

ONDERZOEK

Bachelor's programme

Science and Innovation Management

Utrecht University

Report of the limited programme assessment

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# Executive summary

The outcome of the external assessment of the bachelor's programme Science and Innovation Management (NW&I) of Utrecht University by an NVAO-approved panel is positive.

The programme aims to form a basis for students to become academic professionals who can function at the interface between research, development, and implementation of innovations in society. The panel values the embedding of NW&I in the Copernicus Institute, a well-known research institute.

The intended learning outcomes are sufficiently concrete and reflect more than adequately the level and orientation that can be expected of a bachelor's programme at a university. To position itself more distinctively within the domain, the panel encourages the programme to further solidify its own profile.

The curriculum structure of the programme, which combines innovation science courses, natural science courses and courses related to an application domain (Energy & Transport (ET) or Life Sciences (LS)), research methods courses, and integration courses, reflects the objectives of the NW&I programme. According to the panel, the curriculum has a good balance between core courses, electives and projects. It also ascertained that the programme is feasible.

The panel values group work as it allows students from diverse backgrounds to contribute to interdisciplinary challenges and learn from each other. However, the panel advises the programme to make sure that students gain academic skills individually (such as writing skills) before starting the bachelor's thesis.

The programme is taught by a high-quality and committed teaching staff. The panel appreciates the use of external guest speakers who add different perspectives. The programme offers students plenty of support, and students appreciate the involvement and dedication of the teaching and supporting staff.

The programme has a valid, transparent, and reliable system of assessment in place. The assessment methods are varied and fit the goals of the programme. NW&I's assessment plan clearly outlines the integral execution of the examination policy and serves as a working document with ambitions and recommendations for continuous assessment improvement within the programme.

The panel is pleased with the measures the programme took to assess the group work. For further improvement of the programme the panel recommends bringing down the proportion of group assessment of courses (except the innovation projects) to 50% or lower and implementing measures to assess the individual contribution in group assignments.

Although the Board of Examiners (BoE) sufficiently safeguards the quality of assessment and thus carries out its formal tasks, it was not on top of all content and procedures of the programme. The panel encourages the programme to continue the professionalisation of the BoE and recommends introducing a more structural approach to improve the communication between the BoE and the programme.

The panel concludes that graduates achieve the intended learning outcomes by the end of the programme. The theses are generally of good quality. The panel is of the opinion that one of the theses it studied, should have been assessed as unsatisfactory. The panel considers this to be an outlier, not being representative of the general quality of the theses.



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

Date: 18 January 2023

Wiebe Bijker  
(chair)

Annemarie Venemans  
(secretary)



# 1. Introduction

## 1.1 Administrative data

Name of the programme:	B Natuurwetenschap en Innovatiemanagement (NW&I)
CROHO number:	56982
Level of the programme:	Bachelor
Orientation of the programme:	Academic
Study load:	180 EC
Location:	Utrecht
Variant:	Full-time
Submission deadline:	1 May 2023

## 1.2 Introduction

This report focuses on the assessment of the bachelor's programme Science and Innovation Management (Natuurwetenschap en Innovatiemanagement, NW&I). This assessment forms part of a cluster assessment of six programmes at three universities. Appendix A provides an overview of the six participating programmes.

The assessment is based on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands 2018 (limited framework).

## 1.3 Panel composition

The panel that assessed this bachelor's programme consisted of the following members:

- Prof. Wiebe Bijker (chair), emeritus professor of Technology & Society, Maastricht University;
- Prof. Magnus Klofsten, Professor in innovation and Entrepreneurship, Linköping University, Sweden;
- Prof. Lotte Krabbenborg, Associate Professor Public participation in the development of science and technology, Radboud University;
- Dr. Pieter Heringa, Strategic advisor research policy, Hogeschool Inholland;
- Iris Brugmans MSc (student member), student M Healthcare policy innovation and management, Maastricht University.

The panel was supported by dr. Annemarie Venemans-Jellema, who acted as secretary.

All panel members and the secretary have signed a declaration of independence and confidentiality. In this declaration they affirm not to have had any business or personal ties with the programme in question for at least five years prior to the review.

