

EVALUATION AND ACCREDITATION DOCUMENTS

M.Sc. Water Resources and Environmental Engineering

Africa Centre of Excellence in New Pedagogies
on Engineering Education (ACENPEE)

Ahmadu Bello University

Zaria, Nigeria

June 2024

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EVALUATION REPORT

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March 2024

The Ahmadu Bello University has mandated the Hcéres to perform the evaluation of its Water Resources and Environmental Engineering M.Sc. programme. The evaluation is based on the “External Evaluation Standards” of foreign study programmes, adopted by the Hcéres Board on 31st January 2022. These standards are available on the Hcéres website (hceres.fr).

On behalf of the experts committee¹ :

Olivier Boutin, President of the committee

In the name of Hcéres¹ :

Stéphane Le Boulter, Acting President

¹In accordance with articles R. 114-15 and R. 114-10 of the Research Code, evaluation reports are signed by the chair of the experts committee and countersigned by the President of Hcéres.

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I. STUDY PROGRAMME IDENTITY SHEET

- University: Ahmadu Bello University (ABU), Zaria, Nigeria
- Department concerned: Department of Water Resources and Environmental Engineering
- Title of the programme: M.Sc. Water Resources and Environmental Engineering
- Year of creation and context: 1982. The Department of Water Resources and Environmental Engineering (WREE) evolved from the Department of Civil Engineering in 1980.
- Site where the programme is taught (town and campus): Department of Water Resources and Environmental Engineering, Samaru Campus, Ahmadu Bello University (ABU), Zaria, Nigeria

PROGRAMME DIRECTOR

- Surname, first name: Sani, Badruddeen Saulawa
- Profession and grade: Head of Department
- Main subject taught: Environmental Engineering

METHODS AND RESULTS OF THE PREVIOUS ACCREDITATION(S)

- In 2022, the programme was evaluated by the National Universities Commission (NUC). The programme has received its full accreditation by the NUC for 5 years, from March 2022 to March 2027.
- No previous international accreditation. Three other programmes from the ACENPEE (M.Sc. Civil Engineering, M.Sc. Mechanical Engineering and M.Sc. Chemical Engineering) are being evaluated by Hcéres in 2023.

HUMAN AND MATERIAL RESOURCES DEDICATED TO THE PROGRAMME

- **Human resources**

Academic staff	Professors	Readers	Senior Lecturers	Lecturers	Total
	8	4	4	3	19
Technical staff	Assistant Chief Technology Officers	Principal Technologists	Higher Technical Officer	Others	Total
	2	2	1	2	7
Administrative staff	Principal Confidential Secretary	Senior Secretarial Assistant	Chief Library Officer	Others	Total
	1	1	1	2	5

- **Material resources:** computer lab, smart classrooms, open access and subscription to databases, video conferencing applications (Zoom, Skype, Google Meet), learning management devices, lecture theatres, laboratories (hydraulic, water analysis), workshops (welding and fabrication, machine tools, carpentry, electrical), Central University Library, and a functional physical Library. There is also a collection of e-books and other relevant publications. There is an e-library at the Central University Library with a large collection of current e-books, journals, patents, theses, dissertations, etc. The Central University Library has provided access to eleven commercial databases.

STUDENT POPULATION: EVOLUTION AND TYPOLOGY OVER THE LAST 4 YEARS

		2019/2020	2020/2021*	2021/2022	2022/2023*
Enrolment	Male	25	-	23	-
	Female	5	-	2	-
	Total	30	-	25	-
	<i>including foreigners</i>	2	-	2	-
Graduates	Male	20	-	5	-
	Female	4	-	0	-
	Total	24	-	5	-
	<i>including foreigners</i>	0	-	0	-

*Due to the Covid-19 pandemic and industrial action embarked by Academic staff of Nigerian universities, Ahmadu Bello University had to cancel two academic sessions (2020-2021 and 2022-2023). No admissions were possible during these specified periods.

II. PRESENTATION OF THE STUDY PROGRAMME

1 – PRESENTATION OF THE STUDY PROGRAMME

The Centre for New Pedagogies in Engineering Education is an Africa Centre of Excellence hosted by Ahmadu Bello University in Zaria, Nigeria, implemented as part of the ACE Project supported by the World Bank in 2019. The Centre was established to enhance engineering education by experimenting with new teaching methods, developing curricula, and moving those findings into the classrooms of tomorrow's engineers, for them to respond creatively and responsibly to 21st century challenges. Therefore, its stated mission is to provide a world-class teaching and learning environment to promote innovation in techno-pedagogical skills and competencies for engineering education and practice. Several programmes are hosted in the Centre, such as Mechanical Engineering, Chemical Engineering and Civil Engineering.

