunity to develop their own specializations.

On the basis of the information given in the self-evaluation report, study guides, course material and meetings held during the site visit, the committee concludes that the compulsory courses have a good level, which should enable students to achieve the intended learning outcomes. The 'canon' of theoretical strands, offered at the beginning of the curriculum, at first seemed to run the risk of making the programme too eclectic. However, the committee is convinced that it is actually a good choice, in the light of the intended learning outcomes. Students really learn to think in an interdisciplinary way and ask relevant questions. The literature used in the courses has a good level. It exceeds the quality that can reasonably be expected. This also applies to the methodology and research components of the curriculum. The programme may consider applying the concept of a canon to the methodology courses as well.

The committee could confirm that the design of the curriculum is clear and cohesive. The working methods meet the objectives of the programme components. The committee established that the programme has taken significant measures to improve its quality and feasibility. Firstly, this concerns the structure of the curriculum and the content of the courses in year 1. The courses have a clear build-up and relation to each other, although the committee thinks the titles could be a bit more exciting. Secondly, the flexible way in which the internship can be combined with the master thesis research constitutes an important improvement. It not only makes the programme more feasible, it also helps to connect the scientific and professional orientation of the programme. The committee recommends considering how internships can be promoted and facilitated even more. Thirdly, the committee is positive about the measures the programme has taken to improve the time

management of its students. It is convinced that the 'flowchart' and stricter admission rules counteract the delays.

The committee recognises the staff's scientific quality and teaching experience. It noticed that recent developments in scientific research are brought into the courses. The academic environment in which SIM students work is inspiring and provides interactions between education and research. Like the bachelor's programme, it can be called ambitious. It provides an intellectual community as described in the educational concept. Furthermore, the lower staff-student ratio ensures that students get sufficient support. The committee noticed that they feel challenged and work hard. It is a good sign that students spend more hours per week studying than during the last assessment. The performance rates have improved already.

The committee is positive about the facilities offered by the programme (student counselling, etc.), most of which resemble those of the bachelor's. The overall picture of the teaching-learning environment suggests it exceeds the quality of the bachelor's. The programme has put a lot of effort into improving the programme and its feasibility. Evaluations indicate that the students are positive about the programme. It is demanding, but the teaching-learning environment makes it feasible. The committee feels the curriculum, staff and facilities enable the incoming students to achieve the intended learning outcomes. They constitute a coherent teaching-learning environment which exceeds the generic quality.

2.3 Conclusion

Master's programme Science and Innovation Management: the committee assesses Standard 2 as **good**.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and 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. The tests and assessments are valid, reliable and transparent to the students.

3.1 Findings

The assessment modes for all courses are described in the study guides. The committee studied these descriptions and found that students are evaluated in a number of different ways, such as oral assessments, papers and poster presentations. During the site visit, students confirmed that they thought the assessments were representative. Some thought that the 'Designing Innovation Research' course was a bit too easy. In general, it seems that it is more difficult to get a good grade for a project or paper than for an exam.

Like NW&I, SIM follows the university's educational model regarding the organization of examinations. Important features of this model are early feedback during the course and limited opportunities to retake assessments. Students take intermediate tests and assessments during every course, in order to activate their learning behaviour and to receive feedback on how well they are realizing the intended learning outcomes. Assignments are discussed during tutorials. If the individual final grading of the course is between 4.00 and 5.49, students are allowed to do a 'repair' exam. The committee established that this practice is part of a well considered policy on 'time management' within the programme, which increases the students' overall performance.

The self-evaluation report describes how the quality of examinations is assured in different ways. The staff is trained in examination skills. Furthermore, all assessments are reviewed by a colleague. The course coordinator has the primary responsibility for the quality of the examinations, but this is ensured by the organization of the examinations within the programme and by the Board of Examiners. This board has delegated part of its responsibility to the Committee of Assessments, which independently evaluates the quality of a selected subset of examinations. The committee found that a routine still has to be developed in evaluating assessments. The self-evaluation report mentions as a weak point the fact that the assessment system has not yet been fully implemented. It also states that the individual feedback could be improved. During the site visit, the Board of Examiners confirmed that they consider the available budget and time to be sufficient to carry out its tasks properly. The assessment policy is being applied not just bureaucratically, but in cooperation with teaching staff.

Theses and achieved learning outcomes

The examination of the theses is done by a supervisor and an independent second reader. Both are SIM staff members with a PhD. The thesis examination is carried out using the assessment form of the Graduate School of Geosciences. According to the self-evaluation report, this form will be adjusted to make the science and technology aspect more explicit. After the independent assessment of the quality of each thesis by the supervisor and the second reader, they discuss their judgments until consensus is reached about necessary improvements to the quality of the thesis or its grading. If consensus cannot be reached (i.e. if the difference in grading is more than one point), the quality of the thesis will be assessed by an independent third reader appointed by the Board of Examiners. During the site visit, some students made critical remarks about the lack of transparency of this process. To them, it was not clear what the role of the second reader should be. Some felt that second readers may prefer a different methodology, which then negatively influences the final mark. Staff argued that the thesis process is clear. Students write a research proposal, which has to be presented and approved before they may continue. The research process is worth 20 percent of the final mark; the final presentation 10 percent. The committee established that the thesis process has been formalized and elaborated in the course catalogue. It noted that a second reader does not need to be present at the final presentation.

The committee noticed big differences between the bachelor's and master's theses. For bachelor students, the number of possible topics is limited, and so is the time spent on supervision. Their theses only amount to 7.5 EC. The master's thesis is the product of a long graduation trajectory (45 EC). It is a very serious project, which it should be given the amount of attention, consideration and supervision. Students can do 'whatever they like', as long as it is scientifically relevant and linked to innovation. They have 40 hours to spend with their supervisor, which is applied quite flexibly. During the site visit, the staff members showed great enthusiasm about the master's theses. They found the supervision really interesting. To some of them, it did 'not feel like work load at all'. There are examples of teachers who published papers together with students, based on their thesis research.

The committee assessed the achieved learning outcomes by inspecting a selection of 15 theses from the two most recent cohorts of the programme. This selection was done at random by the project leader and the committee members. Consideration in selecting the thesis reports was given to the grading (low, average and high grades). The committee found that, essentially, the theses were very good. The overall level was high and demonstrated that the intended learning outcomes were achieved. The theses showed logical structures and clearly applied theoretical knowledge to social, technological and innovation perspectives. In general, the committee agreed with the grades awarded by the supervisors. In several cases it would have even given higher marks. The enthusiasm about the programme was in many cases

reflected in careful reports. Alumni stated they appreciated the freedom to choose their own topics and to develop their own methodologies. Some of them argued, however, that 30 EC would be enough to carry out a proper research project independently. When this issue was raised in the final meeting, the programme management stated it preferred to stick with the current curriculum, mostly because it wants to ensure the option of combining the theses with internships. Alumni also had some critical remarks regarding the final presentation, which does not seem to get much attention. Nor is it as big a happening as it could be. They therefore recommended making the final presentation a 'thesis defence'.