The NVAO approved the composition of the panel on 16 September 2022.



## 1.4 Working method

### *Preparation*

The programme drew up a self-evaluation report describing the programme's strengths and weaknesses. This self-evaluation report included a chapter in which the students reflected on the programme. The panel members prepared the assessment by analysing the self-evaluation report and the appendices provided by the institution. The panel also studied a selection of fifteen bachelor's theses and the accompanying assessment forms from the programme. The theses selection was made by the panel's secretary based on a provided list of theses of the most recent years. In the selection, consideration was given to a variation in assessments (grades) specialisations, and topics.

The panel members individually formulated their preliminary findings and a number of questions they wanted to raise during the site visit. The secretary made an overview of these preliminary findings and questions and sent these to the panel members. On 18 October 2022, the panel held an online preparatory meeting. In this meeting, the panel discussed the programme's preliminary findings and discussed the most important topics they wanted to touch upon during the site visit.

### *Visit*

The site visit took place on 9 November 2022 (see Appendix B for the schedule). During the preparatory meeting, the panel discussed the preliminary findings and decided which questions to raise in their meetings with the programme representatives. During the visit, the panel spoke with representatives of the management, students, lecturers, alumni, and Board of Examiners about this programme and the master's programme Science and Innovation. Everybody involved in the programme had the opportunity to inform the panel in confidence about matters they consider important to the assessment. No one made use of this opportunity. The panel used the last part of the visit to evaluate the interviews and had a second meeting with the programme's management to receive answers to remaining questions. At the end of the visit, the chair presented the panel's preliminary findings and impressions of the programme.

### *Report*

The secretary drew up a draft report based on the panel's findings. This draft report was presented to the members of the panel and adjusted on based on their feedback. After adoption, the draft report was sent to the institution for verification of factual inaccuracies. The secretary discussed the programme's comments with the chair, after which the secretary drew up the final report and circulated it to the panel for a final round of comments.

The report follows the four standards such as set of in the NVAO's Assessment Framework 2018 (limited framework): 1) the intended learning outcomes, 2) the teaching-learning environment, 3) assessment, and 4) achieved learning outcomes. Regarding each of the standards, the assessment panel gave a substantiated judgement on a three-point scale: meets, does not meet, or partially meets the standard. The panel subsequently gave a substantiated conclusion regarding the quality of the programme, also on a three-point scale: positive, conditionally positive, or negative.



*Development dialogue*

Although clearly separated from the process of the programme assessment, the assessment panel members and programme representatives conduct a development dialogue, with the objective to discuss future developments of the programme considering the outcomes of the assessment report.





## 2. Review

### 2.1 Intended learning outcomes

*The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.*

#### *Findings, analysis, and considerations*

The NW&I programme is a 180 EC bachelor's programme offered by the Department of Sustainable Development, Faculty of Geosciences of Utrecht University. The mission of the programme is to educate students in understanding and contributing to innovation processes at the interface of natural science and technology as well as to innovation processes in organisations and in wider society. The programme provides a basis for students to become academic professionals who can function on the interface between research, development, and implementation of innovations in society. The programme is embedded in the Copernicus Institute, a well-known research institute that focuses on the development of multi- and interdisciplinary knowledge that facilitates transformations to a sustainable and equitable society.

The panel studied the aims and profile of the programme and concludes that the programme has a clear and relevant profile. According to the panel, the programme has a strong interdisciplinary character and meets the requirements from academia and industry for students who can connect technological and social innovation. The embedding in the Copernicus Institute provides the programme with a focus on the technological possibilities and the societal achievements in the area of sustainable energy, transport and life sciences and guarantees a strong embedding in state-of-the-art research in this area.

In close collaboration with the programme directors of the affiliated programmes at Vrije Universiteit Amsterdam (VU) and the Technical University of Eindhoven (TU/e), a domain-specific reference framework was established in 2021, in which the respective bachelor's and master's programmes were included that educate students in the field of innovation sciences. The panel highly welcomes this joint effort and considers the framework to be an appropriate description of the international academic field of innovation sciences. In addition, the framework provides a good description of the programme objectives of both the bachelor's and master's programmes in this field and the requirements graduates of these programmes must meet. The panel encourages the programme to use this framework to further solidify its own profile and make more explicit how it differentiates itself from other innovation sciences programmes.

