

# **Water Science and Engineering**

**UNESCO-IHE  
Institute for Water Education**

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This report was finalised on 11 December 2012



# Report on the master's programme Water Science and Engineering of the UNESCO-IHE Institute for Water Education, Delft

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a guiding document.

## Administrative data regarding the programme

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### Master's programme Water Science and Engineering

Name of the programme:	Water Science and EngineeringWater Science and Engineering
CROHO number:	75010
Level of the programme:	master of science
Orientation of the programme:	academic
Number of credits:	106-123 EC
Specialisations or tracks:	<p>The programme offers the following specialisations:</p> <ul style="list-style-type: none"><li>• Hydrology and Water Resources, Delft, with option to start in Nanjing, PRC (106 EC);</li><li>• Hydraulic Engineering and River Basin Development, Delft (106 EC);</li><li>• Hydraulic Engineering – Coastal Engineering and Port Development, Delft, with option to start in Nanjing, PRC (106 EC);</li><li>• Hydraulic Engineering – Land and Water Development, Delft (106 EC);</li><li>• Hydraulic Engineering – Land and Water Development, Delft and Bangkok, Thailand (120 EC);</li><li>• Hydraulic Engineering – Land and Water Development, Delft and Palembang, Indonesia (123 EC);</li><li>• Hydraulic Engineering – Land and Water Development, Delft and Alemaya, Ethiopia (110 EC);</li><li>• Hydroinformatics: Modelling and Information Systems for Water Management, Delft (106 EC);</li><li>• Hydroinformatics: Modelling and Information Systems for Water Management, Delft, with option to start in Nanjing, PRC (106 EC);</li><li>• Hydroinformatics: Modelling and Information Systems for Water Management, Delft, with option to start in Cali, Colombia (106 EC);</li><li>• Erasmus Mundus Programme on Flood Risk Management, Delft; Dresden, Germany; Barcelona, Spain and Ljubljana, Slovenia (120 EC);</li></ul>

	<ul style="list-style-type: none"> <li>• Erasmus Mundus Programme on Ecohydrology, Delft; Faro, Portugal, Lodz, Poland and Kiel, Germany (120 EC).</li> </ul>
Location(s):	Delft (in cooperation with other institutes as indicated per specialisation)
Mode(s) of study:	full-time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee to the UNESCO-IHE Institute for Water Education took place on 17-19 September 2012.

### **Administrative data regarding the institution**

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Name of the institution:	UNESCO-IHE Institute for Water Education
Status of the institution:	(partly) publicly funded institution
Result institutional assessment:	pending

### **Quantitative data regarding the programme**

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The required quantitative data regarding the programme are included in Appendix 6.

### **Composition of the assessment committee**

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The committee that assessed the master's programme Water Science and Engineering consisted of:

- Prof. dr. André van der Beken (chair), emeritus professor, Free University Brussels, Belgium;
- Prof. ing. Janos Bogardi, professor in Water Resources at the Faculty of Agriculture of the University of Bonn, Germany;
- Academician Dipak Gyawali, professor at the Nepal Academy of Science and Technology (NAST), Nepal;
- Prof. dr. Rivka Kfir, extraordinary professor Microbiology and Plant Pathology and senior advisor at the Water Institute, University of Pretoria, South Africa;
- Prof. dr. Grietje Zeeman, professor in New Sanitation at Wageningen University and Research Centre (WUR), the Netherlands;
- Franca Kramer BSc, master student of Water Management at Delft University of Technology, the Netherlands,.

Appendix 1 contains the CV's of the members of the committee.

The committee was supported by Adrienne Wieldraaijer-Huijzer M.A., QANU staff member and project leader, and by dr. Marianne van der Weiden who acted as the committee's secretary.

All members of the committee and the secretary signed a declaration of independence as required by the NVAO protocol to ensure that the committee members judge without bias,

personal preference or personal interest, and the judgement is made without undue influence from the institute, the programme or other stakeholders (see Appendix 8).

## **Working method of the assessment committee**

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### *Preparations*

Upon receiving the critical reflection of the master's programme Water Science and Engineering (WSE) on 29 June 2012, QANU checked the critical reflection to ensure that it could serve as the key document informing the assessment. A revised version, received on 16 July 2012, was found to fulfil the criteria of relevance and completeness. Copies of the critical reflection were then sent to the members of the assessment committee.

In addition to the critical reflection, the committee received ten recent student's theses from the Water Science and Engineering programme. This was done based on a pre-selection of the ten from the list of theses in the critical reflection. The theses evaluated by the committee covered the full range of marks: included in the sample were theses with a low mark (6.0-6.9), with an intermediate mark (7.0-8.4) and with a high mark (8.5-10). The committee members used QANU's checklist for the assessment of theses to ensure that their assessments were comparable and covered the relevant aspects.

Prior to the site visit, the project leader met with representatives of the UNESCO-IHE Institute and agreed on the programme for the site visit and the associated practical arrangements. The programme included consultations with staff members and students and both groups were informed about the opportunity to speak to the committee confidentially during the visit.

### *Site visit*

The site visit took place on 17, 18 and 19 September 2012. The detailed programme of the site visit is presented in Appendix 2. It started with a preparatory meeting, in which the committee members discussed the critical reflections and the theses they had received prior to the site visit. The committee also discussed and agreed on the questions and issues to be discussed during the interviews with representatives of the programme, students and other stakeholders.

The committee conducted interviews with the management of the institute, students, lecturers, alumni, members of the Programme Committee (the equivalent of the Education Committee), the Examination Board, the student counsellor and the alumni officer. In addition, the members of the committee studied supplementary materials made available by the programme management. An overview of this documentation is given in Appendix 7.

The site visit was extended by half a day to allow for the assessment of the proposed joint degree programmes. The committee studied additional documents that were made available by the programme management, relating to the structure of the joint degree programmes and their management, the cooperation agreements, joint exam regulations and detailed module and course descriptions. Interviews with the partner institutes were arranged through Skype and telephone conferencing. In its deliberations the committee paid separate attention to the assessment of the joint degrees.

The committee conducted a concluding interview with the management, followed by a committee internal meeting. During this meeting the committee discussed its findings,

formulated its conclusions and gave its assessment of the standards of the assessment framework. Finally, the chairman of the committee presented the committee's preliminary findings to staff and students of the institute.

### *Report*

Following the site visit, the committee secretary composed a draft report. Thereafter, the report was studied by all committee members who provided further comments and insights to the secretary. The secretary processed all corrections, remarks and suggestions for improvement provided by the committee members to finalise the preliminary report which was submitted to QANU. QANU's secretariat sent this version to the UNESCO-IHE Institute, inviting them to check it for factual errors, inaccuracies and inconsistencies. The secretary forwarded the comments and suggestions provided by the Institute to the chairman of the committee, and, where necessary, to the other committee members. The committee decided whether the comments and suggestions were to be incorporated in the report or ignored. On the basis of the committee's decisions, the secretary compiled the final version of the programme report.

### *Decision rules*

In accordance with the NVAO's Assessment Framework for Limited Programme Assessments, the committee used the following definitions for the assessment of both the standards and the programme as a whole.

### **Generic quality**

The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

### **Unsatisfactory**

The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

### **Satisfactory**

The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

### **Good**

The programme systematically surpasses the current generic quality standards across its entire spectrum.

### **Excellent**

The programme systematically surpasses the current generic quality standards well across its entire spectrum and is regarded as an (inter) national example.

The default assessment is 'satisfactory', i.e. the programme complies adequately with the criteria.



## Summary judgement regarding the quality of the master's programme Water Science and Engineering

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The judgement of the assessment committee is based on information provided in the critical reflection, a sample of theses, additional documentation provided during the site visit and interviews conducted with staff, students and graduates of the programme. During its assessment, the committee noted positive aspects as well as ones which could be improved. Taking these aspects into consideration, the committee decided that the programme in Water Science and Engineering **fulfils the requirements** set by the NVAO for accreditation.

### *Standard 1: Intended learning outcomes*

UNESCO-IHE is a development oriented institute of higher education and the Master Water Science and Engineering is one of the four master's programmes offered to mid-career professionals from around the world. Water Science and Engineering offers seven specialisations, most of them in cooperation with international partner institutes. The programme combines hydraulic engineering, hydrology and hydroinformatics. These different fields 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. An international benchmark has been executed by the programme and shows that the contents of the programme are in line with other programmes in the Netherlands and Europe. However, the programme has its special niche in the combination of disciplines it offers to a specific target group of mid-career professionals as well as its orientation on developing countries and countries in transition.

The learning objectives of the programme are the acquirement of scientific knowledge and understanding of natural and engineering sciences, the application of this knowledge in broad contexts, the ability to conduct research on the basis of a good research plan and appropriate methodologies, the skills to communicate the results of research to colleagues and stakeholders orally and in written reports, and the ability to support planning and operation of infrastructures in the domain of water engineering. The formulation of the intended learning outcomes testifies to its ability to successfully navigate between applied and academic science. The consequential hybrid character of the programme is considered most appropriate for a field such as Water Science and Engineering. The committee therefore assesses the first standard as **satisfactory**.

### *Standard 2: Teaching-learning environment*

The Delft-based curriculum consists of 106 ECTS and runs over 18 months. The programme follows a modular structure, each module having a duration of three weeks and a study load of 5 EC. It has four distinct phases: Foundation, Deepening, Broadening and Research. The institute has used the T-shape model in designing the curriculum. In this model the vertical bar of the letter T represents the in-depth knowledge of the main discipline and the horizontal bar reflects the basic knowledge of adjacent disciplines. The students appreciate the effect of the programme in first broadening their scope and then focusing again.

The double degrees with partner institutes have a longer duration, ranging from 110 to 123 EC. The double degree programmes are neatly combined with the specialisation modules of the Delft programme and are tailored to the needs and possibilities of students in developing countries and their employers. The Erasmus Mundus programmes focus on specialized issues of current interest and also make use of the existing modules. The committee concludes that these double degree programmes are a worthwhile addition and that the programme staff ensures that their contents and level are of the same quality as the single degree programme.

The didactical concept of the Water Science and Engineering programme aims to stimulate the student's independent and active learning attitude and intellectual growth. The learning objectives are described in clear module sheets. Each module uses a variety of teaching and assessment methods, depending on the goal of the course. This may include laboratory work, lectures, self-study, field trips, small group assignments and individual exams. Lectures are given by UNESCO-IHE staff and by guest lecturers who provide additional applied and theoretical expertise and illustrations from the professional field.

Students find the study load demanding. A large volume of material has to be covered, and many students have been out of the classroom for many years. Especially the work on the research project is difficult for many students because only few of them have a research background. The guidance and supervision during the research phase are intensive to give the students the necessary support.