The overall level of selected theses demonstrated that the intended learning outcomes were achieved. In the self-evaluation report, this conclusion is supported by the observation that the types of activities alumni perform within organizations are in line with the programme's goals. They include assessment of technological solutions, advising about implementation, assessing strategic plans and scenarios, and ensuring clear communication. A recent labour market survey illustrates that the job prospects for SIM graduates are very good: most alumni found a job within one month after graduating. Employers appreciate their analytical and research competences and their ability to familiarize themselves quickly with unknown scientific and technological fields or upcoming societal topics.

3.2 Considerations

The committee concludes that the programme uses a reasonable mix of assessments, with a balance between theory (written exams) and application (assignments). The assessments match the intended learning outcomes of the courses and have an appropriate level. The programme uses different instruments to guarantee the quality of the examinations. The committee noted that the assessment procedures have recently been streamlined and urges the programme to apply its assessment policies strictly. It concludes that the intended learning outcomes are achieved. The level of the theses is good and exceeds the generic quality. Both staff and students show contagious enthusiasm about the research projects. Students get sufficient supervision. The committee supports the recommendation made by alumni to upgrade the thesis presentation to a defence ceremony. It also thinks the second reader should be present at this ceremony. The positive conclusions about the achieved learning outcomes are confirmed by the presented evidence that graduates easily find work within the professional field and that they perform to everyone's satisfaction.

3.3 Conclusion

Master's programme Science and Innovation Management: the committee assesses Standard 3 as **good**.

General conclusion

The committee concludes that the intended learning outcomes of the master's programme have been concretised well in terms of content, level and orientation and fully meet the international requirements. It also concludes that the content and structure of the curriculum, the staff and facilities constitute a coherent, attractive and challenging teaching-learning environment for the students. It can be considered a good practice. The programme has an adequate assessment system and demonstrates that the intended learning outcomes are achieved. The level of the theses the committee evaluated was rather high. Since the committee assessed all standards for the master's programme as 'good', it is confident that it can conclude that the programme on the whole is to be assessed as 'good'.

Conclusion

The committee assesses the *master's programme Science and Innovation Management* as **good**.

APPENDICES

Appendix 1: Curricula Vitae of the members of the assessment committee

Prof. Paul Wouters is director of the Centre for Science and Technology Studies (CWTS) and professor of scientometrics at Leiden University. He obtained a MSc degree in biochemistry (1977, Free University Amsterdam) and a PhD in science and technology studies (1999, University of Amsterdam). He is visiting professor of Cybermetrics at the University of Wolverhampton. He was director of the Virtual Knowledge Studio of the Netherlands Academy of Arts and Sciences (2005- 2010) and professor of Knowledge Dynamics (Erasmus University Rotterdam) (2007-2011). He has worked as freelance science journalist focusing on science-society interactions since 1988. He has published on the history of the Science Citation Index, on scientometrics, on the way the criteria of scientific quality have been changed by citation analysis, and on the role of information and communication technologies in knowledge creation. He is member of a number of editorial boards of the leading journals in science & technology studies.

Prof. John Grin is professor of Policy Science, especially system innovations at the University of Amsterdam, and co-director of the Programme Group Transnational Configurations, Conflicts and Governance of the Amsterdam Institute for Social Science Research (AISSR). He obtained a BSc (1983) and MSc (1986) degree at the Free University Amsterdam, and a PhD (1990) on technology assessment from the same university. After post-doc positions at VU University and Princeton University, he joined the University of Amsterdam, Dept. of Political Science. The constant throughout his career has been an interest in the relationships between science, technology, society and politics, drawing on political science, sociology and science, technology and innovation studies (STIS). Currently, his main foci are transitions and system innovations in health care, agro food, and energy. Grin is co-editor of the Routledge Sustainable Transitions Series and has been Co-Director of the Dutch Knowledge Network on System Innovations and transitions (2005-2010). Between 2006-2010, he was scientific director of the Amsterdam School for Social Science Research.

Prof. Volker Hoffmann is an associate professor for Sustainability and Technology and the head of the Department of Management, Technology, and Economics of ETH Zurich. He holds a diploma in chemical engineering from ETH Zurich and a diploma in business administration from the University of Hagen, Germany. Later, he worked as a visiting scholar at MIT where he investigated uncertainty propagation in large scale process models. In 2001, he obtained his PhD from ETH Zurich with a thesis on multi-objective decision making under uncertainty in chemical process design. Before joining the faculty of ETH Zurich in 2004, he was a project manager at McKinsey & Company. He focused on strategy development for European utility companies, especially in the light of upcoming greenhouse gas regulations. Volker Hoffmann's research at ETH Zurich centers on corporate strategies with respect to climate change, with a focus on climate policy, energy policy, and innovation.

Prof. Cees Leeuwis obtained an MSc degree in Rural Sociology at Wageningen University in 1988. In 1993 he completed his PhD dissertation on the use and development of computer-based systems for decision support in the agricultural sector. Both degrees were awarded 'cum laude'. From 2002 to April 2012 he was professor of Communication and Innovation Studies at Wageningen University, and was appointed as professor of Knowledge, Innovation and Technology in May 2012. He is also chairman of the MSc programme Development and Rural Innovation (MDR). Cees Leeuwis studies processes of socio-technical innovation and transformation, with special attention to the communicative and socio-political dynamics involved in the production, exchange, integration and use of scientific and other knowledge. This simultaneously involves studying technology's impact on society and the social shaping of technology as two sides of a co-production process, and the analysis of interactions,

interventions, design approaches and institutional set-ups relevant to enhancing and supporting innovation processes in society. These endeavours to understand science-society interaction are situated in the context of challenges and opportunities in the Wageningen domain, such as food security, poverty, health hazards, inequality, obesity, environmental degradation, climate change, conflict and scarcity of resources. Cees Leeuwis has (co)authored over 50 articles in peer reviewed scientific journals, published 6 books, served as (co)promotor of more than 20 completed PhD projects.

Ms. Aniek Berendsen, BSc is a master student in System Engineering, Policy Analysis & Management at Delft University of Technology. She obtained her bachelor degree in 2011 in the same programme. This is a multidisciplinary programme in which students learn how to integrate technology and social factors in both solution designs and management processes. Next to her education programme, she is takes part in several activities at the faculty of Technology, Policy and Management (TPM). Since 2008 she has been a work student at the department of education and quality assurance of the faculty TPM. She is responsible for the evaluations of the bachelor's programme, electives and three master's programmes of the faculty TPM. For four years, she took part in the lecture response groups, in which the running courses were evaluated. In 2011-2012 she was a member of the Faculty Student Council, representing the interest of the students in the policy and strategy of the faculty as well as in the quality of the education and facilities. Furthermore, she was a tutor for first year students as well as a student assistant on policy analysis projects for first year bachelor and master students. Since the start of her student time, she has been active at her study association Curius. She has participated in four committees and currently fulfils the position of a fulltime board member as Commissioner of Master and Career.