NW&I formulated intended learning outcomes (ILOs) in line with the domain-specific framework of reference. The panel observed these ILOs are well-formulated and sufficiently concrete. According to the panel, the ILOs are aligned with the Dublin descriptors, thus clearly reflecting the bachelor's level.

To achieve these ILOs, NW&I students choose one of two application domains: Energy & Transport (ET) or Life Sciences (LS). The panel considers the domains well-chosen as they reflect the research expertise of the staff members.



*Conclusion*

The panel concludes that the programme has a clear profile and the ILOs are well described in terms of level and orientation. The programme, therefore, meets standard 1.

**2.2 Teaching-learning environment**

*The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.*

*Findings, analysis, and considerations**Curriculum*

The interdisciplinary programme has a basic set-up of four main categories of courses: (A) innovation science courses, (B) natural science courses and courses related to an application domain (ET or LS), (C) research methods courses, and (D) integration courses (innovation projects). A complete outline of the curriculum can be found in Appendix E.

During their innovation science courses in the first year, students gain an understanding of innovation processes in three compulsory courses: *Introductie Technologie en Innovatie*, *Innovation Systems*, and *Principles of Economics*. These three courses introduce the building blocks for three theoretical learning trajectories that structure the innovation science courses in years two and three. All innovation courses in years two and three are major-elective courses.

The first natural science courses are introductory to natural sciences (including *Wiskunde en Systeemanalyse*). From the second half of the first year onwards, the natural science topics are integrated into the application domains' courses. Understanding the natural sciences is geared towards studying the technologies that are important in the application domains.

Students learn research skills, including collecting and analysing data, in two research-methods courses: *Onderzoeksvaardigheden Innovatiewetenschappen* and the *Statistics* course.

Integration of the knowledge and skills from the abovementioned course categories takes place in the integration courses. The integration course at the end of the first year, *Technologiebeoordeling en evaluatie*, teaches students a range of technology assessment methods and applies these to a predefined innovation problem. In *Innovatieproject 1* (end of year 2), students solve a problem for a real-life client related to either the ET or LS domain, following predefined steps leading to an integration step in which several technological options are compared on natural science and innovation science criteria.

The two other integration courses, *Innovatieproject 2* and the bachelor's thesis are the courses in which all ILOs are tested. *Innovatieproject 2* is a course at the end of the programme in which students start with a practical problem introduced by a real-life client, then translate this problem into a research question and conduct the ensuing research. In the 15 EC bachelor's thesis, students show that they can individually (with supervision) conduct a delineated, independent research project, mostly based on collecting their own empirical data.



The bachelor's thesis starts with the writing of an individual research proposal. After receiving approval for their research proposal, students begin to research their topic. The research culminates in a thesis on a particular innovation related to the domain that corresponds with the track they follow. Students give a poster presentation of their thesis to fellow students and lecturers. In addition, they complete a peer review of the proposal and thesis of a fellow student.

From 2023-2024 onwards the programme will introduce a new curriculum. Although this new curriculum is not part of this accreditation, the panel is positive about the extensive development process the programme has undertaken so far. It is confident that this new curriculum responds well to developments in the field. For example, the programme aims to strengthen the coverage of digital innovation in both domains and to introduce more cultural diversity into the topics.

The panel studied the current curriculum of the programme, as well as the content of several courses, and discussed this with the programme management, students and teaching staff. The panel considers the curriculum of both domains to be an appropriate reflection of the intended learning outcomes of the programme, comprising theoretical and methodological knowledge and skills as well as academic and research skills. The curriculum is well-structured, attractive for students and has a good balance between core courses, electives, and projects.

The panel appreciates the room provided to students to determine their own study route. In addition to the major elective courses, there are several minors available that fit well with the NW&I programme. The panel is pleased with the newly developed major elective course *Digital Innovation*. The panel is also positive about the coherent major-elective learning pathways being developed to help students with their choice of electives.

The panel speaks highly about the integration courses. According to the panel, these courses are well-designed with increasing complexity and achieve their goals. This finding was confirmed by the students who consider these courses to be very important as they offer room for in-depth study in a different learning mode.

