

Assessment report  
Limited Framework Programme Assessment

**Bachelor Earth Sciences**

VU Amsterdam

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## 1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Bachelor Earth Sciences programme of VU Amsterdam, which has been assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, as published on 20 December 2016 (Staatscourant nr. 69458).

The programme objectives are relevant and sound. The panel welcomes the breadth of the programme, educating students in a range of components of the earth sciences domain. The panel also appreciates the programme objectives to teach students auxiliary sciences, to train them in scientific research and to have them acquire academic skills.

The programme objectives meet the domain-specific reference framework for Earth Sciences programmes. The panel appreciates the efforts by the joint Earth Sciences programmes in the Netherlands to draft this framework and regards this to be the sound and up-to-date description of this domain.

The panel welcomes the comparison to other programmes in the Netherlands, demonstrating the profile and the specific features of the programme.

The panel is positive about students being educated to enrol in master programmes of VU Amsterdam or other universities in this domain.

The programme intended learning outcomes correspond to the programme objectives, are comprehensive and conform to the bachelor level. As some of these seem to be somewhat outdated, the panel advises to update the intended learning outcomes regularly.

The student inflow numbers of the programme are appropriate. The panel regards the entry requirements to be clear and relevant. As mathematics proficiency differences among incoming students may affect (applied) mathematics education, the panel advises to raise the mathematics proficiency of students with prior Mathematics A level education and proposes to schedule remedial courses for these students.

The curriculum meets the programme intended learning outcomes. The basic concepts in the programme domain are strongly represented in the curriculum. The panel is positive about the breadth of the curriculum and considers it to be coherent. The panel especially welcomes the pronounced practical and fieldwork components. The panel recommends strongly to increase the quantitative knowledge and skills components in the curriculum, educating students in mathematics, physics, chemistry and computer programming. The panel perceives the modelling pathway as planned by the programme as a positive step in that sense. Although the learning pathways are appreciated, the panel proposes to outline these more clearly in the curriculum.

The panel regards the teachers in the programme to be capable researchers and dedicated and skilled teachers. Their educational capabilities are up to standard, as may be deduced from the proportion of BKO-certified teachers. The panel feels the teachers' workload to be adequately managed.

The educational concept and study methods meet the programme characteristics. The number of hours of face-to-face education are generous. The panel is very positive about the study guidance and about the feedback given to students. The panel perceives the number of drop-outs as well as the student success rates to be quite appropriate.

The examinations and assessment rules and regulations of the programme are adequate, these being in line with VU Amsterdam and Faculty of Science policies.

The panel approves of the examination methods adopted by the programme and welcomes the wide variety of methods used. The methods are consistent with the goals and contents of the courses.

The supervision and assessment processes for the Bachelor thesis projects have been well-organised. Although students are offered appropriate supervision, some theses processes take long. Therefore, the panel suggests to schedule and monitor these processes more strictly. The assessment procedures are up to standard, involving two examiners assessing the work separately and on the basis of extensive and detailed assessment scoring forms.

The panel considers the measures ensuring the validity, reliability and transparency of examinations and assessments to be satisfactory.

The Bachelor theses the panel studied, match the intended learning outcomes and are adequate research projects. No theses were found by the panel to be unsatisfactory. The level and quality of the theses differ, which is reflected in the grades. The panel supports the grades given by the programme examiners. The panel finds literature studies for the Bachelor thesis projects to be less desirable and proposes to oblige students to conduct empirical research in their projects. In addition, the panel advises to achieve one standard format, limiting, among others, the differences in lay-out and referencing.

The panel regards the programme graduates to have reached the intended learning outcomes and to be qualified to enrol in master programmes in this domain.

The panel that conducted the assessment of the Bachelor Earth Sciences programme of VU Amsterdam assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be satisfactory. Therefore, the panel advises NVAO to accredit the programme.