Appendix 2: Domain-specific framework of reference

The importance of knowledge and innovation

It is generally recognized that knowledge in all its forms plays a crucial role in the knowledge-based economy and that innovation is at the heart of economic progress. For this reason governments are active in developing policies to stimulate knowledge development and the pace (and direction) of innovation. The economic rationale is not the only reason why innovation is considered such an important topic, however.

Today, the world's economies are facing some extraordinary challenges. Environmental pressures and resource scarcity, for example, challenge the sustainability of our development models and longer life expectancy is putting a strain on the capability of health systems to meet the needs of an ageing population. Innovation is increasingly seen as critical for meeting these challenges effectively. It will play a major role in finding new and sustainable sources of growth and competitiveness.

Consequently, innovation is a critical process in our modern economy but it is not a process that is easily understood. Since the 1980s innovation has been regarded as a more complex and systemic phenomenon than was previously thought. Systems approaches to innovation have replaced the (technology deterministic) linear model of innovation and put emphasis on the interplays between technology, organizations and institutions (rules of the game), looking at these interactive processes both in the creation of knowledge and in its diffusion and application. The term 'national innovation system' has been coined for this set of organizations, institutions and flows of knowledge. Also, the development and diffusion of innovations and the development of our society are strongly interlinked. Owing to the many technological innovations, our modern society is very different from the society in which our grandparents lived. Thus innovations shape society. On the other hand, the development and diffusion of technological innovations is strongly influenced by society, e.g. consumer preferences, institutional rules, and existing physical infrastructures. Insight into the co-evolutionary interaction between technology and society is a prerequisite for intelligent strategies regarding technological innovation for governments, firms and other stakeholders.

The expanding discipline of innovation studies

The insight that innovation is a complex, systemic and evolutionary process results from the work of several scientific communities that are specifically dedicated to studying and understanding innovation processes. These are known as innovation studies or science, technology and innovation (STI) studies. These communities have roots in evolutionary economics, the sociology of technology, science and technology studies (STS), and management and organization studies. This makes these communities interdisciplinary in character.

Since technology has a basis in natural science, whereas organizations, markets and institutions have a basis in behavioural science, innovation studies requires a combination of natural and social sciences, with their different outlook, style and method. This presents a fundamental problem for programmes in innovation studies. It is useful but also difficult for students to bridge the natural science and social science fields, and this is not made any easier by the fact that it is difficult to find teaching staff who have experience in both areas. Furthermore, there are also choices to be made within the fields of natural science and social science.

In the analysis of organizations and markets one should ideally combine economics, sociology and psychology, and fields based on those disciplines, such as marketing and organizational

behaviour. Sociology is needed to understand the effects of social structure, such as networks of people and firms, which are increasingly seen as crucial for innovation. Psychology, including social psychology, is needed by entrepreneurs, producers and consumers to understand motivation and decision-making under the uncertainty of innovation. We should probably expand the range of disciplines to include cognitive science, because if knowledge, learning and collaboration are crucial in innovation, and we talk of the knowledge economy, we should surely include sciences of cognition and language. Such combinations of disciplines within the social science field are not easy. Even within economics and sociology there are divergent and rival schools of thought. Within economics there are the fields of neo-classical, evolutionary and (new and old) institutional economics. Within sociology there are the fields of population ecology, networks, rational choice and interpretative or configurational sociology. They may all have a contribution to make. Innovation is closely related to entrepreneurship, which constitutes an area of its own, with a body of literature that has exploded over the past fifteen years.

Within science and technology there are a variety of fields and related industries: chemicals, biotechnology, pharmaceuticals, ICT, software, mechanics, sensors, robotics, nanotechnology, new materials, etc. Should one opt for reasonable depth of treatment of one or two technologies ('focus'), or for a more cursory treatment of a wider range ('scope')?

Finally, there is also a choice to be made concerning the level of aggregation: the macro (inter)national level of innovation policy, the meso level of industry and markets, and the micro level of firms or projects.

In sum, the content of innovation studies varies in five dimensions:

- Natural science: mathematics, physics, chemistry, biology, etc.;
- Technologies: chemicals, biotechnology, pharmaceuticals, ICT, software, mechanics, sensors, robotics, etc.;
- Social science: economics, sociology, social psychology, cognitive science, etc. ;
- Innovation studies: institutions, innovation systems, entrepreneurship, strategic management, marketing, organization (structure and behaviour), etc.;
- Level of aggregation: macro, meso, micro.

Note that not all of these dimensions are independent. Not all elements can be combined and coherence and depth maintained; nor can they all be fitted within the time available. Choices have to be made. Because the innovation studies field is relatively young, there is no generally accepted blueprint for programmes that aim at teaching students in this field. Within the Netherlands and internationally different choices are made with regard to the above-mentioned dimensions of innovation studies. These choices pertain to the specific goals and missions of the different programmes, but are also related to the history of the programmes and the availability of staff, cultural environments and related programmes.

The above makes it clear that the NW&I and SIM programmes in Utrecht University have made specific choices over the last 12 years which make these programmes relatively unique within the Netherlands and internationally. In the past few years, similar programmes have been started in the Netherlands, showing that there is a (growing) market for education in innovation studies and related fields of study.

NW&I and SIM

An internationally-oriented knowledge-intensive economy requires well-educated graduates who are creative, and can think and act critically to solve problems in interdisciplinary settings

[…]. As innovation is so vital for the (sustainable) development of our economy, graduates are needed who are able to analyse and comprehend the complex, co-evolutionary and systemic nature of innovation and contribute to intelligent innovation strategies. This requires graduates to have natural science knowledge so they can understand the technological possibilities and limitations of technological innovations. They also need to have social science knowledge that provides insight into the processes and mechanisms that influence the successful development and diffusion of innovations in society. Therefore, the NW&I programme is a multidisciplinary programme wherein students gain natural science knowledge (mathematics, physics, chemistry, biology) that allows them to understand and characterize new technologies, as well as social science knowledge such as learning about different innovation theories. The different courses in the NW&I curriculum focus on specific parts of this complex interaction between society and technological innovation and the overall programme is characterized by a comprehensive overview of the main processes that determine the sustainable and successful development and diffusion of technological innovation.

The SIM programme specifically focuses on mastering a wide range of dominant innovation theories and social science research methods in order to enable students as far as possible to analyse complex innovation processes and develop strategies for stakeholders to improve the development and diffusion process of innovation.