The panel is convinced of the focus on critical thinking throughout the programme. Students are well trained to provide clear and critical analyses, scientifically sound argumentation, and practical strategies for problem identification and solution. Students with whom the panel met explained that critical thinking is a common thread throughout the curriculum. Especially the innovation projects are helpful for them to critically reflect and to practice giving feedback in a safe environment.

The language of instruction of the programme is Dutch. However, some courses are taught in English because these are shared with the international bachelor's programme 'Global Sustainability Science' or are taught by international staff members. In line with UU guidelines, no more than 30% of the courses are taught in English. The panel supports this choice.

#### *Learning environment*

In line with the UU educational concept, the programme offers students a personal, activating and small-group learning environment. The courses combine lectures with small-group tutorials, assignments, group discussions, and projects based on real-life cases. According to the end-of-year evaluations, students value collaboration in small groups. Students mentioned in the student chapter that working in teams is important for social skills and getting to know fellow students. In their opinion, it also allows lecturers to create more interesting assignments because much more can be achieved when working together. The students did have some reservations concerning the assessment of group work, which will be discussed in standard 3.



According to the panel, group work is very well suited to the small-scale and interdisciplinary character of the programme, as it allows students from diverse backgrounds to contribute to interdisciplinary challenges and learn from each other.

However, the panel is of the opinion that group work doesn't guarantee that students gain all academic skills. The panel did also notice that the programme does not explicitly monitor the division of tasks in project groups. According to the panel, this could lead to 'specialisation', where students practice skills that they are already good at rather than those that they still need to develop. In addition, individually writing and individually presenting are only part of the bachelor's thesis (and for students who follow the LS domain, individually writing is part of the *Management of Life Sciences* course). The panel advises the programme to make sure that students gain academic skills (such as writing skills) individually, before starting the bachelor's thesis. The panel is pleased that this is on the agenda in the new curriculum.

#### *Student intake*

The bachelor's programme must deal with increasing student enrolment numbers. In the past academic year, the programme had to accommodate 175 enrolling students, while in 2015 only 80 students enrolled. Part of the increase is due to the COVID-pandemic. NW&I aims at enrolling between 110-120 new students per academic year.

The panel noted that the students are not evenly spread over the two domains with a majority choosing the ET domain. It agrees with the programme management that more can be done to better communicate the profile of the LS programme to interest more students in this domain.

The panel is positive about the measures the programme takes to increase the diversity of the incoming student population in terms of gender, cultural background, and first-generation students. NW&I will participate in two faculty-wide projects on diversity in intake and building an inclusive curriculum.

#### *Staff*

The programme is taught by a multidisciplinary teaching staff originating from the Copernicus Institute. The teaching staff members all hold a doctorate and are active researchers. The panel acknowledges the staff's excellent international academic reputation. It is of the opinion that on the one hand, the excellent research contributes to the relevance of the programme, and on the other hand, it also offers students optimum opportunities to get to know the scientific professional field.

All courses are coordinated by a tenured staff member with a relevant PhD and University Teaching Qualification (UTQ). 61% of the staff is tenured. In addition to tenured teaching staff the programme benefits from a group of junior lecturers, junior researchers, and junior assistant professors (39%), who are involved in teaching (mostly tutorials, in some cases, also lectures) and supporting course organisation and improvement. The Copernicus Institute expects temporary teaching staff to take part in the new university-wide 'Start to teach' programme and in the UTQ trajectory.

To further professionalise teaching staff, the programme has a well-functioning system in place. In addition to the regular lunch meetings, there is the yearly Education Day for all staff members involved in education, in which the educational programme is discussed and experiences with new teaching practices are shared.



The panel has met with a team of NW&I lecturers. It is clear to the panel that students are part of a high-quality and committed teaching and research environment. In addition, students were very pleased with the involvement of staff members. According to the students, there is always a lot of interaction between the staff and the students. External guest lecturers are appreciated because they offer different insights and perspectives that add to the knowledge provided by the lecturers.

During the site visit, the panel discussed with the programme management and the teaching staff the workload related to growing student numbers. The panel was pleased that the programme has used part of the quality funds to recruit additional teaching staff to keep the workload manageable.