Rotterdam, 18 March 2019

Prof. dr. ir. A. Veldkamp  
(panel chair)

drs. W. Vercouteren  
(panel secretary)

## 2. Assessment process

The evaluation agency Certiked VBI received the request by VU Amsterdam to organise the limited framework programme assessment process for the Bachelor Earth Sciences programme of this University. The objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

Having conferred with management of the VU Amsterdam programme, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. ir. A. Veldkamp, dean ITC Faculty of Geo-Information and Earth Observation, University of Twente, the Netherlands (panel chair);
- Drs. T.M. van Daalen, director Geological Survey of the Netherlands, Netherlands Organisation for Applied Scientific Research, the Netherlands (panel member);
- Prof. dr. P.A. van der Beek, full professor, Institut des Sciences de la Terre, Université Grenoble Alpes, France (panel member);
- Prof. dr. M. Landrø, full professor, Department of Petroleum Technology and Applied Geophysics, Norwegian University of Science and Technology, Norway (panel member);
- Prof. dr. ir. N.E.C. Verhoest, associate professor, Department of Environment, Ghent University, Belgium (panel member);
- L. Roelofs BSc, student Master Earth Surface and Water, Faculty of Geosciences, Utrecht University, the Netherlands (student member).

On behalf of Certiked, drs. W. Vercouteren served as the process coordinator and secretary in the assessment process.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected the theses of 15 graduates from the last few years. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of theses of the programme graduates, these theses being part of the selection made by the process coordinator.

Well before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this meeting, the preliminary findings of the panel members, including those about the theses were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 8 and 9 January 2019, the panel conducted the site visit on the VU Amsterdam campus. The site visit schedule was as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Examination Board members, teachers and final projects examiners, and students and alumni.

In a closed session at the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives. This included the judgements for each of the standards.

Clearly separated from the process of the programme assessment, assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given two weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the Board of VU Amsterdam, to accompany their request for re-accreditation of this programme.

### 3. Programme administrative information

Name programme in CROHO: B Aardwetenschappen (B Earth Sciences)  
Orientation, level programme: Academic Bachelor  
Grade: BSc  
Number of credits: 180 EC  
Specialisations: Earth Surface  
Geology & Geochemistry  
Location: Amsterdam  
Mode of study: Full-time (language of instruction Dutch)  
Registration in CROHO: 56986

Name of institution: VU Amsterdam  
Status of institution: Government-funded University  
Institution's quality assurance: Approved

## 4. Findings, considerations and assessments per standard

### 4.1 Standard 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*

The Bachelor Earth Sciences programme is one of the bachelor programmes of the Faculty of Science of VU Amsterdam. The dean of the Faculty has the responsibility for all programmes of the Faculty. This Bachelor programme is part of the Bachelor College of Earth, Ecology and Environmental Sciences of this Faculty. The director of the programme is responsible for the contents, quality and implementation of the programme. The programme director is assisted by the programme coordinator. The Programme Committee for the programme, being composed of three teachers and three students, advises programme management on quality issues. The Faculty Examination Board monitors the programme adhering to the applicable Education and Examination Regulations. The sub-committee of the Examination Board for the Earth, Ecology and Environmental domain supervises the quality of examinations and assessments of the programme. Almost all teachers in the programme are employed at the Department of Earth Sciences of the Faculty.

The Bachelor Earth Sciences of VU Amsterdam is a three-year, research-based, broad, academic bachelor programme in the multi-disciplinary Earth Sciences domain. The programme covers the geosphere, hydrosphere, atmosphere and, to some extent, the biosphere components of the Earth Sciences field. The programme objectives are to educate students broadly in the Earth Sciences field, encompassing geological and geographical aspects and emphasising the interaction of physical and chemical processes at and below Earth's surface and Earth's evolution through time. In addition, the programme aims to acquaint students with scientific research in this domain, to teach them auxiliary sciences, such as mathematics, physics, chemistry and information technology and to train them in academic skills, needed in this field. Students may specialise in one of the specialisations Geology and Geochemistry or Earth Surface.

The programme has been benchmarked against the domain-specific reference framework for the Earth Sciences in the Netherlands, which has been drafted by the joint programmes in the Netherlands. The objectives of the programme conform to this framework.

The programme has been compared to other bachelor programmes in Earth Sciences in the Netherlands. Although being quite similar to these programmes in a number of ways, the programme distinguishes itself from these programmes by being broad, by providing students with extensive fieldwork training and by offering small-scale education.