The academic staff is well-qualified academically and professionally and have good teaching skills. They are highly committed. Their international background and experience fit the scope of the programme and the contexts of the students. For additional input guest lecturers are called upon. The committee recommends to evaluate the number of guest lecturers and the contents they offer with respect to the load of each module. The Student Affairs Office offers non-academic support in a proactive manner and well-coordinated with the academic support by the Programme Coordinator and the Specialisation Coordinator. The committee recommends to establish for each incoming student a 'portfolio' with his/her initial motivation and career plan, which should be discussed and updated as needed, preferably with a unique mentor from the start.

The committee recognises the often intricate selection of the right candidates with the correct background. It recommends therefore to explore the possibilities for on-line preparation and self-learning opportunities through the e-Campus development. The committee acknowledges the effort to balance the appropriate level of the curriculum and its necessary flexibility within the constraints of the duration of the programme. The committee suggests to look into the possibility of offering a programme of 120 EC for all students and granting credits to incoming students with professional experience, comparable with an internship of 6 months.

The curriculum clearly reflects the T-shaped concept. The Programme Committee is aware of the often overwhelming choice of modules or specialisation and evaluates the curriculum regularly. The group work approach is a useful way to prepare future water leaders to face real-life problems. This approach as well as most of the curriculum allows for good interaction among students. An international exposure is given in field trips and site visits. The institute has well-staffed specific services and good facilities. The committee therefore assesses the second standard as **satisfactory**.

### *Standard 3: Assessment and achieved learning outcomes*

The committee established that the assessment system of the UNESCO-IHE functions very well. Good control mechanisms ensure that work is systematically and consistently graded. The committee further found the variety of assessment methods to be appropriate. The examination structure has clearly been tailored to the intended learning outcomes of the programme. The committee especially appreciates the system of blind marking and the involvement of external assessors. The assessment system has strong checks and balances and the assessments are transparent, valid and reliable.

The committee studied a representative sample of the Water Science and Engineering theses. In most cases the committee agreed with the mark given by the thesis committees, but in a number of cases the committee would have marked slightly lower. The committee suggests to include an examiner, fully external to the Institute, in all thesis committees. All theses met the minimum requirements for academic quality and some were at a higher level. On this basis the committee concludes that the master's programme Water Science and Engineering graduates have achieved the intended learning outcomes of an academic master. The positive effect of the master's programme was confirmed by the alumni with whom the committee met. The committee therefore assesses the third standard as **satisfactory**.

The committee assesses the standards from the assessment framework for limited programme assessments in the following way:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory

General conclusion	<b>satisfactory</b>
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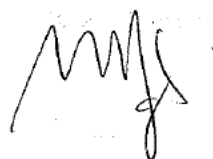
The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 11 December 2012



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Prof. dr. André van der Beken



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Dr. Marianne van der Weiden

## Description of the standards from the Assessment Framework for Limited Programme Assessments

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### Structure and mission of the institute

The UNESCO-IHE Institute for Water Education was established jointly by UNESCO and the Government of the Netherlands in 2003 as a UNESCO ‘category I’ institute. The Institute carries out research, education and capacity building activities in the fields of water, environment and infrastructure. UNESCO-IHE continues the work that began in 1957 when IHE first offered a postgraduate diploma course in Hydraulic Engineering to practising professionals from developing countries.

UNESCO-IHE envisions a world in which people manage their water resources sustainably and in which all sectors of society, particularly the poor, can enjoy the benefits of basic water services. Its mission expresses a commitment to generating and sharing knowledge, training water leaders and building capacity all over the world.

Whilst UNESCO-IHE is involved in its own research and education on the Delft premises, it is also instrumental in strengthening the efforts of other universities and research centres throughout the world, which increase the knowledge and skills of professionals working in their respective water sectors.

UNESCO-IHE offers four master’s programmes, partly with international partner institutes:

- Master Water Management;
- Master Municipal Water and Infrastructure;
  - Including double degree programmes with KNUST, Ghana; UniValle, Colombia; AIT, Thailand\*;
- Master Water Science and Engineering;
  - Including double degree programmes with UniValle, Colombia; Ain Shams University, Egypt; Haramaya University, Ethiopia; AIT, Thailand; Sriwijaya University, Indonesia; Technical University Dresden, Germany; Barcelona Tech, Spain; University of Ljubljana, Slovenia (Erasmus Mundus); University of Algarve, Portugal; University of Lodz, Poland; University of Kiel, Germany (Erasmus Mundus);
  - Including specialisations together with Hohai University, China;
- Master Environmental Science;
  - Including double degree programmes with AIT, Thailand\*; UniValle, Colombia; ICT, Prague and University of Ghent, Belgium (Erasmus Mundus)\*; BOKU, Austria and Egerton, Kenya\*.

\* UNESCO-IHE intends to change four double degrees into joint degrees.

Characteristic for the institute is its combination of applied research and advisory work, its multidisciplinary and international staff and its teaching programmes for an international student body.

## Standard 1: Intended learning outcomes

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

### **Explanation:**

As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

## **1.1. Findings**

This section deals with the mission of the programme (§1.1.1), the domain-specific framework of the field of water science and engineering (§1.1.2), the educational objectives (§1.1.3), the level (§1.1.4) and benchmarking of the programme (§1.1.5).

### ***1.1.1 Mission of the programme***

The critical reflection states that the master's programme in Water Science and Engineering aims to deepen the knowledge, insights and skills for Hydraulic Engineering (part of Civil Engineering and covering the disciplines River Basin Development, Land and Water Development and Coastal Engineering and Port Development), Hydroinformatics (a technology oriented discipline) and Hydrology (an earth system science). These different fields 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.

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 contribute to the development of integrated solutions for reducing the impact of water-related natural hazards and other water issues. The programme focuses mainly on emerging and least developed countries and is especially suitable for mid-career professionals.

### ***1.1.2 Domain-specific framework***

The concept of Water Science and Engineering, as stated in the critical reflection, is born out of the recognition that the technical and scientific problems related to water are increasingly multidisciplinary and graduates can no longer rely on spending their future working within only one of the traditional disciplines. Water Science and Engineering includes a range of science and engineering disciplines related to the aquatic environment. 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 committee approves of the way Water Science and Engineering builds on these frameworks and finds them an appropriate basis for the interdisciplinary master's programme.

A more elaborate description of the domain-specific framework, derived from the critical reflection, can be found in Appendix 3.

### ***1.1.3 Educational objectives of the programme***

The overall objective of the Water Science & Engineering Master's Programme is in the critical reflection described as follows:

"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".

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). Therefore, these fields form the foundation for the Master Water Science and Engineering programme. In line with this overall objective, the programme has the following intended learning outcomes.

Upon successful completion of the Water Science and Engineering master's programme, graduates will be able to:

Knowledge and understanding

1. demonstrate knowledge and understanding of hydrological, hydraulic, morphological and environmental processes and phenomena and their inter-relationships;
2. identify and characterise the causes and impacts of water-related problems on society, the economy and the environment;
3. explain the need for integration of monitoring, modelling and information systems to support safe and reliable decision making;
4. demonstrate critical thinking skills, the ability of both independent and team problem-solving and the sense of engineering creativity and design;

Applying knowledge and understanding

5. apply modelling and data management related to hydrological, hydraulic, morphological and environmental processes;
6. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;
7. support planning, design, implementation, operation and maintenance, and management of engineered measures, of both a constructive and an operational character, aimed at the solution of problems arising from the multiple uses of water;

Making judgements

8. co-operate within a multidisciplinary and interdisciplinary framework with due consideration of ethical and social aspects related to the application of their knowledge and skills;
9. critically judge and evaluate their own work and results, as well as prior research carried out by others;

Communication

10. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a

variety of audiences, making use of appropriate information and communication technologies;

#### Learning skills

11. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions) to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner;
12. integrate ethical issues encountered in engineering practice and in relation to working in emerging and least developed countries and countries in transition.

In an annex to the critical reflection these general learning objectives have been specified for the seven specialisations in detailed and concrete learning outcomes. See appendix 4 for an overview.

Helpful tables have been provided in the critical reflection to indicate the relationship between the learning objectives and the programme components. These tables show that all intended learning outcomes are addressed as a primary focus in at least one programme component and typically in at least two other programme components as a secondary focus. The tables also show that the master's research is justifiably the programme's masterpiece since it focuses on all learning objectives.

#### **1.1.4 Level**

The critical reflection states that the Dublin descriptors have played an explicit role in formulating the intended outcomes of the programme. The learning objectives have been grouped under the internationally accepted headings (see section 1.1.3).

In order to achieve the intended academic master level the learning objectives are addressed in the programme components in a systematic way, progressing to a more independent way of working in the course of the programme. Professional problem solving at an academic level and academic research are seen as the cornerstones of the programme. The graduate students are being prepared, stimulated and challenged to carefully study problems, to formulate appropriate questions, to create original design and research approaches, to think in multidisciplinary and interdisciplinary dimensions, to evaluate alternatives, to analyse and interpret results critically and, finally, to propose solutions that are applicable in real-world cases.

Furthermore, the academic orientation is made concrete by a six-month master's research phase, which is preceded by a course in research methodology and master's research proposal development, and concluded with a master's thesis that is defended in front of a committee which includes at least one external examiner. In most cases the master's research is related to on-going research projects that include PhD or post-doctoral studies or other projects at top-level research institutes or engineering consultancies.

#### **1.1.5 Benchmarking**

The final qualifications and the intended learning outcomes of the Master Water Science and Engineering and its specialisations are, according to the critical reflection, formulated in agreement with related master's degree programmes provided by Dutch universities and many universities abroad.

The VU University Amsterdam, Utrecht University, Delft University of Technology and Wageningen University all have master's degree programmes in Hydrology (though the names

vary), as do for instance the Universities of Freiburg and Dresden in Germany, and Lancaster and Imperial College London in the United Kingdom; Hydroinformatics is taught for example in Cottbus (Germany) and Newcastle (United Kingdom); and Coastal Engineering and Port Development can be found at the Danish Technical University, University of Plymouth (United Kingdom) and the University of Delaware (USA).

Specific for the UNESCO-IHE is its mandate to train mid-career water professionals from around the world, including emerging and least developed countries. UNESCO-IHE therefore takes into account and assesses the work experience of applicants in the admission procedure.

## **1.2 Considerations**

The committee fully subscribes to the mission of the programme. The programme is an engineering programme that pays attention to the social interactions and societal aspects that play a role when designing solutions and trying to implement them.

The range of subjects covered by the programme is wide, combining hydraulic engineering, hydrology and hydroinformatics. The programmes which Water Science and Engineering is benchmarked against are usually focused on only one of these three subjects. The UNESCO-IHE programme is therefore unique. This is an asset but also a challenge, since it requires the integration of three fairly different key subjects into one programme and makes it difficult to create one clear profile. Hydroinformatics can be seen as an important supporting discipline not only for hydraulic engineering and hydrology but also for the other programmes offered by UNESCO-IHE. The committee therefore questions the inclusion of this subject within Water Science and Engineering.