#### *Study load and study guidance/mentoring*

The previous accreditation panel recommended increasing the study load for the students in especially the first year and making the courses more challenging. In response, the programme improved several first-year courses. During the site visit, the panel asked students about the feasibility of the programme. Students need to work hard to successfully complete their courses and projects but feel that the programme is overall feasible and allows them to complete it within the designated time. They value the gradual build-up in workload throughout the programme.

Students feel well-supported throughout the programme, including during the COVID-19 pandemic. The study advisors meet first-year students three times a year on a plenary basis to discuss issues such as the structure of the programme, study planning, registering for courses, choosing electives and minors, studying abroad, and what to do in case of a negative 'Binding Study Recommendation' (BSA). The study advisors are also the first point of contact for individual questions and problems.

All first-year bachelor's students have a tutor who is also an NW&I lecturer. Tutors meet with students three times a year individually to discuss their first experiences, study progress and study plans. Complementary to this tutoring system, the study association NWSV Helix has set up a student-mentoring system in which first-year students are advised by senior students. In years two and three the study advisors remain the students' first points of contact in the case of individual questions and problems.

The panel praises the attention the programme pays to feasibility and study guidance. It noted that this has translated into a high success rate. According to self-evaluation report, the success rate after four years is 83%, which is higher than the national average (68%).

Students receive their information in various places, most notably through computer-supported communication channels, such as the MyTimetable app and the e-learning platform Blackboard. In addition, students have an account to access Osiris to view their grades and study progress, and to enrol in courses. The panel found this documentation accessible.

#### *Conclusion*

The panel concludes that the programme fulfils all specific requirements for the teaching and learning environment of a bachelor's programme and therefore meets standard 2.



### 2.3 Student assessment

*The programme has an adequate system of student assessment in place.*

#### *Findings, analysis, and considerations*

##### *Assessment system*

The system of student assessment for the NW&I programme is based on the UU policy regarding the organisation of assessments. The rules for testing and assessment are set out in the Teaching and Examination Regulations and the Rules and Guidelines of the Board of Examiners (BoE). The previous accreditation committee recommended the programme to draft a comprehensive assessment matrix which relates the goals, contents, and examinations of each of the courses. The panel was pleased that the programme took this recommendation by heart and has developed an Assessment Plan in which this matrix is outlined. According to the panel, the assessment matrix in the Assessment Plan shows that the assessment is aligned with the ILOs of the programme.

NW&I's Assessment Plan identifies some principles for assessment: 1) there is a clear relationship between the programme's ILOs, course learning objectives and the chosen assessment methods and forms per course; 2) both summative assessments and formative assessments will be used; and 3) the assessments are valid, reliable, and transparent. The panel is positive about the Assessment Plan which clearly outlines the integral execution of the examination policy for the NW&I programme on a curriculum as well as on a course level. The panel appreciates that this plan also serves as a working document with ambitions and recommendations for continuous improvement of assessment within the programme.

The panel is positive about the multiple types of assessment the programme uses to best assess the different course objectives. Types of assessment are for example written exams, research papers, research posters, written assignments, and oral presentations. The panel understood from the materials and the discussions that the programme has a policy of continuous assessment to activate students' learning behaviour and to monitor students and give them feedback on their achievement of the course's ILOs throughout the course. In practice, this means that for every course there are at least two different assessments. In addition to the summative assessment, several modes of formative assessments are applied, including formative feedback on draft papers and assignments, and peer feedback.

In most courses, individual assessment counts for more than 50% of the final grade. This is not the case for the integration projects and the courses *Business, Sustainability and Innovation* and *Innovation Strategies of Firms and Entrepreneurs*. The two integration courses (*Innovatieproject 1 and 2*) with a group assessment share of 100% are intended to revolve around group work leading to solving interdisciplinary, real-life innovation problems. Therefore, the panel understands that a group assignment for these courses is a logical choice. However, the panel recommends that the proportion of group assessment of the courses *Business, Sustainability, and Innovation* and *Innovation Strategies of Firms and Entrepreneurs* should be brought down to 50% or lower.

