

# Expert group joint opinion

Evaluation Procedure: Assessment of Study Field

Higher Education Institution: Riga Technical University

Study field: Environmental Protection

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# Summary Assessment of the Study Field

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The study field "Environmental Protection" of RTU is relevant in the context of both the EU and Latvian environment. Study programmes complement each other. The content and administration of study field and programmes correspond to legal requirements. RTU has a well-functioning inner quality assurance system. Staff and students are provided with high-quality resources. Staff or RTU IESE carries out active research work, involving also all level students. Different forms of collaboration with Latvian and foreign institutions are developed. The main positive aspects of study field are suitable research infrastructure, competent staff, and research-based studies. The main negative aspects are connected with communication with students, low activity of students in mobility programmes and management practice of study field.

The Bachelor study programme "Environmental Engineering" corresponds to study field and legal requirements, it is well structured. The programme is student-centred. The qualification of teaching staff fully corresponds to the requirements. The main positive aspects are interconnection with the labour market, a multidisciplinary approach in teaching, and good facilities. The main negative aspects are low student mobility, need for better communication between students and administration.

Master study programme "Environmental Engineering" corresponds to study field and legal requirements, it is well structured. The programme is student-centred, students are involved in programme evaluation. The qualification of teaching staff fully corresponds to the requirements. The main positive aspects are broad programme content, a multidisciplinary approach in teaching, and good facilities. A minor negative aspect is the lack of a student manual.

The doctor study programme "Environmental Engineering" corresponds to study field and legal requirements, it is well planned to facilitate completion of promotion work. The programme has a strong emphasis on research and publications. The programme is student-centred, students are involved in programme evaluation. The qualification of teaching staff fully corresponds to the requirements. The main positive aspects are broad programme content, well-equipped laboratories, quality faculty members. A minor negative aspect is the lack of a student manual.

## 1. Management of the Study Field

### Analysis

1.1. Based on the information presented in their self-assessment report, Riga Technical University (RTU) has shown that they have developed a clear strategy for 2020-2025 for the study field of "Environmental Protection". This strategy, and hence the field of study "Environmental Protection" is relevant in the context of Latvia, the EU and the international reality. The aims of the study field are clearly defined in an umbrella goal, which was subsequently described through a series of more specific "sub-goals" ("vertical" and "horizontal"). These goals are explicit and attainable and have been supported by specific tasks that have been formulated towards their attainment. The stated strategy for the field of study is part of the wider development strategy of RTU, which, in turn, is part of the process of building the future of European engineering education, via RTU's participation as a member of the Conference of European Schools for Advanced Engineering Education and Research. This strategy is developed/updated every five years, hence ensuring that it remains current at all times. The vision and the direction of the field of study, as this has been described in the strategic plan is clear, ambitious, yet attainable. A performed SWOT analysis, also presented in the self-assessment report, characterizes the seriousness of this endeavour. The development strategy for the study field has set specific indicators that are used for the continuous evaluation of its performance. These indicators are often more stringent than those set by the university at large,

thus indicating the high standards set for the field of study and its programmes of study.

1.2. The programmes of study that comprise the field of study 'Environmental Protection' are implemented by RTU's Institute of Energy Systems and Environment, of the Faculty of Electrical and Environmental Engineering. The field of study comprises six programmes of study (three of which are under the current evaluation for accreditation). A single programme director is leading the three programs of study that are currently being evaluated. The program director leads a Study Direction Committee that comprises nine members (five academic staff representatives, 3 representatives from the industry/employers, and one non-voting student representative). While the majority of the support for the science integration into the study programs is provided by the scientific laboratories of RTU's Institute of Energy Systems and Environment, several other organizational units of RTU provide input and support to the field of study and its programs. Several administrative and technical support staff have been named as providing logistical support to the field of study (amounting to a total of 11 dedicated staff members). The roles and involvement of all involved parties in the administration of the field of study is distinct and have been described in detail in the self-assessment report submitted by the university.

During the site visit, the leaders of the field of study, alongside RTU's administration, exhibited a composed approach towards their goals, as well as a good level of preparation and coordination. The director of the field of study came across as organized, with a clear vision and a good sense of direction and control over the procedures. An additional piece of information that was gathered during the site visit, came in the form of a reaction received from students interviewed, who expressed the opinion that the director of the field of study seems to have a central position in the decision-making scheme. Although this opinion may have been provided in a more negative spirit (in the sense that all decisions are made by a single person), it seems to corroborate the fact that there is a solid management scheme that oversees the field of study.

1.3. RTU has clearly defined admissions criteria and procedures stipulated in the University's Admission Regulations, which are elaborated based on Latvia's Law on Higher Education Institutions and Regulations. These are easily accessible by interested parties via the published rules and regulations and via RTU's website through the following two URLs: for local students at <https://www.rtu.lv/lv/studijas/uznemsana/uznemsanas-noteikumi> and for foreign and exchange students at <https://international.rtu.lv/>. The duration of studies is clearly defined for all programs of study.

With regards to the Bachelor's programme of study, applicants are admitted based on the results of the Centralized Examinations in Mathematics, the Latvian language and the Foreign Language, and the final grades in individual subjects obtained in the Secondary Education and the entry test results. Centralized examinations results in Physics or Chemistry are also considered in the ranking calculation. Special procedures for applicants who received their secondary education prior to 2009, and for those who received their secondary education prior to 2004 are also detailed in RTU's regulations.

With regards to the Master's and Doctoral programmes of study, a specific procedure is detailed in the university's regulations, and for the Master's degree, emphasis is given on whether an applicant has acquired a Bachelor' degree or professional study degree in a relevant field of study. Admission is based on weighted averages of the Bachelor studies grades. For PhD candidates, the identification and written consent of a scientific advisor from RTU (who could be different from the Doctoral Thesis scientific advisor) is required, prior to formal application. The explicit admissions procedure to the

Doctoral studies program involves two entities; RTU's Doctoral Studies Department, and the Faculty's Scientific Committee. For applicants who completed their previous level of education in a field not related to environmental protection or engineering and technologies, additional courses may be required, as these are detailed in the "Regulations for Admission to Master's Studies with Amendments" and the "Regulations for Admission to Doctoral Studies with Amendments".

The procedure through which recognition of previously acquired formal and non-formal education at RTU is detailed in the "Regulation on the Recognition of the "Courses Completed at Other Universities and RTU Study Programmes" and the "Procedure for Recognition of Competencies Developed Outside Formal Education or From Professional Experience and Learning Outcomes Achieved in Previous Education at Riga Technical University" Recognition of study courses mastered in formal education in all study programmes of the direction takes place almost every semester upon request of students. Students of the Bachelor's and Master's study programmes, enrolled at later staged of studies have the study courses mastered at the previous level of studies or first level professional higher education study programme (college) recognised, provided that their prior study courses correspond to RTU's study programmes in content in rigour.