Related university programmes in the Netherlands

NW&I and SIM are not the only programmes in the Netherlands that focus on understanding new technology and innovation processes. The most similar programmes are Technical Innovation studies (Technical University Eindhoven) and Science, Business and Innovation (VU, Amsterdam). Both programmes also focus on the combination of natural/technical science and innovation theory. Science, Business and Innovation is narrower in its focus than SIM and NW&I since the focus is only on innovation management within organizations and not on innovation policy. Table A1 compares the programmes in Utrecht, Eindhoven and Amsterdam. Another programme that aims to bridge natural and social sciences is the Beta Gamma programme in Amsterdam but the specific focus on innovation is lacking.

It is important to note that NW&I and SIM are very different from social science programmes like Master of Business Administration, Organizational Science and Political Science. In such programmes, innovation may also be an important topic, but it is just one in a wider spectrum of topics. Furthermore, the technological characteristics of innovations are not taken into account in these programmes. The Technology Management programmes are also very different since these programmes focus strongly on how to manage innovation processes within firms. The NW&I and SIM programmes focus on understanding the dynamics of innovation in society and how this influences the strategies of a wide range of actors. Finally, a number of natural science programmes focus on innovation, such as the MSc programmes Drug Innovation and Applied Science. These programmes are predominantly natural science programmes with a minor focus on innovation processes.

Based on this domain-specific framework of reference, and in agreement with the Dublin descriptors, the intended learning outcomes for the NW&I Bachelor's Degree Programme are reported in Appendix 3.

Characteristics of different educational programmes related to innovation

Programme (institution)	Level	Focus areas	Disciplines	Fields/domains
Science and Innovation Management (Utrecht University)	BSc	Innovation Management	Innovation Studies, Natural Science	Energy & Transport Life Sciences
Technical innovation studies (Eindhoven University of Technology)	BSc	Innovation Management	Psychology Innovation Studies Natural Science Engineering	Psychology and Technology/ Sustainable Innovation
Science, Business and Innovation (VU University Amsterdam)	BSc	Innovation Management	Natural science Organization Science	Energy Science Life Science
Beta-Gamma (University of Amsterdam)	BSc	Natural Science and Social Science combined	Natural Science, Social Science, Philosophy	
Future Planet Studies (University of Amsterdam)	BSc	Natural Science and Social Science combined in relation to societal challenges	Natural Science, Social Science, Philosophy	
Science and Innovation Management (Utrecht University)	MSc	Innovation Management	Innovation Studies	Energy and Transport Life Sciences
Innovation Sciences (Eindhoven University of Technology)	MSc	Innovation Management	Innovation Studies Technical Science	The Social Science of the Internet/ Knowledge Economy & Society/ Innovation & Sustainability/ Technology, Globalization & Europeanization.
Science, Business and Innovation (VU University Amsterdam)	MSc	Innovation Management	Natural Science Organization Science	Energy Science Life Science

Appendix 3: Intended learning outcomes

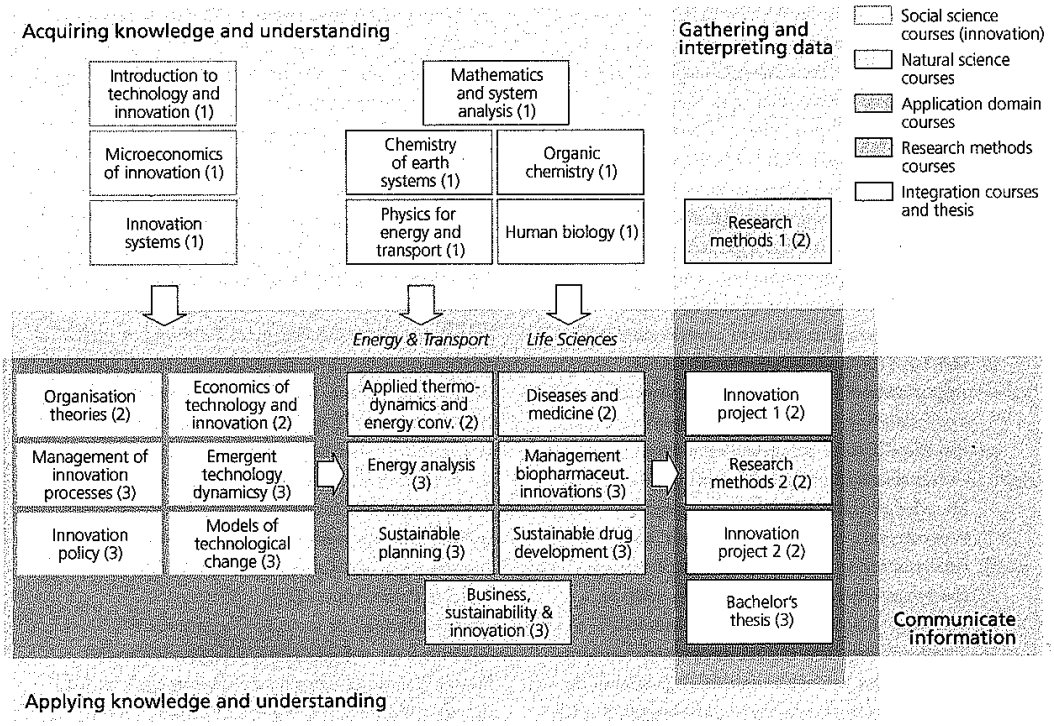
Bachelor's programme

Overview of the intended learning outcomes in relation to the Dublin descriptors

Qualifications after completion according to the Dublin descriptors	**Intended learning outcomes**
Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study	The graduate has knowledge and understanding of natural science and of the field of innovation studies The graduate has knowledge and understanding of the theoretical and methodological principles of natural science and of the field of innovation studies
Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study	The graduate has acquired general academic skills, especially in relation to natural science and of the field of innovation studies The graduate can use the acquired knowledge and understanding in a way that shows a professional approach to his/her work or profession
Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues	The graduate - can translate a practical question or problem of the subject area into a clear and investigable research question - can adequately operationalize the terms contained within that research question - can study a subject both theoretically and empirically while relating one to the other - can present the result(s) in a coherent argumentation that is synthesized in a clear conclusion - can use the result(s) for answering a practical question or to contribute to clarification and – if possible – solution of the problem - can form a judgement that includes reflection on relevant social, scientific and

	ethical issues
Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences	The graduate can communicate information, ideas and solutions to both specialist and non-specialist audiences
Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy	The graduate has developed those learning skills that are necessary to undertake a higher education programme at the master level.