The panel extensively deliberated with management, staff, students, and BoE about the grading of group assignments. The previous accreditation committee recommended better identifying the individual results in group assignments. Since the last accreditation, the programme has made progress towards discussing this topic with course coordinators and during regular lunch meetings and developing a guide that outlines procedures for addressing free riding in different types of group



work. The panel has seen some good practices of students evaluating their own contribution in group work, for example by writing a colophon at the end of the group reports. However, students mentioned in the student chapter and during the site visit that they still experience free riding as a problem. The panel appreciates the steps the programme took to reduce free riding but recommends implementing more measures to assess the individual contribution in group assignments to reduce free riding.

#### *Grading of the theses*

The panel studied the thesis assessment forms and the thesis assessment procedure for grading the bachelor thesis. The final grade of this course is based on the assessment of the abstract (go/no go), research proposal (20%), thesis (70%), poster & presentation in English (10%) and peer feedback given to fellow students (pass/fail). To pass this final course, the research proposal, final thesis, poster presentation and peer reviews all need to be completed with a sufficient grade. The bachelor's thesis is assessed by the supervisor and by an independent second assessor separately, who both assess the 1) quality of research and thesis (70%) and 2) structure and writing style (20%). The thesis process is assessed by the supervisor only (10%).

The panel considers this assessment procedure to be well-designed. The use of an independent second examiner is a good quality assurance measure, and the division of assessment into several elements helps students keep on track with their thesis and gives them multiple opportunities to demonstrate their skills.

As part of the preparation for the site visit, the panel studied fifteen theses with the accompanying assessment forms. It concludes that the form has useful sub-criteria and rubrics to evaluate the thesis. The panel is pleased with the recent actions the programme took to further improve the thesis grading process. These actions include increasing the weight of the content of the thesis in the final grade, new instructions to lecturers on including elaborate feedback in the assessment form and including repair assignments in the assessment forms.

#### *Board of Examiners*

The BoE of the Undergraduate School of Geosciences and the Graduate School of Geosciences is responsible for the quality of the examinations. The BoE consists of one central BoE and three chambers. The faculty-wide Committee of Assessments (Toetscommissie) is – as a subcommittee of the BoE – responsible for securing the quality of assessment in the programmes of the Faculty of Geosciences.

The BoE ensures the quality of the programmes and awards degrees to the students. The Committee of Assessments independently evaluates the quality of a selected subset of examinations including theses and advises the BoE. The selection is partly random and partly based on lecturer and/or student evaluations.

The panel concludes that the BoE sufficiently safeguards the quality of assessment and thus carries out its formal tasks. Nevertheless, the panel thinks there is room for improvement. The panel observed that the BoE was not on top of all content and procedures of the programme. In addition, the panel noted that communication between the BoE and the programme could be improved. For example, the BoE didn't know if their recommendations based on thesis evaluations were implemented in the programme.





The panel understood from the programme management that there have been many personnel changes in the BoE and that much work is now being done to improve the functioning of the board. The panel encourages the programme to continue this professionalisation of the BoE and recommends introducing a more structural approach to improve the communication between the BoE and the programme.

#### *Conclusion*

The panel is positive about the system of assessment in the programme. The assessment methods are varied and fit the learning goals of the individual courses as well as the overall ILOs. The programme, therefore, meets standard 3.

## **2.4 Achieved learning outcomes**

*The programme demonstrates that the intended learning outcomes are achieved.*

#### *Findings, analysis, and considerations*

The students demonstrate that they have achieved the ILOs through *Innovatieproject 2* (7.5 EC) and the *bachelor's thesis* (15 EC). The end-product of *Innovatieproject 2* is a research-based, academic consultancy report that serves a real-life client who has an innovation challenge. Working on such an assignment links particularly well with the ILO of informing or designing policy and strategy. The research for the bachelor's thesis has a more academic, theoretical character.

To establish whether students achieve the end qualifications, the assessment committee has reviewed a sample of fifteen bachelor's theses. In the run-up to the site visit, the programme management provided an overview of the theses that were submitted in the academic years 2019 - 2020 and 2020-2021. The secretary selected the theses to be reviewed ensuring a fair distribution across scores and year of submission.