The committee compliments the programme management with the balance it has found between high academic standards and the applicability of the theoretical knowledge. The committee judges the final qualifications and learning objectives to be well-formulated. These objectives serve to clarify to staff and students what is expected from Water Science and Engineering graduates in general and for its specialisations. The learning objectives reflect the appropriate master level and are recognisably formulated in terms of the Dublin descriptors. They show the necessary focus on analytical and research skills for an academic master's programme.

## **1.3 Conclusion**

*Master's programme Water Science and Engineering:* the committee assesses Standard 1 as **satisfactory**.



## Standard 2: Teaching-learning environment

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

### **Explanation:**

The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

## 2.1 Findings

This section firstly covers the coherence and structure of the curriculum (§2.1.1). Subsequent paragraphs discuss the didactical concept (§2.1.2), study load (§2.1.3) and system of student guidance (§2.1.4). Finally, the composition of the academic staff (§2.1.5), the student body (§2.1.6) and the facilities (§2.1.7) are dealt with.

### **2.1.1 The curriculum**

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 one chosen specialisation. 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.

This is in line with the T-shape model that UNESCO-IHE uses in designing the curricula. The vertical bar of the letter T represents the in-depth knowledge of the main discipline and the horizontal bar reflects the basic knowledge of adjacent disciplines. For Water Science and Engineering this model differentiates between cognitive competencies in a certain specialisation (e.g. hydrology; vertical leg of the T) and other cognitive/knowledge competencies in neighbouring fields (e.g. hydraulics, aquatic ecology, land use management etc.) and functional, personal and values competencies and meta-competencies (horizontal bar of the T). For the effectiveness of graduates as professionals, a variable mix of competencies is required that are developed throughout the curriculum and facilitated by the variety of didactical approaches and assessment methods.

The curriculum of Water Science and Engineering incorporates seven specialisations:

- Hydrology and Water Resources (HWR);
- Hydraulic Engineering and River Basin Development (HERBD);
- Hydraulic Engineering – Coastal Engineering and Port Development (HECEPD);
- Hydraulic Engineering – Land and Water Development (HELWD);
- Hydroinformatics: Modelling and Information Systems for Water Management (HI);
- Erasmus Mundus Programme on Flood Risk Management (FRM);
- Erasmus Mundus Programme on Ecohydrology.

Several tracks of these specialisations have been developed as part of educational programmes that lead to a double degree (from UNESCO-IHE and partner organisation).

HECEPD, HWR and HI offer the possibility to start in China by following the first three modules at Hohai University, Nanjing, and then move to Delft for the rest of the programme. HI also offers a similar possibility to start at Universidad del Valle in Colombia, or at Ain Shams University in Egypt. In these cases, the modules offered abroad are the same as the ones offered at UNESCO-IHE, using largely the same course material. These universities have their own didactical approach and assessment methods. Some of the teaching is done by UNESCO-IHE staff members. The committee accepts these courses as equivalent to the Delft-based modules on the basis of the adequate study progress and graduation results of the students concerned.

LWD is, in addition to the track offered in Delft, also organised as a double degree programme with three other partners, AIT in Thailand, Sriwijaya University in Indonesia and Haramaya University in Ethiopia. FRM is an Erasmus Mundus double degree programme, organised with the Technical University of Dresden (Germany), UPC Barcelona Tech (Spain) and the University of Ljubljana (Slovenia). Ecohydrology is an Erasmus Mundus double degree programme, organised with the University of Algarve (Portugal), the University of Lodz (Poland) and the University of Kiel (Germany).

The programme of the five Delft-based specialisations follows a modular structure, each module having a duration of three weeks and a study load of 5 EC. The learning objectives, content and didactical approach are described in module sheets for each module. The committee found these very helpful not only for the students, but also as a basis for discussions among staff about the coherence and fine-tuning of the programme. In addition, during the site visit the committee studied the learning materials and assignments for a selection of the Water Science and Engineering modules. These were well-designed and the literature was up-to-date and of an appropriate level. An overview of the curriculum structure is given in Appendix 5.

The programme has four distinct phases:

- Foundation (10 EC);
- Deepening (25 EC);
- Broadening (25 EC);
- Research (46 EC).

The foundation phase consists of two common modules, focusing on fundamental knowledge and system understanding of importance to all specialisations. Students are also introduced to key methodologies and learn to understand their field of study and related disciplines in a broader context.

In the deepening phase students follow five specialisation modules, dealing with the core subjects of the specialisation. In the broadening phase students choose three elective modules offered by the other specialisations and programmes, in consultation with the specialisation professor or coordinator, and they work collaboratively with the students outside their own specialisation during an international fieldtrip and fieldwork and in a common study project. In this period they further learn to appreciate the interrelationship between their own specialisation and the other specialisations and programmes. The students told the committee that the programme provides enough choice. The Programme Committee has put much effort to achieve, within the time constraints of the 18 months programme, a careful choice of compulsory subjects that form the main skeleton of each specialisation programme and common subjects and electives to promote inter-specialisation thinking and development.

The committee noticed a significant improvement, compared to the previous assessment in 2006, as reflected in moving the specialisations from isolated tracks into parts of a common master's programme.

The critical reflection describes that in the research phase the students develop a research proposal, follow a course in research methodology and two elective summer courses of 2 EC each. The module sheet mentions that the actual offering of summer courses depends on the availability of staff and the interest of students and that the courses are not subject to examination. In the final six months the students conduct an independent thesis research project, based on research experiences gained in the earlier parts of the curriculum. The research project includes the writing of a thesis which is defended before a committee. Students select the topic for their research project before the start of the elective modules. This allows them to select electives that are closely related to their research topic. Students are allowed to select their own topic on condition that it meets the programme objectives, or they can select a topic from a list of available projects. The fieldwork period is short, which makes it crucial to define the research question precisely.

During the programme a number of excursions are organised, besides the international fieldtrip. These excursions are compulsory and serve as essential elements for exposing the students to real-world examples. In addition, events are organised for which no credit points are given, such as master's presentations, UNESCO-IHE colloquiums and research seminars. Students are strongly advised to attend these events.

The duration of the Erasmus Mundus Programme on Flood Risk Management (FRM) is two years. It starts with a semester of five foundation courses at the Technical University of Dresden, after which the students spend the second semester at UNESCO-IHE. The courses in FRM are partly those of other specialisations of Water Science and Engineering or the other Erasmus Mundus programme (Ecohydrology), and partly developed specifically for FRM. The third semester is spent at UPC Barcelona Tech (Spain) and the University of Ljubljana (Slovenia) for further specialisation courses including on socio-economic and management aspects. In the final semester students work on their thesis research at one of the four participating institutes.

The Erasmus Mundus Programme on Ecohydrology consists of four semesters (two years). In the first two semesters students follow courses in basic functioning of aquatic systems and applying ecohydrology either in the University of Algarve or in the University of Lodz. In Algarve the emphasis is on coastal ecosystems, while the courses at Lodz focus more on freshwater ecosystems. For the third semester students move to UNESCO-IHE or to the University of Kiel, for courses on physical aspects (hydraulics and hydrology) and approaches to water resources management. During this third semester students also begin working on their thesis proposals. In the final semester students conduct their thesis research in any of the consortium institutions. At UNESCO-IHE there are some specific courses on Ecohydrology but most are shared with River Basin Development (HERBD).

The module descriptions, including learning objectives, content and didactical approach, cover the contributions of all partners in the Erasmus Mundus programmes and are very clear and extensive. They show that the outline of these two programmes has been well-thought out and lead to a coherent curriculum.

Students indicated that the programme provides a broad general foundation of knowledge about water engineering, which is a good basis for the later specialisation. In their opinion the

programme affords enough possibilities for choice, such as in the selection of elective modules, the possibility to focus on ground or surface water in HWR and the selection of the topic and location of the thesis research. The students feel well prepared and supervised during the research project. The committee noted based on students views that the combination of modules with international partners leads at times to scheduling problems. Students also maintain that this causes differences in background knowledge between the different groups of students who participate in the module.

The Programme Committee carries the overall responsibility for the academic quality, content and organisation of the Water Science and Engineering programme. The Programme Committee consists of thirteen members: five professors representing the various specialisations, the Programme Coordinator, five Specialisation Coordinators, a student representative and a representative of the Education Bureau. The issue of modules combination and its consequences and the concerns of the students were discussed with the Programme Committee. This committee maintains that to their knowledge the level of the students who commence studies at Delft after completing the foundation modules with other partner institutions, is the same as the level of the Delft students. The modules taught by the international partners use the same course materials and often are delivered by UNESCO-IHE staff. Students who arrive at a later stage than their colleagues need an adjustment period to UNESCO-IHE and the Netherlands, while the Delft students are already settled. Staff members monitor all students closely.

The committee raised the issue of the number of specialisations and the possibility of merging, for example, HELWD and HERBD, because of the closely related content of both, and for greater efficiency. The Programme Committee mentioned in response that LWD is also offered as a double degree, with four international partners. These are essentially the same as the UNESCO-IHE specialisation, but are adapted “at the fringes” to the circumstances of the specific partners. This leads to varying lengths in terms of EC’s and different entrance dates at UNESCO-IHE. Students from Sriwijaya University, Indonesia, start with a six-month programme at home and then follow the Delft programme from the beginning. Students from AIT have a five-month programme in Thailand before they enter the Delft programme after the two foundation modules and two specialisation modules. The Ethiopian students join in after a six-month programme at Haramaya University, when the Delft students have finished the two foundation modules and three specialisation modules. Most of the programme, and especially the interdisciplinary modules and the research phase, are therefore done at UNESCO-IHE, and the committee has no reason to doubt that the overall quality and outcomes of the double degrees are comparable with the single degree. It is a good way to expand the impact of UNESCO-IHE and lower the threshold in cooperation with partner institutes abroad. It makes it possible to teach a larger group of students who would otherwise not have the possibility to reach the necessary entrance level (Indonesia) or to spend 18 months in the Netherlands (Thailand, Ethiopia).

Water Science and Engineering has at present no intention to change the double degrees to joint degrees. Joint degrees are easier to develop and implement for stand-alone programmes, while the current double degrees are to a large extent interwoven with the specialisations. The choice also depends, of course, on the wishes of the partner institutes. At this stage there is no intention to change the existing arrangements and students seem to prefer the fact that they receive two diplomas of respectable institutions.