The M.Sc. programme in Water Resources and Environmental Engineering is designed to train high-level manpower to manage the State Water Boards, River Basins Development Authorities (RBDA) and other related higher institutions of learning. Its curriculum was proposed by the African Ministerial Council on Water Resources in collaboration with UNESCO. The postgraduate programme is structured into three areas of specialisation: Hydraulics and Engineering Hydrology, Irrigation and Drainage Engineering and Environmental Engineering. The programme is four semesters (two years) degree post Bachelor's degree programme, and it leads to the award of a Master of Engineering degree. The curricula require a sound basis in Mathematics, Engineering Science and Design. Also, instructions are given in the other relevant fields, which have direct impact on the profession, such as Economics, Law, and Sociology and Management studies.

2 – PRESENTATION OF THE PROGRAMME'S SELF-EVALUATION APPROACH

The Faculty of Engineering has a committee on quality assurance, which comprises one member from each of the departments. This member is the quality assurance officer of the Department and Chairman of the Departmental quality assurance committee, comprising three members. The submitted self-evaluation report was very rich, with appendices (106 pages) providing qualitative and quantitative data. A few additional documents were requested, and were all received within the week.

III. COMPOSITION OF THE EXPERTS PANEL

- **Olivier BOUTIN**, Chair of the panel, Full professor, Aix-Marseille University, France
- **Ali DAOUADJI**, Full professor, INSA Lyon, France
- **Demba DIALLO**, Full professor, Paris-Saclay University, France
- **Maxime LEBRETON**, Ph.D. candidate, ENS-PSL Paris, France

Hcéres was represented by **Zakia MESTARI**, project manager, Europe and International Department.

IV. VISIT DESCRIPTION

- **Date of the visit:** the visit took place on Friday 8th December 2023.
- **Summary of the proceedings:** before the visit took place, the self-evaluation report and numerous appendices had been received by the experts. Two preparatory meetings between the Director of the Hcéres Europe and International Department, the project manager and the panel of experts were held in Paris (13th November) and online (29th November). The on-site visit took place for one day, according to a schedule agreed between the ACENPEE, the NUC and the panel. During the visit, the experts requested some additional documents to obtain quantitative data. All of these documents were received.
- **Organisation of the visit:** for security reasons, the visit was organised in hybrid mode in Abuja and the panel was not able to visit the Centre in Zaria. The Centre leaders, programme director and postgraduate coordinator of the Ahmadu Bello University met the panel in Abuja, as well as some students and academics.
- **Cooperation of study programme and institution to be accredited:** ACENPEE has been cooperative throughout the process. The self-evaluation report was sent according to the agreed schedule. The questions asked before and during the visit were answered clearly and precisely. The panel is satisfied with the conclusion reached, as it is based on available and relevant information. In addition, the involvement of the National Universities Commission was very helpful throughout the process.
- **People met:** the experts' committee was able to meet with 34 people from different panels:

	Session	Audience
8:00 – 9:30	Presentation of the programme and discussion	Centre Leaders, programmes directors and their teams
9:30 – 10:30	Academic staff	Representative panel of academics from both programmes
10:45 – 11:45	Quality assurance	Quality assurance representatives
11:45 – 12:45	Alumni	Representative panel of alumni
14:00 – 15:00	Socio-economic partners and employers	Representative panel of socio-economic partners and employers
15:00 – 16:30	Students	Representative panel of students from both programmes
16:30 – 17:30	Closing session	Centre Leaders, programmes directors and their teams

V. EVALUATION REPORT

1 – TRAINING POLICY AND CHARACTERISATION

The study programme is perfectly in line with the institution's objectives, as part of the Water Resources and Environmental Engineering Department in the Faculty of Engineering of Ahmadu Bello University. The Department, as well as the programme, has been created in 1982, as an evolution of the Department of Civil Engineering. It is part of broader University initiative to develop dedicated programmes for managing water resources, water boards and river basins, mainly in Nigeria. This programme is positioned as more academically oriented, contrasting with other programmes that are more professionally oriented. The programme is part of the Africa Centre of Excellence on New Pedagogies in Engineering Education (ACENPEE), which is common to several Engineering programmes. Some students of the M.Sc. in Water Resources and Environmental Engineering are part of this programme. The programme is the first one in this field in Nigeria. It is clearly dedicated to local and national management of water resource. It is well-identified by the UNESCO Institute Water for Education. Three other universities are identified in Nigeria with a similar programme (Ilorin, Bayero and Aliko Dangote universities). There is no identical programme in neighbouring countries in West Africa, although some of them are dedicated to water issues. However, they are more focused on a certain aspect of water management. At Ahmadu Bello University, the M.Sc. is developed in a coherent and complementary manner with other study programmes in the same academic cycle, especially with Master's programmes dealing with other engineering aspects (chemical engineering, biology, and chemistry) and one M.Sc. in Integrated Water Resource Management in the same Department, more professionally oriented (for this master, there is no in-depth laboratory works, more certificates are provided, and it is opened to everyone working in the field as an engineer).

