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B Aarde, Economie en Duurzaamheid
Vrije Universiteit Amsterdam

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Project code P2304

Contents

Summary

Standard 1. Intended learning outcomes

The ambitions of the BSc Aarde, Economie en Duurzaamheid (AED) are fitting for an academic bachelor's programme in this field. The aims of the programme have been translated into a coherent set of intended learning outcomes (ILOs) that are properly aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an active Professional Advisory Board as a means to keep the ILOs connected to the requirements of the professional field.

The panel is satisfied that the institutional structure supports the programme's profile properly. The collaboration between the three contributing departments leads to a programme that corresponds well to current developments in the academic and professional field. The panel encourages the programme to communicate its own vision and approach to interdisciplinarity better, as it would help all stakeholders (including potential students) to better grasp what the programme has to offer.

Standard 2. Teaching-learning environment

The curriculum of the B AED enables student to achieve the intended learning outcomes of the programme. The curriculum is coherent and structured. The panel recommends that the programme introduces minimum requirements regarding the understanding of qualitative methods to ensure students' awareness of these methods.

The panel noted from the discussions during the site visit that the complex organization (three departments/two faculties) is managed well, which is essential for the cohesion and quality of the programme. The panel appreciates, in particular, the introduction of learning pathways and its coordinators. The programme uses several activating and inspiring teaching methods that support its interdisciplinary approach. The programme is feasible and student support/guidance is available.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. The panel appreciates the co-teaching method. The panel finds that the programme deploys ample initiatives to look after the quality and coherence of the programme. The programme is open to feedback and is willing to take measures to improve itself.

Standard 3. Student assessment

The programme has a reliable, valid and transparent system of assessment in place. There are adequate procedures for design and quality assurance of exams, assignments and the theses. The panel recommends that the programme considers introducing more formative assessments, for instance concerning the assessment of soft skills.

On the new thesis assessment forms, motivations are largely provided for the different grades although not always to the same extent. The panel encourages the programme to ensure that motivations are always given to justify and substantiate grades given.

The Examination Board fulfils its legal duties. The panel recommends the EB formulates a general, clear and transparent policy on the use of generative AI tools, as this is not yet available.

Standard 4. Achieved learning outcomes

The theses show that students of the programme realize the intended learning outcomes of the programme. Alumni primarily progress to a (specialized) master's programme and subsequently find a job in the field of their choice.

Score table

The panel assesses the programme as follows:

Bachelor's programme Earth Sciences, Economics and Sustainability

Standard 1: Intended learning outcomes	meets the standard
Standard 2: Teaching-learning environment	meets the standard
Standard 3: Student assessment	meets the standard
Standard 4: Achieved learning outcomes	meets the standard
General conclusion	positive

Em. prof. dr. J.T.A. (Hans) Bressers, panel chair
Drs. L. (Linda) te Marvelde, panel secretary
Date: 2 September 2024

Introduction

Procedure

Assessment

On 8 April 2024, the bachelor's programme Aarde, Economie en Duurzaamheid (in English: Earth Sciences, Economics and Sustainability) of the Vrije Universiteit Amsterdam was assessed by an independent peer review panel as part of the cluster assessment Environmental Sciences. The assessment cluster consisted of 17 programmes, offered by the institutions Open University, University of Amsterdam, Wageningen University, Radboud University, Vrije Universiteit Amsterdam, University of Groningen, Maastricht University, Leiden University, Utrecht University and the Amsterdam Institute for Advanced Metropolitan Solutions (of Delft University of Technology and Wageningen University). The assessment followed the procedure and standards of the NVAO Assessment Framework for the Higher Education Accreditation System of the Netherlands (September 2018).

Quality assurance agency Academion coordinated the assessment upon request of the cluster Environmental Sciences. Peter Hildering and Jessica van Rossum acted as coordinator and panel secretaries. Annemarie Venemans, Esther Poort, Anne-Lise Kamphuis, Linda te Marvelde and Carlijn Braam also acted as secretaries in the cluster assessment. They have been certified and registered by the NVAO. Linda te Marvelde acted as panel secretary in the assessment of the programme of the Vrije Universiteit Amsterdam.

Preparation

Academion composed the peer review panel in cooperation with the institutions and taking into account the expertise and independence of the members as well as consistency within the cluster. On 15 December 2023, the NVAO approved the composition of the panel. The coordinator instructed the panel chair on his role in the site visit according to the Panel chair profile (NVAO 2016).

The programme composed a site visit schedule in consultation with the coordinator (see appendix 3). The programme selected representative partners for the various interviews. It also determined that a development session would be made part of the site visit in the form of thematic sessions. A separate development report was made based on this dialogue.