The programme does not explicitly prepare students to enter the labour market, but aims to prepare them for master programmes in this field, both of VU Amsterdam and of other universities in the Netherlands and abroad. On a regular basis, programme management consults with the Field of Employment Advisory Board to keep the programme aligned with professional field requirements.

The programme objectives have been translated into intended learning outcomes, specifying knowledge and understanding of the components of the Earth Sciences domain, specific knowledge and understanding of one of the programme specialisations, knowledge of auxiliary disciplines, scientific research skills, critical thinking and critical appraisal of literature and research outcomes, awareness of the societal and ethical aspects, academic skills, and self-directed learning competencies.

Programme management presented the comparison of the intended learning outcomes to the Dublin descriptors for the bachelor level.

#### *Considerations*

The panel considers the programme objectives to be relevant and sound. The panel welcomes the breadth of the programme, educating students in a range of components of the Earth Sciences domain. The panel also appreciates the programme objectives to teach students auxiliary sciences, to train them in scientific research and to have them acquire academic skills.

The programme objectives meet the domain-specific reference framework for the Earth Sciences programmes. The panel appreciates the efforts by the joint programmes in the Earth Sciences in the Netherlands to draft this framework and regards this to be the sound and up-to-date description of this domain.

The panel welcomes the comparison to other programmes in the Netherlands, demonstrating the profile and the specific features of the programme.

The panel is positive about students being educated to enrol in master programmes of VU Amsterdam or other universities in this domain.

The programme intended learning outcomes correspond to the programme objectives, are comprehensive and conform to the bachelor level. As some of the intended learning outcomes seem to be somewhat outdated, the panel advises to update the intended learning outcomes regularly.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

## 4.2 Standard 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*

The number of incoming students in the last five years was on average about 70 students, the inflow being quite stable across these years. For reasons of optimisation of organisational capacity, the programme has set the target intake numbers at about 80 students. The entry requirements of the programme are the secondary education (vwo) diploma, including courses on chemistry, physics and mathematics A or B. Applicants with Mathematics A or Mathematics B are both admitted. This leads to differences among students. Mathematics courses in the curriculum are experienced by some students as too challenging and by other students as too easy. The vast majority of the incoming students have the vwo-diploma as their prior education. Some students have degrees from institutes for higher vocational training or from foreign institutions.

The curriculum of the programme takes three years and carries 180 EC of study load. For the programme, a table was presented, showing the mapping of the intended learning outcomes and the courses. The curriculum has been organised in four distinct learning pathways, being Earth's Processes, Earth Scientist's Skill and Tool set, Academic Skills and Auxiliary Courses. Each of the courses in the curriculum are part of one of these pathways. The Earth's Processes learning pathway introduces students to the breadth of Earth Sciences, offering them fundamental knowledge and understanding of the domain. The Earth Scientist's Skill and Tool set trains students the methods and techniques, needed to work as earth scientists in academia, industry or consulting. Important parts of this pathway are laboratory work, fieldwork and excursions. Fieldwork is scheduled in the first two years of the curriculum and also, for the majority of the students, part of the Bachelor thesis project in the third year. The Academic Skills pathway includes courses on philosophy of science and history of science, general transferable skills, academic writing and career preparation. In the Auxiliary Courses learning pathway, students take courses in mathematics, physics, chemistry and information technology. In the third year of the curriculum, the modelling course *Geophysics and Computer Modelling* is scheduled. The programme intends to design and implement a modelling learning pathway, starting in the first year and covering the curriculum as a whole. This modelling learning pathway will allow students to acquire basic, but sufficient knowledge of mathematics, physics and chemistry. In the third year minor, students may specialise in either the Geology and Geochemistry or Earth Surface specialisations. They may also take other minors or do internships. At the end of the curriculum, students complete the individual Bachelor research project (18 EC). The options for the thesis are to do research on the basis of laboratory work, field work or, in rare cases, literature study. Talented students having grade point averages of 7.5 or more, may take the honours programme, implying 30 EC of additional courses.