In terms of continuity, the cycles are clear in the Water Resource and Environmental Engineering Department, with four postgraduate programmes in Water Resources and Environmental Engineering preparing for the M.Sc., and a doctoral programme with the same title. At both the local (four laboratories) and national (six laboratories) levels, the academic partnerships are very well identified, complementary in terms of research themes, and relevant to the programmes. In the laboratories that belong to the Department, the students can do practical work and research activities. They have informal relationships with other laboratories in Nigeria. These laboratories are complementary to their own activities, particularly in terms of analysis. Students are required to provide an introduction letter from their Master's supervisor, outlining the research purpose of their visit. In the programme, the contributions of multidisciplinary and interdisciplinarity are well-identified with some general courses on water resources, Hydrology Engineering, as well as Water Law, Management, and Economics. Some specialisation courses on different themes such as irrigation and public health are also provided. Moreover, there are numerous exchanges between the different Departments of the Faculty of Science, for instance for co-supervision of research projects, leading to strong interdisciplinarity.

At the Ahmadu Bello University level, there are some international partnerships with universities in the United Kingdom and the United States of America (MIT) for training purposes for the staff, and with Canada (Toronto University). The latter is relatively new and has not been fully developed yet. Therefore, these international exchanges are quite few, and their real added value is not clearly demonstrated. International academic partnerships for students' outgoing mobility are identified (universities in Malaysia, China, United Kingdom, and the Netherlands) with five effective mobility opportunities within the last four years. It has also been indicated that some other students travel abroad for a full programme, in Malaysia, for instance. On the evaluated period, two incoming student mobility are identified. This number could be enhanced. All incoming and outgoing students received a financial support, from the TETFund or the ACENPEE programmes.

Teaching, practical and research works can take place in different specialised laboratories: hydraulics and fluid mechanics, computer modelling, AutoCAD laboratory, hydrology equipment room, chemical, and microbiology. These research structures are all part of the Water Resources and Environmental Engineering Department. The study programme includes a mandatory research project, conducted under the supervision of at least two confirmed researchers (and occasionally a socio-economic partner). Most research works are focused on practical activities. Each M.Sc. student is required to propose three scientific seminars during the two years of their programme. Attendance to these seminars is mandatory for all students, including some Ph.D. students. This research project (called M.Sc. thesis) is more intensive during the second year. The final presentation and validation of students' work are conducted in front of at least one external examiner and two internal examiners. Several days of the week are devoted to this research project and to seminars. The provided list of academic staff indicates that all Professors are specialised in areas connected with the programme curriculum (Environmental Engineering, Hydraulics, and Hydrology) and that most of them have an effective research activity leading to a satisfactory h-index. Research integrity and ethics are fully developed and are important objectives as set out in Ahmadu Bello University documents (details are given on recruitment

procedure, staff integrity, and scientific publication management). However, it appears that there is no direct training on research integrity and ethics at the students' level, even if these aspects are embedded in most of the courses. There are neither research-based learning nor courses on research methods in the curriculum. However, M.Sc. students have access to the Central University Library, as well as a library located in the Department. The university also provides access to an e-library with collections of e-books, journals and patents.

Regarding the curriculum content, the study programme considers socio-economic needs, as the different courses are oriented on current and future socio-economic issues linked to water management and environmental preservation (water pollution). At the Ahmadu Bello University, it is stated that socio-economic partners can be involved in the elaboration of the curriculum. However, it is not explained how these objectives are considered for the M.Sc. in Water Resources and Environmental Engineering. The Department offers opportunities for continuing education through graduate programmes, certificate programmes, and professional development trainings. This helps professionals to keep updated with the latest developments in the field and to enhance their skills. Some partnerships exist between the programme and several institutions engaged in an activity related to the programme, for instance the Petroleum Technology Development Fund, the Raw Materials Research and Development Council, and the Tertiary Education Trust Fund. These institutions mainly provide funds for students' scholarships and research grants. All foreign students and students enrolled in the ACENPEE programme benefit from a scholarship. There are also partnerships with six national companies (five in Kaduna State: Environmental planning consultant, Drilling of boreholes, National oil spill detection and response agency, Sunseed limited Nigeria, Mother cast limited construction; and one in Katsina state: Rural water supply and sanitation). These numerous partnerships show the attractiveness of the programme for socio-economic partners. Socio-economic actors have the opportunity to provide regular seminars, either online or in person, to introduce their companies and job opportunities. At Ahmadu Bello University, students are trained for their job-market integration at the undergraduate level. It would be interesting though to offer this type of training at postgraduate level.

In conclusion, the M.Sc. in Water Resources and Environmental Engineering is perfectly aligned with the university's priorities and socio-economic needs. Indeed, this M.Sc. is perfectly integrated and complementary to other programmes of the Faculty of Engineering of the University and has been awarded the "Africa Centre of Excellence" label. The programme offers a comprehensive and engaging exploration at water management and preservation challenges.