The programme provided the coordinator with a list of graduates over the period October 2021 – August 2023. In consultation with the coordinator, the panel chair selected 15 theses of the bachelor's programme Earth Sciences, Economics and Sustainability. They took the diversity of final grades and examiners into account. Prior to the site visit, the programme provided the panel with the theses and the accompanying assessment forms. It also provided the panel with an information file and additional materials (see appendix 4).

The panel members studied the information and sent their findings to the secretary. The secretary collected the panel's questions and remarks in a document and shared this with the panel members. In a preliminary online panel meeting on 25 March, the panel discussed the initial findings on the information file and the theses, as well as the division of tasks during the site visit. The panel was also informed on the assessment framework, the working method and the planning of the site visits and reports.

Site visit

During the site visit, the panel interviewed various programme representatives (see appendix 3). The panel also offered students and staff members an opportunity for confidential discussion during a consultation hour. No consultation was requested. The panel used the final part of the site visit to discuss its findings in an internal meeting. Afterwards, the panel chair publicly presented the preliminary findings.

Report

The secretary wrote a draft report based on the panel's findings and submitted it to the coordinator for peer assessment. Subsequently, the secretary sent the report to the panel for feedback. After processing this feedback, the secretary sent the draft report to the programme in order to have it checked for factual irregularities. The secretary discussed the ensuing comments with the panel chair and changes were implemented accordingly. The panel then finalized the report, and the coordinator sent it to the Faculty of Science and the Vrije Universiteit Amsterdam.

Panel

The following panel members were involved in the cluster assessment Environmental Sciences:

- Em. prof. dr. J.T.A. (Hans) Bressers, emeritus professor in Policy Studies and Environmental Policy at the University of Twente (chair);
- Prof. dr. A.C. (Arthur) Petersen, professor in Science, Technology and Public Policy at the University College London (United Kingdom);
- Dr. A.R. (Ana) Vasques, senior lecturer at the Erasmus University College of Erasmus University Rotterdam;
- Dr. S.E. (Sarah) Cornell, associate professor at the Stockholm Resilience Centre of Stockholm University (Sweden);
- Em. prof. dr. M.C. E. (Rietje) van Dam-Mieras, emeritus professor in Sustainable Development and Innovation of Education at Leiden University, and member of the Top Consortium for Knowledge and Innovation (TKI) Biobased Circular (focus Human Capacity Agenda);
- Dr. ir. T. (Thijs) Bosker, associate professor in Environmental Sciences at Leiden University;
- Prof. dr. ir. S.E. (Siegfried) Vlaeminck, professor in Microbial Cleantech and Environmental Systems Analyses at the Universiteit of Antwerpen (Belgium);
- Prof. dr. M.P.J. (Maarten) Loopmans, professor in Human Geography and Political Ecology at the KU Leuven (Belgium);
- Dr. ir. S.G. (Gerd) Weitkamp, associate professor in Health Geography, Mobility, and Geospatial Technologies at the University of Groningen;
- Prof. dr. P. (Paquita) Perez Salgado, professor in Natural Sciences at the Open University;
- Prof. dr. E. (Esther) Turnhout, professor in Science, Technology and Society at the University of Twente;
- Em. prof. dr. ir. J.T. (Hans) Mommaas, emeritus professor in Regional Sustainability Governance at Tilburg University, and chair of the Ecological Authority;
- Dr. P. (Patricia) de Cocq, director Living Environment and Nature at HAS Green Academy;
- Prof. dr. ir. Z. (Zofia) Lukszo, professor in Smart Energy Systems at the Delft University of Technology;
- M. M. (Marisa) Beunk MSc., alumn (March 2023) of the master's programme Environmental Sciences (Policy Track) of Wageningen University (student member);
- F.O. (Fenna) Oostrum, alumn (September 2023) of the master's programme Environment and Society Studies of Radboud University (student member).

The panel assessing the bachelor's programme Earth Sciences, Economics and Sustainability at the Vrije Universiteit Amsterdam consisted of the following members:

- Em. prof. dr. J.T.A. (Hans) Bressers, emeritus professor in Policy Studies and Environmental Policy at the University of Twente (chair);
- Dr. A.R. (Ana) Vasques, senior lecturer at the Erasmus University College of Erasmus University Rotterdam;
- Dr. S.E. (Sarah) Cornell, associate professor at the Stockholm Resilience Centre of Stockholm University (Sweden);
- Prof. dr. M.P.J. (Maarten) Loopmans, professor in Human Geography and Political Ecology at the KU Leuven (Belgium);
- F.O. (Fenna) Oostrum, alumn (September 2023) of the master's programme Environment and Society Studies of Radboud University (student member).

Drs. Linda te Marvelde acted as secretary for the site visit.