Contributions to the realization of the obligatory and optional major courses taught in the NW&I programme are summarized as follows:



	Intro technology and innovation	Mathematics and system analysis	Microeconomics of innovation	Research methods 1-Innovation	Research methods 2-Innov&Env	Innovation systems	Innovation project-1	Innovation project-2	BSc-thesis
level	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**3**
1. The graduate has knowledge and understanding of natural science and of the field of innovation studies	**x**		**x**			**x**	**x**	**x**	**x**
2. The graduate has knowledge and understanding of the theoretical and methodological principles of natural science and of the field of innovation studies	**x**		**x**	**x**	**x**	**x**	**x**	**x**	**x**
3. The graduate has acquired general academis skills, especially in relation to natural science and of the field of innovation studies	**x**	**x**	**x**	**x**		**x**	**x**	**x**	**x**
4. The graduate can use the acquired knowledge and understanding in a way that shows professional approach to his/her work or profession				**x**	**x**	**x**	**x**	**x**	**x**
5. The graduate:									
a. can translate a practical question or problem of the subject area into a clear and investigable research question				**x**	**x**	**x**	**x**	**x**	**x**
b. can adequately operationalise the terms held within that research question				**x**	**x**	**x**	**x**	**x**	**x**
c. can study a subject both theoretically and empirically while relating one to the other		**x**		**x**	**x**	**x**	**x**	**x**	**x**
d. can present the result(s) in a coherent argumentation that is synthesised in a clear conclusion				**x**	**x**	**x**	**x**	**x**	**x**
e. can use the result(s) for answering the practical question or to contribute to clarification and – if possible – solution of the problem				**x**	**x**	**x**	**x**	**x**	**x**
f. can form a judgement that includes reflection on relevant social, scientific and ethical issues				**x**		**x**	**x**	**x**	**x**
6. The graduate can communicate informations, ideas and solutions to both specialist and non-specialist audiences				**x**	**x**	**x**	**x**	**x**	**x**
7. The graduate has developed those learning skills that are necessary to undertake a higher education programme at the Master level	**x**			**x**		**x**	**x**	**x**	**x**

Master's programme

SIM degree qualifications

The level of the SIM Master's degree programme is defined by the qualifications to be attained by the students. Since the Science and Innovation Management programme is part of the Graduate School of Geosciences and the CROHO Science and Innovation Management, a set of qualifications is formulated at these three levels: the level of the Graduate School, the level of the CROHO and the level of the programme, as shown in Table 3.1. The degree qualifications of the Graduate School of Geosciences apply to all eight programmes of this school (see Appendix 5). The degree qualifications of the CROHO SIM apply to all programmes of the CROHO (which currently comprise only the SIM Master's programme), whereas the degree qualifications of the Science and Innovation Management Master's Programme apply specifically to this programme.

Degree qualifications of the SIM Master's programme

Degree qualifications Graduate School of Geosciences

The graduate:

1. has a deep knowledge and understanding of the subject matter of Geosciences;
2. has a thorough knowledge of a specialism in their degree programme, or a thorough knowledge at the interface of their degree programme and another subject area;
3. has the skill to independently identify, formulate and analyse problems in the field of Geosciences, and to propose possible solutions;
4. has the skill to conduct research in the field of Geosciences and to report on this research in a manner that meets the standards usual for the discipline;
5. possesses professional and academic skills, particularly in relation to research in the field of Geosciences;
6. is able to apply and knowledge and understanding so as to demonstrate a professional approach to their work;
7. is able to communicate conclusions, as well as the knowledge, reasons and considerations underlying these conclusions, to an audience of specialists and non-specialists alike.

General degree qualifications CROHO Science and Innovation Management

The graduate:

1. has advanced knowledge and understanding of the field of Science and Innovation in its organizational/societal context;
2. is able to conduct research in the field of the programme in a creative and independent way;
3. has the ability to apply knowledge and understanding and problem-solving abilities in broader contexts related to the field of Science and Innovation;
4. has insight into the interaction between science, innovative technology and society and is able to reflect critically upon the roles of science and technology in society;
5. has a professional and critical attitude towards social and ethical aspects of the

knowledge acquired and competencies gained;
6. is able to work effectively in (multidisciplinary) teams and to communicate conclusions, as well as the knowledge, reasons, and considerations underlying these conclusions to an audience of specialists and non-specialists alike;
7. has the learning skills to pursue (advanced) research in the field of Science and Innovation in its organizational/societal context.

Degree qualifications Science and Innovation Management Master's Programme

The graduate:

1. can, from their topical knowledge about scientific and technological innovation processes, describe, explain, illustrate, and evaluate the accepted theoretical concepts, paradigms, and models;
2. is able to indicate, illustrate, integrate, analyse, and evaluate significant examples which show the interaction between the development of science on the one hand and organizational and social developments on the other;
3. has knowledge of the most significant concepts, models, and explanations in the field of innovation theory and is able to make well-considered choices while analysing innovation issues;
4. is able to apply knowledge of science and innovation theory while analysing, preparing, implementing, and evaluating complex innovation processes and intervention mechanisms;
5. has knowledge of the foundation and use of relevant research methods and techniques in the field of innovation studies, and is able to apply these methods and techniques while planning, implementing, and validating research in this field;
6. has knowledge of the foundations and use of methods for modelling and analysing systems in order to integrate knowledge of science and innovation studies, while exploring potentially viable innovation trajectories;
7. has knowledge of methodologies for policy analysis, planning, implementation, and evaluation as well as for project management. Furthermore, s/he is able to use these methodologies in policy and management matters within the scope of innovation trajectories;
8. is able to communicate effectively (orally and in writing) and can work effectively in a team.

Correlation of degree qualifications of the SIM Master's programme with the Dublin descriptors

These SIM Master's degree qualifications correspond with the Dublin descriptors of qualifications that signify completion of the second cycle of higher education, as described below and summarized in Table 3.2.

Dublin qualification A
The students have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically with Bachelor's level, and that provides a basis or

opportunity for originality in developing and/or applying ideas, often within a research context.

The qualification is achieved by the attainment of the *SIM Master's degree qualifications 1, 2* and *3*, which state:

1. The graduates are able – from topical knowledge about scientific and technological innovation processes – to describe, explain, illustrate, and evaluate the accepted theoretical concepts, paradigms, and models.
2. The graduates are able to indicate, illustrate, integrate, analyse, and evaluate significant examples which show the interaction between the development of science on the one hand and organizational and social developments on the other.
3. The graduates have knowledge of the most significant concepts, models, and explanations in the field of innovation theory and are able to make well-considered choices while analysing innovation issues.

Dublin qualification B
The students can apply their knowledge and understanding and problem-solving abilities in new and unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.

The qualification is achieved by the attainment of the *SIM Master's degree qualifications 4* and *5*, which state:

4. The graduates are able to apply knowledge of science and innovation theory while analysing, preparing, implementing, and evaluating complex innovation processes and intervention mechanisms.
5. The graduates have knowledge of the foundations and use of relevant research methods and techniques in the field of innovation studies, and are able to apply these methods and techniques while planning, implementing, and validating research in this field.

Dublin qualification C
The students have the ability to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information but include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.