To reach its objectives, the programme proposes strong links with national research and socio-economic partners. As far as research is concerned, the programme has, within the Department, the facilities (equipment, library, and software) necessary for the students to develop their two-year research project. Other national laboratories complement their research requirements, as for analytical purpose, for instance. Students can attend a Ph.D. programme in the same department. It would be interesting to add core courses on ethics and research integrity. Regarding the relations with the socio-economic partners, they are significant through several effective partnerships with public institutions and private companies, which present a real added value to the programme. It would be valuable to further engage these partners in curriculum development and offer more professional seminars.

There is outgoing and incoming mobility with foreign universities, as well as numerous international partnerships. This aspect of international exchanges could be improved, especially for an academic Master's degree. To maximise the programme's strong national positioning, it is advised to foster more international partnerships, which would benefit both students and Faculty.

2 – PEDAGOGICAL ORGANISATION OF THE STUDY PROGRAMME

The study programme, its objectives and contents are very well explained in the Post Graduate Programme Structure of the Department of Water Resources and Environmental Engineering. The curriculum clearly explains the different core courses with a comprehensive description of the contents. Some courses are run by other Departments (numerical methods by the Department of Civil Engineering and economics by the Department of Economics). The programme structure enables the progressive specialisation of students, with core courses on basics of Water Engineering in the first semester, followed in the second semester and second year by three options: Hydraulics and Engineering Hydrology; Irrigation and Drainage Engineering; Environmental Engineering. Students are also able to choose and attend courses from other departments in the Faculty of Engineering, or from outside the Faculty. In this case, these courses are graded and used in CGPA computation. General knowledge and skills to be acquired are indicated in the Handbook of studies, for instance the management of water resources and systems, physical approach for waste management as well as computer tools. The research book provided to students for their research project includes a list of different skills that students should acquire, covering academic, technical, and communication skills.

The programme diversifies its teaching methods with lectures, assignments/homework, individual/group projects, tutorials, design and practical exercise, and seminars/presentations, allowing to foster the students'

success. Part of the courses can be provided online. Due to internet connection issues, it is recommended to systematically record the online courses and make them available on a platform that is accessible to all students. In several courses, one credit out of three is dedicated to lab work. Technical staff carry out the experiments for the whole group, which is then divided into subgroups so that the students can reproduce the experiment on their own. The development of more practical works dedicated to industrial concerns is recommended, although visits to industrial sites are organised (wastewater treatment plant for instance). For the promotion of students' success, a Guidance and Counselling Centre exists at the University level to assist students; and the Postgraduate School offers an orientation service. At the department level, the two supervisors who advise students during the two years of the programme for research projects also informally assist them. In addition, monthly student presentations help identify those experiencing difficulties. For the weakest students, videos are available to help them grasp the course material. The training on information and communication technologies is embedded in different programme courses and in the research project. Furthermore, students are also permitted to enrol in these courses in other Departments as electives. It would be interesting to provide additional formal training on these subjects.

As English is the native language of most Nigerian students, no other language is taught to students. A six-month training in English is offered to foreign students (as French-speaking students from Chad and Niger) before starting the M.Sc. programme. Students are not sufficiently prepared for outgoing mobility programmes; it would help the programme to develop international mobility.

As for the opportunities to learn about entrepreneurship, the Department organises seminars for students. These sessions include guest professionals from private companies discussing entrepreneurship development and their own company experiences. Students are offered two periods of professional immersion. The first is the research project, which takes place over the two years of the programme, particularly in the second year. The practical part of this research is done in one of the laboratories of the Department. The second period consists of an internship of at least one month in a private company. This internship is mandatory for students selected in the ACENPEE programme. The companies are selected and provided by the programme and validated by the World Bank. Although the socio-economic partners sometimes offer students seminars and workshops that contribute to their integration into the job market, it appears important that the programme proposes additional formal opportunities to acquire skills that are useful for their integration into the labour market.

In conclusion, the curriculum of the programmes is designed in a comprehensive manner and the two years are well-organised. Students receive courses on all important aspects related to water management issues, from water pollution and water treatment up to economic and law concerns. It is also interesting to note that interdisciplinarity is provided through courses run by other Departments of the University. The knowledge and skills are well-identified and address the main concerns of water socio-economic world. The pedagogical practices are well-diversified. To go further, it is recommended that more practical work on industrial cases be developed, as well as the acquisition of additional skills related to communication tools.

Professional immersion, which is one of the strengths of the programme, is ensured through the research project, which is carried out over the two years. Moreover, an internship is mandatory for students enrolled in the ACENPEE programme. This requirement, coupled with incentives for students' engagement with the socio-economic and international spheres, could be extended to all students for a more extended duration.

Although various elements of soft skills are offered to students, these are often scattered and informal. They should be developed and systematised to better prepare students for incoming and outgoing mobility. It would help them acquire additional skills relevant to their job-market integration and have a greater mastery of information and communication tools.

