Assessment Report
Limited Programme Assessment

Master Geographical Information Science

VU University Amsterdam

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1. Executive summary

On 8 June 2012 the assessment panel, the composition of which had been approved by NVAO, conducted a quality audit of the Master of Science programme Geographical Information Science of the Faculty of Earth and Life Sciences of VU University Amsterdam. In this executive summary the panel presents the main findings, considerations, recommendations and conclusion regarding the quality of the programme.

The quality of the programme has been audited in accordance with the NVAO Accreditation Framework. As the programme has the characteristics of a post-initial academic master's programme, the panel has taken into account the additional notes of NVAO regarding the assessment of these programmes.

The critical reflection report of the programme provided the information needed. The panel has experienced much enthusiasm for the programme on the part of the students who take the programme, and management and lecturers who work hard and successfully to execute, adapt and improve the programme.

The programme is a joint responsibility of the Faculty of Earth and Life Sciences and the Faculty of Economics and Business Administration of VU University Amsterdam. The panel has observed the collaboration to be productive. The cost-recovering tuition fee that he students have to pay distinguishes this programme from other programmes of VU University Amsterdam. The programme is, especially, interesting for mid-career professionals who want to expand their knowledge and skills on geographical information science. There is a substantial demand on the part of these students for this programme. Their employers are prepared to pay the tuition fee. The majority of the students finish the programme with a certificate and/or diploma, a minority continues to attain the master's degree.

The learning outcomes meet both the domain-specific theoretical knowledge and skills and scientific research skills very well. In the domain-specific knowledge, the technical aspects of geographical information systems are predominant. The learning outcomes are of a master's level and, clearly, have an academic orientation. As the programme shares the learning outcomes with foreign programmes of the UNIGIS network, the learning outcomes meet the international standards well.

The information for the incoming students is appropriate. The admission procedure is sound and selects the students who have a fair chance to complete the programme. Students who do not meet the requirements have to take a pre-master programme consisting of a GIS-part and an academic skills part in order to achieve the required level of both aspects. The GIS-part is not well-documented.

The literature and the study materials reflect the required level. The theoretical knowledge and the skills the students acquire meet the requirements of this technically oriented programme. The pre-master Academic Skills module, the Research Methods module, the master's thesis proposal and the master's thesis provide a satisfactory trajectory to bring the academic research knowledge and skills of the students up to a master's level. The workshops in the programme promote the communication skills of the students and their abilities to work together in a group, solving complicated problems. The study material the students receive is well-structured and enables the students to complete the modules in a largely self-directed way. Some of the module contents, however, is not entirely up-to-date.

The panel assesses the study guidance to be appropriate and applauds the measures taken by the programme management to intensify the study guidance and lower the drop-out rate. The panel approves of the selective effect of the first module in the programme.

The lecturers are experienced researchers in this domain, meeting the international research standards. The panel considers that 60% of lecturers having a PhD is consistent with a post-initial master's programme. The number of lecturers with a basic teaching qualification is sufficient. The relation of the programme management and lecturers with the professional field is satisfactory.

The material facilities of the programme are adequate. The students have enough means to study and to obtain additional material for their study and their assignments. The educational committee of the programme works well.

The assignments in the programme are challenging and reach a good level, although some of the practical assignments could have been given more weight. The master's theses the panel members have studied, meet the theoretical and methodological standards of a master's programme. Theses graded with a 6 (just satisfactory) are, indeed, satisfactory and are not below the line. The assessments of the assignments as well as of the master's theses are not very clear or detailed. The panel had difficulty in tracing the way in which the assessors had reached their judgements. The examination board works in accordance with the Faculty rules and guidelines but should monitor procedures more effectively.

The panel feels the drop-out rate of the students is relatively high. The programme management has listed a number of plausible explanations for this and has intensified the study guidance, especially in the first year to prevent students from dropping out. The panel is positive about the steps taken. The programme prepares the graduates well for their career. Given the evidence presented, the panel is convinced the graduates of the programme have ample opportunities to improve their position in the professional practice.

Main recommendations by the panel

The panel recommends the programme management to:

- look for the right balance between the scientific research orientation on the one hand and professional knowledge and skills orientation on the other hand, making use of the opportunities the post-initial academic master's status of the programme may have;
- make the difference in aims and levels between the three parts of the programme (certificate, diploma, degree) more transparent for students and employers and in the structure of the programme;
- document more precisely the geographical information science part of the pre-master programme;
- continue to update the modules in the programme and make available enough resources to be able to complete this task;
- continue to improve and to intensify the study guidance in order to curb the student drop-out rate and study delay;
- limit the grade in case of a third examination resit to a maximum of 6.0;

- adopt and implement more clear procedures with regard to the assessment and grading of the assignments and the master's theses.

Conclusion of the panel

The panel assesses the intended learning outcomes (standard 1) to be *good*. The teaching-learning environment (standard 2) and the assessment and achieved learning outcomes (standard 3) are assessed by the panel to be *satisfactory*. The panel is convinced the programme complies with the requirements of post-initial academic master's programmes, as laid down in the additional notes of NVAO. Therefore, the panel advises NVAO to assess the quality of the programme Master Geographical Information Science of VU University Amsterdam to be satisfactory and to grant the programme the re-accreditation.

Prof.dr. H.F.L. Ottens
Chair

drs. W.J.J.C. Vercouteren RC
Secretary

2. Assessment process

The programme management of the degree programme Master Geographical Information Science of VU University Amsterdam has comprised an assessment panel for the quality audit of the programme. This audit is part of the procedure by means of which the programme management aims at re-accreditation of the programme by NVAO.

The assessment panel was composed as follows:

- prof.dr. H.F.L. Ottens (chair)
- prof.dr. J.C.H. Stillwell (expert member)
- prof.mr. J.W.J Besemer (expert member)
- ing. H-J. Lekkerkerk BSc (student member).

Drs. W.J.J.C. Vercouteren RC acted as secretary and process co-ordinator.

On 8 May 2012 VU University Amsterdam submitted the assessment panel's composition for approval to NVAO. On 23 May 2012, NVAO informed the University about their approval of the panel's composition.

The programme management and the secretary of the panel discussed the set-up of the site visit and the documents to be presented during the site visit as well as the structure of the critical reflection including the appendices. The secretary commented on the draft version of the critical reflection, making remarks only on the completeness of the document.

Preceding the site visit on 8 June 2012 the members of the assessment panel studied the critical reflection and the accompanying documents sent to them by the programme management (please refer to annex 2 of this report). In this documentation fourteen master's theses were included, being the total number of master's theses approved from 2007 to 2012. These master's theses were distributed to the panel members according to the scheme set by the panel's chair. All panel members had access to the digitally published versions of the theses. Prior to the site visit the secretary informed the panel members about the procedure. During and shortly after these meetings the panel members presented their questions to the secretary. In cooperation with the panel's chair a complete, structured list of discussion points was compiled. The list served as a guideline for the panel for the meetings during the site visit.

On 7 June 2012 panel member prof. John Stillwell informed the secretary of his not being able to attend the site visit. Urgent personal circumstances prevented him from coming to Amsterdam. The panel decided to proceed with the site visit, even though the absence of Mr Stillwell, obviously, was a major handicap. Nevertheless, the panel was convinced to be able to conduct a sound site visit and to incorporate Mr Stillwell's input during the process of compiling the assessment report. The programme management also agreed to proceed with the site visit.

During the preliminary meeting of the panel on 8 June 2012 the panel members exchanged their views on the theses they had studied and assessed. They all shared the view the theses were up to standard for this master's programme.

After the site visit the panel's chair informed Mr Stillwell about the general conclusions of the panel on 8 June 2012. Mr Stillwell agreed to these, expressing his views to be in accordance with those of the other panel members. The chair and Mr Stillwell agreed the absence of Mr Stillwell on 8 June 2012 did not have any detrimental effects on the assessment process.

The secretary drew up a draft assessment report, based upon the findings, considerations and conclusions of the panel. He sent the draft version to the panel's chair who inserted his amendments. Then, the draft was sent to all other panel members. They corrected and amended the draft report. The secretary drew up a final report which, after having been checked by the panel's chair, was sent to the programme management. After having corrected the report for factual errors, the secretary sent the final report to the programme management to serve as an appendix to their request for re-accreditation.

Having studied the documentation of the programme, having met with various representatives of the programme and students of the programme and having discussed the findings and considerations with all of the panel members, the assessment panel is convinced to have been able to come to a sound and reliable assessment of the quality of the programme.

3. Outline of the programme

3.1 Facts and figures

Formal information about the programme

Name of programme in CROHO:	M Geographical Information Science
Programme's orientation and level:	Academic (WO) master's programme
Number of credits:	60 EC
Specialisations pathways (four):	Geographical Information Systems, Geographical Information Science, Geographical Information Systems and Management, Geographical Information Systems and Environment
Location:	Amsterdam
Study mode:	part-time, 3 years, distance-learning programme
Registration number in CROHO:	75040

Formal information concerning the institution

Name of the institution:	VU University Amsterdam (Vrije Universiteit)
Status of the institution:	Government-funded

Quantitative information about the programme

Figures on the number of students who have dropped out and on the number of students who have graduated in four years, for the latest six cohorts (n.a. means: not available) are presented in this table:

Cohort	Inflow	Drop-out	Graduation in 4 years
2005/2006	15	8 (53%)	1 (7%)
2006/2007	18	8 (44%)	1 (6%)
2007/2008	22	7 (32%)	1 (5%)
2008/2009	19	5 (26%)	1 (5%)
2009/2010	19	5 (26%)	n.a.
2010/2011	21	1 (5 %)	n.a.

The figures in this table underestimate the graduation rate. A number of students do not intend to achieve a master's degree but intend to obtain the UNIGIS Certificate (awarded upon the (successful) completion of the first year) or the UNIGIS Diploma (awarded upon the (successful) completion of the second year). In the table below the graduation rates are shown for the years more or less complete figures are available for. Still, students of these cohorts are active in the programme.

Cohort	Inflow	Drop-out	Certificate	Diploma	Master	Graduation total
2005/2006	15	8	1	1	2	4 (27%)
2006/2007	18	8	2	1	1	4 (22%)
2007/2008	22	7	2	2	2	6 (27%)
2008/2009	19	5	0	0	1	1 (06%)

The core teaching staff in the programme consists of 15 lecturers. Nine (60%) of these have obtained a BKO certificate (BKO is the Dutch abbreviation for basic teaching qualification). One of the other lecturers will start a BKO course in 2012.

The staff-to-student ratio varies from 1 : 45 to 1 : 55, depending on the cohort and has been calculated from the number of students on the programme and the number of staff involved in the programme. When calculated on the basis of full-time equivalents of both staff and students the staff-to-student ratio is between 1 : 15 and 1 : 20, depending on the cohort.

The average number of contact hours per year in this distance-learning programme is:

	Year 1	Year 2	Year 3
Contact hours	48	40	28

3.2 Profile of the institution

The degree programme Master Geographical Information Science is a programme of the Faculty of Earth and Life Sciences of VU University Amsterdam.

VU University Amsterdam was founded in 1880. Some 20,000 students are enrolled in the programmes of the university. More than 10,000 staff is employed by the University and by the affiliated VU Medical Centre.

VU University Amsterdam aspires to be an open organization, strongly linked to people and society. For the University what matters is not just the acquisition of a greater depth of knowledge, but also a wider scope.

The University expects students, researchers, PhD candidates and employees to look further than their own interests and their own field, and further than what is familiar and further than the here and now.

Academic research and education at VU University Amsterdam are characterized by a high level of ambition, and encourages free and open communications and ideas.

VU University Amsterdam stands for universal university values such as academic freedom and independence, which is reflected in our name ('VU' is the Dutch abbreviation for 'free university'): free from the church, state and any commercial interests. The basic philosophy of VU is expressed in three core values: responsibility, openness and personal engagement.

The Faculties of VU University Amsterdam are the Faculties of Earth and Life Sciences, Human Movement Sciences, Economics and Business Administration, Sciences, Medicine, Theology, Arts, Psychology and Education, Law, Social Sciences, Dentistry and Philosophy.

3.3 Intended learning outcomes

The intended learning outcomes of the programme specify the students should have:

- an academic master's level of thinking and working (logical, reflective, critical attitude, creativity, ethical and independent);
- theoretical, methodological and empirical knowledge of the relevant concepts in geographical information science from different perspectives (technical, geographical, organisational), especially about aspects of spatial informatics and information systems, of spatial analysis and geoprocessing methods and techniques (more specifically, the methods and techniques within cartography, geodesy and geography), of the different phases of spatial research and analysis, and of data representation;
- the knowledge and insight to integrate spatial data and information from various disciplines and the ability to use technology, data and methods to implement geo-information systems within organisations;
- skills to independently set up, prepare, carry out and report on scientific research and, more specifically, GIS-projects and –analyses, the ability to adequately analyse, interpret and critically examine their own research results and those of others and to clearly present the results of such analyses verbally as well as on paper;
- insight into the importance of the field of geographical information science in its broad historical and social context, as well as insight into the multitude of connections of geo-information science with other disciplines;
- professional skills required to apply this knowledge adequately, efficiently and productively in actual practice; moreover, the students have developed the ability to creatively and systematically handle problems occurring in professional practice, by using relevant theoretical and methodological knowledge and skills to clarify and solve them;
- the ability to determine data quality; the students are aware of the limitations of geo/information science and their own expertise;
- professional and communicative skills required for working in multidisciplinary teams;
- insight into the challenges present in the domain of the programme, and knowledge and skills to adequately reflect on them and give appropriate advice from an geo-information science perspective;
- the ability to translate spatial questions into the different phases of scientific research and indicate which geo-information solutions can be used to solve the issues;
- the knowledge to design, implement and analyse databases;
- academic attitude, independence, communicative abilities (verbally and on paper), a collaborative attitude and a critical awareness of the moral and ethical dimensions of scientific knowledge and its application;
- academic skills in accessing new literature, judging its relevance, absorbing and applying it in their daily professional practice; and
- acknowledge the importance of the *life-long-learning* concept.

3.4 Outline of curriculum

The curriculum of the programme has a study load of 60 EC and a duration of three years. The curriculum consists of the following modules:

- The first year consists of the Workshop I Introduction (0 EC), the modules Advanced GIS (5 EC), Database Theory (4 EC), Geodata Capture, Standards and Quality (5 EC), Research Methods (4 EC) and Workshop II Spatial Analysis (1 EC). The number of credits in the first year is 19 EC.
- In the second year the students choose their specialisation pathway. In the specialisation pathway Geographical Information Systems, the students take the compulsory module GIS in Organisations (5 EC) and three elective modules, one of 5 EC and two of 4 EC. In the specialisation Geographical Information Science, the students take the compulsory modules GIS and Modelling (5 EC) and Databases for Entreprise GIS (5 EC) and two elective modules, both of 4 EC. In the specialisation pathway Geographical Information Systems and Management, the students take the compulsory modules GIS in Organisations (5 EC) and GIS Project Management (5 EC) and two elective modules, both of 4 EC. In the specialisation Geographical Information Systems and Environment, the students take the compulsory modules Environmental Impact Assessment and GIS (5 EC) and Remote Sensing for GIS Applications (5 EC) and two elective modules of 4 EC each.
- For the elective modules in the various specialisation pathways, the students may choose from the modules GIS in Organisations (5 EC), GIS and Modelling (5 EC), Databases for Enterprise GIS (5 EC), GIS Project Management (5 EC), Environmental Impact Assessment and GIS (5 EC), Remote Sensing for GIS Applications (5 EC), Programming in GIS(5 EC), European Aspects of GIS (5 EC), Spatial Analysis and Health (4 EC), Spatial Health in Practice (4 EC), Visualisation for GIS (4 EC) and Internet GIS (4 EC).
- The third year consists of Workshop III (0 EC, part of thesis work) and the MSc Research Proposal (Literature Review) and MSc Thesis (22 EC).

4. Overview of assessments

Standards NVAO assessment framework	Assessment
Standard 1. Intended learning outcomes	Good
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Assessment and achieved learning outcomes	Satisfactory

5. Assessment per standard

5.1 Standard 1: Intended learning outcomes

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

Findings
The programme is a joint programme of the Faculty of Earth and Life Sciences and the Faculty of Economics and Business Administration of the VU University Amsterdam. These faculties closely work together in the programme. The responsibilities of the two faculties have been clearly defined. In the future, the faculties want to continue and further improve their collaboration with regard to this programme.

The programme is mainly aimed at mid-career professionals who want to further their careers and become eligible for positions where in-depth technical and managerial knowledge and skills with regard to geographical information science are required.

The programme is not government-funded. The students have to pay a fee to cover the costs of the programme. The programme is a distance-learning programme with only a very limited number of contact hours per year.

The main aim of the programme is to educate students to be able to do independent scientific research in the field of geographical information systems. The students are educated to be able to analyse complex spatial problems with an explicit geo-information science component, to take into account the multidisciplinary aspects of these problems and to suggest management decisions, policy measures or other actions needed.

According to the aims of the programme, the graduates will have thorough and up-to-date knowledge of geographical information systems and geographical information science. They will be able to apply their knowledge to spatial problems in domains where geographical information systems knowledge is useful for solving these problems. The graduates, also, will be able to draft relevant research questions, do empirical scientific research and present the results thereof in writing or orally.

The programme management has drafted the intended learning outcomes of the programme (please refer to section 3.3 of this report). In these learning outcomes, the aims of the programme are reflected. The programme management has put emphasis on the academic master's level of thinking and working, the theoretical, methodological and empirical knowledge of the relevant concepts in the geographical information science field, the scientific research skills, the academic skills and the professional skills of the graduates.

The intended learning outcomes have been compared to the Dublin descriptors by the programme management. From this comparison, it is evident that the learning outcomes meet

the Dublin descriptors completely. The Dublin descriptors are evenly distributed over the learning outcomes.

The programme management is a co-founder of the UNIGIS international network. Currently, some eleven universities and a number of study centres are a member of this network. Universities are situated in the United Kingdom, Austria, Poland, Hungary, Portugal, Spain and the United States. Every year the UNIGIS partners meet officially. In between the official meetings, the institutions have frequent informal contacts. The UNIGIS network is engaged in jointly developing and updating the core curriculum, the course materials and the research projects. The intended learning outcomes of the programme of the VU University are the same as those of the UNIGIS partner universities in the United Kingdom, although these are two-year programmes whereas the programme of the VU is a one-year programme.

Considerations
The panel regards the programme to be unique in more than one respect. The programme is a joint responsibility of the Faculty of Earth and Life Sciences and the Faculty of Economics and Business Administration. The panel has observed the collaboration to be productive. The cost-recovering tuition fee the students have to pay is another feature, which distinguishes this programme from other programmes of the university.

The programme attracted a fair number of students in the past five to six years. This number has slightly risen over the years. The programme is, especially, interesting for mid-career professionals who want to expand their knowledge and skills on geographical information science. The panel notes that there is a substantial demand on the part of these type of students for this programme, a demand which has been rather stable over the years and seems to increase. The employers of the students are prepared to pay the tuition fee. It should, however, be noted that only a minority of the students intend to complete or completely do the full programme. Most students decide to stop after having attained a UNIGIS Certificate (after one year of part-time study) and/or a UNIGIS Diploma (after two years of part-time study). These students do, of course, not attain the final programme aims. These facts should be better incorporated into the way the programme is presented, in the specification of aims and learning outcomes of the programme and, maybe, also the structure and organisation of the programme.

The panel considers the aims of the programme to be sound and the learning outcomes to reflect the aims of the programme in an appropriate way. The panel is very positive about the learning outcomes, since they meet both the domain-specific theoretical knowledge and skills and scientific research skills very well. In the domain-specific knowledge, the technical aspects of geographical information systems are predominant.

The learning outcomes correspond to the Dublin descriptors, as the programme management has shown. Therefore, the learning outcomes are consistent with the requirements of a master's programme, for those students that complete the whole programme. As the learning outcomes contain a substantial number of references to the scientific research and academic skills of the graduates, the panel regards the programme to, clearly, have an academic orientation.

As the programme shares the intended learning outcomes with a number of programmes abroad, all belonging to the UNIGIS network, the panel considers the final learning outcomes to meet the international requirements very well.

The programme, nevertheless, still seems to look for the right balance between scientific research on the one hand and professional knowledge and skills on the other hand. As the programme is a post-initial master's programme, directing the learning outcomes towards solving complex, multidisciplinary problems might prove a productive direction to look for this balance. The panel encourages the programme to continue the search for the right balance.

As indicated before, the other, related point for further discussion is to more transparently differentiate between the aims for the Certificate, the Diploma and the master's degree, so it becomes clear to students and employers what the nature of the different post-initial education is.

Conclusion
The assessment panel assesses the Intended learning outcomes (standard 1) to be *good*.

5.2 Standard 2: Teaching-learning environment

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

Findings
Students who are interested to enter the programme are informed by the programme management about the characteristics of the programme, including the distance-learning aspects.

The programme has developed an admission procedure to be able to select students who meet the requirements to complete the programme successfully. This admission procedure specifies admission paths for students from various backgrounds and with different prior educations. All the students who want to enter the programme have to present in writing their motivation for this programme, an overview of their references and a specification of their geographical information systems knowledge and skills. Having studied these documents the examination board of the programme decides whether or not a student is allowed to enter the programme and whether he or she should first take the pre-master programme.

Students with an academic bachelor's or master's degree of a Dutch university are directly admitted to the programme. If students did not have geographical information systems courses in their previous education, they are required to take a pre-master prerequisite, which consists of the module Introduction to GIS (6 EC). Once the students have finished this module they are allowed to enter the programme.

Students who have a degree of a Dutch Higher Vocational Education institution (HBO) should have a grade point average (GPA) of at least 7.0 or should have at least three years of relevant working experience on top of their HBO-degree. If they meet these requirements, they ought to complete the pre-master assessment, which is a standard assessment of VU University Amsterdam. If they have passed this assessment, they may enter the pre-master programme. For them, the pre-master programme consists of both the Introduction to GIS module (6 EC) and the Academic Skills module (6 EC) of the University. Once they have completed this pre-master programme successfully, they are admitted to the programme.

In the admission procedure, the programme management tests the fluency in English of the students, especially the foreign students, as well. Some 20 to 25% of the students come from abroad.

As a consequence of adopting this set of strict admission criteria, the distribution of the prior education of these students has shifted in recent years. The percentage of students with a HBO-bachelor degree changed from 67% of the total inflow for the cohort 2007/2008, via 50% for the cohort 2009/2010 to 27% for the cohort 2011/2012. The percentage of students with an academic bachelor's degree remained stable around 20% of the total inflow. The percentage of students with an academic master's degree increased from 11% in 2007/2008 via 17% in 2009/2010 to 46% in 2011/2012.

Even if the students meet the formal requirements of the programme, they still may lack some up-to-date knowledge of aspects of geographical information systems. They, therefore, are advised to study additional material and literature, which has been specified by the programme management. The students are made aware of their own responsibility to mend the deficiencies they may have in this respect.

The programme management has drafted the curriculum (please refer to section 3.4 of this report). The programme has been divided in three parts, which correspond to the programme years. The modules in the first part, the foundation, are compulsory for all of the students and add up to 19 EC. Upon completion of this first year the students acquire the UNIGIS Certificate. In the second part, the specialisation, the students choose one out of four specialisation pathways. The pathways consist of one or two compulsory modules and two or three elective modules. Having completed the first and second year the students obtain the UNIGIS Diploma. In the third part, called the thesis, the students do research and write their master's thesis, after first having presented their proposal for this thesis. The students are required to present and defend their master's thesis. The study load of the thesis, including the proposal is 22 EC.

The curriculum corresponds to the learning outcomes of the programme. The programme management has drafted a table demonstrating the relations between the learning outcomes and the parts of the curriculum (modules, workshops and thesis). From this table it can be deduced that the learning outcomes are completely and evenly represented in the curriculum. This applies to all of the specialisations. In the descriptions of the modules and the workshops, the learning goals, the contents, the literature and course materials and the assessments are specified. The educational committee regularly verifies the correspondence of the learning goals of the modules, the contents of these and the assignments.

The programme has introduced a new module at the end of the first year, the module Research Methods. This module builds on the Academic Skills module of the pre-master programme and is meant to bring all the students early in the programme on the same level regarding research methods and techniques. The students are expected to apply this knowledge in their specialisation and in their thesis.

In the first two years the students participate in a number of face-to-face workshops. The first workshop is an introductory workshop of one day at the beginning of the first year. The other workshops are at the end of the first year and at the end of the second year. The second workshop takes five days and addresses the topic of spatial analysis. The students have to solve problems within a limited time frame, forcing them to work together effectively. The third workshop, also with a duration of five days, has decision support as the main subject.

Within the UNIGIS network, the modules are updated regularly. In recent years the programme has become more involved in the updating process, whereas previously the programme was more dependent on the UNIGIS-partners in the United Kingdom. The programme management has developed a geographical information systems minor, together with other Dutch universities. The programme management expects this minor to attract more students for this programme.

The students have access to the course materials by electronic means. These materials include the study framework, background materials and assignments. The modules are divided in sections, each of the sections having learning goals, context setting introductions, self-assessment exercises and additional reading materials. The students are invited to reflect on their learning process. They can communicate with the lecturer and with other students.

The first of the modules in the programme, Advanced GIS, is regarded by the students to be especially challenging. This module functions as a selection mechanism within the programme. The modules which follow, being Database Theory and Geodata Capture, Standards and Quality are also considered quite challenging by the students.

The study guidance in the first year has been intensified. In the first module of the first year, the students have to complete a group assignment. In the view of the programme management, group efforts by students promote the pace of their studying. The students contact the lecturers via e-mail and in the form of Skype-sessions. The deadlines for sending in the assignments are observed more strictly. The students are encouraged to participate in discussion boards. The discussions of the students may act as a stimulus on the pace of their study. The programme management has introduced the Progress Monitor by means of which the study progress of each of the students is monitored every three months. During the workshops, lecturers have meetings with students about their study progress. The students whom the panel has met were content with the study guidance.

Most of the lecturers are employed as researchers in either the Spatial Information laboratory (SPINlab) at the Department of Spatial Economics or at the Institute of Environmental Studies. The research evaluations of these institutes in 2007 and 2009 ranged from very good to excellent. The SPINlab participates in a number of international projects regarding geographical information science. Calculated in terms of persons, some 45% of the lecturers have obtained a PhD. When calculated in terms of the time the lecturers lecture in the programme, the percentage of lecturers with a PhD is about 60%. When a lecturer does not yet have a PhD, he or she may lecture under the authority of a lecturer who does have a PhD. The percentage of lecturers having a BKO (basic teaching qualification) is about 60%. The lecturers meet two times per year to discuss the programme. The lecturers of the modules in the first year meet more frequently.

The programme management and lecturers maintain working relations with organisations like Geodan, CapGemini, Rijkswaterstaat and Geonovum. As the students are mid-career professionals through their work they are involved in the professional field as well.

Classrooms and computer labs are available for the workshops. The students have access to the VU library and to the Geoplaza web portal which is a co-production of SPINlab and the VU library and which provides spatial data. The students have the right to use ArcGIS, an important software programme for geographical information systems. When making their assignments, the students may use their own software.

The educational committee advises the programme management on matters concerning the quality of the programme. The students fill out digital surveys expressing their views on the quality of the programme. Due to the low response rate they are asked to fill out surveys during the workshops as well.

Considerations
The panel considers the information the programme management provides to the incoming students to be appropriate. The admission procedure the programme management adopts is sound and selects the students who have a fair chance to complete the programme. The admission procedure distinguishes quite rightly between students with an academic bachelor's or master's degree or a bachelor from a Dutch Vocational Education institute (HBO). The latter students are tested for their academic abilities by means of the VU pre-master assessment and have to take a pre-master programme to bring their academic skills up to the required level. The panel feels the programme management should document more precisely the GIS part of the pre-master programme. The programme management has, nevertheless, clearly remedied the somewhat lacking admission procedures and criteria the accreditation panel noticed in 2007.

The panel regards all of the learning outcomes to be appropriately reflected in the curriculum. From the descriptions of the modules and the workshops, it is evident that the contents of the modules meet the learning goals of the modules.

The panel considers the literature and the study materials to correspond to the learning goals of the modules and to be of the required level. Nevertheless, some of the study materials of the modules are not up-to-date. There have been some complaints of students in this respect. The programme management intends to be more active in updating the modules and make sure they are (also) appropriate for the Dutch context. The panel underlines the urgency of the intention of the programme management and emphasizes the need to make available sufficient resources to complete this task.

The theoretical knowledge and the skills the students acquire meet the requirements of this technically oriented programme. The panel regards the introduction of the module Research Methods as an improvement. The pre-master Academic Skills module, the Research Methods module, the master's thesis proposal and the master's thesis provide a satisfactory trajectory to bring the academic research knowledge and skills of the students up to a master's level. The underrepresentation of the research skills in the curriculum, as noted by the accreditation panel in 2007, has been corrected. The workshops in the programme promote the communication skills of the students and their abilities to work together in a group, solving complicated problems.

The study material the students receive is in general well-structured and enables the students to complete the modules in a largely self-directed way.

The measures the programme management has taken, are an improvement for the study guidance. The panel assesses the study guidance to be appropriate. The panel approves of the selective effect of the first module in the programme. The students ought to be aware of the challenges which lie ahead.

The panel is positive about the research qualities of the lecturers. Their research track record is adequate for an academic master's programme. The lecturers are experienced researchers in this domain, meeting the international standards. The panel considers the percentage PhD lecturers of 60% to be consistent with the characteristics of a post-initial master's programme, directed towards solving complicated and multidisciplinary problems. The critical remarks of the accreditation panel in 2007 about the number of lecturers with a PhD being too small, no longer apply. The number of lecturers with a basic teaching qualification is sufficient. The core lecturers should monitor and support less experienced lecturers to make sure they perform adequately.

The relation of the programme management and lecturers with the professional field is satisfactory.

The material facilities of the programme are adequate. The students have enough means to study and to obtain additional material for their study and to make their assignments.

The educational committee of the programme works well. The surveys among the students are well-suited for the quality assurance of the programme.