The qualification is achieved by the attainment of the *SIM Master's degree qualifications 6* and *7*, which state:

6. The graduates have knowledge of the foundations and use of methods for modelling and analysing systems in order to integrate knowledge of science and innovation studies, while exploring potentially viable innovation trajectories.
7. The graduates have knowledge of methodologies for policy analysis, planning, implementation, and evaluation as well as for project management. Furthermore, they are able to use these methodologies in policy and management matters within the scope of innovation trajectories.

Dublin qualification D
The students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.

The qualification is achieved by the attainment of the *SIM Master's degree qualification 8*, which states:

8. The graduates are able to communicate effectively (orally and in writing) and they can work effectively in a team.

Dublin qualification E
The students have the learning skill to allow them to continue to study in a manner that may be largely self-directed or autonomous.

The qualification is achieved by the attainment of *SIM Master's degree qualifications 3, 4, 5* and *6* as stated above. These qualifications ensure that SIM graduates are capable of analysing new unfamiliar innovation problems requiring them to learn individually and independently new knowledge and methods, integrating them in their existing knowledge base and combining them in their research.

Correlation of degree qualifications of the SIM Master's programme with the Dublin descriptors

Dublin descriptor	Degree qualification SIM programme	General degree qualification CROHO SIM	Degree qualification Graduate School of Geosciences
A	1, 2, 3	1	1,2
B	4, 5	2, 3	3,4
C	6, 7	4, 5	5,6
D	8	6	7
E	3, 4, 5, 6	7	3,4

Realization of the degree qualifications in the courses
The contribution of the courses taught during the first year of the SIM programme to the realization of the SIM Master's degree qualifications, which are described in Section 3.1.2, can be summarized as follows. For every course in Year 1 of the SIM programme the objectives are stated below (see also the SIM Course Catalogue 2010-2011 in Appendix 4) and its relationship(s) with the SIM Master's degree qualifications numbered above is/are given in brackets.

Innovation & Organization (I&O)
- Acquisition of knowledge about different theoretical strands in the literature on organizational learning and innovation. [1]
- Construction of testable conceptual models and relating them to existing theories on organizational learning and innovation. [2,3,8]

Mastering Theories of Technology and Innovation 1 (MTTI1)
- Acquisition of knowledge about the most important theories of innovation. [1]
- Developing skills to apply these theories in the analysis of technology and innovation. [2,3,8]

Mastering Theories of Technology and Innovation 2 (MTTI2)
- Acquiring capabilities regarding the identification of the role of theories in problem-solving. [3,8]
- Developing capabilities to apply theories in order to understand technology and innovation. [4,8]

Measuring and Modelling Innovation 1 (MMI1)
- Acquisition of knowledge and skills concerning methods of measuring and modelling innovation. [5]
- Acquisition of knowledge and skills concerning the collection of quantitative data. [5]

- Acquisition of knowledge and skills concerning the interpretation of the collected quantitative data and the results. [6,7,8]

Measuring and Modelling Innovation 2 (MMI1)

- Acquisition of knowledge and skills concerning methods of measuring and modelling innovation. [5]
- Acquisition of knowledge and skills concerning the collection of quantitative data. [5]
- Acquisition of knowledge and skills concerning the interpretation of the collected quantitative data and the results. [6,7,8]

Designing Innovation Research (DIR)

- Learning a structured approach in terms of how to start, pursue and complete a research project. [3,4,5,6,7,8]

Project Innovation Management (PIM)

- Learning how to analyse independently the complexity of context-dependent innovation management in practice based on sound theoretical models, data collection and data analysis. [2,3,4,5,6,7,8]
- Learning to derive innovation management measures from the results obtained that can be applied in practice in the form of management advice. [2,3,4,5,6,7,8]

Overview of the relations between the objectives of the SIM courses and the MSc thesis and the SIM Master's degree qualifications

SIM qualifications	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Courses								
Innovation and Organization	x	x	x					x
Mastering Theories of Technology and Innovation I	x	x	x					x
Mastering Theories of Technology and Innovation II			x	x				x
Measuring and Modelling Innovation I				x	x	x	x	x
Measuring and Modelling Innovation II				x	x	x	x	x
Designing Innovation Research			x	x	x	x	x	x
Project Innovation Management		x	x	x	x	x	x	x
Master's thesis SIM	x	x	x	x	x	x	x	x

Appendix 4: Overview of the curricula

Bachelor's programme

All courses amount to 7.5 or 15 EC. Students take 15 EC per period.

- **Compulsory major course**
- **Major dependent elective course**
- *Recommended elective course*
- LS = Life Sciences; ET = Energy and Transport

Year 1

Period 1	**Introductie Technologie & Innovatie,**	**Wiskunde en Systeemanalyse**
Period 2	**E&T: Chemie van Systeem Aarde** *Moleculaire Celbiologie en Genetica*	**Micro-economie van Innovatie**
Period 3	**LS: Organische Chemie**	**E&T: Natuurkunde voor Energie en Transport** **LS: Humane Biologie**
period 4	**Organisations Theories**	*The Microscope and the Elephant (Philosophy of Science)*

Year 2

Period 1	**E&T: Toegepaste Thermodynamica & Energieconversies**	**Innovation Systems**
Period 2	**Onderzoeksvaardigheden 1 Innovatiewetenschappen** *Global Climate Change*	**LS: Ziekte en Medicijnen** *Wetenschapsfilosofie en ethiek: De microscoop en de olifant*
Period 3	**Economie van Technologie en Innovatie**	**Innovation Policy** *Innovaties voor Duurzame Mobiliteit*
Period 4	**Innovatie Project 1**	

Year 3

Period 1	**Management of Innovation Processes** **Duurzaam Ruimtegebruik**	**LS: Sustainable Drug Development**
Period 2	**Emergent Technology Dynamics** **LS: Management Life Sciences Innovaties**	**E&T: Energy Analysis** **Business, Sustainability & Innovation** **Bachelor Thesis NW&I**
Period 3	**OV: Onderzoeksvaardigheden 2**	**Models of Technological Change**
Period 4	**Innovatieproject-2,**	**Bachelor Thesis NW&I**

Master's programme

Year 1 (start 2011)

Period 1	(A) Mastering Theories of Technology & Innovation I	(C) Technology Related Venturing
Period 2	(A) Mastering Theories of Technology & Innovation II	(C) Measuring & Modelling Innovation I
Period 3	(C) Designing Innovation Research	(D) Measuring & Modelling Innovation II
Period 4	(A+C) Project Innovation Management	

Year 2 (start 2010)

Period 1	Optional Course	Optional Course
Period 2	Master Thesis	
Period 3		
Period 4	Optional course: Publishing your Research	

Recommended optional courses:
in period 1, slot C, Environmental Ethics & SDor in period 1, slot C, Introduction to the Energy and Resource Systemor in period 2, slot A, Policy Analysis
or in period 4, slot A, Energy Policy & Transitions
or in period 2 (slot to be determined), Sustainable Entrepreneurship

or writing a competitive PhD proposal (7.5 EC). By invitation only!