3 – ATTRACTIVENESS, PERFORMANCE AND RELEVANCE OF THE STUDY PROGRAMME

The information system is mainly based on information available on the Ahmadu Bello University's website. This access is satisfactory for the different kinds of audience. The advice is mainly available on the programme's website. The Communication Officer develops strategies to scale up visibility, and a newsletter on the ACENPEE's activities is produced. The programme measures its attractiveness by monitoring and analysing the applications. Over four years (2018 to 2021), 217 students have applied, 138 have been admitted and 101 have registered. Among the registered students, 65 were from Ahmadu Bello University, 35 from 14 other universities in Nigeria, and one from Niger. These figures indicate that while the programme is popular in Nigeria, it is not as well-known or attractive internationally. It should be noticed that only 27 students are sponsored (25 by ACENPEE, one by the Petroleum Technology Development Fund, and one by Ahmadu Bello University). Some students enrolled take their courses but do not begin or complete their research projects, possibly because they enter the job market instead. Some of them achieve their course later. The fluctuations in the number of graduate students compared to entry-level students can be attributed to the Covid-19 crisis and the long strikes by teaching staff.

The way in which the curriculum monitors student success rates and analyses the impact could be improved. If a student fails an exam, his course attendance is checked and must be over 75%. In the event of other problems, such as financial difficulties, students may postpone their M.Sc.

Job market integration is known and presented for 32 graduated students who have followed the ACENPEE programme. 16 are working in the public sector and seven among them in the academic research field. They work in national laboratories or agencies in the field of water management. A large part of graduated students working in the private sector are either at “Environmental international limited” (consulting engineers in environment) or at “Mothercat Constructed limited” (water management), both located in Kaduna State.

In conclusion, the attractiveness is well-followed by the programme, with a consequent number of applicants (217 applications over four years), a significant part (55%) of them coming from other universities. Therefore, the programme is well-known in the field of Water Management. This attractiveness has increased with the launch of the ACENPEE programme. The students’ follow-up during their programme could be enhanced. The integration of graduates into the labour market is also well-monitored, owing to the identification of the companies and institutions that employ them.

4 – ACADEMIC PROGRAMME MANAGEMENT AND CONTINUOUS IMPROVEMENT

The programme management is clearly defined and efficiently coordinated in the Department of Water Resources and Environmental Engineering. The roles and responsibilities of the teaching staff are clearly defined for the different courses. The M.Sc. degree coordinator is clearly identified. The list of contributors to the programme and their status are known to the students, thanks to the Post Graduate Programme Structure of the Department. This document also details the academics’ areas of expertise. A significant part of the teaching staff has a good h-index, revealing their level and involvement in the dedicated research field.

Regarding human resources at the Department level, the needs of the various programmes are met, with 19 professors or lecturers, five administrative staff and seven technical staff. The pedagogical resources of the Department are quite large, with classrooms and seminar room, computer rooms, libraries and technological halls for the numerous aspects of hydrology and water management. It appears necessary though to renew and develop the equipment, especially for practical works and research projects development. Some equipment should be multiplied to enhance the development of practical work, and other equipment should be purchased to complement existing equipment. In addition, some equipment is used for both practical work and research activities, which can sometimes be valuable but can also present problems of availability (undergraduates also use this equipment). About software, many licences are available for Matlab. During the first period of integration of newly recruited staff, they benefit from informal mentoring with the Head of Department and senior colleagues. After this period, new staff members are assigned to more experienced colleagues to help them navigate the Department, its procedures, policies, and staff, and provide advice on career progression. The outgoing mobility of current academics is mainly for pedagogical training, for example, in the UK or at the MIT in the US (curriculum and course design, use of open courseware, teacher empowerment training). Outgoing mobility for research activities seems to be concentrated at doctoral level. Therefore, it would be interesting to increase outgoing mobility opportunities.

A system of regular staff evaluation/assessment is organised at the University level. For academic staff members, teaching competence is assessed by performance reviews at the end of every academic session. The performance reviews involve students’ evaluation of teaching. The evaluation form is the same for all the programmes of the University and includes many details on the course evaluation. The evaluation result is provided to the Head of Department who inform the academics on potential issues. The management boards of the programme consist of the Departmental Postgraduate Board, the Faculty Postgraduate Board, the School of Postgraduate Studies Board and the University Senate. The members include Ph.D. holders, coordinators, deputy deans, and the Director of Academic Planning. The Department Council meets at the end of each half-year to examine the results. The other councils meet once a month. Although some class representatives are elected and can submit requirements to the Head of Department and to these bodies, it would be worthwhile involving students in these bodies. Furthermore, a students’ union at the University level can intervene and interact with the various University bodies and officials. The programme undergoes every five years an external evaluation by the National Universities Commission in Nigeria. It is considered in this evaluation as an Africa Centre of Excellence. The last accreditation has been awarded in 2022.