Information on the programme

Name of the institution:	Vrije Universiteit Amsterdam
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive
Programme name:	Aarde, Economie en Duurzaamheid (International name: Earth Sciences, Economics and Sustainability)
CROHO number:	50668
Level:	Bachelor
Orientation:	Academic
Number of credits:	180 EC
Location:	Amsterdam
Mode of study:	Full time
Language of instruction:	Dutch
Submission date NVAO:	1 November 2024

Description of the assessment

Organization

The Dutch-taught bachelor's programme Earth Sciences, Economics and Sustainability (Aarde, Economie en Duurzaamheid, hereafter: AED) is the result of a collaboration between three departments across two faculties of VU Amsterdam (VU): Earth Sciences and the Institute for Environmental Studies from the Faculty of Science, and Spatial Economics from the School of Business and Economics.

The Faculty of Science is the administrative owner (in Dutch: penvoerder) of the programme. Management of the programme is the responsibility of the programme director and the programme coordinator. The programme director is responsible for strategic management, including contacts with the three contributing departments, other programme directors, and the board of the Faculty of Science. The day-to-day operation of the programme, including most contact with students, teachers and the VU administration, is carried out by the programme coordinator.

The programme has its own programme committee (in Dutch: Opleidingscommissie/OLC), with representation from all three different departments. The Examination Board is organized at the level of the Faculty of Science (see Standard 3).

Recommendations previous panel

The programme's documentation included an overview of how it followed up on the recommendations given by the previous accreditation panel (2018). The panel finds that the recommendations have been largely acted upon by the programme; the panel is satisfied with the measures taken and sees that these have contributed to the improved quality of the programme.

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

Profile

The bachelor's programme AED aims to train students to become experts in solving complex spatial challenges related to sustainability. The programme approaches sustainability challenges based on a fundamental understanding of the Earth and climate system, the socio-economic system, and their interactions. The sustainability challenges that are central to the programme include the use of scarce natural resources (water, land, energy), specifically in the context of climate change, and climate change adaptation and mitigation. Graduates of the programme have a thorough systems-understanding as well as a set of skills for the quantitative and spatial analysis of these systems, including field measurements, as well as computer-based analyses. Students learn how to use their understanding and analytical skills to support evidence-based policy making and sustainable development more broadly. The programme combines attention for quantitative skills with in-depth thematic subjects, in an interdisciplinary way.

The panel finds that the programme's aims and ambitions align well with the Dutch referential framework for academic programmes in Environment and Sustainability 2023 (which takes environment and sustainability as its core), as well as with the VU Amsterdam thematic profile Science for Sustainability.

The bachelor AED can be characterized as broad; it prepares students for continuation at master's level in a specialized direction, such as Hydrology; Spatial, Transport and Environmental Economics; and Earth and Climate, all of which are VU master's that accept AED graduates either directly or with a limited set of extra requirements. Alternatively, AED alumni may choose to continue their academic career at another university in various environmental sciences oriented master's programmes such as Sustainable Development (UU), Climate Studies (WUR) and Innovation Sciences (UU). The panel finds that AED offers its graduates ample opportunity for further studies at a master's level.

Evolving programme

The panel encountered a programme that is continuously evolving. In 2019, it transitioned from a duo-disciplinary programme (Earth Sciences and Economics) to the current interdisciplinary programme (Earth, Economics and Sustainability). Before this transition, students developed a foundation in the scientific disciplines Earth Sciences and Economics before they were confronted with a number of courses in which these two were integrated. Since the transition to AED, the programme takes a selection of sustainability challenges as starting point to which courses contribute by either providing the relevant (but tailored) disciplinary knowledge, or already more interdisciplinary content. The selected sustainability challenges are represented in the first four intended learning outcomes of the programme, and include: 1) climate change and natural hazards, 2) energy and scarce resources, 3) integral socioeconomic solutions, and 4) sustainable land use.

In 2023, a curriculum committee (consisting of members representing all three contributing departments) reviewed the programme to strengthen its interdisciplinary ambitions, particularly in relation to the four intended learning outcomes mentioned above. In addition, the curriculum committee was tasked to make the programme more attractive to potential students with a view of increasing student intake. The recommendations of the curriculum committee have been approved by the faculty board in Autumn 2023 and will be implemented from 2024/2025 onwards (see Standard 2). This includes for instance the introduction of learning lines in the curriculum. The panel appreciates that the programme is open to feedback, leading continuous learning and further development of the AED programme.

The panel discussed the vision of the programme and its interdisciplinary approach at length, as it found it challenging to grasp the 'vibe' of the programme on paper. The panel learnt that the programme has its own distinct ethos and approach to interdisciplinarity, based on deliberate choices, in which fieldwork and real-world cases play crucial roles (see Standard 2). The panel recommends to communicate the vision and approach of the programme more clearly to all stakeholders involved. As discussed during the site visit, a catchier programme name would not go amiss as the current name Earth Sciences, Economics and Sustainability/Aarde, Economie en Duurzaamheid is quite abstract.