Appendix 5: Quantitative data

Bachelor's programme

Data on intake, transfers and graduates

Intake and transfer pertaining to the last seven cohorts[a]

	Intake		Transfer [b]		
Cohort	**Male**	**Female**	**Total**	**#**	**%**
2005-2006	80	21	101	75	74%
2006-207	100	29	129	93	72%
2007-2008	76	16	95	62	65%
2008-2009	59	17	76	53	70%
2009-2010	78	28	106	71	67%
2010-2011	61	21	82	66	80%
2011-2012	56	14	70	n/a	n/a

a Source: Osiris student database
b Enrolled in the NW&I programme for the next year

Binding Study Recommendation (BSA) pertaining to the last six cohorts[a]

Cohort	**Positive**	**Negative**	**Stopped before February**	**Advice adjourned**	**Started in February**	**No advice**[b]	**Total**
2006-207	93	15	8	0	2	11	129
2007-2008	65	22	0	7		1	95
2008-2009	53	13		10			76
2009-2010	71	18	14			3	106
2010-2011	70	10	2				82
2011-2012	n/a	n/a	n/a	n/a	n/a	n/a	n/a

a Source: Osiris student database
b Students who switched from the doctoral phase and pre-master students

Efficacy of the programme (graduates) pertaining to the last six cohorts [a]

Cohort	**Transfer** [b]	**Total # graduates**	**After 1 year**	**After 2 years**	**After 3 years**	**After 4 years**	**After 5 years**	**After 6 years**
2005-2006	75	74	9%	11%	40%	73%	90%	98%
2006-207	93	93	12%	12%	53%	87%	100%	
2007-2008	62	39	0%	0%	11%	63%		
2008-2009	53	12	0%	0%	23%			
2009-2010	71	0	0%	0%				
2010-2011	66	0	0%					

a Source: Osiris student database
b Enrolled in the NW&I programme for the next year

Average amount of face-to-face instruction per stage of the study programme

	Total face-to-face hours scheduled	EC (major courses)	Hours (major courses)	Percentage of face-to-face hours in major courses
Bachelor-1	326	37,5	1050	31%
Bachelor-2	269	45	1260	21%
Bachelor-3 [b]	284	52,5	1470	19%

a Data taken from the Education Card 2010. The hours mentioned relate to scheduled major mandatory and major optional NW&I courses. Students also take 45 EC in non-major optional courses (over the three-year programme). These optional courses are not included in the numbers. We chose the academic year 2010-11 to provide these data because this was the first year in which the full three years of the new NW&I programme were implemented.
b including the scheduled seven hours' face-to-face contact for supervision of the Bachelor's thesis

Staff-student ratio achieved

Teacher-student ratios achieved 2009-11[a]

	Regular staff (fte)	External staff (fte)	PhD students (fte)	Student assistants (fte)	Total teaching staff (fte)	Number of registered students	Student-staff ratio achieved
2009-2010	3.8	2.4	0.1	1.0	7.3	319	44
2010-2011	4.0	1.0	0.4	0.7	6.1	290	48

a Data are based on a 'teacher-course allocation table' that is constructed every year and shows the precise involvement of each staff member in each of the NWI&I courses. The number of registered students is retrieved from the Osiris student database (number of students per year, active code 4).

Master's programme

Data on intake, transfers and graduates

Registered first-year students for the Science and Innovation Management Master's Programme, by academic year, starting date and gender

academic year	total inflow	start September	start February	% female
2005-2006	42	30	12	19
2006-207	41	34	7	20
2007-2008	34	28	6	12
2008-2009	23	22	1	26
2009-2010	62	54	8	24
2010-2011	34	33	1	21
2011-2012	35	29	6	20

Source: Osiris student database

BSc programmes completed by inflowing SIM students

cohort	total inflow	BSc NW&I	other UU	other Dutch universities	HBO	foreign universities
2005-2006	42	18	4	3	17	0
2006-207	41	27	1	2	10	1
2007-2008	34	25	3	1	5	0
2008-2009	23	20	0	1	1	1

2009-2010	62	50	3	1	5	3
2010-2011	34	22	2	2	8	0
2011-2012	35	21	2	5	3	4

Source: Osiris student database

Number of graduates per cohort of first-year SIM students and their relative accumulated frequencies of graduation after successive years of study (status 1 January, 2012)

cohort	inflow of students	number of graduates	effectiveness (% of registered students)					
		after	1 year	2 years	3 years	4 years	5 years	6 years
Sep-05	30	25	3	13	53	73	83	
Feb-06	12	11	0	8	67	92	92	
Sep-06	34	29	0	12	68	82	85	
Feb-07	7	7	0	29	100	100	100	
Sep-07	28	23	11	36	75	79	82	
Feb-08	6	5	0	0	50	83		
Sep-08	22	17	0	36	73	77		
Feb-09	1	1	0	0	100			
Sep-09	54	24	0	13	44			

Source: Osiris student database

The cohort of 30 admitted SIM students in September 2005 resulted in 25 graduates (83% after five years of study); 3% of these 25 graduates graduated after one year of study, 13% after two years (or, alternatively, 10% graduated after two years of study), 53% after three years (or, alternatively, 40% graduated after three years of study, etc.).

Average amount of face-to-face instruction per stage of the study programme

Face-to-face instruction (contact hours) in Year 1 of the SIM programme

Courses	Lectures	Tutorials/ computer practicals	Feedback/ consultation	Written exam	Total	Hours per week
Innovation and Organization	14	12	4	3	33	3.7
Mastering Theories of Technology & Innovation I	16	10		3	29	3.2
Mastering Theories of Technology & Innovation II	14	8		3	25	2.8
Measuring & Modelling Innovation I	14	12	0.5		26.5	2.9
Measuring & Modelling Innovation II	12	8	0.5		20.5	2.1
Designing Innovation	1	42			43	4.3

Research						
Project Innovation Management	6	8	2.75	2	18.75	1.9

Source: Course schedules 2010-11

Staff-student ratio achieved

Teaching staff, number of registered students (on October 1) and student-staff ratio achieved

	regular staff (fte)	PhD students (fte)	student assistants (fte)	external staff (fte)	total teaching staff (fte)	number of registered students	student-staff ratio achieved
2009-2010	3.00	0.00	0.00	0.00	3.00	119	39.67
2010-2011	3.75	0.02	0.00	0.18	3.95	116	29.37

Sources: Osiris student database and the Annual IES task table

Appendix 6: Programme of the site visit

Programme Audit Natuurwetenschap & Innovatiemanagement (BSc) / Science and Innovation Management (MSc) – Utrecht University, June 7th and 8th 2012