The Programme Committee aims at an average group size of 15-20 students, with a maximum of 25-30, per module. The River Basin Development (RBD) specialisation attracts

15-20 students each year which means there is no logistical need to combine it with other specialisations. The staff aims to deliver programmes that fit the specific preferences and needs of students and their employers. Therefore, the curricula offer focused specialisations (but not too narrow), while providing for a strong common foundation of the Water Science and Engineering programme.

### ***2.1.2 Didactical concept***

The critical reflection describes that the programme is designed to stimulate active learning within a framework of incremental learning. Each module therefore comprises 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 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 UNESCO-IHE and/or partner organisation (usually in cooperation with PhD or post-doctoral research studies). This 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 a unique experience of working in a professional research and/or consultancy environment. Sufficient academic orientation is ensured through co-supervision of the UNESCO-IHE supervisor/mentor throughout the project.

In all cases UNESCO-IHE staff provides support and supervision (approximately 80 hours/student) to ensure a work of sufficient quality, even in the rather limited period of six months that is mainly restricted through the fellowship arrangement. Although some students may continue the research for a longer period if the academic scope suggests this and funding is available, the final examination takes place after six months in the majority of cases, in order to allow all students an equal chance, regardless of funding opportunities.

The implementation of the T-shape model and the interdisciplinarity it aims for were discussed with the Programme Committee. In the case of Water Science and Engineering the horizontal bar of the T is focused on the economic and social aspects of the issues addressed by the programme. It also focuses on social interaction in addition to technical skills where implementation is of concern. The introduction of students to related fields of water management is achieved through the institute-wide lectures given during the introductory week of the programme and the programme-wide group work.

The students indicated their appreciation for the possibilities of choice during the programme, for the guidance and supervision before and during the research project, and for the input of guest lecturers and the additional expertise and knowledge that they bring in.

### ***2.1.3 Study load***

The critical reflection indicates that the curriculum has a study load of 106 EC and has to be completed within 18 months. The specialisations given in partnership with other institutions that lead to double degrees have a study load of 110-123 EC. Most students succeed in completing the programme within this time period although almost all of them told the committee that it is a very full programme. For many students it has been a while since they were in class and it takes some time to get back into the rhythm of studying.

The alumni were of the opinion that the programme should not be made longer but that time should be utilised more effectively. The foundation courses are useful but in their view take are too long. Since the different foundation modules are difficult or easy for different students, depending on their background, the alumni suggest that they should not be scheduled in blocks but parallel to each other, so that the workload is spread more evenly over the semester.

The Programme Committee realises that the programme is heavy, but adds that this is largely unavoidable. The aim is to present the students with the required depth in their specialisation while at the same time acquainting them with the broader context of related fields and the economic and social aspects of water science and engineering. This combination makes it a struggle to fit all the required modules into the 18 months of the programme. The Programme Committee agrees that a longer programme with more content would be nicer and better, but that in practice this is not feasible, mainly for financial reasons such as the fellowship requirements. The committee agrees with them that in the circumstances they have found the best balance. The committee stresses the importance of the selection procedure of applicants and recommends the development of on-line preparation of selected candidates. The committee suggests to look into the possibility of offering a programme of 120 EC for all students and granting credits to incoming students with good working experience, comparable with an internship of 6 months.

Although time pressure remains a concern, the committee established that students do not generally perceive the study load as impossible. The curriculum may be demanding and leave little room for reflection, but it does not lead to students dropping out of the programme. According to the lecturers, students are able to cope with the demands because they are highly motivated and strongly interested in the issues dealt with in the courses.

### ***2.1.4 Tutoring and guidance***

Because students at UNESCO-IHE come from different countries and cultures and mostly have no home base in the Netherlands, much attention is paid to the tutoring and guidance of the students.

In advance of their arrival they 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 UNESCO-IHE, 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 tries to help students in case of emotional problems such as homesickness or the effects of previous traumas. Students with study problems are in principle referred back to their Programme Coordinator or the Specialisation Coordinator, although in some cases the study counsellor is

also involved. For academic support, all lecturers can be approached with questions. For the thesis research a staff member supervises the work of the student. In addition, during the thesis writing, each student has a mentor, a member of the academic staff of the chosen specialisation. The students are, generally speaking, satisfied with the role of the mentor. They note that the students are expected to take the initiative to contact the mentor if they need help. The committee concludes that the arrangements and facilities to support the students during their stay in the Netherlands are extensive and work properly. The committee recommends to establish for each incoming student a 'portfolio' with his/her initial motivation and career plan, which should be discussed and updated as needed, preferably with a unique mentor from the start.

### ***2.1.5 Academic staff***

The master's programme in Water Science and Engineering is developed and delivered by a team of 54 UNESCO-IHE staff members and 58 guest lecturers. For UNESCO-IHE staff members the staff/student ratio is 1:8.9 for the taught part and 1:23.3 for the master's supervision. The core of the programme is taught by UNESCO-IHE staff. Over time the group of staff members has grown, which makes it possible to be regularly available for students. Guest lecturers are invited "to round it up", for additional expertise and illustration. The Programme Committee told the committee that the intention is to further internationalise the staff, by attracting more staff members from the global South.

The UNESCO-IHE staff is well qualified academically: all full professors have appointments at universities in the Netherlands, which testifies to their academic standing. The great majority of associate professors and lecturers hold PhD degrees. The publication record has increased substantially over the last years. Results of their research are used directly in the modules. 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. Finally, the teaching qualities of the staff members are evaluated positively by the students in the regular module evaluations. In their meeting with the committee during the site visit students described their relationship with staff members as open and that they appreciate the intensive guidance offered by the staff during the programme, especially in the research phase.

The committee considers the broad team of educational staff a strong point of the master's programme. The input of guest lecturers provides additional input in a very efficient and effective manner.

### ***2.1.6 Student body***

The Water Science and Engineering programme attracts 70 to 80 students per year. The enrolment in the various specialisations fluctuates over the years and is influenced by the availability of fellowships. A drop in the number of Delft-based students in 2010-2012 was compensated by an increase in the number of students participating in double degree programmes. This is in line with UNESCO-IHE's strategy to develop a Global Campus with shared responsibility for educational programmes by different universities and the critical reflection describes it therefore as a positive contribution to this development.

The programme targets mid-career professionals with at least three years of working experience. This is reflected in the average age of the students: the largest group is 25-30 years old. The largest group comes from Asia (40%), followed by Africa (25-30%) and Latin

America (<10%). The start of the Erasmus Mundus programmes has led to an increase in students from other countries.

The students are very motivated and committed and work hard. For most of them a full time study requires quite an adjustment from the life they were used to. Their employer has allowed them a study leave and they are expected back with a degree after 18 months. The drop out rate is very low (0-5 students over the last five years) and the success rate is on average 95%.

### **2.1.7 Facilities**

The facilities of the UNESCO-IHE institute are geared to the multidisciplinary nature of the programmes. Well-equipped and well-staffed laboratories are used during the modules that focus on chemical analysis in the core part of the programme. The classrooms and work spaces have recently been renovated. The videoconferencing room is an indispensable facility to allow for direct communication with partners overseas.

IT-facilities and the necessary software packages are available. Students receive a laptop at the start of the academic year and can purchase it for a reasonable price at the end of the programme. Wireless internet is available throughout the building. The library is used intensively by students throughout the programme and possesses a large amount of books and journals. The number of electronic journals has increased during the last years. In 2011 the e-campus project was launched, using the Moodle-software (Modular Object-Oriented Dynamic Learning Environment or Course Management System). Students and staff are supported by a Moodle-coordinator.

The committee is of the opinion that the UNESCO-IHE building offers very good facilities for the academic education of the students in an atmosphere that makes their stay in the Netherlands fruitful and enjoyable.

## **2.2 Considerations**

After studying the various aspects of the programme's teaching and learning environment, the committee established that the contents and structure of the curriculum enable students to achieve the intended learning outcomes. The programme provides a good basis in engineering, building on the historical strengths of UNESCO-IHE, and it provides sufficient depth in contents. The specialisations have a common foundation which is clearly visible in the programme. The elective modules and the group work introduce interaction among students from the different specialisations and thus contribute to the horizontal bar of the T-shape model of the curriculum. The relatively high number of double degrees may jeopardise the internal integration of the programme. However, the committee views the cooperation with international partners as an added value both for students and for UNESCO-IHE. The double degrees, including the Erasmus Mundus programmes, provide education on relevant new topics, tailored to the needs of developing countries. They also lower the threshold for new participants because part of the programme can be followed in their own region and, for Erasmus Mundus, because an additional number of fellowships are available. In addition, the double degrees increase the visibility and impact of UNESCO-IHE. By the use of existing modules and an intelligent combination of courses with the input of partner institutes, such as in Erasmus Mundus, the risk of fragmentation is greatly reduced.

The division of the curriculum into four distinct phases of foundation, deepening, broadening and research is logical and allows proper attention to both bars of the T-shape model of education: the vertical bar of deepening and the horizontal bar of broadening. The timely



selection of a research topic, the module in research methodology and the development of the research proposal prepares students for conducting their individual thesis research. The learning objectives per specialisation and the module descriptions are clear and provide insight into the contributions of curriculum components to the achievement of the intended learning outcomes of the master's programme. Overall, the committee is satisfied with the content of the curriculum. The courses are academic in orientation but at the same time never lose sight of the intrinsically applied nature of water science and engineering. The contents are geared to the technological and social context of developing countries. Whenever possible, the results of the research activities and other projects of staff members are integrated in the courses. Furthermore, the literature that is used is appropriate and up-to-date.

The main challenge of the curriculum is its density and the high level of intensity. The programme sets out to present a comprehensive 18-months training programme to a very heterogeneous body of students. The committee maintains that, within the limitations of this set-up, the programme management is doing well. In order to address the widely different levels of knowledge and skills with which the students enter the programme, the management has developed a set of foundation modules. The committee advises the staff to investigate alternative or additional possibilities, for example by expecting self-learning from the students before they commence their studies in Delft and by testing the students' basic knowledge on arrival. The development of the e-campus will be of great help for this purpose. Time should also be set aside for debate on general issues with staff and students from all specialisations, for example in seminars or evening lectures. Supporting students' adjustment is addressed by an extensive system of student monitoring, in which both the Programme Coordinator and the Specialisation Coordinator and the student counsellor play a role. This mechanism assures that potential problems are identified at an early stage. Because of the dedication of both staff and students, the programme in practice seems to work out well.

Staff members are highly motivated and involved, well qualified academically and seem to possess good teaching qualities. The core staff is strongly connected to the professional field in the Netherlands and abroad and brings extensive experience with applied research into the classrooms. This is clearly appreciated by the students. Guest lecturers are called in for additional specific expertise and as a link with the professional field.

Traditionally, the student population of UNESCO-IHE is very diverse, in both academic qualifications and geographical background. As mid-career professionals on study leave they have, on the one hand, some difficulties at the start of the programme to adjust to being back in class but, on the other hand, they are highly committed and motivated to succeed.

### **2.3 Conclusion**

*Master's programme Water Science and Engineering:* the committee assesses Standard 2 as **satisfactory**.

### **Standard 3: Assessment and achieved learning outcomes**

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

#### **Explanation:**

The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

### **3.1 Findings**

This section firstly deals with the assessment system and quality monitoring of the thesis (§3.1.1) and with the achieved learning outcomes on the basis of the quality of the theses and the position of alumni on the labour market (§3.1.2).

#### ***3.1.1 Assessment system***

The Education and Examination Regulations provide a detailed overview of the nature, frequency and marking of assessments as well as the possibilities for re-examination and appeal procedures. They are safeguarded by the Examination Board. All students are informed about the rules in the Handbook they receive at the start of the programme.

The assessments of the modules include written exams, oral exams, assignments, oral presentations, written reports and modelling exercises. Some assessments are carried out by small groups to facilitate team working skills. Most modules include two or more methods of assessment to reflect the multiple intended learning outcomes of the modules. In order to adequately reflect on individual performance within a group, student-peer assessments will be introduced for extensive group assignments.

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

Written exams are compiled by the module coordinator and peer-reviewed by the programme and/or specialisation coordinators. Marking is done anonymously based on student registration numbers. Oral exams are always conducted by at least two staff members to ensure impartiality. After each assessment students are given feedback on their performance and are given the chance to inspect their exams. Students are asked to evaluate the quality of the assessments in the module evaluations. Re-examinations normally take place during the next examination period indicated in the academic calendar. Students will not be allowed to sit for further re-examinations or reassignments if they failed more than three re-examinations for the first thirteen modules of the programme. An appeal procedure is in place and fraud or cheating is taken very seriously.

The assessment of the final thesis follows a procedure of four steps. First, the final version of the thesis is checked with modern software to minimise the chances of plagiarism. Second, for each thesis assessment an exam committee is established, consisting of the supervisor (professor), the mentor and an external member from another department within UNESCO-IHE or from outside the institute. The composition of the exam committee has to be

approved by the Examination Board. Third, the student presents and defends his/her thesis in an oral public defence. Fourth, the exam committee uses a list of evaluation criteria to grade the performance of the student, including the content, academic attitude and editorial aspects of the presented work. These criteria are listed in the Handbook and therefore known to the students. They are not yet cross-linked with the learning objectives of the programme. The Examination Board intends to do this next year. The committee considers this to be an important step. There is no rule for the relative weight of the different criteria in the final mark of the thesis. This has been discussed among the staff but was viewed as a mechanistic approach that may be risky. Also, it was felt that this would not give sufficient freedom for the different roles in the exam committee, such as the mentor being focused on the process and the external examiner on the product. Although the committee agrees with this line of reasoning, additional mechanisms could add great value to the assessment of thesis. The committee recommends a rubric for assessment of master's theses. The thesis evaluation form should include a relative weight for the different criteria for assessing the final mark, which will enable a more objective assessment of the master's theses. Relative weights for thesis assessment are used in many universities in the Netherlands as well as other universities in Europe and other parts of the world.

The Examination Board safeguards the compliance with the rules set for the thesis assessments. The deadline for submission of the thesis in early April is clear to students and upheld quite strictly. Requests for extensions are handled by the Examination Board. The staff is responsible for the marks but the Examination Board supervises the outcomes on the basis of statistics and extreme grades. Decisions on distinctions are taken by the Examination Board and are based on the module marks and the thesis mark. Module marks and thesis marks differ quite often, and reflect that different skills are expected. Usually module marks are higher than the thesis marks. The use of an external examiner provides another reference point for addressing potential inflation of thesis marks and the granting of distinctions. The Examination Board also regulates assessment marks by comparing the outcomes of the different master's programmes and by benchmarking the average thesis marks with the Delft University of Technology, Wageningen University and the VU University of Amsterdam. To date, the grades allocated by the programme were at the same level.

The committee has studied the information on the assessment system and discussed the assessment system with the Examination Board. The committee also noted that the students did not raise any serious issues about the assessment system or the individual assessments, although it was mentioned that a more extensive feedback on their assignments would be preferable. In some cases the feedback is limited unless the student takes the initiative to ask the lecturer for more detail. Some lecturers organise a review session when the marks are available. Overall, the procedures as set and safeguarded by the Examination Board apparently ascertain a fair and transparent system. The various checks and balances oversee the process of assessments and validate its validity and reliability. The committee considers this to be a strong point. The link between the learning objectives of the programme and the marking of the thesis, to be made explicit in the near future, will further improve the assessment.

The committee investigated the diploma and diploma supplement that are issued after graduation. The diploma supplement contains the relevant information about the degree and the degree level, and includes the learning objectives of the chosen specialisation, the names of the modules and the marks that were earned, and the title and mark of the final thesis. The committee concludes that this is a valuable and clear document that will help students in their future careers. Students who fail to meet the programme examination requirements will be

issued a certificate stating the result achieved including the EC for each successfully completed component of the programme as well as the period of registration. Students who fail to meet the programme examination requirements and have accumulated a minimum of 45 EC will be awarded a 'certificate of post-graduate study'.

### ***3.1.2. Achieved learning outcomes***

The committee studied a representative sample of the Water Science and Engineering theses. In most cases the committee agreed with the mark given by the programme staff, but in a number of cases the committee would have marked slightly lower. Especially the lower marked theses (6-7) showed deficiencies in one or more aspects, such as formulation of objectives, selection and application of methods and techniques and the use of references. In general, however, the theses had clear objectives and problem formulation, an adequate selection and application of research methods, showed proper operationalisation and logical reasoning and followed the criteria for academic reporting. All of them were at least sufficient in these respects and some were at a higher level. On this basis the committee concludes that the Master Water Science and Engineering graduates have achieved the intended learning outcomes of an academic master. To further raise the level of the theses, the committee advises to guide the students more closely on the adequate use of scientific literature and referencing.

The critical reflection describes that in 2010-2011 a tracer survey was held among 6,500 UNESCO-IHE alumni, to which 1,149 alumni responded. The respondents included 113 Water Science and Engineering alumni who graduated between 2005 and 2010. The survey shows that more than half (55%) changed jobs (either new post with the same employer or with a new employer) while 33% kept the same position. In their employment 91% of the alumni contribute to the development of their country or region and 91% agree that their working environment was conducive for using the knowledge and skills they had acquired during their study at UNESCO-IHE. The alumni officer informed the committee that each year a number of refresher courses is organised for the alumni.

These positive outcomes were confirmed by the feedback the committee received from a limited number of alumni. Their main asset after completing their UNESCO-IHE degree was that they felt prepared to work all over the world with very different people and on different topics. They found the interdisciplinary approach useful and were able to apply their knowledge across various sectors. UNESCO-IHE taught them to be critical and took them to a higher level, which helped them make further career moves. The programme builds up team work among the students and combines a practical approach with theoretical knowledge. The alumni described this as "the beauty of the institute". They admit that there may be engineering or scientific programmes with a stronger disciplinary reputation, but that the combination offered by UNESCO-IHE is unique and a better combination for developing countries. When asked for suggestions for improvement the alumni mentioned that the programmes should embrace new issues in environmental science, such as the pollution by electronic waste, and interdisciplinary modelling. They also suggested that there should be more synchronisation among the master's programmes regarding the grading criteria for the theses. The committee agrees that UNESCO-IHE should always be alert for new developments to be addressed in its programmes, but regards the new initiatives with various partners as an indication that this awareness is present. The committee advises the Examination Board to keep monitoring the grading criteria and grades for the master theses.

### 3.2. Considerations

The committee established that the assessment system of the UNESCO-IHE functions very well. Good control mechanisms are ensuring that work is systematically and consistently graded. The committee further found the range of assessment methods to be appropriate. The examination structure has clearly been tailored to the intended learning outcomes of the programme. The committee especially appreciates the system of blind marking and the involvement of external assessors. The assessment system has strong checks and balances and the assessments are transparent, valid and reliable.

After studying examination results as well as a sample of recent theses, the committee established that graduates of the Water Science and Engineering programme meet the end qualifications as specified under Standard 1. From the committee's conversations with alumni, it became sufficiently clear that graduates of the programme are truly able to function as capable water engineers.

### 3.3. Conclusion

*Master's programme Water Science and Engineering*: the committee assesses Standard 3 as **satisfactory**.

### General conclusion

The committee has assessed all three standards as satisfactory. The committee judges the programme to be a stimulating academic master's programme. The profile of the programme, its position within the field, the clearly formulated intended learning outcomes, the coherent structure and interdisciplinary contents of the curriculum, the well-kept facilities, and the overall enthusiasm displayed by both staff members and students all contribute to a fitting teaching-learning environment. The assessment of the learning outcomes in tests, assignments and, above all, the master thesis meets the required quality standards. Both the quality of the theses and the experiences of the alumni show that the intended learning outcomes are achieved. The committee members recognised a strong improvement of the programme as the result of the comments of the 2006 assessment committee.

The committee assesses the *master's programme Water Science and Engineering* as **satisfactory**.



## APPENDICES





## **Appendix 1: Curricula vitae of the members of the assessment committee**

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**Prof. dr. André van der Beken (chair)** has been an emeritus professor at the Free University Brussels since 2003 after having been a full professor since 1979. In 1969 he obtained his PhD in Agricultural Sciences from the University of Ghent. He has been a visiting professor at the Technical University Delft, Dept. of Hydrology (1981-1982); the University of Dar es Salaam, Dept. of Civil Engineering, Tanzania (1983, 1986); the Institut National d'Agronomie de Tunisie, Tunis (1984-1987); the Faculty of Sciences and Technology, Universidad Mayor San Simon, Cochabamba, Bolivia (1986); WARREDOC, University for Foreigners, Perugia, Italy (1988); the master's programme in Eremology, University Ghent (1990-1996) and the Centre for Environmental Sanitation, University Ghent (1992 -2004). He has been the Director of the Interuniversity Post-graduate programme in Hydrology and a member of the Steering Committee of the Interuniversity Programme in Water Resources Engineering. André van der Beken was a member of the Peer Review Evaluation of the programmes of the Fonds National de la Recherche Luxembourg (2008-2010) and participated in the assessment of the education and training needs of the water resources management services of the Republic of South Africa (1998).

**Prof. ing. Janos Bogardi** has been a co-opted professor in Water Resources at the Faculty of Agriculture of the University of Bonn, Germany since 2004. He obtained his PhD (dr. ing.) in Water Resources Management from the University of Karlsruhe in 1979. He has been the Executive Officer of the Global Water System Project of ESSP since 2009 and Senior Fellow since 2010, both at the Center of Development Research of the University of Bonn. Previously he was Director of the Institute for Environment and Human Security of the United Nations University (UNU-EHS) (2003-2009), including the vice-rectorship of the UNU in Europe from 2007 until 2009; worked as a Senior Programme Specialist and Chief of Section at UNESCO, Paris (1995-2003); as a professor at the Agricultural University of Wageningen, the Netherlands (1989-1995) and as an Associate Professor at the Asian Institute of Technology (AIT) in Bangkok, Thailand (1985 – 1988).

He is a member of the Deutsches Komitee für Katastrophenvorsorge (member of the board 2009-2011), of the International Association of Hydrologic Engineering and Research (IAHR) and of the International Association of Scientific Hydrology (IASH).

**Dipak Gyawali** is *Pragya* (Academician) of the Nepal Academy of Science and Technology (NAST) since 1992 and chairman of Interdisciplinary Analysts, a research and consulting firm. He chairs the newly founded liberal arts college, the Nepâ School of Social Sciences and Humanities. He also directs research at the non-profit Nepal Water Conservation Foundation. By profession, he is a hydroelectric power engineer (Moskovsky Energeticheskyy Institute, USSR, 1979) as well as a political economist studying resource use (Energy and Resources Group, University of California, Berkeley, 1986). He has served as Nepal's Minister of Water Resources (responsible for power, irrigation and flood control) between November 2002 and May 2003 and was a UNESCO/UNU-IAS Visiting Professor of Water and Cultural Diversity at the United Nations University in Yokohama, Japan in 2010. He was a member of the panel of experts of the Mekong River Commission and he currently serves on the Steering Committee of the Mekong Program on Water Environment and Resilience (MPower). Previously he has been chair or member of numerous national and international committees and programmes on water research and water management. Dipak Gyawali was a member of the assessment committee UNESCO-IHE in 2007.

**Prof. dr. Rivka Kfir** has been an Extraordinary Professor and advisor at the Water Institute, University of Pretoria, South Africa since 2011. She obtained her doctorate in medical microbiology in 1981. She also holds a degree in Management, obtained from the Faculty of Economics and Political Science, University of London (1996). From 2001 until 2011 she was Chief Executive Officer of the Water Research Commission (WRC), Pretoria, South Africa. Before that she was Executive Director of Knowledge Management and Strategy, National Research Foundation, (NRF), Pretoria, South Africa (2000-2001) and Technology Manager, Council for Scientific and Industrial Research (CSIR), Pretoria, South Africa (1996-2000). Rivka Kfir's professional activities include being a member of the Academy of Science of South Africa, ASSAf, the Water Institute of Southern Africa. She was a Founding Board member of the Global Water Research Coalition and a Governing Council member of the International Water Association (IWA). She has published numerous papers and articles.

**Prof. dr. Grietje Zeeman** is professor in New Sanitation at the Sub-department of Environmental Technology (ETE) at Wageningen University and Research Centre (WUR). She obtained her PhD in Agricultural and Environmental Sciences from Wageningen Agricultural University, The Netherlands in 1991. She has acquired funding for various research projects, such as The London School of Hygiene & Tropical Medicine (2011-2013), STW PhD and Post-doc research on Enhanced Enzymatic Anaerobic Fermentation of Organic Residues (EnzyFOR) (2011-2015). Grietje Zeeman has been on the scientific board for international conferences organised by the International Water Association (IWA) and on the organisation board of other international conferences. Her professional activities include chairing the Technical Committee Anaerobic Digestion (TCA) of the Dutch National Association for Water Quality Management (NVA) and her membership of ONS, an advisory body on New Sanitation.

**Franca Kramer BSc** obtained her bachelor's degree in Life Science and Technology from Delft University of Technology/University Leiden in 2009 and is currently enrolled as a master's student in Water Management, a specialisation programme in Civil Engineering at Delft University of Technology. Part of her master's programme was a research project at the Technical University Bandung, Indonesia. She participated in a study visit to Israel and Palestina on water management and attended the Young Water Professionals Conference in Leuven 2011. She has been a student member of the educational committee Civil Engineering.

## Appendix 2: Programme of the site visit

Time	Subject	Panel
<b>Monday 17 September</b>		
08.45	<i>Welcome day 1</i>	Prof. Andras Szollosi-Nagy, rector Jan Herman Koster, Education Bureau
09:00 – 10:30	Preparatory meeting of the committee: discussing the NVAO framework for limited assessments and joint degrees	
10:30 - 11:30	Inventory and reading of information on programmes and joint degrees, supplied by UNESCO-IHE	
11:30 - 12:15	Discussing the critical reflections and theses of all four programmes	
12:15 – 13:00	<i>Lunch</i>	
13:00 – 14:00	Introductory meeting with the management	Prof. Andras Szollosi-Nagy, rector Prof. Stefan Uhlenbrook, vice-rector Academic Affairs Prof. Maria Kennedy, Chair programme committee MWI Prof. Dano Roelvink, Chair programme committee WSE Prof. Pieter van der Zaag, Chair programme committee WM Greet Vink, Business Director Jan Herman Koster, Education Bureau
14:00 – 14:45	Meeting with students of the master <b>Water Management</b> (students of all different tracks)	Claudia Zamora, WQM, Peru Bunthida Plengsaeng, WCM, Thailand Tobias Angula, WRM, Namibia Joseph Nartey, WRM, Ghana Risch Tratschin, WSM, Switzerland Kurniati Widyastuti, WSM, Indonesia
14:45 – 15:30	Meeting with the programme committee (teachers + student member ‘educational committee’) of the master <b>Water Management</b>	Prof. Pieter van der Zaag, Chair Jeltsje Kemerink, Programme Coordinator Schalk-Jan van Andel Prof. Meine Pieter van Dijk Safa Fanaian Student member Peter Kelderman Marloes Mul Maria Rusca Klaas Schwartz Jan Herman Koster, Education Bureau
15:30 – 16:00	<i>Break</i>	
16:00 – 16:20	Alumni officer	Maria Laura Sorrentino
16:20 – 17:05	Meeting with students of the master <b>Water Science and Engineering</b> (students of all different tracks)	Fátima Mussá, HWR, Mozambique Alex José Kaune Schmidt, LWD, Germany Eunice Rodrigues da Silva, HECEPD, Portugal Hesam Sanaee, HECEPD, Iran Ricardo González Flores, HERBD, Bolivia Alifta Ariestwi, HI, Indonesia Zhao Yi, HI, China

17:05 – 17:50	Meeting with the programme committee (teachers + student member ‘educational committee’) of the master <b>Water Science and Engineering</b>	Prof. Dano Roelvink, Chair Erik de Ruyter, Programme Coordinator Schalk Jan van Andel Karen Anguizola, Student member Luigia Brandimarte Prof. Charlotte de Fraiture Shreedhar Maskey Prof. Michael McClain Prof. Arthur Mynett Prof. Dimitri Solomatine Suryadi Prof. Stefan Uhlenbrook Mick van der Wegen Jan Herman Koster, Education Bureau
17:50 – 18:30	Rounding up	
18:30 – 19:00	<i>Travelling time</i>	
19:00 – 21:00	<i>Dinner</i>	
<b>Tuesday 18 September</b>		
08:45	<i>Welcome day 2</i>	
09:00 – 09:45	Meeting with students of the master <b>Environmental Science</b>	Ndayisaba Cyprie, EST, Rwanda Freweyni Tammene, EST, Eritrea Brenda Chimombe, EPM, Zimbabwe Mark Ayertey, WQM, Ghana Perdana Nugroheni, IMETE, Indonesia
09:45 – 10:30	Meeting with the programme committee (teachers + student member ‘educational committee’) of the master <b>Environmental Science</b>	Prof. Piet Lens, Chair Henk Lubberding, Programme Coordinator Hans van Bruggen Bipin Dangol, Student member Edwin Hes Tineke Hooijmans Prof. Ken Irvine Peter Kelderman Jeltsje Kemerink Prof. Jan Leentvaar Jan Herman Koster, Education Bureau
10:30 – 10:45	<i>Break</i>	
10:45-11:15	Skype conversation with the management committee including representative from AIT Bangkok about the ES Joint Degree programme <b>Environmental Technology for Sustainable Development (ETSuD)</b>	Prof. Piet Lens, UNESCO-IHE Peter van der Steen, UNESCO-IHE Prof. Ajit Annachhatre, AIT Dr. Thammarat, AIT Jan Herman Koster, Education Bureau
11:15 – 11:30	<i>Break</i>	
11:30 – 12:00	Skype conversation with the management committee including representatives from the BOKU university in Austria and the Egerton University in Kenya about the ES Joint Degree programme <b>Limnology and Wetland Management</b>	Edwin Hes, UNESCO-IHE Prof. Ken Irvine, UNESCO-IHE Dr. Kitaka, Egerton University Prof. Owido, Egerton University Dr. Stefan Schmutz, BOKU University Dr. Gerald Winkler, BOKU University Jan Herman Koster, Education Bureau
12:00-12:15	<i>Break</i>	

12:15 – 12:45	Skype conversation with management committee and representatives from the Gent University and the Institute of Chemical Technology Prague about the ES Joint Degree programme <b>Environmental Technology and Engineering</b>	Prof. Piet Lens, UNESCO-IHE Peter van der Steen, UNESCO-IHE Jan Bartacek, ICT Prague Prof. Gijs du Laing, Ghent University Prof. Filip Tack, Ghent University Jan Herman Koster, Education Bureau
12:45 – 13:30	<i>Lunch</i>	
13:30 – 14:15	Guided tour / Consultation hour (if there are applications for the consultation hour the committee will split on the basis of expertise)	
14:15 – 15:00	Examination Board	Prof. Arthur Mynett, Chair Erick de Jong, Secretary Peter Kelderman Jan Nonner Prof. Dimitri Solomatine Nemanja Trifunovic
15:00 – 15:15	<i>Break</i>	
15:15 – 16:00	Real-life and Skype meeting with alumni of all programmes from different countries	Aline Okello, Mozambique, PhD student Nirajan Dhakal, Nepal, PhD student Ali Dastgheib, Iran, UNESCO-IHE staff member Raquel dos Santos, Brazil, UNESCO-IHE staff member Benly Ramirez, Mexico, researcher Maria Pascual, Spain, Evides International Lukas Kwezi, Tanzania (through Skype), National Coordinator Global Water Initiative Julius Kipkemboi, Kenya (through Skype), Egerton University
16:00 – 16:20	Student counsellor <i>NB. For study advice and problems students go to the mentor of the programme committee. With other problems they go to the student counsellor. Because of the international character of UNESCO-IHE there is a short meeting with the student counsellor</i>	Sylvia van Opdorp-Stijlen
16:20 – 18:00	Looking at Joint Degree information and discussion	
18:00 – 18:30	<i>Rounding up</i>	
18:30 – 19:00	<i>Travelling time</i>	
19:00 – 21:00	<i>Dinner</i>	
<b>Wednesday 19 September</b>		
08.45	<i>Welcome day 3</i>	
09:00 – 09:45	Meeting with the students of the <b>master Municipal Water and Infrastructure</b> (students of all different tracks)	Leonard Msenyele, WSE, Tanzania Mira Yuliawati, WSE, Indonesia Angela Salinas, SE, Bolivia Zeeshan Bilal, SE, Pakistan Mohanad Abunada, UWEM, Palestine Sergio Muñoz Vazquez, UWEM, Mexico

09:45 – 10:30	Meeting with the programme committee (teachers + student member ‘educational committee’) of the master <b>master Municipal Water and Infrastructure</b>	Prof. Maria Kennedy, Chair Tineke Hooijmans, Programme Coordinator Prof. Damir Brdjanovic Jan Herman Koster, Education Bureau Maria Rusca Francesco Rubio, Student member Zoran Vojinovic
10:30 – 10:45	<i>Break</i>	
10:45 – 11:15	Skype conversation with the management committee including representative from AIT Bangkok about the MWI Joint Degree programme <b>Urban Water Engineering and Management</b> [NB. Local time in Bangkok: 15:45 – 16:45]	Prof. Damir Brdjanovic, UNESCO-IHE Zoran Vojinovic, UNESCO-IHE Prof. Maria Kennedy, UNESCO-IHE Tineke Hooijmans, UNESCO-IHE Prof. Visvanathan, AIT Dr. Babel, AIT Jan Herman Koster, Education Bureau
11:15 – 12:00	Internal committee meeting: preparation for concluding meeting with management	
12:00 – 12:30	<i>Lunch</i>	
12:30-13:15	Concluding meeting with management	Prof. Stefan Uhlenbrook, vice-rector Academic Affairs Prof. Maria Kennedy, Chair programme committee MWI Prof. Piet Lens, Chair programme committee ES Prof. Dano Roelvink, Chair programme committee WSE Prof. Pieter van der Zaag, Chair programme committee WM Jan Herman Koster, Education Bureau
13:15 – 14:45	Internal committee meeting preparing draft of preliminary results	
14:45-15:15	Preparing public presentation of the chairman	
15:15-15:30	Public presentation of preliminary results by the chairman	
15:30-16:00	Reception	

## Appendix 3: Domain-specific framework of reference

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### **The concept of Water Science & Engineering**

The concept of Water Science & Engineering is born out of the recognition that the technical and scientific problems related to water are increasingly multidisciplinary and graduates can no longer rely on spending their future working within only one of the traditional disciplines, rather, dealing with even the more technical aspects of water problems requires a mix of disciplines that:

- deal with water fluxes and quality in the natural and human-influenced environment;
- are concerned with different aspects of water resources management and development;
- explore the natural and anthropogenic influences on the water cycle at various spatial and temporal scales;
- investigate the management and optimisation of the human impact on water resources through structural and non-structural measures;
- develop and apply various simulation and predictive models for different phases of the water cycle;
- consider physical and logistical aspects of transport over water;
- are concerned with protection against water-related natural hazards.

### **The academic field of Water Science & Engineering**

Water Science & Engineering includes a range of science and engineering disciplines related to the aquatic environment. 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).

In short, the disciplines comprise:

- Hydrology: an earth system science that deals with the occurrence, circulation and distribution of water and the chemical and physical properties of water in the environment. In addition, it is the science that deals with the processes governing the depletion and replenishment of the water resources of the land areas of the earth, and various phases of the hydrological cycle;
- Hydroinformatics: a discipline which deals with applications of information and communication technologies, advanced risk-based modelling and forecasting tools, system analysis and optimisation to all areas of integrated water management and especially to river basins, aquifers, urban water systems, estuaries, and coastal waters;
- Hydraulic Engineering: a part of Civil Engineering that deals with the application of engineering principles and methods to the control, conservation and utilisation of water. This discipline is further divided into Land and Water Development, River Basin Development and Coastal Engineering and Port Development.





## Appendix 4: Intended learning outcomes

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### Water Science & Engineering Masters Programme: final qualifications

Upon successful completion of the Water Science & Engineering Masters Programme, graduates will be able to:

1. demonstrate knowledge and understanding of hydrological, hydraulic, morphological and environmental processes and phenomena and their inter-relationships;
2. identify and characterise the causes and impacts of water-related problems on society, the economy and the environment;
3. explain the need for integration of monitoring, modelling and information systems to support safe and reliable decision making;
4. demonstrate critical thinking skills, the ability of both independent and team problem-solving and the sense of engineering creativity and design;
5. apply modelling and data management related to hydrological, hydraulic, morphological and environmental processes;
6. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;
7. support planning, design, implementation, operation and maintenance, and management of engineered measures, of both a constructive and an operational character, aimed at the solution of problems arising from the multiple uses of water;
8. co-operate within a multidisciplinary and interdisciplinary framework with due consideration of ethical and social aspects related to the application of their knowledge and skills;
9. critically judge and evaluate their own work and results, as well as prior research carried out by others;
10. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences, making use of appropriate information and communication technologies;
11. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions) to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner; and
12. integrate ethical issues encountered in engineering practice and in relation to working in emerging and least developed countries and countries in transition.

## **Specialisation-specific learning outcomes Hydrology and Water Resources**

Upon completion of the Hydrology and Water Resources specialisation, the graduates will be able to:

- a. explain 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 and the natural and human-induced variability in space and time of hydrological systems;
- b. apply and integrate the relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts, and to use information and communication technology within a hydrological context;
- c. implement 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 of catchment hydrological modelling and aquifer modelling techniques;
- d. 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;
- e. design and conduct hydrological research and experiments for both application and scientific purposes, either independently or within a team-based framework;
- f. describe and discuss the importance of hydrology to society and the relationship of hydrology with related disciplines such as ecology, meteorology and climatology.

## **Specialisation-specific learning outcomes Hydroinformatics-Modelling and Information Systems for Water Management**

Upon completion of this specialisation, the graduates will be able to:

- a. explain the information cycle in relation to the management of water based systems and the flow of information from data acquisition to modelling, to support for decision making;
- b. explain the theories and concepts of physical, chemical and biological processes relating to the flow of water in the natural environment, including river basins, coastal waters and urban water systems, as necessary to generate safe and reliable models for water based systems;
- c. implement the theory and practice of different modelling paradigms, and, in particular, physically based and data driven modelling, and to integrate them in hydroinformatics systems applied to a wide variety of hydraulic, hydrological and environmental situations;
- d. explain advanced and appropriate information and communication technologies and their application to manage information relating to water management;
- e. select and apply proprietary and public domain software tools and critically assess their advantages and disadvantages in application to water resources management, hazard risk assessment and forecasting, environmental planning and asset management;
- f. explain the importance of the relationship of Hydroinformatics with related disciplines such as hydraulics, hydrology, ecology and information science;

- g. make critical use of advanced theories and concepts in Hydroinformatics to research creative solutions for new problems and situations, either independently or within a team;
- h. provide considered advice to managers and users of advanced Hydroinformatics tools.

### **Specialisation-specific learning outcomes Hydraulic Engineering and River Basin Development**

Upon completion of the Hydraulic Engineering and River Basin Development specialisation, the graduates will be able to:

- a. explain physical processes and natural phenomena in river basin systems, development of river basins by human interference, such as designing river structures and training works, and the management of floods and droughts;
- b. implement the major hydraulic methodologies and applications for river structures and river modelling techniques with regard to techniques for data collection, processing and analysis;
- c. evaluate and analyse river basin systems and processes at a wide range of scales for the purpose of water resources, including morphological assessments, impact analysis of hydraulic structures and natural hazards assessment and mitigation taking into account relevant aspects of environmental, economical and social planning and management;
- d. design and conduct hydraulic research, experiments and tests for both practical and scientific purposes, either independently or within a team-based framework;
- e. develop and undertake critical evaluations of strategies for the implementation of river engineering works, by intelligent use of engineering and scientific principles;
- f. apply and integrate relevant concepts and methodologies in the area of hydraulic and hydrological engineering and research as well as applying computational principles within the context of hydraulic engineering.

### **Specialisation-specific learning outcomes Hydraulic Engineering-Coastal Engineering and Port Development**

Upon completion of the Hydraulic Engineering-Coastal Engineering and Port Development specialisation, the graduates will be able to:

- a. explain hydraulic and morphologic coastal processes and nautical and logistic aspects as well as their interactions with nearshore and offshore structures;
- b. apply state-of-the-art coastal engineering design techniques to advance the needs of society for infrastructure and a safe environment;
- c. evaluate and implement coastal engineering solutions in a multidisciplinary and interdisciplinary environment;
- d. develop strategies to cope effectively with problems related to natural coastal hazards (e.g. flooding, oil spill) and shoreline erosion problems incorporating the tension between anthropogenic coastal developments and natural coastal processes;
- e. apply hydraulic, nautical, logistic and economic theories in the planning and design of coastal and ports layout and port logistics.

## **Specialisation-specific learning outcomes Hydraulic Engineering-Land and Water Development**

Upon successful completion of the Hydraulic Engineering - Land and Water Development Specialisation, the graduates will be able to:

- a. explain the latest concepts and theories of irrigation, drainage, flood protection, land reclamation and consolidation technologies for sustainable development;
- b. explain the cross-sectoral linkages comprehending wider aspects of society, economy and the environment;
- c. apply the latest hydraulic engineering and hydrological methods in planning, design and implementation of irrigation, drainage and flood protection schemes, independently or in a multidisciplinary team;
- d. identify and cross-evaluate alternative land and water development options for areas under different land uses and assess their technical, economical, and environmental feasibility;
- e. engage in or advise developers, system managers and water users on the participatory development and management of irrigation, drainage and flood protection schemes for their planning, design, implementation, operation and maintenance, financing and performance assessment;
- f. acquire knowledge and understanding of contemporary research issues in the field of land and water development.

## **Specialisation-specific learning outcomes Flood Risk Management**

An Erasmus Mundus Master Programme run jointly with Technical University of Dresden (Germany), Barcelona Tech (formerly Technical University of Catalonia) (Spain) and University of Ljubljana (Slovenia)

Upon completion of this specialisation, the graduates will be able to:

- a. apply a broad and cross-boundary scientific knowledge on flood risk management, including the understanding of socio-economic issues related to flooding;
- b. apply a broad scientific knowledge about conservation, restoration and management measures to overcome challenges imposed on water by humans and by climate change;
- c. analyse the reciprocal relationships between the physical system, the institutional framework and the socioeconomic environment, identifying future social and climatic pressures and needs and the consequent trends in system management;
- d. 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;
- e. 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;
- f. review scientific literature and carry out independent research (such as writing a state of the art paper based on research and practice literature);
- g. apply sophisticated hydroinformatics and modelling tools and best practices to address the problems of flood risk management;

- h. communicate his/her knowledge and research results to the scientific and non-scientific communities (such as presenting papers/posters to scientific congresses, general lectures to policy makers and interested non-specialists).