The student recruitment procedures are clearly explained at the Ahmadu Bello University level. For the M.Sc. in Water Resources and Environmental Engineering, students are required to have a bachelor’s degree in engineering with a first or second class honours in addition to possessing O’level requirements of five credits (including English, mathematics, physics, and chemical) from a recognised university. Other possibilities are also clearly explained in the documentation related to the Master’s degree. The evaluation of knowledge follows

accurate procedures common to all the Master's programmes at the University, that are well-described in the Quality Assurance policy of the University. These procedures are known to the students. In addition, the research notebook, given to all students to help them carry out their research project, provides a means of regularly assessing the various skills. Students are asked to complete an evaluation survey for all courses. Most students completed the survey, which the Postgraduate coordinator analysed. Depending on the survey results, a different lecturer may be assigned to a course. Students can also write directly to the Head of Department. The programme has defined and implemented anti-plagiarism for thesis reports and anti-fraud measures for examinations. For instance, the similarity index must not exceed 25% for the dissertation to be acceptable for external examination.

In conclusion, the programme organisation is clearly defined and efficient. The contributors to the programme have an excellent level of expertise covering the different objectives of the programme in the field of water management and resources. The number of teaching staff and technical staff is satisfactory. The pedagogical resources of the department are at a good level, from equipped classrooms, libraries to technological halls for the several aspects of water issues. It is important to emphasise that a significant financial contribution would enable the renewal of some of the equipment that could benefit the students, as well as providing access to costly simulation software licences. The integration of newly recruited staff is efficient. It would be interesting to develop outgoing mobility possibilities.

The different procedures for recruitment and examinations are well-detailed and explained. Continuous assessment of the courses is done. This process is effective but could be more systematic. The students, except through class representatives and students' unions, are not part of the different bodies (such as the Department Council). Their contribution to these bodies would be a good way of strengthening their involvement and taking their suggestions into account in the programme.

VI. CONCLUSION

Ahmadu Bello University's "Water Resources and Environmental Engineering" programme trains engineers at the highest level. Graduates have the skills and knowledge to contribute to the crucial issues related to water resources. In Nigeria and the West African region more generally, the management of water resources and their treatment following pollutions require the training of many engineering students. To meet these objectives, the management teams (Department, Master's degree and ACENPEE programme) are highly engaged in consistently and systematically monitoring this programme.

From the recruitment process to graduation, the procedures are clear, accessible, and efficient. The courses' content is comprehensive and matches the multidisciplinary approach required for water management, from resource preservation to the management of wastewater treatment plants. Three options are also offered, all of which effectively address water-related issues: hydraulics and engineering hydrology, irrigation and drainage engineering, and environmental engineering. A key feature of the programme is the research project that each student carries out over the two years. This project, which tends to focus on experimental research, is supervised by several supervisors, whose choice from other Departments in the Faculty of Engineering and/or in companies reveals the interdisciplinary nature of some research subjects. This research project is closely monitored over the two-year period, with all milestones and progress documented meticulously. All these elements help the students to find their place in this programme.

International links and collaborations exist, but they do not yet give the programme the visibility and attractiveness it could have at international level. It would be interesting to develop more formal agreements and encourage incoming and outgoing mobility through greater financial support for students. The facilities offered by the programme are generally satisfactory. There is a wide range of laboratory equipment and pilot plants, covering most of the aspects of water and water treatment. The access to scientific documentation is good, classrooms have recently been upgraded with modern communication tools, and students have access to a mathematical modelling tool (Matlab). However, new pilots in line with current water management issues should be implemented. In addition, there is also a need for greater financial support from the partner institutions. These essential financial resources can also be obtained by strengthening links with the socio-economic world, including alumni.

In addition, to increase its visibility, attractiveness, and national and international performance, the programme would benefit from strengthening awareness, training, and the opportunities offered to students in terms of integration into the labour market. This should also involve strengthening the study grants allocated to students, to enable them to work in the best conditions and to limit cursus interruptions (temporary or permanent) for financial reasons. Similarly, monitoring students during their studies and professional lives, as well as contacts with former students, could be strengthened to provide further cohesion to the different batches of students. This would be a strength for the Water Resources and Environmental Engineering programme. These assessments should be seen in the context of the recent launch of the ACENPEE programme (2021), and the impact of the Covid-19 pandemic and recent strikes.

STRENGTHS

- The alignment of the programme with the University objectives, in a sector of water resources, treatment, and management, essential for Nigeria and the West-African region
- The 2-year research project which enables students to immerse in an in-depth and formative research process
- The resources and visibility provided by the ACENPEE programme
- The intense links with socio-economic partners, which are very helpful for the programme development
- The teaching staff of a high scientific level

WEAKNESSES

- The lack of financial resources for scholarships to facilitate student work
- The lack of financial resources for the programme development (research activities, upgrading pilot equipment and access to simulation software)
- The insufficiently developed international partnerships, which limit the visibility and attractiveness of the programme at the international level
- The limited follow-up of students during their studies, and their integration into the job market
- The lack of courses on ethics, scientific integrity, and communication

RECOMMENDATIONS

- For greater substantial funding, enhance and diversify responses to calls for projects, seek out partnerships with public institutions, and strengthen connections with the socio-economic sphere, including alumni.
- Increase the number of collaborations with programmes and research units abroad, and propose formal training and seminars to provide information on international opportunities. This would also further increase the number of incoming and outgoing mobility.
- Ask for additional financial support to institutions, universities, and companies to enable students to complete their studies within two years of enrolment.
- Develop a more systematic and formalised follow-up of students and alumni, and strengthen the programme with courses and seminars that focus on soft skills to facilitate integration into the job market.
- Set up courses, seminars, and workshops on scientific integrity and ethics, and communication.