A total number of about 40 teachers are involved in the programme. The teachers are employed at the Department of Earth Sciences. Most of the teachers are active researchers in their fields. All staff members except the two part-time junior teachers have PhD degrees. Of the total number of teachers about 75 % are BKO-certified. Another 12 % of the teachers are in the process of acquiring the BKO-certificate. In addition, some teachers have acquired or are in the process to acquire the SKO-certificate.

Teachers experience the workload as demanding, but manageable. New staff as well as junior teachers have been recruited to alleviate the teachers' workload. Twice per year, teachers' meetings are scheduled to inform teachers about programme developments. Students are content about teachers' performances and accessibility.

The educational concept of the programme is meant to promote students engaging actively in the learning processes. The total number of hours of face-to-face education is on average 18.5 hours per week in the first year of the curriculum, 17.5 hours per week in the second year and 9.5 hours per week in the third year. Study methods adopted in the programme are, among others, lectures, practical classes, exercises, fieldwork assignments, and oral and written presentations. Students are guided by their cohort mentors, who inform them about choices to be made in the curriculum. Cohort mentors are assisted by the programme coordinator. In case of study delay, students are invited to meet with mentors and support to remedy any problems is offered. Elaborate feedback is given on course examinations, practical work and fieldwork assignments. Feedback on the fieldwork assignments in the first and second year is provided two times before submission of the final version. Students may turn to the programme study advisor or the trust person for guidance. Students with whom the panel met, expressed being content about study guidance. In the first year and in line with the Binding Study Advice, students must obtain 42 EC. About 15 % to 20 % drop out of the programme, the vast majority of them in the first year. The curriculum is quite challenging, but doable in the students' view. The student success rates are 44 % after three years and 78 % after four years (students' proportions re-entering in second year, figures for last three cohorts).

### *Considerations*

The student inflow numbers of the programme are appropriate. The panel regards the entry requirements to be clear and relevant. As mathematics proficiency differences among incoming students may affect (applied) mathematics education, the panel advises to raise the mathematics proficiency of students with prior Mathematics A level education and proposes to schedule remedial courses for these students.

The curriculum meets the intended learning outcomes of the programme. The courses are up to standard. The basic concepts in the programme domain are strongly represented in the curriculum. The panel is positive about the breadth of the curriculum and considers it to be coherent. The panel especially welcomes the pronounced practical and fieldwork components. The panel recommends strongly to increase the quantitative knowledge and skills components in the curriculum, educating students in mathematics, physics, chemistry and computer programming. The panel perceives the modelling pathway as planned by the programme as a positive step in that sense. Although the learning pathways are appreciated, the panel proposes to outline these more clearly in the curriculum.

The panel regards the teachers in the programme to be capable researchers and dedicated and skilled teachers. Their educational capabilities are up to standard, as may be deduced from the proportion of BKO-certified teachers. The panel feels the teachers' workload to be adequately managed.

The panel considers the educational concept and study methods to meet the programme characteristics. The number of hours of face-to-face education are generous. The panel is very positive about the study guidance and about the feedback given to students. The panel perceives the number of drop-outs as well as the student success rates to be quite appropriate.

*Assessment of this standard*

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

### 4.3 Standard 3: Student assessment

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

#### *Findings*

The programme examination and assessment procedures are aligned with the VU Amsterdam policies and the Faculty of Science policies.

As has been indicated, the Examination Board for the programme has the authority to monitor the quality of examination and assessment processes and products. The sub-committee of the Board for the Earth, Ecology and Environmental domain specifically monitors the examinations and assessments quality for this programme.

The examination methods for the courses are selected in line with the courses' contents. In most of the courses, multiple examinations are scheduled. The examination methods in the programme are quite diverse and include written examinations, practical assignments, fieldwork assignments, reports, written assignments, and oral presentations. Throughout the programme, group work is gradually being replaced by individual assignments.