1.4. RTU has set detailed academic integrity principles and mechanisms. These procedures have been defined in a report that includes cases of violation of academic integrity, its examination and registration, and possibilities of appealing. This information was presented through the self-assessment report. Informing and educating students on aspects of academic integrity takes place during study courses and at special seminars. The accuracy of this information was verified through interviews with students during the site visit. Further, students and academic staff have access to the book "Academic integrity glossary - General guidelines for academic integrity" that educate both parties on principles and procedures. Concerning plagiarism detection tools, RTU has implemented three major plagiarism control tools in the study process (the first being implemented within the study program, the second and third ensured at a university-wide level). These tools make use of the ORTUS portal and require electronic submission of assignments and papers, as well as the Joint Computerized Plagiarism Control System (JCPCS) that is used by many Latvian universities and colleges.

1.5. RTU's website contains information about all study programmes, which corresponds to the information available in the official registers. The information contains all essential items that may concern prospective and current students. A list of specific webpages has been provided in the self-assessment report submitted by RTU. Further, links to relevant social media sites have been provided.

## **Conclusions. Strengths and weaknesses**

The study field "Environmental Protection" of RTU is relevant in the context of both the EU and Latvian environment. The bachelor's, master's and doctoral study programmes complement each other well and ensure the continuity of studies within the university. The content of both programmes is developed in accordance with the EU and Latvian environmental policy planning documents.

The administration and decision-making of the study field (and the pertinent study programmes) are efficient and effective and in tune with the development of the study field. The management of the study field is in close collaboration with one another and have a good grasp on the issues concerning the further development of this study field. Support personnel is relevant and adequate to the needs of the involved programmes of study.

RTU has clearly defined the admission criteria for students, which can be found publicly on their

website and through their published rules and regulations.

In its activities, RTU has established the principles and mechanisms of academic integrity described in pertinent publications made available to students and faculty alike. These define actions for detecting plagiarism and successive actions to eradicate them and their consequences and are available to all parties concerned.

RTU's website contains information about all study programs, which corresponds to the information available in the official registers. The information contains all essential items that may concern prospective and current students.

#### Strengths

1. There are clearly defined rules and regulations, all of which are documented in pertinent published material, which is available to interested parties;
2. The management of the study field is in tune with RTUs management structure, all of whom have a common sense of direction and grasp in the vision and procedures.

#### Weaknesses

1. According to information obtained during student interviews (during the site visit), it may be concluded that the communication avenues between bachelor programme students and the administration may be lacking and should be revisited/strengthened.

## **2. Efficiency of the Internal Quality Assurance System**

### **Analysis**

2.1. It can be stated that the RTU as the higher education institution has established a quality policy that is publicly available. RTU has an internal quality management system in place in accordance with the RTU Quality Policy updated and approved at the meeting of RTU Senate on 25 September 2017, Minutes No 612. which is available on the RTU website under the link: [Kvalitātes politika | Rīgas Tehniskā universitāte \(rtu.lv\)](#). RTU also implements a so-called "Excellence approach" regarding quality assurance and management within the university. It is based on the ESG (Standards and Guidelines for Quality Assurance in the European Higher Education Area) developed by the European Association for Quality Assurance in Higher Education and fundamental principles of EFQM (The European Foundation for Quality Management) Excellence Model. It is also publicly available and can be accessed here: [RTU\\_excellence\\_approach.pdf](#). It is notable that high-quality assurance, high - quality study process, excellence in science and institutional excellence is also a part of "RTU Strategy and Development Programme for 2021-2025" (approved at the meeting of RTU Senate on 21st of December 2020). Publicly available here: [Strategy | Riga Technical University \(rtu.lv\)](#). All of these aspects reflect that RTU as a higher education institution is paying close attention to continuous development and improvement of quality policy within the study direction and relevant programmes. According to the information gathered on the on-site visit and information provided within the SAR p.56, it can be concluded that RTU constantly pays attention to the interests of their academic staff, students regarding quality assurance procedures. It is proved by RTU becoming a member of the European Foundation for Quality Management ( further on referred to as "EFQM"), having joined the global quality cooperation network since December 2018. EFQM is seen as a great basis for the maintenance of performance at a high level and a prerequisite for RTUs continuous improvement in quality assurance questions.

Regarding the study field "Environmental protection" the best indicators of the level of quality are seen by the constant participation of the academic teaching staff in scientific research and the competence, high quality of professional experience, constant control by the administrative staff of the internal quality of the study process. The use of various kinds of surveys conducted by students within the study process is useful and significantly help to maintain high-quality studies.

2.2. It has to be noted that during an on-site visit an expert group identified that RTU has established various forms of feedback systems for different kinds of study levels. For example, for Masters students, RTU has established a notebook system that provides opinions of Masters students of every class they are taking. It has also been identified as one of the feedback system tools within the SAR p.58.

For the purpose of efficient performance of the study field, RTU has implemented a self-check system within the field when colleagues or the so-called "committee" visit each other's course lectures and provide feedback in a written form in an opinion form of possible improvements of the course. It helps to make more student-centred approach, implementing specific activities that may have not been part of the course yet.

One of the most important feedback mechanisms of quality assurance is questionnaires of students, graduates and employers. RTU has established a polling system for the purpose of that. There are various forms and types of questionnaires/surveys implemented on various platforms. During the on-site visit, RTU stated that they are working on transitioning all of these questionnaire forms on one platform in order for a more convenient feedback process.

As found out during on-site visit interviews with academic staff and students as well as it is being identified within SAR p.61., when starting studies at RTU, a student survey is conducted about expectations from studies, availability of information, and the admission process. The survey takes place electronically on the ORTUS portal. Each semester, the polling of the students at a study programme is conducted to find out student opinion about the instructor's work quality and obtain an evaluation of the study programme. Polling is conducted electronically in ORTUS portal, the results are received by each instructor personally and the head of the organizational unit. In case of bad reviews of the course or certain recommendations have been made of the course, the information has been taken into account for the purpose of improvement of the study course next year. In the SAR p. 61 RTU identified that they may also implement mid-semester surveys. During an on-site visit, an expert group found out that starting from the spring semester academic year 2020/2021 RTU has managed to establish these surveys. Mid-semester surveys are a beneficial tool in order to eliminate any possible shortcomings within the study course not only after the course has ended.

The only concern regarding the student's questionnaires is the rather low activity of students participating in them. During an on-site meeting, an expert group found out that only 35% of students participate in surveys. Less than a half of students within the study field. So, it would be advisable to increase the number of students who take part in the quality assurance activity for more objective feedback. It can be done by making the surveys mandatory in order to enter the next study module, semester.

With regards to feedback from graduates, it is also conducted regularly after each graduation round, polling of the graduates of Bachelor and Master programmes. The results are taken into consideration in the improvement of the study programmes within a study field and discussed at methodological seminars. During an on-site visit, an expert group found out that one of the indicators of close relations with graduates is their active participation as guest lecturers or providers of internships for current students. Plus, it is of importance to note that RTU has also established the RTU Alumni Association. The website is <http://alumni.rtu.lv>, where all the relevant information of alumni events is being added as well as an active Facebook account - <https://www.facebook.com/RTUAlumni/>.

Doctoral students also participate in the questionnaire process. At the beginning of doctoral studies

in the study field of “Environmental protection”, future doctoral students complete a survey, and overall attitudes and expectations at the beginning of their studies are learned. There is another survey at the end of studies to assess the overall satisfaction of the graduate with the study process, the quality of studies and confidence in the knowledge and skills acquired during the study process. Feedback to doctoral students within the study field “Environmental protection” is also provided through semesterly reports (first-year students at least twice per semester, students of another year at least once per semester).( SAR p.62.)

With regards to the feedback system established with employers, the form of communication mechanism is at the end of the internship of each student, as well as within the scope of development of study programmes. Although, according to SAR p.61. and meeting with administration, RTU is planning to improve that to regular centralised polling of RTU employers in the nearest future for more sufficient and consistent feedback.

2.3. RTU collects and analyses the information (statistics) on the relevant study programmes of the study field on a regular basis and efficiently uses it to improve the study field.

As mentioned before in section 2.2., there are existing various forms of questionnaires, surveys for students where they can submit their suggestions and complaints regarding specific lecturers and/or study courses. Expert group meeting with administrative staff found out that, particularly with the Head of Quality Assurance that it can be done through the RTU ORTUS portal (<https://ortus.rtu.lv>) or submitting an application electronically (<https://www.rtu.lv/>). Another option is to submit the application in person to the RTU Career Support and Services Division. Having received a written application, an employee of the RTU Career Support and Services Division determines the provider of a reply by topic, registers the application, scans and electronically sends it to the responsible organisation unit for the provision of a reply. Overall, the largest number of proposals and complaints of a total 137 received in the time period between 12 August 2019 and November 2020, was regarding the study process (53). According to SAR p.64., of all the submissions 30 were complaints, 80 were problems and 27 were suggestions.

It can be seen that RTU tries to deal with any complaints and takes into account the suggestions provided regarding quality assurance maintenance and eliminating any types of problems that occur on the way. As already stated before, one of the mechanisms of prevention of complaint occurrence for Masters is the existence of a notebook evaluation system which includes written opinions of students including the quality of the class, suggestions, complaints that are regularly reviewed by the teaching staff and administration. The opinions are also reviewed in RTU IESE meetings. In the Bachelor level study programme, complaints and suggestions regarding the progress of the study process are summarised by study course leaders and passed on to the representatives of the RTU Self-Government, who discuss them with the administration of the study programmes during a meeting. To conclude, it can be stated that in cases of possible complaints, there are existing effective dealing mechanisms with such issues.

Regarding statistical data and collection of them frequently in order to improve and find solutions for further development, 28 performance indicators characterizing process quality are set for one of the cores RTU activity processes. The data are summarized once a year for the previous academic year by study level and study programme. It has been stated within SAR p. 67. The data in the quality review that is submitted to RTU administration are analysed by study level, by faculty and by study direction. Indicators of numerous study programmes are compared with the general average RTU level. RTU has established a system of review which include distribution of students by study programme, enrolment results distribution of enrolled students by age, university revenues in the previous year and others which are dealt by specific units of the university.

2.4. RTU has identified the standards set forth in Part 1 of the ESG, which require special attention. In order to improve the performance of the relevant study programmes of the study direction, RTU has determined aims and measures, which are integrated in a joint quality assurance system.

As stated before, RTU has established a Centre of Academic Excellence which is seen to play an enormous role in quality policy within the university. It helps the university to address student-centred learning, teaching and assessment, perceiving the development of curriculum and study forms. The largest challenge identified when discussing with students and it also is identified by the university itself is low activity in participation of mobility programmes as ERASMUS+ study exchange. The main issue is not the fact that students do not want to participate but rather because they cannot go to the university they wish. The reason is the inability to assimilate the earned credit points abroad to the courses provided at RTU so the students shall study for another semester when arriving back. The only university the students feel free to go to is in Lithuania but rarely someone chooses to go there. To compensate for this, RTU promotes international opportunities by inviting guest lecturers and conducting study courses with foreign students. It is of great importance that students participate in international projects so it would be highly advisable that another solution - other universities are to be found and provided as options for the students to choose from not worrying of credit point assimilation.

RTU itself has identified in the SAR p.70., that they face difficulty to reach an agreement on the common structure and curriculum of separate sections for the study programmes submitted for licensing. It is promoted by the Study Department, which deals with developing the study programme description template and completing the sections applicable to the RTU in general. Overall, the RTU complies with lined out ESG standards regarding the policy for quality assurance. Design and approval of programmes student-centred learning, teaching and assessment, student admission, progression, recognition and certification and others.

### **Conclusions. Strengths and weaknesses**

Overall, RTU has managed to establish a well-functioning inner quality assurance system that helps to improve and maintain the good quality of the system. There are exciting various forms of feedback mechanisms that students may use to reach out in order for sharing complaints, suggestions for study courses and teaching staff. RTU is acting responsibly to provide the best quality of studies for their students.

Strengths:

1. Well-functioning feedback mechanism on all levels - students, graduates, employers;
2. Close relation with graduates, alumni network;
3. Constant development and implementation of changes according to received feedback;
4. Compliance with ESG standards.

Weaknesses:

1. Low student activity in participation in student surveys;
2. Low activity of students in mobility programmes;
3. Difficulty reaching agreement on the common structure and curriculum of separate sections for the study programmes submitted for licensing.

### **3. Resources and Provision of the Study Field**

#### **Analysis**

3.1. RTU has developed a system to determine the financial resources required for the implementation of the study field and the relevant study programmes.

As outlined in the on-site meeting and provided in the SAR p.75. RTUs funding is mostly based on the state budget and the financing received depends on the number of students admitted each year for the study programme. Taking a look at the provided data and information gathered from the teaching staff as well as management of RTU, the funding of the study direction “Environmental protection” has been stable in recent years and has even increased. In the 2019/2020 study year 93% of the students in this study field received a state-funded budget. No local student has paid for their studies and only 7% which is known to be international students, had to pay for their studies at RTU in this study field(SAR p.80). During the meeting with the students of all levels, it came clear that almost all of them are in budget places which are found to be appreciated and valued. The funding is mostly spent on various expenses like taxes, utilities, equipment, staff remuneration and scientific activities. As specified within the expert group meeting with the management of the RTU, The peculiarity of RTU is it has a decentralized budget, and each organizational unit is allocated a separate budget. RTU has specified the allocation of the funding received. The financing is distributed following: 1. Subsidy or basic budget funding; 2. Tuition fee funding; 3. Performance funding; 4. Research base funding; 5. Foreign student tuition fee funding is allocated several times a year.

According to SAR p.76., each head of the RTU organizational unit is provided with remote access to operational financial information on it's budget, including the envisaged workload and correspondingly allocated funding for the implementation of study programmes and study courses in subsequent periods. The head of the organizational unit is the one in charge and planning the work of the unit at the beginning of each financial or budget year, including remuneration issues for academic staff.

Excluding the above-mentioned fundings, RTU also receives the funding for the implementation of study programmes and activities related to the improvement of the study process as for example a scientific research base, for maintenance of included study programmes. These fundings include grants from the state budget for the implementation of the study programme, funding from companies and private persons covering the tuition fee, including fees of international students as well as indirect funding that has been received through funding programmes of the European Union and different countries for upskilling of academic staff and funding programmes of the European Union and different countries for exchange trips of academic staff and students ( SAR p.81).

There is a system for financing the scientific research and/or artistic creation activities in place, and this system is efficient. SAR p. 79 states that RTU makes 3 project calls a year with internal funding. The 1st project call aims at supporting the publication activities of young scientists. The 2nd call supports projects where RTU cooperates with industry partners, and this call is aimed at promoting inter-faculty and inter-disciplinary research within six research platforms of RTU. The goal of the 3rd call is to involve graduates in the research process. During the on-site visit it has also been provided that current students are encouraged to participate in the development of research projects which help them to gain practical skills in their chosen field and topic of interest. Within the RTU has been established a separate fund called RTU Research Support Fund that has its main focus on providing financial support for various research-related activities. As identified by the academic staff members, the funding is very useful for various activities such as covering expenses related to participation and organization of scientific conferences and scientific journals. Under scientific research, there is also extensive funding that RTU gains from funding programmes of the European Union. The projects that are funded as so-called “other sources” provide financial resources indirectly for the implementation of academic study programmes including infrastructure for

laboratories, equipment and practical classes as modelling software and lectures that require scientific literature, databases.

3.2. RTU has identified the infrastructure resources and the material and technical provision required for the implementation of the study field, and they are available for the university. The students and the teaching staff have access to the necessary resources.

Regarding the resources, in RTU K ipsala campus, there are currently 54 classrooms, 187 laboratories, 19 special training rooms, 10 computer classrooms, 12 workshops and several research centres. RTU also provides hostels with around 950 available beds for people with disabilities as well as a dormitory for foreign students and guest lecturers to stay in. RTU infrastructure elements around the premises that are provided to the students and staff are toilets on each floor, a specialised drinking water tank is available, an elevator, an open type student study room/reading room, several lounges, classrooms and instructors' offices, meeting rooms, a cafeteria, as well as vending machines selling different drinks and snacks have been installed in the premises. The technical support of research laboratories for the study process is continuing to expand with such tools as computer equipment - monitors, computers, presentation lasers, laboratory equipment (data loggers, barometers, air humidifiers, gas analyser, set of cold cameras, a climate station, weights, muffle furnace, drying cabinet, detector, gas sensor adapter, etc.), and equipment for study auditoriums. Research performance funding should be mentioned as one of the financial support instruments for improving the scientific research base.

To ensure effective implementation of the study process, Moodle e-learning environment is used, where all relevant information is compiled in an automated way including study courses, users, groups, course literature. It is easily accessible to both lecturers and students. It has been an important tool of use during Covid - 19 pandemic times when remote studies were implemented. During Covid -19 had the ability and skill has to use Zoom and Microsoft Teams video conferencing platforms for distance online classes. The academic staff members place various electronic materials, assessment tests, homework assignments, information on a particular study course in the system so the students can look at them and prepare for the next lecture. Students can also view their financial information on the ORTUS portal, as well as make requests for documents such as references, transcripts of records, copies of a learning agreement and others. In addition to all that, ORTUS allows each RTU student and academic staff member access to their schedule, which provides information on the venue, time, instructor, room, title and type of lecture to be held. Due to Covid -19, students did feel the impact from the inability to do the practical tasks in laboratories which seemed more complicated to understand the topic, although all of the students tried to find creative approaches with simulations and group work to provide at least the possible level of practical work. Students and academic staff during an on-site expert meeting pointed out that they appreciated the use and implementation of the Moodle system. All the materials in the Moodle seem to be located and easily accessible in one place, final exams could be filled on the platforms, especially used during Covid -19. The RTU system called the ORTUS portal, in their opinion, is good and well-built. During seminars, students can easily upload the work in the system and they can review each other's work. Lecturers can easily see the work, both students and staff can see the grades. They have a system that generates the table of information that provides the grades, works, and students in one table. There is no mandatory requirement to add such information on ORTUS but it depends on the lecturer. The presentations, general basic info on the course has to be always uploaded on the system. There is no requirement to use ORTUS tasks, virtual materials.

Regarding practical skills, the best students are invited to help as scientific assistants of lecturers in various scientific projects because it provides a new perspective and development of personal skills.

For the purpose of easier data gathering, for a couple of years, student surveys are also implemented electronically. For additional convenience of RTU students, academic and general staff members, RTU leases 84 Microsoft Windows and Microsoft Office software, which provides all users with access to the latest Microsoft software including access to a variety of additional collaboration and productivity tools Microsoft Teams, SharePoint Online, Forms, OneNote, OneDrive, Outlook.

To support research activities, RTU has developed the Centralized Research Support System, which records all information on publications, patents, commercialization applications, Doctoral Theses, RTU scientific journals, research staff, etc. The system provides access to information according to the OpenAccess principle <https://science.rtu.lv>. RTU students and academic staff also have centralized access to research software. RTU also provides WiFi network infrastructure with over 400 access points, including the international Eduroam service.

RTU uses a lot of databases for the use of its staff and students. The databases include ProQuest Ebook Central, Academic Search Complete EBSCOhost, Applied Science & Technology Source EBSCOhost, Business Source Ultimate EBSCOhost, EBSCOhost eBook Academic Collection, Wiley Online Library, SpringerLink, The International Monetary Fund as well as subscriptions financed by the Latvian MoES (ScienceDirect, SCOPUS (Elsevier), Web of Science); Latvian databases LETA, Letonika, database of Latvian standards (available only in library premises).

When meeting with academic staff, students, administration, no complaints or shortcomings were mentioned and everything needed having been provided. When it comes to practical tasks of thesis or research papers, if something cannot be provided within the laboratories of the study field, it is possible to use other laboratories in RTU buildings around the city. In the case of use of library materials, searching for library resources is ensured by the Primo Discovery search tool (RTU Library ([https://primolatvija.hosted.exlibrisgroup.com/primo-explore/search?sortby=rank&vid=371KISCRTU\\_VU1&lang=en\\_US](https://primolatvija.hosted.exlibrisgroup.com/primo-explore/search?sortby=rank&vid=371KISCRTU_VU1&lang=en_US))). It allows searching for the information in the library catalogue.

There is a common system and procedures for the improvement and purchase of the material, technical, methodological, and informative provision in place.

In order to improve technical, methodological and informative provision and to meet the information needs of academic and research staff, the Library Council has been established, which decides on replenishing the library collection with printed publications and subscribing to the necessary databases. In case students or teaching staff cannot find in the library necessary materials for their use, they can contact the library which will help to provide it from another library or buy it. The academic staff once a year is allowed to request books for their use and development of the course materials.

3.3. RTU has developed and implements and complies with the procedures for attracting highly skilled teaching staff (for the study direction and the relevant study programmes).

For RTU it is of importance to attract foreign teaching staff for the international environment and wider perspective, knowledge of the sphere. One of the problems identified during on-site visits is the attraction of foreign PhD students - researchers. The procedure of recruitment is being implemented according to the Law on Institutions of Higher Education and Regulations that are approved by the Senate regarding the election of the academic staff procedure. Every applicant has to go through an evaluation procedure of the particular candidate. The recruitment procedure follows a certain procedure which starts with an announcement for a competition for academic staff positions at RTU website, the Euraxess vacancy portal and at least in one mass medium distributed throughout Latvia. The applicant shall personally submit or send by email the signed application documents no later than one month after the date of the competition announcement (SAR p.90.).

Before taking up employment, the applicant shall present an identity document – passport or identity card, the Foreigner shall additionally present a visa or residence permit, as well as a work permit if such a permit is required in accordance with regulatory enactments.

The academic and research workload of the teaching staff is balanced. The needs of the teaching staff for professional and didactic improvement are identified in a target-oriented manner.

According to the on-site visit, the academic staff outlined that their work balance depends on the scientific project amounts and the deadlines. Overall, all of the academic members outlined that they feel as the workload is rather balanced with few exceptional situations when lectures and intense scientific procedures take place at the same time and just cannot be avoided. As stated before in the previous paragraphs, academic staff is being provided with all the necessary equipment for research use and course materials when needed, although larger purchases of resources happen once a year.

Appropriate improvement measures are undertaken, and the outcome and efficiency of the implemented measures are assessed. The teaching staff members take part both in outgoing and incoming mobility, which brings added value to the implementation of the study process and the study quality.

At the end of 2018, the Center for Academic Excellence was established at RTU in order to support RTU academic staff in the areas of pedagogical, intercultural communication and self-development. The main tasks of the Center for Academic Excellence are to organize various educational events, such as seminars, thematic series of events, guest lectures, conferences, discussions with the participation of the Latvian and foreign specialists; to coordinate experience exchange activities within faculties and other organizational units; to inform the academic staff about the latest teaching and learning trends that are appropriate for RTU. Lecturers have the opportunity to improve their knowledge of English using the courses proposed by the Institute of Applied Linguistics and the courses provided by the RTU Riga Business School, which are organised thanks to the SO 8.2.2 project funding. (SAR p.92.) RTU IT User Support Center regularly organizes training on IT systems and the latest technology tools for RTU academic and general staff on e-learning environment Moodle, searching in subscribed databases and others. Academic staff have opportunities to supplement professional knowledge and gain valuable experience in a foreign university using Erasmus and Erasmus +, COST or project mobility opportunities, which is coordinated with the European Higher Education Area development strategy.

During on-site visits, the academic staff stated that they have always options to choose from where to go and participate in mobility projects as guest lecturers and visiting other universities abroad as well as take part in short term seminars funded by ERASMUS+. One of the lecturers stated that for him the most valuable experience has been a seminar on how to work with foreign students. Kazakhstan was the most visited one by RTU lecturers (18 visits) to Rudnenskiy Industrial'nyy Institut (Kazakhstan) and Kostanay State University (Kazakhstan), where RTU IESE (RTU Institute of Energy Systems and Environment) teaching staff went to teach within the TEMPUS project "Green Engine". Other countries visited for the purposes of teaching, mainly within ERASMUS+ and scientific research projects, were Lithuania (15 times), Uzbekistan (8 times), Italy (9 times) and Scandinavian countries (Finland, 7 times). (SAR p.104.). While incoming, most lecturers have taught from Lithuania (58 times), followed by Norway (13 times) and Finland (12 times). The problem seen by experts is that the incoming number of foreign lecturers have significantly decreased during Covid - 19 and possibly other aspects by half in this 2019/2020 academic year compared to the previous one. (SAR p.107).

RTU staff is very active in the scientific research field and participation in conferences, seminars as well as receiving awards for their input and excellent work. Two examples - 1. Dagnija Blumberga

won the A.Vītola Award for an excellent contribution to energy, for a lifetime investment in Latvian energy; 2. In 2019, the REGIOSTARS award was received by RTU IESE professor Andra Blumberga in the category “URBAN DEVELOPMENT: Creating cities resistant to climate change”(SAR p. 96.). Students highly value that the academic staff is quite young professionals with whom they can find a common language and see as role models. The average age of the academic staff is 40 years.

3.4. RTU has identified the support necessary for the students and established a well-functioning support system, based on the needs of the students. RTU maintains students with a wide range of career and psychological support services.

Before being admitted to the RTU, prospective students are provided with consultation on study programme selection, study selection and skills profiling and career choice seminars within RTU Open Days.

For existing students, regular seminars and individual consultations on the development of career are being provided and an annual career day aimed at informing students majoring in engineering, natural and social sciences about the best and leading companies in the respective fields, and bringing them closer to potential partner companies for undertaking internship and employers. In case of need, students may receive psychological support that includes individual consultations and support in case of difficulties with studies and individual psychologist consultations on personal issues and difficulties. The Student Service Centre is opened on a daily basis for any sort of student's questions relating to the study process.

## **Conclusions. Strengths and weaknesses**

Overall, the quality of the provided resources are high quality and easily accessible for students and staff within the campus and outside it. Any necessary resources not available immediately to the students or staff are provided or found in other libraries. Various different databases are provided and easy to navigate.

Strengths:

1. Various different databases to use;
2. Students can use laboratories all around RTU premises in Rīga;
3. Lecturers are actively participating in scientific research;
4. Training as English language course and seminars on knowledge development are provided for the academic staff;
5. Psychological support is being provided to students;
6. RTU receives various forms of funding and can develop its resource system;
7. Participation of the academic staff in outgoing mobilities to gain international experience and knowledge.
8. Rather good transition from onsite to online lectures;

Weaknesses:

1. During Covid-19 practical tasks seemed to lack for students.

## **4. Scientific Research and Artistic Creation**

### **Analysis**

4.1. The directions of scientific research in the study field are defined according to:

- the strategic goals of the RTU Faculty of Electrical and Environmental Engineering for 2014-2020;

- the development concept (2016-2020) of the Department of Energy Systems and Environment (RTU Institute of Energy Systems and Environment (RTU IESE)).

The overall goal of the above-mentioned strategies is to ensure that RTU will become Latvia's leading internationally recognized study, science, and innovation institution in the fields of energy, electrical engineering, and environmental science, ensuring a high-quality study process, internationally recognized scientific research, and sustainable innovation, commercialization and knowledge transfer in the economy.

RTU IESE priority areas of scientific research are:

- sustainable production;
- sustainable energy and transport;
- sustainable society.

To ensure full and systematic implementation of the goals RTU IESE developed programs in all three levels – undergraduate, master, and doctor. Such decision was based on the present and future needs of Latvia economy and science, i.e. ensure the development of research and innovations in the above-mentioned areas, to introduce the latest scientific research results and technologies in the economy, to achieve a reduction in production processes and the impact of consumption on the environment, and to create a regulatory framework ensuring the sustainable development of Latvian and European societies.

It should be stressed that IESE is one of the leading research institutions in the field of environmental engineering and energy research in the Baltic States, which is developing research in various areas related to energy and the environment, such as climate change and climate technologies, renewable energy sources, 4th generation heating, bio-economy, fuel combustion, circular economy and resource management, environmental management systems. RTU IESE has 5 laboratories: Environmental Monitoring Laboratory, Bio-system Laboratory, Combustion Research Laboratory, Solar Energy Systems Laboratory, and Building Energy Efficiency Laboratory. Also, IESE integrates the Information and Study Centre on Sustainable Development which is operating within the study directions and hosts scientific research in the areas of urban resilience, system dynamics, and environmental management. In the laboratories, the researchers and students of all three levels can perform experiments, which got significant recognition in Latvia and abroad. The evident proof of this is the high number of scientific publications and international projects.

In the period from 2015 to 2020, publications of RTU IESE teaching staff contributed to the development of 158 thematic areas (76 thematic clusters). The rates of the most cited IESE publications are in the range from 34 up to 46.

Such achievements resulted from RTU support mechanisms for the involvement of academic staff in scientific activities:

- RTU Research Support Fund (decision of RTU Senate No. 585 “RTU Regulation of Research Support Fund” as of 15 December 2014), which aims to provide financial support for various research-related activities, such as support for maintenance of research equipment, protection, and licensing of intellectual property, covering of expenses related to the Doctoral study process, publishing of scientific journals, participation, and organization of scientific conferences, support to researchers in establishing new laboratories in a prospective research field.
- Six research platforms in the main strategic research areas of RTU were established in 2013 as an instrument for fostering inter-disciplinary and inter-faculty cooperation of researchers in the areas of importance for industry and society. These platforms are as follows: “Energy and Environment”, “Cities and Development”, “Information and Communication Technologies”, “Transport”, “Materials, Processes and Technologies”, “Security and Defense”. Similar to the faculties, the platforms have

the Research Program (Decision of RTU Senate No. 590 “On Authorization to Approve RTU Research Program by RTU Scientific Council” as of 27 May 2015; “Research Program of Riga Technical University 2016–2020”), annual action plan and dedicated funding from the Research Support Fund.

The results of scientific research are used in the development and renewal of study courses. Study courses are reviewed annually and are regularly supplemented with the latest research results. Activities of RTU IESE academic and scientific staff in scientific research projects play a big role in this process.

Exceptional attention is paid to the doctoral studies – the topics of PhD dissertations correlates with actualities and the newest research activities of IESE professors, which are re-evaluated and re-elected every six years. Candidates are obliged to comply with certain criteria in terms of scientific research, i.e., a number of publications or patents, supervised Doctoral candidates, etc. (Decision of RTU Senate No. 594 “On RTU Regulation regarding the Approval of the New Edition of Procedure of Electing Professors and Associate Professors” as of 30 November 2015). In order to be allowed to supervise Doctoral students, the academic staff has to be approved experts in their fields, which is possible only if criteria regarding the number of publications/patents are met.

In general, the study field comply with RTU aims and the development level is high.

4.2. Faculty of Electrical and Environmental Engineering of RTU (RTU FEEE) has identified four main strategic areas based on long-term research objectives:

- to increase the international visibility of research and to increase the quality of drafted publications by improving the environment that promotes innovative thinking;
- to reduce the fragmentation of the research directions of institutes and to encourage inter-institutional cooperation and cooperation within RTU research platforms;
- to increase the economic and public importance of research by participating in the EU research and innovation program Horizon 2020 and in other international support programs;
- to develop research infrastructure through the creation of new laboratories and more efficient use of UseScience, including not only equipment but also services and competencies that FEEE can provide.

The study programmes are arranged according to the above-mentioned goals and integrate the interdisciplinary research by engaging RTU Research Platforms which aim to provide inter-faculty, interdisciplinary research in areas of importance to the national economy and society. The Research platforms ensure cooperation between business, public institutions, and science. RTU IESE together with other FEEE institutes participates in the RTU research platform “Energy and Environment” coordinated by RTU FEEE. The link between the platform activities and study process is ensured by:

- knowledge transfer principles and continuous improvement of competencies;
- involvement of the programmes students in research;
- invitation of visiting lecturers in lectures and practical classes;
- active participation of the students in international conferences and seminars;
- preparation of international scientific publications and participation in international cooperation research projects.

RTU IESE encourages bachelor, master, and doctoral students to actively participate in research. Students of the study field “Environmental protection” actively participate in the development of spin-offs, where researchers and graduates continue to successfully develop scientifically and economically successful results affecting the economy, society, and culture. Such activities increase the sustainability of study programs by encouraging students to work in science, to select future doctoral studies as well as doctoral students, to continue their scientific activities after obtaining a doctoral degree at IESE and in other scientific institutions.

A Scientific Committee created in RTU FEEE fosters the development of science at the faculty, including integration of scientific research results in the study courses, thus ensuring continuous updates of the study programmes.

4.3. RTU IESE has high competencies and experience in national and international collaboration with research institutions, businesses, governmental institutions, and NGOs.

The institute researchers and students participate in joint Baltic Sea Region, Horizon 2020, and Nordic Energy Research programs and projects. The results of the above-mentioned projects significantly contributed to the development of environmental science and engineering sciences as well as to the practical innovations for the industry. The number of such projects has tripled in the period from 2013 to 2020. Furthermore, the amount of funds raised by the projects implemented by RTU IESE has quadrupled from 2013 to 2020.

Also, it should be highlighted that the competencies, experiences, and scientific results are used for continuous improvement of study programs at all three levels – bachelor, master, and doctoral. Another very important strength of such research activities – interdisciplinarity and practical application.

4.4. The RTU staff development strategy is based on the diverse improvement of teaching staff, which includes involvement in scientific research, professional development, and improvement of academic competencies.

Specific attention is paid to research work and scientific project activities (mentioned in 4.1).

The evaluation of staff competencies is performed annually, according to the criteria indicated in the yearly plans of each researcher. Such planning and evaluation process led to high research production results and national /international recognition of IESE staff, for example, 475 publications, were published from 2013 to 2020 in internationally quoted databases. The increase in the number and quality of publications is explained by a number of factors:

- Financing model of RTU is based on scientific performance;
- RTU IESE's strategic approach is based on scientific excellence, including the science-based study process;
- Capacity building in research project development and implementation;
- Additional performance requirements for RTU IESE doctoral students to publish yearly research results.
- RTU IESE organizes the international scientific conference "CONNECT";
- RTU IESE has been issuing the international scientific journal "Environmental and Climate Technologies" (included in SCOPUS and Web of Science Metrics).

In the process of evaluation of the academic staff, significant attention is paid to the quality and number of scientific publications, therefore almost all IESE publications are presented in the indexed scientific databases.

Also in order to promote scientific excellence, RTU FEEE initiated the competition "Best scientific publication", which is open to academic staff and students from all levels of studies.

In the reporting period, RTU IESE showed an impressive result – published 16 monographs related to the study field "Environmental protection" and participated in the drafting of 4 collective international monographs. In order to promote the development of the national scientific language, monographs are mainly published in Latvian (15 monographs in 2013-2020). The prepared monographs are used in the study process for the creation of content of study courses, thus ensuring integration of scientific activity in the study process.

During the reporting period in the study field “Environmental protection” 35 doctoral theses were approved and defended by RTU Doctoral Council “Environmental Science and Heat Energy” (previously RTU Doctoral Council P-19 “Environmental Science”).

It should be noted that in June 2020, the international university ranking U-Multirank recognized RTU as one of 25 leading world universities in terms of the share of Open Access Publications. This means that a considerable number of publications of RTU researchers can be found in open access scientific journals making research results available to all interested persons.

4.5. RTU and RTU IESE have developed and implemented the following mechanisms to involve students from all study levels and programmes in research activities:

- the integration of problem-solving approaches into higher education;
- the integration of research in all study levels and valorization of created innovations.

Among the most important activities can be mentioned:

- Support funds for conducting scientific projects (Master's studies, doctoral studies);
- Involvement of students in the implementation of scientific projects;
- Student employment in the university's scientific laboratories;
- Availability of research infrastructure, including hardware and databases;
- Participation of students in the international conferences and the university's annual scientific-technical conference;
- Organization of the Summer schools on research methods and methodology;
- Students have access to different tutorials and mentoring.

At RTU level doctoral grants are provided to Doctoral students on a competitive basis. International calls are made to attract post-doctoral projects. In addition, the internal Research Excellence Grant for young scientists was established in 2018 as a new initiative, providing 270 000 EUR for the 3-year period based on international competition (conditions are similar to EC ERC grant with international call and evaluation performed by external, i.e., foreign well-recognized researchers). The grant allows young and talented researchers to establish their own research groups and make research careers at RTU.

Internal project calls provide additional funding for publishing articles in SCOPUS/WoS indexed editions, and internal projects within six research platforms - “Energy and Environment”, “Cities and Development”, “Information and Communication Technologies”, “Transport”, “Materials, Processes and Technologies”, “Security and Defence” (for more information of research platforms see section 4.1) - stimulate the involvement of Doctoral and Master students in multi-disciplinary and inter-faculty research projects in cooperation with the industry. RTU's internal project calls within the six research platforms, which are organized every year, have criteria regarding the involvement of students in the project, giving an additional score if students at the Bachelor, Master or Doctoral level are involved in the project.

The Research Support Fund (10% of the research base funding is allocated to this fund) provides support to Doctoral students (attending conferences, publishing papers, and thesis, etc.). Employment of Doctoral students and post-doctoral researchers at RTU went up from 0 FTE in the period of 2013-2016 to 88 FTE (Doctoral students) and 97 FTE (Post-doctoral researchers) in 2018.

For the doctoral students, the doctoral grants were established to support research related to doctoral theses and to contribute to the defense of the doctoral thesis in the 4th year after starting doctoral studies. The amount per grant is EUR 10,000. 4 grants were granted for the doctoral study

programme “Environmental Science” in 2019, and 9 grants in 2020.

Concerning the post-doctoral research:

- 17 post-doctoral 3-year long projects with total funding of 2.28 million EUR were launched in 2017;
- 16 post-doctoral 3-year long projects with total funding of 2.14 million EUR were launched in 2018;
- 12 3-year long projects with total funding of 3.7 million EUR were launched in 2019;
- 18 post-doctoral 3-year long projects with total funding of 2.4 million EUR were launched in 2020.

The post-doctoral projects allowed to attract new researchers to RTU from abroad and other Latvian research institutions, and providing academic career opportunities to Doctoral students who graduate from RTU.

A success story is the establishment of RTU Design Factory Labs for design and prototyping. Its task is to provide expertise and shared infrastructure for developing prototypes of new products and technologies, based on ideas of students and researchers.

Another important decision implemented by RTU is the Engineering High School. It is the place where the most talented Latvian pupils can acquire the study courses in exact and natural sciences at an advanced level to get prepared for engineering studies. At the EHS, special attention is paid to the integration of engineering studies and scientific research activities into the study process.

To develop students' innovative thinking, creativity, and entrepreneurship, RTU implements a project “Innovation grants for students” (project No. 1.1.1.3/18/A/001 “RTU innovation grants for students” co-financed by ERDF). Students of all levels are offered to involve in different activities and to improve their business skills, to cooperate with the industry, to develop early science-intensive business ideas, to get a scholarship and a support grant. Students of the study direction “Environmental protection” also actively use the opportunity to participate in this project.

RTU also has support mechanisms for the involvement of Master and Bachelor students in scientific research work.

4.6. The vision of Riga Technical University until 2025 is to become an internationally competitive, dynamic, and modern university of science and technology. In order to implement this setting, the strategy defines four objectives of the University:

- excellence in science,
- high-quality study process,
- sustainable valorization and
- institutional excellence.

The RTU is a modern, internationally known university of science and technology, which prepares highly qualified engineering specialists needed for the Latvian economy. General modernization and the takeover of the world's best experience ensure the dynamic and sustainable development of RTU, enabling RTU and its graduates to compete at the international level. Innovation, valorization, and the introduction of innovative methods in the study process are the strategic priorities of RTU. FEEE innovation activities take place in several directions and at several levels:

- Since 2020, RTU teaching staff have been ensuring the implementation of the study course “Environmental and Climate Roadmap”, which provides students with knowledge on innovation in the field of environmental protection and practical skills in evaluating such innovations;
- MSc students are actively involved in the development of innovative ideas, for example, within the EIT Climate-KIC program there the student create start-ups;
- All level students participate in environmental protection hackathons;
- The doctoral students and young teaching staff participate in product commercialization projects.

In general, innovative solutions, international and local experience are actively and successfully integrated into the study process resulting in both in new collaborative projects in the academic and scientific research fields and joint scientific publications.

## **Conclusions. Strengths and weaknesses**

The information provided by RTU in the self-assessment files and interviews with the representatives of the RTU IESE, revealed that in the evaluated study field the unit carries out active research work, acquiring national and international partners from academic, research institutions, businesses, and governments.

The partnerships have different forms such as research project development and implementation, exchange experiences, development of research competencies, and awareness-raising. The mentioned activities resulted in high-level publications, patents, the development of new study programmes, and continuous renewal of the contents of the present programmes.

The presented material shows that research activities at IESE are designed to ensure the integrity, interdisciplinary approach, and sustainability of environmental engineering study programmes at different levels.

Strengths:

1. Renewed study and research infrastructure;
2. Competent, active, and loyal academic/research staff;
3. Research-based studies;
4. Active participation in the development and implementation of research projects on a national and international level;
5. Good scientific performance indicators (number and citation rate of publications, contract work, etc.);
6. Active international cooperation in the field of study and scientific research;
7. A successful process of renewal of academic staff due to the growing number of doctoral graduates;
8. Development of new research directions promoting the opening and improvement of new study programs;
9. Active involvement of all study programs students in research activities (projects, development of scientific papers, participation in the conferences);
10. Financial motivations to perform research work (funds, platforms).