Intended learning outcomes

The ambitions of the programme have been translated into a clear and balanced set of Intended Learning Outcomes (ILOs) (see Appendix 1). The panel deems the ILOs to be in line with the aims of the programme, including its level and orientation which is reflected in the structuring of the ILOs according to the Dublin descriptors. A suggestion the panel makes is, when the next update of the ILOs takes place, the programme could consider giving soft skills more prominence (see Standard 2). The panel is satisfied with the manner in which the programme keeps the ILOs and the curriculum up-to-date, e.g. via discussions with its Professional Advisory Board (in Dutch: Werkveldadviesraad).

Considerations

The ambitions of the BSc AED are fitting for an academic bachelor's programme in this field. The aims of the programme have been translated into a coherent set of intended learning outcomes (ILOs) that are properly aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an active Professional Advisory Board as a means to keep the ILOs connected to the requirements of the professional field.

The panel is satisfied that the institutional structure supports the programme's profile properly. The collaboration between the three contributing departments leads to a programme that corresponds well to current developments in the academic and professional field. The panel encourages the programme to communicate its own vision and approach to interdisciplinarity better, as it would help all stakeholders (including potential students) to better grasp what the programme has to offer.

Conclusion

The panel concludes that the programme meets standard 1.

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

Curriculum

The panel finds that the Dutch-taught bachelor's programme AED (180 EC) is well-structured and coherent. The first year is dedicated to laying a solid disciplinary basis; students follow a number of (disciplinary) foundational courses (Earth Sciences, Economics) and methods courses. The year ends with an interdisciplinary field project on climate adaptation in the Netherlands (Limburg). The second year builds on the first year and includes interdisciplinary, thematic courses. In addition, the methodological courses focus on further developing research skills. The second year also ends with an interdisciplinary field course; this time students go abroad (Salzburg, Austria). The third year includes a minor (30 EC), courses which provide conceptual, technical, and international depth to the knowledge gained previously, and the bachelor's thesis (12 EC). The bachelor's thesis is always an individual project, conducted under the supervision of a staff member of one of the contributing departments. To ensure adequate guidance, students all start their thesis process at the same moment and receive a number of centrally organized classes on the design, execution, and reporting of their research project.

The panel appreciates that throughout the programme students are exposed to real world cases. This ensures that students learn and understand the practical relevance of their studies, the contextualization of sustainability challenges, and are exposed to working with a range of stakeholders. Real world activities start in the very first course, which includes excursions to a number of companies, and institutions working on relevant topics, and also includes assignments based on actual cases in various courses, and a fieldwork assignment that is provided by a Dutch Water Board (in Dutch: Waterschap) in Zuid-Limburg, a flood-prone area in the South of the Netherlands that is working on climate adaptation. In the second year, students can choose from a wider range of topics all centred around the city of Salzburg. During this field course, students develop a project to design sustainability solutions in response to a range of challenges identified in Salzburg specifically, such as energy transition, protection against rockfall, and tourism and its environmental consequences. These projects require insights in the natural and socioeconomic context within which they

are placed, and also a range of quantitative skills to propose evidence-based solutions. The panel is satisfied that the field projects serve both to integrate the knowledge and skills that students acquired in the courses and to apply them in a real-world context.

Methods
The panel discussed the programme's deliberate choice to focus on quantitative research methods. The previous panel made a recommendation to increase attention to qualitative research methods, however the programme stands by its choice to retain its focus on quantitative methods. Underlying this choice is the programme's firm belief that quantitative analysis is essential to make informed decisions. As such AED teaches a range of analytical approaches, including statistics and data analysis, spatial analysis (GIS), and regressions and other econometric methods. Discussions with students revealed that they (understandably) have limited to no (basic) understanding of qualitative methods. The panel respects the response of the programme to the recommendation of the previous panel, but still thinks that the programme would benefit from increased attention to qualitative next to quantitative methods in the curriculum, as the diversity of challenges that graduates will be working on in their careers will also include qualitative aspects. Even though students do not need to be experts in qualitative methods, basic knowledge of and respect for qualitative approaches/aspects is important, as it makes for better quantitative researchers. The panel encourages the programme to introduce qualitative perspectives by (for example) inviting guest lecturers from the highly regarded VU Instituut voor Milievraagstukken (IVM) to educate students on what policy making entails, and/or perhaps incorporate policy texts to papers. The panel argues that it is beneficial for students to understand what the receivers of their research (policy makers, members of the public etc.) need and recommends that the programme introduce minimum requirements regarding the understanding of qualitative methods to at least ensure students' awareness of these methods.