Thursday	June 7th		(Staff) members
09.30	12.30	Committee meeting behind closed doors + lunch (discussing self evaluations and theses)	N/a
12.30	13.30	Meeting with management and staff responsible for the programme	Dr. Margien Bootsma (Director of Education), Dr. Jan Faber (Programme leader SIM), Dr. Jacco Farla (Programme leader NW&I). prof. dr. Marko Hekkert (head of section IS)
13.30	14.15	Meeting with BSc students	Dieke ter Weel (NW&I, year 1, LS), Clarice van Manen (NW&I, year 1, E&T), Mandy van der Net (NW&I Honours, year 2, LS), Veroni van Es (NW&I, year 3, LS), Koen Gorissen (NW&I, year 2, E&T), Matthee le Cointre (Chairman Helix Board NW&I, year 3, E&T)
14.15	15.00	Meeting with MSc students	Toon Meelen BSc (SIM, year 1), Ingrid van Prooijen BSc (SIM, year 1), Nastya Abolina MSc (SIM, year 1), Tijmen Altena BSc (SIM, year 2), Paul Tuinenburg BSc (SIM, year 2), Marijn van Weele BSc (SIM, year 2)
15.00	15.15	Break	n/a
15.15	16.15	Meeting with staff members	Prof. Dr. Marko Hekkert (Professor), Prof. Dr. Ir. Harro van Lente (Professor), Prof. Dr. Ellen Moors (Professor), Dr. Andrea Herrmann (Assistant professor), Dr. Gaston Heimeriks (Assistant professor), Dr. Evert Nieuwlaar (Assistant professor), Dr. Frank van Rijnsoever (Assistant professor)
16.15	17.00	Meeting with alumni	SIM: Allard van Mossel Msc, Alco Kieft MSc, Bastian Mostert MSc, Chris Eveleens MSc. NW&I: Lorain Giesbers BSc, Malou Oreel BSc, Pieter van Os BSc.
17.00	18.00	Consultation hour / committee meeting behind closed doors	Consultation hour for all students. Register at: delange@qanu.nl
18.30	21.00	Working dinner committee	n/a
Friday	**June 8th**		
9.00	10.00	Meeting with Board of Examiners and student advisor	Prof. Dr. Peter Driessen (Chairman Board of Examiners) (until 9.45am), Dr. Floortje Alkemade (Member Board of Examiners), Dr. Stefan Dekker (Member Board of Examiners), Drs. Erika Dijksma (Secretary Board of Examiners)
10.00	10.30	Meeting with members of the Educational Committee (BSc)	Dr. Simona Negro (Member bachelor education committee), Dr. Floris van den Berg (Member bachelor education committee), Yvette de Jong (Member bachelor education committee), Fabiana Keller (Member bachelor education committee), Willem Aberson (Member bachelor education committee)
10.30	11.00	Meeting with members of the Educational Committee (MSc)	Dr. Alexander Peine (Member master education committee), Daniël Doorman BSc (Member master education committee), Myrna de Hoop BSc (Member master education committee)
11.00	12.00	Committee meeting behind closed doors	N/a
12.00	12.45	Lunnch meeting	Dr. Margien Bootsma (Director of Education), prof. dr. Marko Hekkert (head of section IS), Prof. Dr. Ellen Moors (Professor), Prof. Dr. Ir. Harro van Lente (Professor)
12.45	13.30	Committee meeting behind closed doors	n/a
13.30	14.00	meeting with management	Prof. dr. Ronald van Kempen (Dean), Prof. dr. Piet Hoekstra (vice-dean), Dr. Margien Bootsma (Director of Education),
14.00	15.30	Committee meeting behind closed doors	n/a
15.30	16.15	Oral presentation on first impression by committee + Reception	Prof. dr. Ronald van Kempen (Dean), Prof. dr. Piet Hoekstra (vice-dean), Mr. Yvonne van Rooij, Warda Sharif MA, IW staff

Appendix 7: Theses and documents studied by the committee

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

Bachelor's programme

3275191	3312275	3106160	3221075	3376052
3377407	3361144	3404471	3282678	3402029
0030252	3379574	3302385	3345483	0448206

Master's programme

3117960	3061884	3186601	0441953	3183300
0441910	3235998	3405079	3032205	0473111
0378178	0488712	3102181	0473138	0324817

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

- Domain-specific reference framework;
- Overview of the curricula;
- Outline and description of the curriculum components, with extra attention to the Innovation courses and methodology courses;
- Reference books and other learning materials;
- Blackboard sites of bachelor's and master's courses;
- method(s), attainment targets, assessment methods, literature (mandatory/ recommended);
- Teaching and Examination Regulations;
- Allocated staff with names, positions, scope of appointment, level and expertise;
- Reports on consultations with relevant committees/bodies;
- List of the final projects of the past two years;
- Summary and analysis of recent evaluation results and relevant management information;
- Results of the National Students Survey concerning the SIM programmes.

Appendix 8: Declarations of independence

nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: P F Wouters

HOME ADDRESS:

Jeeradtkade 17D
1103 PW Amsterdam

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Science and Innovation Management
Utrecht University

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Utrecht University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands-vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Leiden

DATE: 6/6/12

SIGNATURE:

2

nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: J Grin

HOME ADDRESS: Ruiterlaanbrug 7d
1034 XD Amsterdam

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Science & Innovation Management

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

University of Utrecht

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands-vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Utrecht

DATE: 7/6/2012

SIGNATURE:

2

nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Volker HOFFMANN, PROF Dr

HOME ADDRESS:

CHRUMMWISSTR. 27
8700 KÜSNACHT, SWITZERLAND

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

BSc NWI } Utrecht U.
MSc SIM }

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Utrecht U.

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Zurich DATE: 6.6.12

SIGNATURE:

2

nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Cees Leeuwis

HOME ADDRESS:

Rijksstraatweg 123
6573 CL Beek-Ubbergen

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

BSc & MSc Science and Innovation Management.

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

University Utrecht

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Utrecht DATE: 7-6-2012

SIGNATURE:

2

nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Aniek Berendsen

HOME ADDRESS:

Jacoba van Beierenlaan 63
2613 JA Delft

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Science and Innovation Management
Bachelor & Master Degree - University Utrecht

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Utrecht University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIE
OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL C
CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULI
INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME
EITHER A POSITIVE OR A NEGATIVE SENSE;

nvao
nederlands-vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Utrecht

DATE: 07/06/2012

SIGNATURE: Berendsen

nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Daan de Lange MA

HOME ADDRESS: Catharijnesingel 56
Postbus 8035
3503 RA Utrecht

HAS ~~BEEN~~ ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN ~~EXPERT~~ / SECRETARY:

BSc Natuurwetenschap en Innovatiemanagement
MSc Science and Innovation Management

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Utrecht University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

nvao
nederlands-vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Utrecht

DATE: June 7th 2012

SIGNATURE: