WO-master Programme in Water Science and Engineering
IHE-Delft Institute for Water Education

AVG compliant

8 februari 2019

Table of Contents

1 Executive summary

The Master's programme in Water Science and Engineering (WSE) is an 18-month master's programme offered by the IHE Delft Institute for Water Education (IHE). The programme offers the following specialisations: Coastal Engineering and Port Development, Hydraulic Engineering – River Basin Development, Hydroinformatics: Information and modelling systems for water management, Hydrology and Water Resources, Land and Water Development for Food Security, Flood Risk Management (joint specialisation with TU Dresden, University of Catalonia and the University of Ljubljana), Ground Water and Global Change (joint specialisation with TU Dresden and University of Lisbon). Both joint specialisations are offered as multiple degree modalities.

The programme prepares graduates to improve the sustainable management of human impacts on water resources, design simulation models for various phases of the water cycle, and to contribute to the development of integrated solutions for reducing the impact of water-related natural hazards and other water issues. It focuses mainly on emerging and least-developed countries and is especially suitable for mid-career professionals. The combination of a range of science and engineering disciplines related to the aquatic environment makes the programme unique.

The panel concluded that the intended learning outcomes of the programme indicate that the programme has successfully met the level that has to be acquired for an academic master's programme. Specifically, the program clearly meets the Dutch qualifications framework and ties in with the international perspective of the requirements set by the professional field and the discipline.

The curriculum has a modular structure with teaching organised into three-week blocks. After a period of two blocks there is a week for examinations. Most modules are worth 5 EC, the master's thesis comprises 36 EC. The WSE curriculum also provides a master's thesis preparatory course of 9 EC. The programme starts with a one-week introduction for all IHE students, followed by foundation courses that are mandatory for all specialisations in WSE. The programme follows the concept of aligned teaching and active learning within a framework of incremental learning. Each module therefore consists of formal lectures, supervised and unsupervised workshops, case studies, field trips, field work, and self-study by the student. The panel very much appreciates the intensive efforts IHE puts into tutoring and guidance of the students. The teaching and learning environment created by IHE is very inspiring and motivating. Students feel part of a community and are stimulated to achieve on a high level. The panel in particular appreciates the introductory week with its focus on 'ways of knowing' and encourages IHE to maintain this element in the programme. The panel thinks that the interdisciplinary focus is an exciting element of the programme which should be exploited.

The academic and didactic qualities of the staff are good, although the percentage of teaching staff with a UTQ lags behind. The panel suggests that all academic staff should be encouraged to work towards earning UTQ. The panel noticed that diversity among academic staff is an issue in IHE which still needs consideration. In particular it finds the representation of women in higher academic positions to be too low. Gender diversity related to leadership positions should be improved.

The panel established that the assessment and examinations regulations are clearly described. The Examination Board has reliable procedures and the necessary level of independence. The panel finds the assessment policy coherent and transparent. The interim examinations and the thesis assessments are transparent, valid and reliable. The panel also established that there are proper

forms in place for the assessment of the master's thesis, thesis, though further improvement is possible and recommended.

The panel studied 15 theses to establish whether the graduates had achieved the intended learning outcomes of the programme and found that the theses are appropriate as the final product of an academic master's degree programme. The graduates are well prepared for enhancing their career in the water sector.

The panel appreciates the information provided by the institute, particularly the student reflection report and is very positive about the quality culture in the institute, illustrated, among others, by the direct improvements the institute applied in reaction to the student's reflection.

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

Date: 8 February, 2019

Grietje Zeeman
(chair)

Barbara van Balen
(secretary)

2 The procedure

IHE offers four 18-month Master of Science programmes (Environmental Science, Water Science and Engineering, Water Management and Governance, and Urban Water and Sanitation). IHE chose to invite an international panel of independent experts for the assessment of these four programmes. The NVAO approved of the proposed panel of experts on 30 August 2018.

The panel consisted of:
Chair:

Prof. dr. G. Zeeman, professor emeritus in New Sanitation at Wageningen University, the Netherlands;

Members:

- Dr. K. Rebel, assistant professor in Sustainable Development at Utrecht University, the Netherlands;
- Prof. A. Schleiss, professor emeritus in Hydraulic Constructions engineering at the Swiss Federal Institute of Technology in Lausanne, Switzerland;
- Prof. E. Manzungu, professor in Agricultural Landscapes, Waterscapes and Environmental Management at the University of Zimbabwe;
- Dr. Leila Harris, associate professor at the Institute for Resources Environment and Sustainability and at the Institute for Gender, Race, Sexuality and Social Justice at the University of British Columbia, Canada;
- E.L. Okoro, master's student in Law and Technology at Tilburg University, the Netherlands.

The panel was supported by dr. B.M. (Barbara) van Balen, who acted as secretary.

This composition reflects the expertise deemed necessary by NVAO. (Annex 1: Composition of the panel). All panel members signed a statement of independence and confidentiality.

The panel has based its assessment on the standards and procedures described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands (Stcrt. 2016, nr 69458). Prior to the site visit, the NVAO developed a new assessment framework which is projected to come into effect on 1 February 2019. Anticipating this new framework, the panel (in consultation with the institute) decided to assess the programme using binary judgements. All standards are judged satisfactory, which means that the programme meets the requirements for re-accreditation.

After consultation with the chair and the secretary of the panel, the institute prepared a site visit for the panel and scheduled interviews with representatives of all four degree programmes. The panel members prepared the assessments of the programmes by analysing the documents provided by the institute for each degree programme (Annex 3: Documents reviewed). The panel organised a preparatory meeting on 14 November 2018. During this meeting, the panel members shared their first impressions and formulated questions for the site visit.

The site visit took place on 14-16 November 2018 at IHE. During its visit, the panel was able to discuss the formulated questions and to gather additional information during several sessions (Annex 2: Schedule of the site visit). Afterwards, the panel discussed the findings and considerations and pronounced its preliminary assessments per programme, per theme and per standard. At the end of the site visit, initial findings were presented to the institute.

Based on the findings, considerations and conclusions the secretary produced a draft advisory report for each programme that was first presented to the panel members. After the panel members had commented on the draft report, the chair endorsed the report. On 22 January 2019 the advisory report was sent to the institute, which was given the opportunity to respond to any factual inaccuracies in the report. The institute replied on 5 February 2019. All corrections were adopted. Subsequently the final report was endorsed by the panel chair. The panel composed its advice fully independently and offered it to the institute on 8 February 2019.

3 Description of the programme

3.1 General

Country	:	The Netherlands
Institute	:	IHE – Delft Institute for Water Education
Status	:	Not publicly funded, higher education institute
Result institutional quality assurance assessment	:	positive 12th May 2015
Programme	:	Programme in Water Science and Engineering
Level	:	master
Orientation	:	academic (wo)
Specialisations	:	Coastal Engineering and Port Development Hydraulic Engineering – River Basin Development Hydroinformatics: Information and modelling systems for water management Hydrology and Water Resources Land and Water Development for Food Security Flood Risk Management (Joint specialisation) Ground Water and Global Change (Joint specialisation)
Degree	:	Master of Science
Location(s)	:	Delft
Study Load (EC)	:	106 EC (joint specialisations 120 EC)
Croho	:	75008

3.2 Profile of the institute

IHE Delft Institute for Water Education (IHE) is the largest international graduate water education facility in the world. IHE envisions a world in which people manage their water and environmental resources in a sustainable manner, and in which all sectors of society, particularly the poor can enjoy the benefits of basic services. The mission of IHE is to contribute to the education and training of problem-oriented researchers and professionals, to expand the knowledge base through research, and to build the capacity of sector organizations, knowledge centres and other institutes active in the fields of water, the environment and infrastructure in developing countries and countries in transition.

IHE has three Academic Departments with academic staff responsible for education, training and research programmes. These are the Environmental Engineering and Water Technology, Water Science and Engineering, and Integrated Water Systems and Governance departments. Each Academic Department is composed of Chair Groups, each of which is based on a particular discipline or specialisation.

The institute's education activities include a PhD programme, several masters' programmes and an array of short and online courses, with a focus on practicing and mid-career professionals.

3.3 The master's degree programme Water Science and Engineering

The Master's programme in Water Science and Engineering (WSE) is an 18-month master's programme. It focuses on the understanding, management and development of water resources and water flows and quality in the natural and human-influenced environment, while addressing the multidisciplinary character of human activities dealing with water. The programme aims to deepen the knowledge, insights and skills in relation to Hydraulic Engineering, Hydro-informatics and Hydrology.

In recent years the number of specialisations of the master's programme has grown, as a result of the IHE's participation in international initiatives such as the Erasmus Mundus Programme. Some specialisations are offered jointly with European and overseas partners. These joint specialisations have a different structure and of longer duration than the 18 months Delft based specialisations. Two Erasmus Mundus multiple degree joint specialisations residing under the WSE Programme are the specialisation Flood Risk Management, which is offered jointly with TU Dresden (Germany), University of Catalonia (Spain) and the University of Ljubljana (Slovenia) an the multiple degree specialisation Groundwater and Global Change offered jointly with the University of Dresden (Germany) and the University of Lisbon (Portugal). Both joint specialisations are offered as multiple degree modalities.

4 Assessment per standard

4.1 Standard 1: Intended learning outcomes

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

Outline of findings
The master's programme in Water Science and Engineering (WSE) prepares graduates to improve the sustainable management of human impacts on water resources, design simulation models for various phases of the water cycle, and contribute to the development of integrated solutions for reducing the impact of water-related natural hazards and other water issues. It focuses on the understanding, management and development of water resources and water flows and quality in the natural end human-influenced environment, while addressing the multidisciplinary character of human activities dealing with water. The overall objective of the programme is that by the end of the course, students will be able to work in a complex environment, and, by using interdisciplinary approaches, will be able to improve the management of human impacts on water resources, to develop simulation models for various phases of the water cycle, and to develop methods to reduce the impacts of water-related natural hazards. The programme focuses mainly on emerging and least-developed countries and is especially suitable for mid-career professionals.

To be able to work in this complex environment of water resources and to explore natural and anthropogenic influences on the water cycle as well as to develop solutions, scientific knowledge and academic skills are needed from the perspective of civil engineering (Hydraulic Engineering), technology (Hydroinformatics) and earth sciences (Hydrology). These different disciplines form the foundation for the Water Science and Engineering programme. They are complementary and ensure exposure of the student to a large variety of water issues from different perspectives, and the ability to develop sustainable solutions for complex water problems. Each discipline represents an established and well-defined academic field for which the objectives are readily obtained from international consensus. Hydrology, for example, is defined by the International Association of Hydrological Sciences (IAHS); and the fields of Hydraulic Engineering and Hydroinformatics by the International Association of Hydro-environment Engineering and Research (IAHR) and the International Water Association (IWA). The assessment panel applauds the way Water Science and Engineering builds on these frameworks and finds them an appropriate basis for an interdisciplinary master's programme.

The specialisations of the programme explore natural and anthropogenic influences on the water cycle, from the perspectives of civil engineering, technology and earth system sciences. The specialisation specific part is about 24% of the programme, in time and credit points as well. The assessment panel questioned the number of specialisations in the programme considering the limited number of students involved and discussed this with the programme committee during the site visit. The programme committee ensured the panel that the specialisations fit well in the master programme and explained that the number of specialisations is historical: several master's programmes are combined in one.

In line with the overall objective, the programme has the defined intended learning outcomes (see Annex 1). The intended learning outcomes include the newly defined final qualifications at Institute level that are applicable for all IHE's 18-month master's programmes.

Considerations
The panel finds the profile of the master's programme attractive and very relevant and subscribes to the mission of the programme. It is a unique programme that combines a range of science and engineering disciplines related to the aquatic environment. It pays attention to the social interactions and societal aspects that play a role when designing solutions and trying to implement them. The programme fulfils a societal need to prepare students to address the issues and questions concerning water science and engineering.

The panel finds the final qualifications and learning objectives are well-formulated. They indicate the level that has to be acquired for an academic master's programme sufficiently, meet the Dutch qualifications framework, and tie in with the international perspective of the requirements set by the professional field and the discipline. They are well connected to the needs in society and the requirements in the professional field. There is without doubt a need for the training of mid-career engineers in the WSE field. The panel, however, is of the opinion that the mission should also contain an indication of the need to explore problems in an interdisciplinary way to align the mission with the domain specific framework and the learning outcomes.

The specialisations of the programme properly reflect the need for structural, sustainable responses to environmental/humanitarian crises, which makes the programme an ideal career-enhancing one for mid-career professional or starting researchers.

Conclusion
Satisfactory

4.2 Standard 2: Teaching-learning environment

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

Outline of findings
The critical reflection describes that the overall emphasis of the programme is on water sciences, engineering and technology placed in the contemporary context of society, economy and environment. The specialisations are structured in a sequential build-up of educational components (incremental learning approach), which allow some interchange of topics and other educational activities among groups of students following different specialisations. The programme provides the opportunity for students – although mainly devoted to their selected specialisation – to interact with colleagues of other specialisations and to share information and learning activities in a multidisciplinary context.

The curriculum
The curriculum of Water Science and Engineering incorporates seven specialisations:
• Hydrology and Water Resources (HWR);
• Hydraulic Engineering and River Basin Development (HERBD);
• Coastal Engineering and Port Development (CEPD);
• Land and Water Development for Food Security (LWDFS);
• Hydroinformatics: Information and Modelling Systems for Water Management (HI);

• Erasmus Mundus Programme on Flood Risk Management (FRM);
• Erasmus+ Programme on Groundwater and Global Change (GroundwatCH).

The last two specialisations have been developed as part of educational programmes that lead to multiple degrees (from IHE-Delft and partner organisations).

The five Delft-based specialisations have four distinct phases:

- Foundation: fundamental principles and system understanding as well as key methodologies are introduced.
- Deepening: advanced knowledge and skills in the chose specialisation.
- Broadening: electives and working collaborative with fellow students from other specialisations and programmes on joint problems.
- Research.

The programme has a modular structure with teaching organised into three-week blocks. After a period of two blocks there is a week for examinations. In principle the curricula of the four 18 months master degree programmes of IHE have the same structure. Most modules have a size of 5EC, the master thesis contains 36EC. The WSE curriculum also provides a master thesis preparatory course of 9EC. The programme starts with a one week introduction for all IHE students followed by the foundation courses, which are combined for all specialisations in WSE. The one week introduction is very much appreciated by the students. Students feel that the institute is making considerable efforts to make them feel welcome and include them in the IHE community.

The student representatives report that they find the foundation courses very relevant for refreshing their knowledge and bring students to a level of basic understanding. Particularly useful is the opportunity for getting familiar with GIS (geographical information system). Specialisation courses start with module 3. Modules 8, 10 and 11 are electives. Module 13 is the Group work module, which is described by the students as a good experience and is useful for learning to cooperate with students from different specialisations. During the site visit the students report positively about the field trip and field work (module 9). At the start of the programme the students find the study load very high, but they get used to it and find a balance after a few months.

IHE offers online courses for students to prepare themselves, refresh their knowledge or fill knowledge gaps before starting in Delft. The panel learnt during the site visit that these online courses are seldom used by the students, either because they weren't aware of the existence or because the decision about the scholarship came too late. The panel finds these online courses very valuable and advises to make the students more aware of them.

Didactic concept and policy
All education at IHE follows the concept of aligned teaching and active learning within a framework of incremental learning. Each module therefore offers a balance of formal lectures, supervised and unsupervised workshops, case studies, field trips, field work, and self-study by the student. The knowledge and abilities of students are thereby gradually developed, so that both disciplinary knowledge and insights in problem analysis and problem solving, and general academic skills can be deployed to good effect in subsequent group work and research thesis studies. The master's research project provides a vehicle through which integration of the programme material is achieved.

The master's thesis part is the culmination of the study, the part where independent thinking and problem-solving is further developed. Students typically take one of the following types of topics:

• a research topic from their own home environment, often in a 'sandwich' programme, where field research and/or data collection is carried out for 2-3 months out of the six months period. Almost by definition these are quite development relevant contributions, and quality is ensured by supervision throughout the project;
• a research topic related to a (larger) research project at IHE-Delft and/or partner organisation (usually in cooperation with PhD or post-doctoral research studies) which allows a close link with the latest research in a certain field;
• a topic as part of ongoing research or development project at a knowledge institute like Deltares, or at a consultancy or a company, where the student works in a team and gets an opportunity of working in a professional research and/or consultancy environment. Sufficient academic orientation is ensured through co-supervision of the IHE-Delft supervisor/mentor throughout the project. The assessment panel recommends to always have a staff member of IHE-Delft as the main responsible supervisor.

Teaching staff
The master's programme in Water Science and Engineering is delivered by a team of 66 IHE-Delft staff members, taking into account the multidisciplinary aspects from all three academic departments, and 56 guest lecturers from industry and academia. Out of the 66 IHE-Delft staff 40 are more closely involved in developing and assessing the various modules as Module Coordinators. Actual staff input in the WSE programme for the taught part is 8.4 fte (student/staff ratio 11.6) and for the supervision of the research 4.6 fte. On average a student has 22 contact hours per week.

The IHE-Delft staff members are actively involved in academic research, mostly as part of research programmes that are funded by competitive grants. The staff is well qualified academically: all full professors have appointments at research universities in the Netherlands, which testifies to their academic standing. All associate professors and lecturers hold PhD degrees or are in an advanced stage of obtaining their PhD degree. In addition, all staff members and the guest lecturers have extensive and relevant professional experience in developing countries and in countries in transition. This experience ensures that the educational programme is tailored to the professional and institutional context of the countries of origin of the students. Half of the staff members involved in teaching have fulfilled the requirements of the UTQ (University Teacher Qualification a certification set by the VSNU, the Dutch Association of Universities) while most others are in the process of obtaining their UTQ diploma. In addition, IHE-Delft staff members regularly participate in specific workshops organised by the Institute to update their didactical skills. The students are positive about the quality of the teaching and report that they had some very good guest lecturers.

Guidance and facilities
Much attention is paid to the tutoring and guidance of the students. Prior to their arrival students receive a Preparation Guide with practical information on travelling to and living in the Netherlands. Upon arrival they are given a Practical Guide about the services provided by IHE-Delft, about formal issues such as housing, immigration and health care, and about everyday life in the Netherlands. Information about the programme, its contents, rules and regulations and study-related facilities is provided in the Handbook that students receive at the start of the programme.

Non-academic support is given by the Student Affairs office. A student counsellor is available to help students with emotional problems. Students with study problems are in principle referred back to their Programme Coordinator or the Specialisation Coordinator.

As IHE Delft does not have hydraulic laboratory facilities IHE makes use of the facilities of Delft University of Technology for the curricular educational sessions and for the master thesis research activities of the specialisations , when those are required. The IHE Hydroinformatics laboratory managed by the Hydroinformatics Chair group, has been set up to support educational and research activities across the whole institute. Specialised software packages are used within the programme with a strong and increasing tendency to make use of free software allowing students to continue working with these packages more easily after graduation.

Considerations

After studying the various aspects of the programme's teaching and learning environment, the panel established that the contents and structure of the curriculum enable students to achieve the intended learning outcomes. The programme provides a good basis in the natural sciences and the socio-economic concepts that are required to understand the complex issues in the fields of water science and engineering to play a role at an academic level in analysing and solving environmental problems in a sustainable way. The specialisations provide the necessary depth. The elective modules, the fieldtrip and fieldwork, and the group work introduce interaction among students from the different specialisations. The learning outcomes of the modules are in line with the final qualifications. The curriculum enables the students to achieve the outcomes. The panel appreciates that several teaching methods are used in the modules and that the programme has a high amount of contact hours. Although time pressure is high, the panel established that students do not generally perceive the study load as impossible. This asks for continuous attention of the staff.

The panel very much appreciates the intensive efforts IHE-Delft puts into tutoring and guidance of the students. In the opinion of the panel, the teaching and learning environment created by IHE-Delft is very inspiring and motivating. Students feel part of a community and are stimulated to achieve a high level. The students following the double degree specialisations have different schedules and cannot participate in the introduction week, which is crucial for the community building. The panel sees this as a disadvantage for these joint programmes. However, the advantages of being able to profit from the specific expertise of the universities involved in the joint programme, might partly compensate for this.

Curriculum, staff, services and facilities constitute a coherent teaching-learning environment. The panel in particular appreciates the introductory week with its focus on 'ways of knowing' and encourages IHE-Delft to maintain this element in the programme.

The panel also appreciates module 13, the group work module, and considers this module crucial for developing competences in cooperation and interdisciplinary studies/interdisciplinarity. This module could be further strengthened by organising the same module for students from all master degree programmes in IHE-Delft to ensure that they all learn to work with a variety of experts of different disciplinary backgrounds.

The panel finds that the interdisciplinary focus is an exciting element of the programme. The existence of other master's programmes in the same institute and the various disciplinary backgrounds of the academic staff provides an excellent opportunity to strengthen this element. The panel has identified a few options that might be considered to strengthen the interdisciplinary perspective of the programme:

- Allow the selection of more elective modules across the master degree programmes and promote and encourage students to take different courses;
- Consider integrating more interdisciplinary content in individual modules;
- Promote interdisciplinary engagement in the thesis development phase;

- Consider a mandatory lecture series to expose students to broad fields of knowledge.

The academic and didactic quality of the staff are good, although the percentage of teaching staff with a UTQ lags behind expectations. The panel thinks that all academic staff, including seniors, should be encouraged to work towards earning UTQ. The panel also recommends to implement senior UTQ, in particular for those academic staff members who already have earned their credits in this regard by developing new programmes and implementing didactic innovations. In line with this recommendation the panel suggests consideration of introducing a teaching-based career, enabling lecturers to become professors based on leadership in teaching. Furthermore, the panel recommends that all academic staff with UTQ and PhD be allowed to and to be given credit for supervision of master's theses.

The panel appreciates that IHE- Delft managed to attract teaching staff members with divers cultural and national backgrounds. It, however, also noticed that the women are underrepresented in the leading academic positions. It encourages the management to pay continuous attention to this issue and improve the gender diversity related to leadership positions.

Conclusion
Satisfactory

4.3 Standard 3: Assessment

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

Outline of findings

Assessment system
The critical reflection describes that Education and Examination Regulations is the backbone of the assessment policy. It provides a detailed overview of the nature, frequency and marking of assessments as well as the possibilities for re-examination and appeal procedures for both the taught and thesis part of the programme. The assessments are safeguarded by the Examination Board. All students are informed about the Education and Examination Regulations in the study guide.

In 2017 the IHE rectorate approved an institution-wide policy framework on assessments. It outlines four key areas of importance for developing and implementing assessments:

1. The content of assessments (formats, levels, criteria);
2. The organisation of assessments;
3. Strengthening competence for assessment among staff;
4. Quality assurance for assessment.

Programme committees bear the overall responsibility of the content of assessments and the alignment with the final qualifications of each programme and its specialisations.

The master's programme WSE uses a variety of assessment methods, such as written and oral examinations, assignments, oral presentations, and take-home examinations. Most modules include two or more methods of assessment to accommodate the multiple intended learning outcomes of the modules. Some assessments are carried out by small groups to facilitate team-working skills. To adequately assess individual performances within a group, student-peer assessments are introduced for extensive group assignments. All written examinations are compiled by the module coordinator and peer-reviewed by the programme and/or specialisation coordinators. The programme committee approves the module plans prior to the start of the academic year. The panel appreciates the IHE-Delft procedures to assure the quality of the examinations. Further improvement of these assurance procedures can be achieved by including external review of the module examinations.

Students are informed about the assessment methods and their relative weight for each module. They are listed in the module sheets and are explained in more detail by the module coordinator at the start of each module, including the evaluation criteria that will be used for marking the various assessments. Written hand-outs with instructions are provided for assignments. Sample questions are usually available for students during the module and tutorials are organised to practice the application of the knowledge in preparation for the examinations.

Examination Board
IHE–Delft has an Examination Board, which is autonomous and has the responsibility to safeguard the quality of examinations as well as the related quality of the organisation and procedures concerning. The Examination Board monitors the proper implementation of the regulations and planning of examinations, including the assessment of grading results. Recently IHE-Delft had an institutional audit in which was established that the quality assurance system of IHE-Delft met all the requirements. The Examination Board appoints examiners and ensures that quality assurance mechanisms are in place to monitor the appropriateness and quality of assessments. The quality of

the examinations of the modules offered by other universities is safeguarded by the examination boards of the those universities. The panel concluded that the Examination Board performs all tasks expected from an Examination Board in Higher Education according to the WHW.

The panel had an interview with members of the Examination Board during the site visit. The panel studied the form used for the assessment of the master's theses and had some questions concerning the use of the rubric and the equal weighting of the criteria. The Examination Board mentioned that it reviewed the rubric last year and furthermore evaluated the whole process of the thesis assessment. The proposal to introduce weighting is still in discussion within the Institute. The panel believes that he Examination Board has a good overview of the quality of assessments and examinations. The panel, in particular, appreciates that the Board is pro-actively involved in safeguarding quality of examinations.

Considerations
The panel established that the assessment and examination regulations are clearly described in the Education and Examination Regulations. The Examination Board has reliable procedures and the necessary level of independence. The panel finds the assessment policy coherent and transparent. The interim examinations and the thesis assessments are transparent, valid and reliable. The panel also established that there are adequate assessment forms in place for the master thesis. During the site visit the panel discussed the thesis assessment form with the programme committee and the Examination Board and concluded that some improvements can be made in the assessment form and the corresponding rubric. For instance, the panel advises to give weight percentages to the different criteria and to add criteria for the public/oral defence. Furthermore, the quality of the discussion in a thesis should be part of the rubric. The panel also advises to develop a clear procedure for reconciliation of the differences in mark allocation between the internal and external examiners.

The panel recommends the Examination Board to regularly check the theses assessment by taking a sample and see if the assessment of the thesis can be endorsed.

Conclusion
Satisfactory

4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Outline of findings
The panel concluded that the learning goals of the modules are in line with the intended learning outcomes of the programme and that the assessments adequately test the learning goals. It is convinced that students who have finished the master programme Water Science and Engineering will have achieved the programme's intended learning goals.

The panel studied 15 theses to establish whether the graduates had achieved the intended learning outcomes of the programme. The panel found the theses appropriate as the final product of an academic master degree programme and of sound academic quality. They showed good analyses, correct application of methods and correct application of theory. The panel would have graded some of the theses slightly lower and other theses slightly higher, but the differences were within

acceptable boundaries. The panel observed that theses could use a discussion section and would recommend to consider to require a context section in the master thesis in which students situate their work in relation to the field.

The critical reflection describes that the success of the students is also reflected in the number of master theses resulting in publications in scientific journals and presentations at international conferences with the students as co-authors. In an annex to the critical reflection an overview of journal publications by students is presented. The panel finds this a clear indication of the quality of the master's theses. The critical reflection also describes that many alumni are promoted quickly after their return to their home countries to work at senior positions in the water sector. This is confirmed by the alumni who were interviewed during the site visit. The panel concluded the alumni were all very satisfied with their training at IHE-Delft. They still feel closely connected and are very willing to promote and support the institute in their home country. They definitely see the added value of their education at the institute and would allow professionals in their vicinity to study at IHE-Delft.

Considerations
The panel concludes that graduates of the master's programme WSE have achieved the intended learning outcomes. The graduates are well-prepared for enhancing their career in the water sector. The panel had the opportunity to speak to a few alumni, but did not have a complete overview of the current positions of all WSE alumni. The panel learnt that the Education Bureau of IHE-Delft plans to set out a survey among alumni in the (near) future. The panel advises to systematically investigate what alumni are doing, how they are using their degrees, and how they look back on their master programme.

It became clear to the panel that IH-Delft has an amazing outreach to alumni. This can be considered a clear strength of the programme and evidence of dedication of IHE-Delft and teaching staff.

Conclusion
Satisfactory

4.5 Conclusion

The panel assessed each of the four standards as satisfactory. Following the NVAO decision rules, the panel's general conclusion is that the master programme Water Science and Engineering meets the criteria for accreditation.

5 Overview of the assessments

WO-master Programme in Water Science and Engineering

Standard	Assessment
Intended Learning outcomes *Standard 1 : 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*	satisfactory
Teaching-learning environment *Standard 2 : The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.*	satisfactory
Student assesment *Standard 3: The programme has an adequate system of student assessment in place.*	satisfactory
Achieved learning outcomes *Standard 4: The programme demonstrates that the intended learning outcomes are achieved..*	satisfactory
Conclusion	satisfactory

Annex 1: Composition of the panel

Chair:

Prof.dr. G. Zeeman, professor emeritus in New Sanitation at Wageningen University, the Netherlands. Grietje Zeeman has teaching and testing experience as well as more than 35 years in scientific, technological and research application projects. She is expert in Environmental Technology, Sanitation, Wastewater treatment and Urban Systems Engineering.

Panel members:

- Dr. K. Rebel, assistant professor at Utrecht University Copernicus Institute of Sustainable Development, the Netherlands
- Prof. A. Schleiss, professor emeritus at the Swiss Federal Institute of Technology Lausanne (EPFL) with professional field and academic expertise in hydrology, hydraulic engineering, applied hydraulics and hydraulic structures.
- Prof. E.Manzungu is professor in Agricultural Landscapes, Waterscapes and Environmental Management at the University of Zimbabwe, where he served as chairperson of the Department of Soil Science and Agricultural Engineering and Deputy Dean of the Faculty of Agriculture.
- Dr. L. Harris, associate professor at the Institute for Resources Environment and Sustainability and at the Institute for Gender, Race, Sexuality and Social Justice at the University of British Columbia (UBC), Canada.

Student member:

- E.L. Okoro, master student in Law and Technology at Tilburg University, the Netherlands.

Annex 2 Intended learning outcomes

Final qualifications of the specializations in the WSE MSc Programme The final qualifications of the WSE specializations are presented in an integrated way, including all institute level (IHE) and programme level (WSE) qualifications as well, for each specialization.

Final Qualifications – WSE – Coastal Engineering and Port Development

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have an understanding of the application of modern analysis and design techniques to coastal problems and the expertise necessary to make decisions on effective engineering interventions in the coastal environment (CEPD specialisation level)
- have advanced level of knowledge and understanding of coastal processes, and nautical and logistic aspects and their interrelationship with the nearshore and offshore structures (CEPD)

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- develop strategies to cope effectively with problems related to natural hazards (e.g. coastal floods) and shoreline erosion problems and understand the conflict between coastal developments and natural coastal processes (CEPD)
- apply sophisticated design techniques using theoretical concepts of coastal hydraulics and various principles and approaches of coastal engineering design to advance the needs of society for shelter, infrastructure and a safe environment (CEPD)
- evaluate and implement coastal engineering solutions in a multidisciplinary and interdisciplinary environment (CEPD)
- apply hydraulic and nautical, logistic and economic theories in the planning and design of coastal and ports layout and port logistics (CEPD)

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- place a coastal engineering and/or port project in its environment (social, ecological and physical environment), quantify and understand the interactions between the project and the environment (CEPD)

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Hydraulic Engineering – River Basin Development

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have knowledge and understanding of the latest concepts and theories that are required for independent professionals within the field of hydraulic engineering and river basin development (HERBD specialisation level)
- have knowledge and understanding of the cross-sectoral linkages determinant for the design and planning of sustainable water infrastructures prepared for global change (HERBD specialisation level)
- have an analytical understand of physical mechanisms and processes in the natural and built environment that are determinant for the design and planning of sustainable water infrastructures prepared for global change (HERBD specialisation).

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- apply and master tools like analytical solutions and numerical models for hydraulic and hydrological processes, remote sensing and GIS-based models for the design of water infrastructure at the project scale and for river basin scale planning (HERBD specialisation).
- estimate, predict and prepare the occurrence of hydrological extremes within and across river basins (HERBD specialisation).
- model and quantify fluvial processes involving the transport of water nd sediments, which are determinant for the morphodynamics of rivers, safety of citizens, and for physical, chemical, and biological mechanisms in the river basin (HERBD specialisation).
- plan and design water infrastructures essential for food and energy production, domestic and industrial water supply, and protection against floods and geomorphological hazards (HERBD specialization).
- initiate research and development activities, innovative solutions for the adequate management of water resources and for the sustainable development of water infrastructures within the river basin (HERBD specialization).

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- to identify opportunities for innovative development of tools and strategies for water management at the river basin scale, and to identify research avenues regarding physical processes essential in the design of water infrastructures (HERBD specialization);
- to assess the sustainability of water infrastructures and of tools and strategies for river basin water management, by critical assessment of their technical, socio-economic and environmental components (HERBD specialization).

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Hydroinformatics

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have understanding of the information cycle and systems approach in relation to the management of water based systems, and have a thorough awareness of the flow of information following the sequence “data - modelling - forecasting - optimization - decision support - management”, aimed at sustainable development and stakeholder involvement.
- have a good understanding of numerical methods for solving equations of water flow, and knowledge of their ranges of applicability in various contexts.
- have an understanding of advanced and appropriate information and communication technologies, advances in computer science, computer programming, data science and applied mathematics, and their use in building technologies supporting water management in a wide sense.

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)

- master the theory and practice of different modelling paradigms and systems analysis, and, in particular, physically based and data driven modelling, computational intelligence and multi-disciplinary optimization, and integrate these in hydroinformatics systems.
- apply the knowledge of numerical methods for solving equations of water flow, computational intelligence and data analysis, be able to implement them in research computer codes and apply to various problems of water modelling and forecasting.
- to select and apply available software and internet-based tools, integrate them, and critically assess their advantages and disadvantages in application to water resources management, hazard risk assessment and forecasting, environmental planning and asset management.

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- make critical use of advanced theories, concepts and tools in hydroinformatics to search innovative solutions for new problems and situations, either independently or within a team.

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Hydrology and Water Resources

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)

- be aware of the importance of hydrology to society and the relationship of hydrology with related disciplines (HWR)
- have in-depth understanding of the current theories and concepts in both surface and subsurface hydrology, the relevant physical, chemical and biological process interactions between the hydrosphere, the lithosphere, the biosphere and the atmosphere (HWR)
- master the major hydrological methodologies and applications with regard to both water quantity and water quality, including techniques for data collection, processing and analysis, and the application modelling techniques (HWR)

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- apply and integrate the relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts, and to use information and communication technology relevant to hydrology (HWR)
- design and conduct hydrological assessments and experiments for both application and scientific purposes, either independently or within a team-based framework (HWR).

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- evaluate and analyse hydrological systems and processes at a wide range of scales in both space and time for the purpose of water resources assessment, natural hazards assessment and mitigation, and environmental planning and management (HWR).

Communication
Graduates will have:

- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Land and Water Development for Food Security

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have knowledge and understanding of the latest concepts and theories of irrigation and drainage design, modernization and management, and land reclamation for sustainable development and food security (LWDFS specialization level)
- have knowledge and understanding of the cross-sectoral linkages related to land and water development comprehending wider aspects of society, economy, human health and environment and its contributions to food security (LWDFS specialization)

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- apply the latest hydraulic engineering and hydrological methods in planning, design and implementation of irrigation and drainage schemes, independently or in a multidisciplinary team (LWDFS);
- apply innovative tools like Remote Sensing and GIS in planning and performance management of land and water development schemes for enhanced food security (LWDFS)
- contribute to the development of innovative approaches for adequate and sustainable land and water development for food security (LWDFS)

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- identify options for participatory land and water development, and critically assess their technical, socio-economic and environmental performance (LWDFS)
- evaluate aspects of planning, design, modernization, operation & maintenance and financing of irrigation and drainage schemes (LWDFS)

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Flood Risk Management

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have a comprehensive knowledge base and understanding of the current theory and practice relating to flooding and flood management (FRM)
- have an understanding of advanced and appropriate information and communication technologies and data science, and their use in building technologies supporting flood risk management (HI, FRM)
- have a broad scientific knowledge about conservation, restoration and management measures to overcome challenges imposed on water by humans and by climate change (FRM)

Applying Knowledge and Theory (general research and problem solving skills)

Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- apply specific practical skills, such as identifying the major physical processes in a given river basin or coastal zone and their interaction with the associated assets and receptors (FRM)
- apply sophisticated hydroinformatics and modelling tools, best practices and information and communication technology to address the problems of flood risk management (HI, FRM)

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:
- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- identify the links between all issues related to flooding in order to apply an integrated approach using the best tools to support decision making for the sustainable management of floods (FRM)
- advise on a basin-wide approach to flood risk management (FRM)

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Final Qualifications – WSE – Groundwater and Global Change – Impacts and Adaptation

Knowledge and understanding
Graduates will:
- have knowledge of contemporary water issues, challenges, debates and developments (IHE institute level)
- demonstrate knowledge and understanding of hydrological, hydraulic and environmental processes and phenomena, and their inter-relationships, in natural and built environments (WSE level)
- have in-depth understanding of the current theories and concepts in both surface and subsurface hydrology, the relevant physical, chemical and biological process interactions between the hydrosphere, the lithosphere, the biosphere and the atmosphere (HWR, GroundwatCH)
- be able to explain in depth how groundwater systems respond to climate variability and human activities in both an urban and rural context, and how this is dealt with in water resources management in adaptation to climate and global change (GroundwatCH)

Applying Knowledge and Theory (general research and problem solving skills)
Graduates will have:
- the ability to draft a research plan, including the formulation of research questions and hypotheses and the selection of research methods, theories and techniques (IHE)
- the ability to conduct research independently in a scientifically sound and ethically responsible manner (IHE)
- the ability to contribute to interdisciplinary and evidence-based knowledge development and problem solving (IHE)
Graduates will be able to:
- apply appropriate modelling and data management tools related to hydrological, hydraulic, morphological and environmental processes, to support management and engineering interventions (WSE)
- integrate monitoring, modelling and information to support safe and reliable decisions making (WSE)
- apply and integrate the relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts, and to use information and communication technology relevant to hydrology (HWR, GroundwatCH)
- design and conduct hydrological assessments and experiments for both application and scientific purposes, either independently or within a team-based framework (HWR, GroundwatCH)
- use field assessment and process understanding techniques in combination with modelling tools to study and simulate groundwater and climate processes and their interactions with each other, with the environment and with human activities, within identified and quantified levels of uncertainty, for the purpose of integrated water resources management (GroundwatCH)

Making Judgements (general academic reasoning ability)
Graduates will have:
- the ability to identify and appraise relevant research, concepts and approaches in view of their potential for helping understand or solve water-related problems (IHE)
- the ability to critically discuss and evaluate own research approaches and outcomes within the context of existing knowledge and approaches (IHE)
- the ability to interpret research findings critically in order to formulate evidence-based conclusions, solutions and/or recommendations (IHE)
Graduates will be able to:

- apply engineering creativity and design skills, both independently and in multidisciplinary teams (WSE)
- have a sense of professionalism and an appreciation for the obligations of a professional and be aware of the professional and ethical issues encountered in scientific and engineering practice (WSE)
- evaluate and analyse hydrological systems and processes at a wide range of scales in both space and time for the purpose of water resources assessment, natural hazards assessment and mitigation, and environmental planning and management (HWR, GroundwatCH)
- identify and select the appropriate groundwater-related solutions to water scarcity under climate and global change in terms of technical, socio-economic and environmental feasibility (GroundwatCH)

Communication
Graduates will have:
- the competencies to communicate and present effectively, both in writing and orally, making use of information and communication technologies suited for the audience and the purpose (IHE)
- the competencies to debate and defend findings and insights, in a clear, systematic and convincing manner (IHE)
- the competencies to communicate effectively across disciplines and cultures to enhance collaborations in teams (IHE)

Learning skills
Graduates will have:
- the competencies to further develop and expand their knowledge and skills on their own initiative (IHE)

Annex 3 Overview of the WSE programme

(to be included)

Annex 4: Schedule of the site visit

for the four WO-master Programmes: Water Management and Governance, Water Science and Engineering, Urban Water and Sanitation, Environmental Science

Time	Subject	Participants
Wednesday 14 November 2018		
08.45 – 09.00	Welcome day 1	Rector IHE Delft Head of Education Bureau
09.00 – 09.30	Introduction on the Information provided	Head of Education Bureau
09.30 – 12.15	Preparatory meeting and initial discussion of the panel	
12.15 – 13.00	lunch	
13.00 – 14.00	Institute's management	Rector IHE Delft Vice-rector Business Director
14.00 – 14.45	Students master programme Water Management and Governance	Student from Egypt Student from Lebanon Student from Vietnam Student from Brazil Student from Afghanistan
14.45 – 15.30	Programme committee Water Management and Governance	Programme Chair Professor Colleague Prof. Programme coordinator 3 Programme Committee members
15.30 – 16.00	Break	
16.00 – 16.45	Students master programme Water Science and Engineering	Student from Nepal Student from Rwanda Student from Uganda Student from Egypt Student from Bangladesh
16.45 – 17.30	Programme committee Water Science and Engineering	Programme Chair Professor Programme coordinator 3 Programme committee members Student member

17.30	Rounding up	

Thursday 15 November 2018

08.45 – 09.45	Guided tour of the premises	
09.45 – 10.30	Students master programme Urban Water and Sanitation	Student from Nepal Student from India Student from Uruguay Student from Zambia Student from Bhutan Student from United Republic of Tanzania
10.30 – 11.15	programme committee Urban Water and Sanitation	Programme Chair Professor 3 Programme Committee members Programme coordinator
11.15 – 11.45	Break	
11.45 – 12.15	Skype meeting with Management committee joint degree UWEM	3 Committee members, IHE Delft 3 Committee members, AIT Bangkok
12.15 – 13.00	Lunch	
13.00 – 13.45	Students master programme Environmental Science	Student from Bhutan Student from Nepal Student from Kenya
13.45 – 14.30	Programme committee Environmental Science	Programme Chair Professor Programme coordinator 3 Programme committee members
14.30 – 14.45	Break	
14.45 – 15.15	Skype meeting with Management committee Limnology and Wetland Management (Existing Joint Degree Programme)	2 Committee members, IHE Delft 3 Committee members, BOKU, Vienna 2 Committee members, Egerton University, Nijoro, Kenya
15.15 – 15.45	Break	

15.45 – 16.15	Skype meeting with Management Committee Environmental Technology and Engineering (Existing Joint Degree Programme)	1 Committee member, IHE Delft 1 Committee member, UTC Prague 1 Committee member, University Ghent
16.15 – 17.15	Meeting with lecturers	8 IHE Delft lecturers
17.45	Rounding up	

Friday 16 November 2018

09.00 – 09.45	Examination Board and Registrar	Chair Examination Board 2 members Examination Board Registrar
09.45 – 10.00	Break	
10.00 – 11.00	Alumni by skype	Alumnus, Albania, UWS Alumnus, Sudan, ES Alumnus, Zambia, WSE Alumnus, India, WMG
11.00 – 11.30	Break	
11.30 – 12.15	Preparation for second meeting with Institute's Management	
12.15 – 13.00	Lunch	
13.00 – 14.00	Second meeting with Institute's Management	
14.00 – 16.30	Deliberations panel, formulating preliminary findings and conclusions	
16.30 – 17.00	Feedback to IHE community	

Annex 5: Documents reviewed

Programme documents presented by the institute
Critical Reflection Master of Science Programme in Water Science and Engineering
Annexes to the Critical Reflection

1. IHE Delft vision on education and the quality of education
2. Final qualifications of the specializations in the WSE MSc Programme
3. Curricula overview of the WSE MSc Programme
4. Policy note on instructional methods
5. IHE staff involved in teaching in the WSE MSc Programme 2016-2018
6. Guest lecturers involved in teaching in the WSE MSc Programme 2016-2018
7. Assessment policy
8. Education and Examination Regulations
9. Rubric for MSc thesis examinations
10. Overview of MSc theses in the WSE MSc Programme 2016-2018
11. Journal publications based on MSc thesis research in WSE (from 2011-2013 cohort) with students as (co)authors

Students' Critical Reflection on IHE Master Programmes
Annual Reports Examination Board 2016-2017, 2017-2018
Dossier Module 7
(15) Master Theses

Annex 6: List of abbreviations

EC	European Credit
ILO	Intended Learning Outcome
NVAO	Nederlands-Vlaamse Accreditatieorganisatie
OER	Education and Examination Regulations
UTQ	University Teaching Qualification
WSE	Water Science and Engineering