According to the panel, most bachelor's theses are of good quality. The subjects of the theses are very timely and relevant with a clear connection to the innovation field, for example, high-tech innovation, sustainable food, and health. In addition, students discuss and apply relevant literature (e.g., multilevel perspective, forecasting with quality scenarios, and technology innovation system approach). In some cases, the panel found that the students could place their work in a broader (academic) context.

However, the panel assessed three theses to be unsatisfactory, all graded by the programme with a six. Before the site visit, the panel informed the programme management about these theses. It also requested three more final projects graded with a six to better understand whether the quality of the final projects in the lower echelon is up to standard. The panel agrees that these three additional theses are satisfactory.

The programme responded in writing, and the panel and the programme management further deliberated this issue during the site visit. The management indicated that one thesis was graded unsatisfactory by the assessors in agreement with the panel's assessment but graded satisfactory after a repair assignment. Accidentally, the panel received the version of the thesis that was not repaired. The assignment and the repaired thesis have been made available for the panel. The panel graded this repaired version as satisfactory.





The second thesis which was graded unsatisfactory by the panel was written by a student who followed an older version of the programme, in which the thesis was 7.5 EC instead of 15 EC. The panel agrees that the thesis could pass as a 7.5 EC thesis, though it was not satisfactory as a 15 EC thesis.

In addition, the programme provided 21 end-products of *Innovatieproject 2*. The panel was positive about the selection of end-products of *Innovatieproject 2* it studied. All projects were on the interplay between technology and society (including economics). The end products demonstrate that students can conduct research and write an advisory report for a client from the field.

Based on the good quality of most of the theses and of the selection of end-products of *Innovatieproject 2* the panel concludes that graduates achieve the intended learning outcomes by the end of the programme. The unsatisfactory thesis is regarded by the panel to be an outlier, not being representative of the general quality of the theses. The panel ascertained that the grading process will improve further with the programme's recent measures (see standard 3).

NW&I is an academic bachelor programme, so most graduates are expected to pursue a master's degree. The panel understood from the materials and the discussions that most NW&I graduates indeed continue to a master's degree. They continue in programmes on innovation sciences and management, sustainable business, energy analysis, transport policy, life science innovations, healthcare management, complex systems, and digital innovation.

#### *Conclusion*

The panel concludes that students of the programme achieve an adequate final level. The programme, therefore, meets standard 4.



## 3. Strengths and recommendations

### 3.1 Strengths of the programme

The panel is impressed by the following features:

- Relevant profile - The interdisciplinary programme has a clear and relevant profile that meets the requirements of the working field for students who can connect technological and social innovation;
- Curriculum structure – The programme has a core structure as well as elective courses, which gives students ample opportunity to tailor the programme to their own interests;
- Integration courses – Students take part in three integration courses in which they work in teams. These projects facilitate the integration and application of acquired knowledge, understanding and skills by addressing real-life innovation challenges;
- Teaching team – The teaching staff is dedicated and well-qualified. Staff members are experts in their respective areas, bringing in the latest developments in their field;
- Research environment – The programme is taught at the Copernicus Institute, known as a top-class research institute.

### 3.2 Recommendations

For further improvement of the programme, the panel makes the following recommendations:

- Profile – Solidify the programme's profile to establish a stronger, more distinctive profile in the domain;
- Group work – Bring down the proportion of group assessment of courses (except the innovation projects) to 50% or lower and implement measures to assess the individual contribution in group assignments;
- Board of Examiners – Continue the professionalisation of the BoE and introduce a more structural approach to the communication between the BoE and the programme.



## 4. Conclusion

The panel has found that the ILOs (standard 1), the teaching-learning environment (standard 2), the assessment system (standard 3) and the achieved learning outcomes (standard 4) meet the criteria.

The ILOs reflect the programme's aims and vision and are in line with the domain-specific framework and international requirements. The curriculum, the teaching methods, the quality of the teaching staff and the assessment system enable the incoming students to achieve the ILOs.