Interdisciplinarity and coherence
During the site visit, the panel discussed the challenges that may be encountered due to the complexity of the programme's organizational structure. The programme management informed the panel that they invest in annual meetings with each course coordinator, to facilitate the relation between individual courses and the overall goals of the programme. In many cases this leads to adjustments of courses (such as cases in assignments, invited guest lectures, or topics for exercises) to make it clearer for students how individual courses contribute to the programme, including the disciplinary courses. The panel appreciates that these efforts have helped in developing the programme and its coherence. The panel encourages the programme to keep investing in the promotion of AED's norms, values and vision on (interdisciplinary) education.

In addition, the panel applauds the programme's plans to introduce the new role of 'learning pathway coordinator' in 2024-2025. AED identified six learning pathways; each coordinator will annually check all contributions (i.e. courses) to their learning pathway vis-à-vis the learning outcomes of the programme, to ensure their complementarity and to avoid any overlap. The panel finds that this is a good solution to deal with the complex structure of AED, as a result of which, teachers do not always meet regularly and quite some coordination is needed. The panel is content to have learned in the interviews that introduction of learning pathway coordinators is not expected to add to any increased administrative burden.

Feasibility and guidance
The study load is distributed exactly equally over all periods. The panel found that the programme showed a significant drop-out rate in the first year, which it discussed during the site visit. The panel learned that the programme recognizes that the first year presented challenges for some students due to the nature of the disciplinary, foundational courses and the focus on mathematics. However, the programme has already implemented changes to decrease the risk of early drop-outs in the future. The panel commends the

programme's ability and willingness to respond to feedback and to adjust. Students that the panel spoke with found the programme to be feasible.

Study advisors are available to offer help with study related issues and students informed the panel that they are very easy to approach. The programme provides information about the available minors and master's programmes to ensure that students are aware of their options and to allow them to make informed study choices. GeoVUsie, the student association, organizes a labour market day every second year, in which students can connect with a range of potential future employers, to inquire about potential career paths. Furthermore, students are introduced to the labour market through many guest lectures, excursions, interviews during fieldworks and a weekly lecture followed by network drinks. The panel is satisfied that the programme offers ample support and information to students.

Lecturing staff
The panel finds that the programme is taught by enthusiastic and good teachers with strong expertise in the respective topics. The three departments responsible for the majority of the teaching, each have their own character and background (including natural sciences, social sciences and interdisciplinary science). As a result of this, students are taught by experts in the respective topics and disciplines. The panel is positive about the co-teaching method, which aims to support AED's interdisciplinary approach and which provides teachers with direct, collegial support. Students are satisfied with the lecturers, who they describe as knowledgeable and approachable.

90% of teachers in the programme have obtained their University Teaching Qualification (BKO). Those who have not yet obtained their BKO are expected to do so in the near future. Despite (didactic) courses being available, lecturers told the panel that they do not have the time to actually upskill. The workload is high, mainly due to the amount of contact hours with students and the number of courses taught. The panel discussed the many staff changes that the programme has experienced in recent years. This is not necessarily a bad thing, as every change might present the programme with a new opportunity. The panel compliments the (junior) lecturers on the positive manner in which they deal with the changes in the team.

Considerations
The curriculum of the B AED enables student to achieve the intended learning outcomes of the programme. The curriculum is coherent and structured. The panel recommends that the programme introduces minimum requirements regarding the understanding of qualitative methods to ensure students' awareness of these methods.

The panel noted from the discussions during the site visit that the complex organization (three departments/two faculties) is managed well, which is essential for the cohesion and quality of the programme. The panel appreciates, in particular, the introduction of learning pathways and its coordinators. The programme uses several activating and inspiring teaching methods that support its interdisciplinary approach. The programme is feasible and student support/guidance is available.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. The panel appreciates the co-teaching method. The panel finds that the programme deploys ample initiatives to look after the quality and coherence of the programme. The programme is open to feedback and is willing to take measures to improve itself.

Conclusion
The panel concludes that the programme meets standard 2.

Standard 3. Student assessment

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

Findings

The Faculty of Science has compiled an Assessment Policy, which includes thorough instructions on how to set up reliable examinations and assessments. These instructions were utilized as input by the Examination Board (EB) of the faculty in developing its EB Rules and Guidelines. A detailed explanation of the specific assessment policy for the bachelor's programme AED is laid down in its Assessment Plan.

Course assessments

The panel finds that the programme has an appropriate system of assessment. The programme monitors and improves the quality of assessments via several means, such as the application of the four-eyes principle in designing assessment for each course, the compilation of assessment files (that include the assessment matrices and answer models with grading schemes), and the use of guidelines for formative and summative evaluations.