### **Specialisation-specific learning outcomes Ecohydrology**

An Erasmus Mundus Master Programme run jointly with the University of Algarve (Portugal), the University of Lodz (Poland) and the University of Kiel (Germany).

Upon completion of the Ecohydrology specialisation, the graduates will be able to:

- a. demonstrate knowledge and understanding of the ecological and hydrological processes on varying spatiotemporal scales in the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;
- b. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;
- c. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural contexts, and under often data-poor conditions;
- d. contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of ecohydrological systems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information;
- e. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of wellfounded conclusions and recommendations;
- f. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;
- g. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.



## Appendix 5: Overview of the curriculum of the programme

		Hydrology and Water Resources HWR	Hydroinformatics HI	Hydraulic Engineering and River Basin Development HERBD	Hydraulic Engineering, Coastal Engineering and Port Development HECEPD	Hydraulic Engineering Land and Water Development HELWD	ECTS credits
1	Foundation	Week ONE Introduction (ALL)					5
		Introduction to water science and engineering					
2	n	Hydrology and hydraulics					5
3	Deepening	Earth sciences	Information technology and software engineering	River basin hydraulics, hydrology and geology	Introduction to coastal engineering	Introduction to land and water development	5
4		Hydrogeology	Computational hydraulics	River morphodynamics	Coastal systems	Water management systems and agronomy I	5
5		Surface hydrology	Modelling theory and information management	River basin development	Coastal and port structures I	Water management systems and agronomy II	5
6		Water quality	Data-driven modelling and realtime control of water systems	Data collection and analysis	Coastal and port structures II	Aspects of Irrigation drainage	5
7		Data collection and processing or Groundwater exploration and monitoring	River basin modelling	River structures	Management of Coasts and ports I	Service oriented management of irrigation systems	5
8	Broadening	Tracer hydrology and flow system analysis	Introduction river flood management or Urban flood management and disaster risk mitigation or Environment and climate	River training and rehabilitation or Flood and drought management	Management of coasts and ports II - International port seminar or - Integrated coastal zone management seminar -	Conveyance systems	5
9		Fieldtrip and fieldwork					3
10		Hydrological modelling  or Groundwater-modelling	Flood risk management or Urban water systems or Environment systems modelling	Storage and hydropower	Geotechnical engineering and dredging	Irrigation and drainage structures	5
11		Water resources management	Hydroinformatics for decision support	Modelling and operation of river systems  Water resilient cities	Flood protection in lowland areas	Advanced methods and equipment	5
12		Groupwork					7

13	<b>Research</b>	Research methodologies/skills and elective summer courses	3
14		Master's thesis proposal	7
15		Master's thesis period (6 months)	36



## Appendix 6: Quantitative data regarding the programme

### Data on intake, transfers and graduates

*Student performance and student completion rates for the academic years 2006-2008 to 2010-2012*

Academic year	# students enrolled	# master's degrees awarded	# certificates of postgraduate studies awarded	# certificates of attendance	# left	# students on-going	% student completion ratio
2005-2007	89	87	1		2		98
2006-2008	84	69	2		13*		82
2007-2009	54	50	1		3		93
2008-2010	78	76		1	1		97
2009-2011	76	73		1	2		96
2010-2012	78	66				12	85

\* 7 students from Iraq

### Teacher-student ratio achieved

*Staff input and teacher-student ratio achieved in master's degree programme Water Science and Engineering*

Academic year	Programme part	FTE input	Student/FTE
2010-2012	Taught part UNESCO-IHE staff	7.5	8.9
2010-2012	Taught part guest lecturers	1.3	
2010-2012	Master's supervision	3	23.3

### Average amount of face-to-face instruction per stage of the study programme

*Average contact hours within the master's degree programme Water Science and Engineering*

Study phase	Contact hours
Taught part	506 hours
Master's thesis research	72 hours



## Appendix 7: Documents studied by the committee during the visit

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In addition to the information provided in the critical reflection and its annexes the committee investigated the following documents that were made available during the site visit:

- Overview of the curriculum, in relation to other master's programmes at UNESCO-IHE;
- Outline description of two modules [stating learning outcomes, teaching method(s), attainment targets, assessment methods, literature (mandatory/recommended), teacher and credits];
- Minutes of the Programme Committee 2011 and 2012;
- Examination Board meeting minutes 2011 and 2012;
- Staff satisfaction survey 2012;
- Reports of audit visits to double degree non-EU partners, including their accreditation status, CVs of academic staff teaching in the joint programme, facilities and quality assurance:
  - Asian Institute of Technology, Bangkok;
  - Universidad del Valle, Colombia;
  - Haramaya University, Ethiopia;
  - Sriwijaya University, Indonesia;
- Teaching and examination regulations;
- Programme Handbook 2011-2013;
- Preparation Guide and Practical Guide for students;
- Sample of Diploma and Diploma Supplement;
- Alumni Tracer Survey 2011.

The committee studied ten theses, which were selected at random by the project leader and the chair of the committee.

Hydraulic Engineering – Coastal Engineering and Port Development HECEPD	30356	33368
Hydraulic Engineering – Land and Water Development (HELWD)	30775	32595
Hydraulic Engineering and River Basin Development (HERBD)	29748	30885
Hydroinformatics (HI)	29874	33366
Hydrology and Water Resources (HWR)	28849	33658



## Appendix 8: Declarations of independence



### DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

A. VAN DER BEKEN  
F. Laurentplein 45  
9000 GENT

NAME:

HOME ADDRESS:

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

UNESCO - IHE

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;



HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INsofar AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: GENT

DATE: 26 APRIL 2012

SIGNATURE:

A. VAN DER BEKEN  
F. Laurentplein 45  
9000 GENT



### DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME:

Rivka Kfir

HOME ADDRESS:

97 Versenja dr.  
Lyndwood Lodge, Pretoria 0081  
South Africa

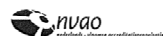
HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Four Master degree programmes at UNESCO-IHE  
Institute for Water Education

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

QANU - Quality Assurance Network University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;



HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INsofar AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Pretoria, South Africa. DATE: 26-04-2012

SIGNATURE:

**DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY**  
TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Prof. Dr. Janos BOGARDI

HOME ADDRESS: Berg Str. 14 53474 Bad Neuenahr-  
Ahrweiler, Germany

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Degree Programmes of UNESCO-IHE Institute for  
Water Education, Delft, the Netherlands

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

QANU

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE.

1

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INsofar AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Bad Neuenahr

DATE: 26. April 2012

SIGNATURE:

*Janos Bogardi*

2

**DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY**  
TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: DIPAK GYAWALI

HOME ADDRESS: 1 KOTHULACHHI, PATAN DHOKA,  
LALITPUR-21, GPO Box 3971, KATHMANDU  
NEPAL

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

UNESCO-IHE INSTITUTE FOR WATER  
EDUCATION

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

QANU

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE.

1

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INsofar AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: KATHMANDU

DATE: 14 Sept. 2012

SIGNATURE:

*Dipak Gyawali*

2



**DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY**  
TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME  
THE UNDERSIGNED

NAME: Grietje Zeeman

HOME ADDRESS: Geertjesweg 108, 6706EE Wageningen, The Netherlands

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT /

The four MSc programmes of UNESCO-IHE

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:  
QANU

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES  
OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR  
CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY  
INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN  
EITHER A POSITIVE OR A NEGATIVE SENSE;

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES  
WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL  
THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH  
THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE  
CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF  
CONDUCT.

PLACE: Wageningen

DATE: 13-11-2012

SIGNATURE:

00369



**DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY**  
TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME:

Franca Kramer

HOME ADDRESS:

Clarendonk 10

2611 RD Delft

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT /  
SECRETARY:

4 MSc's - Unesco-IHE

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Unesco-IHE

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES  
OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR  
CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY  
INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN  
EITHER A POSITIVE OR A NEGATIVE SENSE;



HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES  
WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL  
THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH  
THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE  
CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF  
CONDUCT.

PLACE:

Delft

DATE:

26-04-2012

SIGNATURE:

Q307



# ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Marianne van der Weiden

PRIVÉ ADRES: Homeruslaan 62  
3581 NJ Utrecht

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

UNESCO-IHE

AANGEVRAAGD DOOR DE INSTELLING:

QANU

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEINVLOEDEN;

1



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

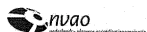
VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht

DATUM: 14-9-2012

HANDTEKENING:

2



# ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Adrienne Veldraaijer-Huizer

PRIVÉ ADRES: Jupiter 116  
1188 EJ Amstelveen

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

4 masteropleidingen UNESCO-IHE

AANGEVRAAGD DOOR DE INSTELLING:

UNESCO-IHE

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEINVLOEDEN;

1



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Amstelveen

DATUM: 2-9-2012

HANDTEKENING:

2



## Appendix 9: List of abbreviations

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AIT	Asian Institute of Technology, Bangkok
BOKU	Universität für Bodenkultur, Austria
EC	European Credit
EPM	Environmental Planning & Management
ES	Environmental Science
EST	Environmental Science and Technology
ETSuD	Environmental Technologies for Sustainable Development
FRM	Flood Risk Management
fte	full-time equivalent
HECEPD	Hydraulic Engineering Coastal Engineering and Port Development
HELWD	Hydraulic Engineering Land and Water Development
HERBD	Hydraulic Engineering River Basin Development
HI	Hydroinformatics
HWR	Hydrology and Water Resources
ICT Prague	Institute of Chemical Technology Prague
IMETE	International Masters in Environmental Technology and Engineering
IWRM	Integrated Water Resources Management
KNUST	Kwame Nkrumah University of Science and Technology, Ghana
LWE	Limnology and Wetland Ecosystems
LWM	Limnology and Wetland Management
MSc	Master of Science
MWI	Municipal Water and Infrastructure
NVAO	Nederlands-Vlaamse Accreditatie Organisatie (Accreditation Organisation of the Netherlands and Flanders)
QANU	Quality Assurance Netherlands Universities
SE	Sanitary Engineering
UniValle	Universidad del Valle, Colombia
UWEM	Urban Water Engineering and Management
WCM	Water Conflict Management
WM	Water Management
WQM	Water Quality Management
WRM	Water Resources Management
WSE	Water Science and Engineering
WSE	Water Supply Engineering