Conclusion
The assessment panel assesses the Teaching-learning environment (standard 2) to be *satisfactory*.

5.3 Standard 3: Assessment and achieved learning outcomes

Standard 3. The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Findings
To obtain the credits for the modules, the students have to complete two assignments for each of the modules. These assignments and the other examinations are checked by at least two lecturers. One of the assignments is a theoretical assignment in which the students have to demonstrate their ability to address a problem, using relevant literature and presenting sound reasoning. The other assignment is a practical assignment. In this assignment, the students are to solve a (spatial) problem using (spatial) data, translating their theoretical understanding into a product (e.g. a map). The assignments the students send in are checked for plagiarism. The students are entitled to two extra chances to have their assignments graded satisfactory. In case of a third chance, the maximum grade is set to be 6.0 by some of the lecturers. Other forms of testing are applied as well. In the module Geodata Capture, Standards and Quality the students take an oral examination.

Both of the assignments are assessed and graded by the lecturer of the module. The grade of the assignments together ought to be above 5.5, the students having the right to compensate for the grades of each of the assignments. The lecturers assess the assignments, using the learning goals of the module as a point of reference.

Before taking part in the workshops the students have to complete two or more modules. If they do not have completed these modules, they are not allowed to attend the workshops. During the workshops, the students complete assignments, which are assessed and graded by the lecturers.

As a consequence of the recommendations of the previous accreditation in 2007, the programme management has increased the study load of the master's thesis from 18 EC to 22 EC. The first step in the process of the master's thesis for the students is to draft their thesis proposal and to discuss the proposal with their fellow students and their supervisor in the MSc Workshop. The next step is to submit their proposal, including the hypothesis to be tested. At least two lecturers assess this proposal. When positively assessed, the student is allowed to continue and write the master's thesis. The writing of the thesis is supervised by a lecturer. The students have a number of meetings with their supervisors in this process. The students the panel has spoken with were content with the supervision. Upon completion of the thesis, the supervisor determines whether the student is allowed to defend the thesis. The presentation is open to the public and the defence of the thesis is before the supervisor, the second assessor and the programme director.

The assessment and grading of the master's thesis have been laid down in a document Master thesis guidelines and evaluation form. The assessment takes into account nine assessment criteria. There are always at least two assessors to assess and grade the thesis.

The examination board of the programme monitors the quality of the assessments and the master's thesis. The board works in accordance with the standards and guidelines of the Faculty of Earth and Life Sciences.

The number of students who completely finish the programme is rather limited. Moreover, many students experience study delays. There are several reasons for this. Firstly, not all of the students want to finish the programme entirely from the beginning. Some of the students are satisfied by obtaining the UNIGIS Certificate or the UNIGIS Diploma. Secondly, the programme is challenging in contents and level but also in terms of having to combine this study with work and personal life. Nevertheless, fourteen students are currently working on their master thesis. This number is substantial, given the fourteen theses which have been written in the last five to six years.

The students whom the panel has met were positive both about the theoretical domain-specific knowledge and the skills and about the knowledge on research methods and techniques they had acquired in the programme.

A survey of the programme management in 2006/2007 showed the alumni of the programme to have obtained more important positions, once they had finished their studies. The alumni of the programme whom the panel has spoken to confirmed their having been promoted to more senior positions. The alumni felt the programme had provided them with the knowledge and skills to adequately fulfill these positions.

Considerations
The panel assesses the assignments to have an appropriate content, to be challenging and to reach a good level, although some of the practical assignments could have been given more weight. The students are, nevertheless, tested in a way the panel would like to see in a master's programme.

The master's theses the panel members have studied, meet the theoretical and methodological standards of a master's programme. These theses testify to the master-level knowledge and skills the students have acquired at the end of their study. The majority of the theses are well-structured. Some of the theses are less innovative but still meet the master's standards. Theses graded with a 6 (just satisfactory) are, indeed, satisfactory and are not insufficient.

The assessments of the assignments as well as of the master's theses are not very transparent and well documented. The panel had difficulty in tracing the way in which the assessors had reached their judgment. The examination board of the programme seems to have had these difficulties as well. The panel urges the programme management to implement and document clearer and more detailed procedures, criteria and benchmarks for these assessments. The point is already taken up by the programme management as it had been detected in the SWOT analysis.

The examination board works in accordance with the rules and guidelines of the Faculty. However, the board seems to operate at some distance of the programme. The panel would like to see more involvement in effectively monitoring procedures.

The panel feels the drop-out rate and the study delay of the students is relatively high. The reasons the programme management has listed, are plausible explanations and account in part for the drop-out ratio and the delays. The programme management has, already, intensified the study guidance, especially in the first year to prevent students from dropping out or facing study delay. The panel encourages the programme management to continue to improve the effectiveness of the study guidance in this respect.

The programme prepares the graduates well for their careers. Given the evidence presented, the panel is convinced the graduates of the programme have ample opportunities to improve their position in the professional practice.

Conclusion
The assessment panel assesses the Assessment and achieved learning outcomes (standard 3) to be *satisfactory*.