VII. COMMENTS OF THE INSTITUTION



AHMADU BELLO UNIVERSITY **ZARIA, NIGERIA.** **OFFICE OF THE VICE-CHANCELLOR**

Vice - Chancellor: **Professor Kabiru Bala**, BSc.(Hons) Building, M.Sc. (Bldg.Serv.), MBA, PhD (Const. Mgt.) (ABU), FNI/OB, MAPM, MCABE, C. Bldg E, MICIArb
VC/REL/43

16th May 2024

Mr. Stephane Le Boulter,
Acting President,
Higher Council for the Evaluation of Research and
Higher Education (HCERES),
2 rue Albert Einstein, 75013 Paris.
France

Dear Sir,

RESPONSE TO OBSERVATIONS FROM INTERNATIONAL GAP ASSESSMENT FOR M.Sc WATER RESOURCES AND ENVIRONMENTAL ENGINEERING PROGRAMME

I write to acknowledge the gap assessment report on M.Sc. Water Resources and Environmental Engineering programme sponsored by Africa Centre of Excellence on New Pedagogies in Engineering Education (ACENPEE), Ahmadu Bello University, Zaria, Nigeria.

The recommendations are well noted and the University administration through the relevant academic organs will ensure that close monitoring of the students will be carried out to better understand the high number of students not graduating within the program stipulated time and reverse the trend.

The curriculum will be reviewed to include seminars, workshops on scientific integrity, ethics, sustainability, entrepreneurship with training on soft skills to promote better integration into the job market, meeting the ever-changing needs of the industry and socio economy. Some of these courses will be handled by professionals from the industry.

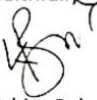
The department will be encouraged to increase the number of collaborations with programmes and research units internationally and propose formal training and seminars to provide information on international opportunities. This will further increase the number of incoming and outgoing mobilities for faculty and students, as well as the involvement of foreign academics. Also, internship for selected students will be made mandatory for all students with increased duration rather than the present one-month.

Financial support will be sought from relevant government funding agencies and private sector, strengthening connections with the socio-economic sphere, including alumni, to provide scholarship and research grants to be able to attract more national and international students as well as maintain and purchase new equipment and software's for training.

Finally, an annual monitoring evaluation will be carried out to check progress.

Accept my highest regard.

Yours faithfully



Prof. Kabiru Bala
Vice Chancellor



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ACCREDITATION DECISION

M.Sc. Water Resources and Environmental Engineering

Africa Centre of Excellence in New Pedagogies on Engineering Education (ACENPEE)

Ahmadu Bello University

Zaria, Nigeria

June 2024

SCOPE OF THE ACCREDITATION GRANTED BY HCÉRES

HCÉRES has based its evaluation process on a set of objectives that study programmes must pursue to ensure recognised quality within France and Europe. These objectives are divided up into four accreditation criteria.

The Accreditation Commission issues an opinion about the accreditation of the study programme after examining the file. The Hcéres President takes the decision based on the Commission's opinion and the final evaluation report of the programme. This accreditation decision, taken in plenary session, is the result of a collegial and reasoned process.

The decision issued by Hcéres regarding the accreditation of the study programme corresponds to the awarding of a label to the evaluated entity.

This decision is independent of the accreditations carried out by the French State and therefore does not entail recognition in France of the institution or the diplomas delivered by it.

Decision No. EI-2024-33 on the accreditation of the M.Sc. Water Resources and Environmental Engineering, delivered by Ahmadu Bello University, Zaria, Nigeria

The President of the High Council for the Evaluation of Research and Higher Education,

Considering the Research Code, in particular Articles L. 114-3-1 to L. 114-3-6;

Considering the Board's deliberation of 29th September 2022 on the accreditation criteria for courses abroad (excluding doctoral/PhD programmes);

Considering the Decision No. 2023-9 of 16th March 2023 on the international accreditation procedure of the High Council for the Evaluation of Research and Higher Education;

Considering the agreement DEI_2023_CONV17 of 14th June 2023 for the evaluation/accreditation of fourteen training courses, delivered by six Centres of Excellence in Nigeria;

Considering the opinion issued by the Accreditation Commission on 18th June 2024;

Decides:

Article 1

Noting that the M.Sc. Water Resources and Environmental Engineering delivered by Ahmadu Bello University in Nigeria meets the four accreditation criteria, voted by the Board of the High Council on 29th September 2022, as follows:

ACCREDITATION CRITERION 1: TEACHING POLICY AND CHARACTERISATION

The M.Sc. in Water Resources and Environmental Engineering is perfectly aligned with the university's priorities and socio-economic needs. Indeed, this M.Sc. is perfectly integrated and complementary to other programmes of the Faculty of Engineering of the University and has been awarded the "Africa Centre of Excellence" label. The programme offers a comprehensive and engaging exploration at water management and preservation challenges.