Most courses use a good range of assessment methods to encourage students to participate actively in the learning process; most courses include group work and oral presentations. Following the structure of the programme, courses in the first year that lay the foundation for the interdisciplinary work are mostly assessed with an exam, sometimes in combination with assignments. The interdisciplinary projects at the end of year 1 and 2 are assessed based on reports of the groups working together. Towards year 2 and 3 students are increasingly assessed based on reports, presentations, and assignments. Methodological courses and courses on specific topics are primarily assessed with exams and assignments, while the courses that contain project work and integration between different disciplines are primarily assessed based on reports and presentations. The panel has found that students receive a (detailed) rubric for every assessment, which also serves as tool to structure the lecturers' feedback. The panel encourages the programme to include (more) formative assessments in the programme, to enhance the learning experience of students, specifically with regards to (soft) skills; as the assessment strategy of AED is currently mostly focused on summative assessments.

Thesis assessment

The panel is positive about the assessment of the theses. Theses are always subject to two assessments, by the supervisor and a second assessor. The assessment of the thesis is based on a recently reviewed rubric that is designed specifically to cover all aspects of research. The rubric is communicated to students to ensure maximum transparency. An oral defence is part of the assessment; this is graded by the thesis supervisor. The panel generally agreed with the grades given for the theses. In addition, the panel appreciates that the thesis assessment form was recently adjusted to give examiners the opportunity to provide more detailed qualitative substantiation of grades given. A substation of the grade, the panel argues, is important to always include as it enhances transparency and could serve as feedback for students.

Examination Board

The panel spoke with an Examination Board (EB) that fulfils its legal duties. The Faculty of Sciences has two EB's: the EB for Natural Sciences and Mathematics (NSM-IS) and the EB for Life Sciences and Earth, Ecological and Environmental Sciences (HLS-EEE). Both have several subcommittees to ensure that each programme in the faculty is given ample attention. NSM-EEE includes the subcommittee 'Earth' which is responsible for the programmes B Earth Science, B AED, M Earth Sciences, and M Hydrology. The Earth subcommittee consists of four senior staff members with distinct roles and responsibilities.

The EB has established an Assessment Committee to oversee the implementation of the examination guidelines. All the EB's subcommittees are represented in the Assessment Committee. Every year, a sample of courses are selected for review. Pass rates (courses with a pass rate of less than 50% are always reviewed), information from previous years, student course evaluations, requests from the Programme Director or Programme Committee, and other signals are used to choose the samples of courses. Each course is reviewed every three to four years. A representative sample of students' theses is selected for review as well, making sure that a variety of grades are part of the sample. The outcomes of the EB's reviews are reported to the Programme Director who is responsible for acting in case of issues. The EB has not flagged any issues recently regarding the assessment and examination of the courses or the theses of the bachelor's programme AED.

Finally, the Examination Board regularly provides ad-hoc guidelines and advice for dealing with specific issues that may have an impact on the quality of assessment. One example is the rise of generative AI tools, such as ChatGPT. The EB informed the panel they have seen an increase in the prevalence of use of ChatGPT, which has led the EB to inform staff and students on the rules and regulations concerning fraud to make sure that all stakeholders are aware of the EB's stance and possible measures taken when fraud is detected. The EB discusses what the emergence of generative AI tools could mean for education in the future. The panel recommends the EB formulates a general, clear and transparent policy on these kinds of new developments, as this is not yet available.

Considerations

The programme has a reliable, valid and transparent system of assessment in place. There are adequate procedures for design and quality assurance of exams, assignments and the theses. The panel recommends that the programme considers introducing more formative assessments, for instance concerning the assessment of soft skills.

On the new thesis assessment forms, motivations are largely provided for the different grades although not always to the same extent. The panel encourages the programme to ensure that motivations are always given to justify and substantiate grades given.

The Examination Board fulfils its legal duties. The panel recommends the EB formulates a general, clear and transparent policy on the use of generative AI tools, as this is not yet available.

Conclusion

The panel concludes that the programme meets standard 3.

Standard 4. Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

Prior to the site visit, the panel studied a selection of 15 BSc theses. It concludes that thesis quality is good and meets academic standards. The theses show that students are able to apply quantitative methods of modelling and spatial analysis to answer their research questions.

Alumni

The vast majority of AED alumni (90-95%) chooses to proceed their studies with a master's programme. Students progress to a wide range of different master's programmes, which confirms to the panel that the broad basis of AED alumni is sufficiently solid to qualify for multiple, in-depth master's programmes. This is consistent with AED's ambitions.

The panel is satisfied that AED ultimately find a job in their preferred field, relatively easily. A recent LinkedIn analysis of AED alumni (n=190), indicates that alumni end up in a wide range of positions, that are somehow related to sustainability. Most alumni work in business (62%), varying from environmental consultancy and engineering firms (37%) to the sustainability of the sector transport, trade and industry (19%), financial services (5%) and others. 23% of the alumni work at governmental organizations, mainly ministries, waterboards, but also the sustainability sectors of provinces and larger municipalities. 9% works in research institutes (e.g. PhD) and higher education.