Annex 1: Schedule of site visit

Amsterdam, 8 June 2012

08.30 h. – 09.30 h.	Arrival and internal deliberations of panel
09.30 h. – 10.00 h.	Meeting with dean, educational director of the Faculty and programme management prof.dr. B. Oudega (dean), dr. N. Harms (educational director), prof.dr. H. Scholten (programme director), dr. J. Dekkers (programme co-ordinator)
10.00 h. – 11.15 h.	Meeting with programme management prof.dr. H. Scholten (programme director), dr. J. Dekkers (programme co-ordinator), drs. M. Molendijk (lecturer and former programme co-ordinator)
11.30 h. – 12.15 h.	Meeting with examination board and educational committee prof.dr. P. Rietveld (chair examination board), prof.dr. H. Scholten (member examination board), drs. M. Molendijk (member examination board), prof.dr. J. van der Schee (chair educational committee), drs. R. Lassche (member educational committee), N. de Graaff (student member educational committee), M. van Dijk (student member educational committee)
12.15 h. – 14.00 h.	Lunch, study of documents presented and internal deliberations of panel, during which time from 12.15 h. to 12.45 h. office hours
14.00 h. – 14.45 h.	Meeting with lecturers dr. R. Lassche, dr. J. Dekkers, dr. N. van Manen, ing. B. Kusse MSc, dr. E. Koomen, dr. E. Dias, dr. M. Eleveld
14.45 h. – 15.30 h.	Meeting with students and alumni N. de Graaff (student), M. van Dijk (student), M. Pegels (student), W. Hartog (student), A. van Houtum (student), E. Visser MSc (alumnus), P. Brooijmans MSc (alumnus)
15.30 h. – 17.15 h.	Internal deliberations of panel
17.15 h. – 17.45 h.	Main findings presented by panel chair to programme management

Annex 2: Documents reviewed

Documents available to the panel members before the site visit:

- Critical Reflection Report UNIGIS Master Geographical Information Science
- Letter Institutional Accreditation
- Success rate per cohort
- Final attainment levels and Dublin descriptors
- Course descriptions from study guide
- Study calendar 2011 – 2012
- Curricula vitae of lecturers
- Master thesis guidelines and evaluation form
- Assessment forms related to Dublin descriptors
- Academic & Examination Regulations
- Master theses
- Course material and assignments (digitally provided)

Documents presented to the panel during the site visit:

- Course manuals of each of the courses
- Literature of each of the courses
- Examinations, including standard answer forms and corrected examinations
- Course evaluations
- Composition of examination board, educational committee and programme management
- Minutes of educational committee meetings
- Minutes of examination board meetings
- Manual assessment (in Dutch: Toetsen en Beoordelen)
- Unigis brochure
- Staff-to-student ratio, calculated in numbers and in full-time equivalents
- Number of courses graded
- Academic staff overview
- Number of students from abroad

Annex 3: List of theses reviewed

The registration numbers of the students of whom the panel studied the theses are:

- 1779966
- 1634593
- 1696807
- 1780042
- 1886002
- 1518615
- 1450166
- 1461494
- 1461508
- 1461311
- 1634607
- 1303708
- 1461346
- 1367315

Annex 4: Composition of assessment panel

Prof.dr. H.F.L. Ottens, chair
From 1992 to 2005 Mr Ottens held the position of full professor in Social Geography at Utrecht University. He was director of the research school Netherlands Graduate School of Housing and Urban Research. He, also, held the position of vice-chairman of the Commission for Geo-Information Science of the International Geographical Union. Currently, Mr Ottens is, among other things, a member of the Board of NICIS, a high-ranking institute in the Netherlands, a member of the advisory board for the Social and Geographical Statistics of the Statistical Bureau of the Netherlands and chair of the European Association of Geographical Societies. Since 2010 Mr Ottens chairs the Royal Geographical Society of the Netherlands. He has published widely.

Prof.dr. J.C.H. Stillwell, expert member
Mr Stillwell is a full professor of the School of Geography at the University of Leeds. His research interests include internal and international population migration, geographical information systems and regional planning and development. From 2006 to 2011 Mr Stillwell has been director of the Centre for Interaction Data Estimation and Research. Currently he is, among other, member of the ESRC Research Committee and editor of Applied Spatial Analysis and Policy. Mr Stillwell has published a very substantial number of scientific articles and books.

Prof.mr. J.W.J. Besemer, expert member
Mr Besemer is chair of the ITC Foundation, an institution of Twente University directed towards geographical information systems and chair of the supervisory board of Geofort. Until recently, he was a professor of Geo-information Infrastructure at the Technical University Delft. He has been director of the Kadaster and, subsequently, chair of the board of directors of the Kadaster. Currently, Mr Besemer is, among other things, chair of the board of Geonovum and vice-chairman of the Dutch Commission for Geodesy.

Ing. H-J. Lekkerkerk BSc, student member
Mr Lekkerkerk pursues his studies for the GIMA MSc programme, Geographical Information Management and Applications. This is a joint programme of University Utrecht, Wageningen University and Research Centre, Technical University Delft and Twente University. Before, he has studied both Hydrography and Electrotechnical Engineering at the Hogeschool of Amsterdam. Currently, Mr Lekkerkerk is employed at the Informatiehuis Water as an Information co-ordinator as well as being self-employed as a hydrographic consultant.