Standard	Judgement
Standard 1	Meets the standard
Standard 2	Meets the standard
Standard 3	Meets the standard
Standard 4	Meets the standard
Conclusion	<b>Positive</b>



## Appendix A – Programmes of the cluster

The cluster Innovation Sciences consists of six programmes:

56265	B Technische Innovatiewetenschappen	Eindhoven University of Technology
66265	M Innovation Sciences	Eindhoven University of Technology
56982	B Natuurwetenschap en Innovatiemanagement	Utrecht University
60709	M Science and Innovation	Utrecht University
50670	B Science, Business & Innovation	Vrije Universiteit Amsterdam
69320	M Science, Business and Innovation,	Vrije Universiteit Amsterdam



## Appendix B – Schedule of the visit

9 November, 2022

Time	Session
08.30 – 09.30	Preparatory meeting and reviewing documents
09.30 – 10.15	Vice-dean and programme management
10.30 – 11.00	Bachelor students and members education committee
11.00 – 11.30	Master students and members education committee
11.45 – 12.15	Board of Examiners
12.15 – 13.15	Lunch
13.15 – 14.15	Lecturers, theses examiners and study advisors
14.30 – 15.15	Alumni and professional field representatives (online)
15.45 – 16.15	Programme management
16.15 – 17.30	Deliberations panel
17.30 – 18.00	Presentation of first findings



## Appendix C – Documents studied

- Self-evaluation report with appendices
  - Appendix 1: Organisation of the NW&I Bachelor's Degree Programme
  - Appendix 2: Follow-up on recommendations from the previous assessment
  - Appendix 3: Domain-specific framework of reference Innovation Sciences
  - Appendix 4: Overview of the intended learning outcomes in relation to the Dublin descriptors and the Domain-specific framework of reference
  - Appendix 5: Key figures to chapter 3 (Teaching and learning environment)
  - Appendix 6: Staff allocated to the NW&I degree programme (September 2021)
  - Appendix 7: Reports Innovation Project-2 2019-2020 and 2020-2021
  - Appendix 8: Bachelor thesis topics 2019-2021
  - Appendix 9: Members of the Advisory Board for the Copernicus Institute
  - Appendix 10: Overview of the study programme NW&I
  - Appendix 11: NW&I Course catalogue 2021-2022, including Teaching and Examination Regulations
  - Appendix 12: Institutional quality assurance assessment
  - Appendix 13: Glossary
  - Appendix 14: Programme-specific Assessment Plan NW&I
  - Appendix 15: Planned new curriculum to start in 2023-2024
  - Appendix 16: Overview of student year evaluations
- Eighteen theses with assessment forms
- Examples course manuals
- Examples of exams and answer models
- Assessment plan
- Annual report Board of Examiners



## Appendix D – Abbreviations

BoE	Board of Examiners
EC	European Credit
ET	Energy & Transport
ILO	Intended Learning Outcome
LS	Life Sciences
NVAO	<i>Nederlands-Vlaamse Accreditatieorganisatie</i>
NW&I	Natuurwetenschap en Innovatiemanagement
TER	Teaching and Examination Regulation
UTQ	University Teaching Qualification
UU	Utrecht University



# Appendix E – Outline of the programme

Figure 1 Curriculum

	Level 1 (~year 1)	Level 2 (~year 2)	Level 3 (~year 3)
(A) Innovation Sciences	Firms & Markets Principles of Economics	Organisation Theories	Innovation Strategies of Firms and Entrepreneurs
	Introductie Technologie & innovatie Innovation Systems Innovation Systems	Economics of Innovation	Innovation Policy
	Responsible Research & innovation	Science, Technology & Society	Digital Innovation Business, Sustainability & Innovation
(B) Natural Science and related application domains	Energy & Transport Science of Energy Technologies Management van Energie- & Transport-technologieën	Applied Thermodynamics & Energy Conversions	Energy Analysis
	Wiskunde & System-analyse Life Sciences Moleculaire Celbiologie & Genetica Humane Biologie	Ziekte & Medicijnen	Management van Life Sciences innovaties
(C) Research methods	Onderzoeks-vaardigheden	Statistics	
(D) Integration	Technologie-beoordeling en -evaluatie	Innovatie-project 1	Innovatie-project 2 Bachelor Thesis
		Electives	→

Major compulsory courses
  Major elective courses