To reach its objectives, the programme proposes strong links with national research and socio-economic partners. As far as research is concerned, the programme has, within the Department, the facilities (equipment, library, and software) necessary for the students to develop their two-year research project. Other national laboratories complement their research requirements, as for analytical purpose, for instance. Students can attend a Ph.D. programme in the same department. It would be interesting to add core courses on ethics and research integrity. Regarding the relations with the socio-economic partners, they are significant through several effective partnerships with public institutions and private companies, which present a real added value to the programme. It would be valuable to further engage these partners in curriculum development and offer more professional seminars.

There is outgoing and incoming mobility with foreign universities, as well as numerous international partnerships. This aspect of international exchanges could be improved, especially for an academic Master's degree. To maximise the programme's strong national positioning, it is advised to foster more international partnerships, which would benefit both students and Faculty.

ACCREDITATION CRITERION 2: THE PEDAGOGICAL ORGANISATION OF THE STUDY PROGRAMME

The curriculum of the programmes is designed in a comprehensive manner and the two years are well-organised. Students receive courses on all important aspects related to water management issues, from water pollution and water treatment up to economic and law concerns. It is also interesting to note that interdisciplinarity is provided through courses run by other Departments of the University. The knowledge and skills are well-identified and address the main concerns of water socio-economic world. The pedagogical practices are well-diversified. To go further, it is recommended that more practical work on industrial cases be developed, as well as the acquisition of additional skills related to communication tools.

Professional immersion, which is one of the strengths of the programme, is ensured through the research project, which is carried out over the two years. Moreover, an internship is mandatory for students enrolled in the ACENPEE programme. This requirement, coupled with incentives for students' engagement with the socio-economic and international spheres, could be extended to all students for a more extended duration.

Although various elements of soft skills are offered to students, these are often scattered and informal. They should be developed and systematised to better prepare students for incoming and outgoing mobility. It would help them acquire additional skills relevant to their job-market integration and have a greater mastery of information and communication tools.

ACCREDITATION CRITERION 3: ATTRACTIVENESS, PERFORMANCE AND RELEVANCE OF THE STUDY PROGRAMME

The attractiveness is well-followed by the programme, with a consequent number of applicants (217 applications over four years), a significant part (55%) of them coming from other universities. Therefore, the programme is well-known in the field of Water Management. This attractiveness has increased with the launch of the ACENPEE programme. The students' follow-up during their programme could be enhanced. The integration of graduates into the labour market is also well-monitored, owing to the identification of the companies and institutions that employ them.

ACCREDITATION CRITERION 4: MANAGEMENT AND CONTINUOUS IMPROVEMENT OF THE ACADEMIC PROGRAMME

The programme organisation is clearly defined and efficient. The contributors to the programme have an excellent level of expertise covering the different objectives of the programme in the field of water management and resources. The number of teaching staff and technical staff is satisfactory. The pedagogical resources of the department are at a good level, from equipped classrooms, libraries to technological halls for the several aspects of water issues. It is important to emphasise that a significant financial contribution would enable the renewal of some of the equipment that could benefit the students, as well as providing access to costly simulation software licences. The integration of newly recruited staff is efficient. It would be interesting to develop outgoing mobility possibilities.

The different procedures for recruitment and examinations are well-detailed and explained. Continuous assessment of the courses is done. This process is effective but could be more systematic. The students, except through class representatives and students' unions, are not part of the different bodies (such as the Department Council). Their contribution to these bodies would be a good way of strengthening their involvement and taking their suggestions into account in the programme.

Article 2

The M.Sc. Water Resources and Environmental Engineering delivered by Ahmadu Bello University in Nigeria, is accredited for a period of five years from the date of this decision.

Article 3

The decision is accompanied by the following recommendations and comments:

- For greater substantial funding, enhance and diversify responses to calls for projects, seek out partnerships with public institutions, and strengthen connections with the socio-economic sphere, including alumni.
- Increase the number of collaborations with programmes and research units abroad, and propose formal training and seminars to provide information on international opportunities. This would also further increase the number of incoming and outgoing mobility.
- Ask for additional financial support to institutions, universities, and companies to enable students to complete their studies within two years of enrolment.
- Develop a more systematic and formalised follow-up of students and alumni, and strengthen the programme with courses and seminars that focus on soft skills to facilitate integration into the job market.
- Set up courses, seminars, and workshops on scientific integrity and ethics, and communication.



Article 4

This decision will be published on the Hcéres website.

Paris, 27th June 2024.

The acting President
signed
Stéphane Le Bouler



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