Considerations

The theses show that students of the programme realize the intended learning outcomes of the programme. Alumni primarily progress to a (specialized) master's programme and subsequently find a job in the field of their choice.

Conclusion

The panel concludes that the programme meets standard 4.

General conclusion

The panel's assessment of the bachelor's programme Earth, Economics and Sustainability is positive.

Development points

1. Communicate AED's own vision and approach to interdisciplinarity better, as it would help all stakeholders (including potential students) to better grasp what the programme has to offer.
2. Ensure that students develop awareness and understanding of qualitative methods.
3. Consider (increasing) the use of formative assessment, specifically in relation to (soft) skills.
4. The panel recommends the EB formulates a general, clear and transparent policy on the use of generative AI tools, as this is not yet available.

Appendix 1. Intended learning outcomes

Kennis en inzicht
1. De bachelor heeft kennis en inzicht in klimaatverandering en natuurrampen: ontstaan, risico's, kansen, voorkomen en aanpassen;
2. De bachelor heeft kennis en inzicht in het energievraagstuk en gebruik van schaarse hulpbronnen: energietransitie, duurzaam watergebruik en circulaire economie;
3. De bachelor heeft kennis en inzicht in integrale sociaaleconomische oplossingen: beprijzen hulpbronnen, waarderen van ecosysteemdiensten, gedragsveranderingen;
4. De bachelor heeft kennis en inzicht in duurzaam landgebruik: ruimtelijke indeling, natuurbescherming, cultureel erfgoed en voedselzekerheid;
5. De bachelor heeft kennis en inzicht in de dynamiek van het systeem Aarde op verschillende schalen van ruimte en tijd;
6. De bachelor heeft kennis en inzicht in economische systemen en menselijk keuzegedrag, in het bijzonder gerelateerd aan schaarse natuurlijke hulpbronnen en keuzes waarin ruimtelijke en temporele verdelingsvraagstukken centraal staan;

Toepassen van kennis en inzicht
7. De bachelor beheerst vaardigheden en meettechnieken om op systematische wijze empirische data te verzamelen (interviews, landschappelijke data, big data) en te werken met stakeholders (participatie, communicatie);
8. De bachelor heeft de vaardigheid om kwantitatieve analysetechnieken toe te passen: statistiek, econometrie en ruimtelijke data-analyse;
9. De bachelor beheerst methoden om besluitvorming in duurzaamheidsvraagstukken te ondersteunen (b.v. maatschappelijke kosten-batenanalyse, multi-criteria analyse, stakeholderanalyse);
10. De bachelor is in staat om zelfstandig interdisciplinair onderzoek naar duurzaamheidsvraagstukken op te zetten, uit te voeren en op wetenschappelijke wijze te verslaan;

Oordeelsvorming
11. De bachelor is in staat verzamelde gegevens in de context van duurzaamheidsvraagstukken te interpreteren, op waarde te schatten, hun toepasbaarheid te beoordelen (inclusief de normatieve en ethische aspecten daarvan) en een onderbouwde mening te vormen en te verdedigen;

Communicatie
12. De bachelor is in staat verworven kennis en inzicht schriftelijk en mondeling op heldere wijze te presenteren aan beleidsmakers, wetenschappers en maatschappelijke organisaties;
13. De bachelor is in staat zelfstandig en in groepsverband te functioneren;

Leervaardigheden
14. De bachelor kan in zijn/haar vak op academisch werk- en denkniveau functioneren en verder leren;
15. De bachelor is in staat vakliteratuur in de Nederlandse en Engelse taal zelfstandig te bestuderen, te begrijpen en kritisch te beoordelen