The Bachelor thesis project procedures are documented in the Bachelor thesis course manual. The thesis projects are guided individual research projects. Students are presented subjects for the projects, but may also propose subjects themselves. Students are entitled to supervision by their individual supervisor. Meetings are weekly. In addition, classes are scheduled to address project design subjects and written and oral presentation guidelines. Part of the supervision process is the go/no-go procedure. This procedure requires students, who risk not to meet the requirements, to find another subject. To complete the project, students are to submit the written thesis and present their findings orally. Bachelor thesis projects are assessed by the supervisor and second reader independently, using thesis assessment scoring forms. The assessment components are attitude (pass/fail), contents and layout (60 % of grade), methodology (30 %) and oral presentation (10 %). The examiners' grades are averaged. In case these assessments differ more than 2.0 points or in case one of the examiners judges the project to be unsatisfactory, a third examiner will be asked to assess and grade the thesis as well. All theses are checked for plagiarism.

Programme management and the Examination Board have taken a number of measures to promote the validity, reliability and transparency of examinations and assessments. The Examination Board appoints examiners, who should have PhD degrees and, preferably, ought to be BKO-certified. For the programme, the assessment matrix has been drafted, specifying the relations of the intended learning outcomes of the programme, the courses and the examination methods adopted in the courses. The matrix is intended to ensure all course goals to be assessed. Examinations' drafts are peer-reviewed by fellow-teachers. In course files, test matrices are required. On behalf of the Examination Board, the Evaluation Committee of Tests and Exams reviews samples of course examinations and samples of Bachelor theses. All courses are reviewed every five years. Samples of Bachelor theses are inspected every year. Cases of plagiarism or fraud are to be reported to the Examination Board, who will handle these cases.

#### *Considerations*

The panel regards the examinations and assessment rules and regulations of the programme to be adequate, these being in line with VU Amsterdam and Faculty of Science policies.

The panel approves of the examination methods adopted by the programme and welcomes the wide variety of methods used. The methods are consistent with the goals and contents of the courses.

The supervision and assessment processes for the Bachelor thesis projects have been well-organised. Although students are offered appropriate supervision, some thesis processes take long. Therefore, the panel suggests to schedule and monitor these processes more strictly. The assessment procedures are up to standard, involving two examiners assessing the work separately and on the basis of extensive and detailed assessment scoring forms.

The panel considers the measures ensuring the validity, reliability and transparency of examinations and assessments to be satisfactory.

*Assessment of this standard*

The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

#### 4.4 Standard 4: Achieved learning outcomes

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

As has been said, the options for the Bachelor thesis project are individual research projects on the basis of laboratory, modelling or field work or, in rare cases, literature study. The panel reviewed 15 Bachelor theses of programme graduates of the last two years. The average grades for the projects were 7.7 for 2016/2017 and 7.6 for 2017/2018.

As a rule, programme graduates do not enter the labour market. They proceed to master programmes in this domain at VU Amsterdam or at other universities. Most of the graduates enrol in the Master Earth Sciences or the Master Hydrology of VU Amsterdam. Graduates are admitted without deficiencies to master programmes of other universities as well, both in the Netherlands and abroad.

##### *Considerations*

The Bachelor theses the panel studied, match the intended learning outcomes and are adequate research projects. No theses were found by the panel to be unsatisfactory. The level and quality of the theses differ, which is reflected in the grades. The panel supports the grades given by the programme examiners. The panel finds literature studies for the Bachelor thesis projects to be less desirable and proposes to oblige students to conduct empirical research in their projects. In addition, the panel advises to achieve one standard format, limiting, among others, the differences in lay-out and referencing.

The panel regards the programme graduates to have reached the intended learning outcomes and to be qualified to enrol in master programmes in this domain.

##### *Assessment of this standard*

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be satisfactory.

## 5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

## 6. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, these have been brought together below. These panel recommendations are the following.

- To update the intended learning outcomes of the programme regularly, as some of them seem to be somewhat outdated.
- To raise the mathematics proficiency of students with prior Mathematics A level education and to schedule remedial courses for these students.
- To increase the quantitative knowledge and skills components in the curriculum, educating students in mathematics, physics, chemistry and computer programming.
- To outline the learning pathways more clearly in the curriculum.
- To schedule and monitor the Bachelor thesis project processes more strictly.
- To make compulsory for students to do empirical research in their Bachelor thesis projects.
- To achieve one standard format for the Bachelor thesis projects, limiting, among others, the differences in lay-out and referencing.