VU VRIJE UNIVERSITEIT AMSTERDAM — Faculteit der Bètawetenschappen

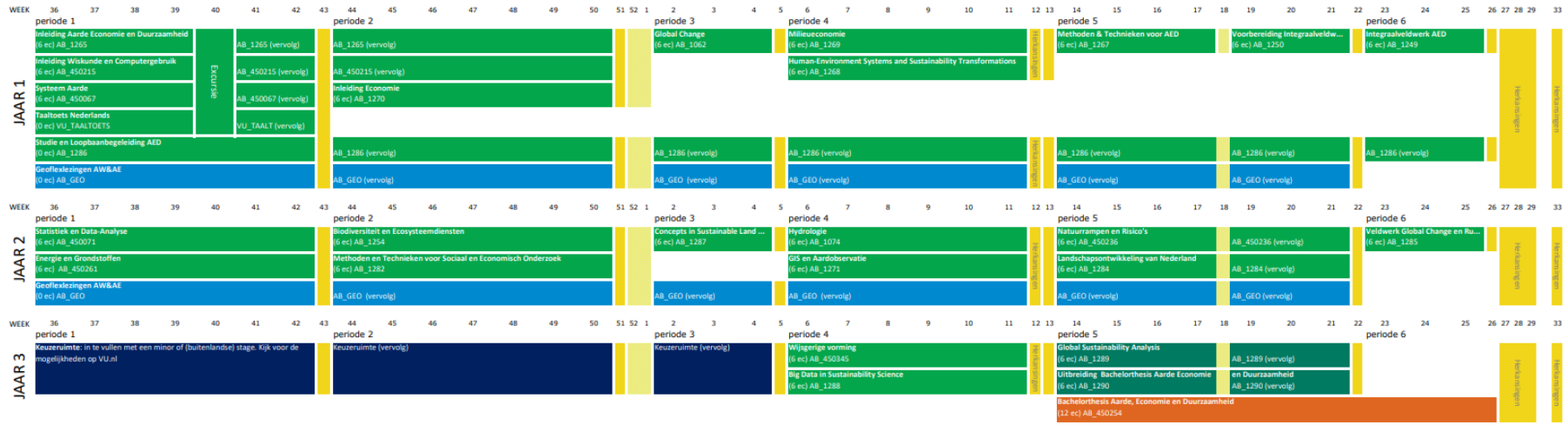
Minor

Verplicht vak | extracurriculaire niet-verplichte lezingenserie, georganiseerd door de studievereniging | Tentamenweek*

Verplichte keuze | Project | Onderwijsvrij**

Laatst bijgewerkt: 15-6-2023

Jaarschema B Aarde, Economie en Duurzaamheid 2023 - 2024



* De tentamens kunnen afwijken van de tentamenweken.

Kijk voor meer informatie over de jaarindeling hier

Kijk voor de actuele planningsinformatie op rooster.vu.nl

** Onderwijsvrij betekent dat er geen gepland onderwijs of tentamens plaatsvinden op de VU campus. Uitzonderingen kunnen o.a. zijn: veldwerk, stage- en onderzoeksvakken

Herkansingen	P1	P2/ 3	P4	P5	P6
	wk 2	wk 12	wk 28	vanaf woensdag in wk 27 en 28	wk 29/33

Appendix 3. Programme of the site visit

Monday 8 April 2024

09.00	09.15	Arrival and welcome
09.15	09.45	Panel preparation
09.45	10.15	Interview programme management BSc
10.30	11.15	Interview students BSc
11.15	11.45	Break/panel deliberation
11.45	12.30	Interview teaching staff BSc
12.30	13.15	Lunch break
13.15	14.45	Thematic sessions BSc
14.45	15.45	Panel deliberation
15.45	16.15	Final meeting management BSc
16.15	17.30	Panel deliberation

Tuesday 9 April 2024

08.30	09.00	Arrival, welcome and preparation
09.00	09.30	Interview programme management MSc
09.45	10.30	Interview students MSc
10.30	11.00	Break/panel deliberation
11.00	11.45	Interview teaching staff MSc
12.00	12.30	Interview Board of Examiners BSc + MSc
12.30	13.15	Lunch break
13.15	15.15	Thematic sessions MSc
15.15	16.00	Panel deliberation
16.00	16.30	Final meeting management MSc
16.30	17.30	Panel deliberation
17.30	18.00	Oral feedback

Appendix 4. Materials

Prior to the site visit, the panel studied 15 theses of the bachelor's programme Earth Sciences, Economics and Sustainability. Information on the theses is available from Academion upon request. The panel also studied other materials, which included:

- VU bachelor Aarde & Economie rapport
- B AED Agenda Setting Memo incl. SWOT analysis
- Student Chapter (Dutch version, original)
- Student Chapter (English version)
- Exit qualifications
- DSK Environmental Science 2023
- Jaarverslag AED 2022-2023
- Verslag werkveldadviesraad AED 2023
- Kader werkveldadviesraad BETA 2023
- Jaarschema B AED 2023-2024
- Study Guide
- BETA OER Bachelor AED 2023-2024
- Overview of staff
- Management information: Factsheet 2023
- Management information: accreditation report
- Course file: Hydrology
- Course file: Integraal veldwerk
- Course file: Methoden en Technieken voor Sociaal en Economisch Onderzoek
- 2022 Assessment Policy Faculty of Science
- Rules and guidelines of the examination board 2022-2023
- Toetsplan B AED
- Toetsprogramma B AED
- Overview of final projects
- Thesis manual
- Rubrics Thesis AED
- Cuco AED eindrapport
- VU onderwijsvisie 2021