Weaknesses:

1. Comparatively not a big amount of research publications in Clarivate analytics database.

## **5. Cooperation and Internationalisation**

### **Analysis**

5.1. The RTU study field “Environmental protection” cooperates with several Latvian universities and colleges at several different levels such as ensuring of the study process, at the level of Council of Professors, the implementation of joint scientific research and academic projects, cooperation of students, in popularizing environmental science education, and the organization of joint academic and scientific research activities. Examples of organizations with which such cooperation exists include the University of Latvia (LU), Liepaja University, Latvia University of Life Sciences and Technologies, Rezekne Academy of Technologies, Daugavpils University, Ventspils University of Applied Sciences, and the Vidzeme University of Applied Sciences.

Further, there is cooperation with a great number of international universities and organizations (from within and outside the EU) at the level of academic and scientific cooperation in student and academic staff exchange programs (including the ERASMUS+ program), in the development of joint study courses, in the implementation of scientific research projects, and at the levels of doctoral councils and councils of professors. A long list of specific organizations with which RTU has been cooperating has been provided in the self-assessment report submitted. Worth mentioning is the fact that the study direction was initially built on the BALTECH cooperation base (which was launched in 2000). The BALTECH consortium transformed into the NORDTEK consortium of technical universities of five Nordic countries.

In addition to the academic and scientific organizations with which RTU has been established cooperation with employers and professional organizations. The groups of such organizations (many examples of which are provided in the self-assessment report) include companies, local government, public authorities, state councils, and professional associations. The type of activities that come under such cooperation includes the organization of joint conferences and seminars, scientific cooperation, consultation on the development of the industry and necessary changes and improvements to the education system. An important example of how employers and professional organizations are consulted includes the fact that the study field's Study Direction Committee officially incorporates industry specialists in its ranks.

All of the aforementioned partners appear to have been selected based on the specific features of the study field and the relevant study programmes, especially as this is corroborated through the detailed account of the type of cooperation types appearing in the self-assessment report. The main criteria for selecting appropriate partners for study programmes include the field of scientific and professional activity of partners, reputation, and experience of previous cooperation.

5.2. RTU has developed a communication strategy through which teaching staff and students from abroad are to be attracted. This strategy targets internal (e.g. management team, academic and administrative staff, and current students) and external (e.g. foreign students and graduates, mass media, opinion leaders, educational institutions, recruitment agencies, diplomatic missions in Latvia) groups. The strategy described lists several types of information channels that are used to address each target audience. Marketing communication employs several public relations tools including press releases, media events, interviews, and opinion polls. RTU's social media channels are used in corporate communication, while such channels as the ORTUS portal are used for internal communication. RTU believes that summer schools organized by IESE and lectures and research activities of academic staff play a significant role in attracting foreign students to the programmes of the study field.

Between the years 2013 and 2020, a total of 121 foreign students have been reported to have studied in the programmes of study of the study field. These programmes of study are limited to the Master's and Doctoral programmes since the Bachelor's programme was not available in English during that time period. The average number of foreign students (80% full-time and 20% exchange students) per year was 17 (the highest student number per year being 25 and lowest being 9). The two countries that contributed most foreign students to the study direction were Lithuania (23 students) and India (15 students). Students from 24 different countries have been reported in the study field. A, rather, overly-ambitious plan to attract more foreign students has been put into place and is counting on the use of English as the language of instruction for the Bachelor's programme of study as being the driving force behind this. Through this plan, RTU seeks to increase the percentage of its foreign students from its current range of 0%-10% to an ambitious 35%-50%. Currently, a specific convincing approach through which the international population of students can

be maintained/enhanced and diversified seems to be absent. This is an item that RTU's administration should consider.

Regarding student mobility under the Erasmus+ Program, 82 incoming students were reported between the years 2013 and 2020, while only 13 outgoing students were reported for the same time period. The main destination for outgoing mobility students was Lithuania. The average number of outgoing students is less than 3 per year, which is clearly a number that could be improved. From student interviews, during the site visit, a rather disconcerting piece of information was divulged to the review panel, which was the fact that undergraduate students were (silently) discouraged from utilizing the Erasmus+ exchange program in outgoing mobility. This is an item that must be revisited by RTU's administration.

Concerning the number of outgoing teaching and scientific research mobilities in the time period between 2013 and 2020, this has witnessed an abrupt decline from 20 and 19 people in years 2013 and 2014 to 1 person in 2019-2020. Most of the outgoing teaching and research mobility destinations has been Kazakhstan and Lithuania. Regarding incoming mobility (for the years 2013-2020) of teaching and scientific personnel, a total of 117 academics from 15 different countries around the world participated in the study programmes under the "Environmental Protection" heading. Most of foreign visiting university lecturers were attracted in the year of studies 2014/2015 (36 academics). The foreign academic staff has represented 22 different universities and international institutions. The number of incoming academics has declined during more recent years, with 2019/2020 witnessing only 7 academics.

5.3. An internship course is offered as an elective in the Bachelor's level study programme of "Environmental Engineering". This course can be taken either as a 3 ECTS or as a 6 ECTS course. The manner in which this course may be taken is detailed in an official document entitled "Internship management procedure". The main points of contact for students who choose to undertake this effort are the Internship Coordinator as well as RTU's Career Support and Services Unit (which also organizes a pertinent annual event called Career Day). A dedicated website through which job vacancies are posted by companies assists in identifying internship positions. Past experience has shown that the companies preferred by many of the totals of 21 students (years 2017 - 2020) who took the Internship elective were companies that collaborate with IESE for scientific research and contract work.

Considering that all study programmes in the field are academic study programmes and internship is not obligatory, no internship is offered through the Master's and Doctoral programmes of study.

5.4. Currently, there are no joint study programmes in the study field "Environmental protection". However, Since 2011, when implementing the Master's study programme "Environmental science", RTU's IESE has been cooperating with the Vilnius Gediminas Technical University (VGTU) in Lithuania in implementing a Master level study programme entitled "Environmental Engineering" (120 ECTS). This double diploma programme was implemented after a previous positive experience in the implementation of the study process (visiting lectures, mobility of students and teaching staff, etc.). Under the umbrella of this cooperation, RTU and VGTU students have the opportunity to apply for a double diploma programme. Cooperation takes place in the implementation of joint study courses and jointly leading graduation Master theses. The double diploma program has received positive reviews from students, who recognize the better competitiveness in the labour market of such a diploma. By continuing successful double diploma cooperation between RTU and VGTU, there are intentions to develop a joint Master study program "Environmental Engineering".

Further, in 2019, talks started with the Kaunas University of Technology (Lithuania) for the creation of a joint study programme at the Doctoral level. Kaunas University of Technology (Lithuania) was preferred for such a collaboration due to the common themes of scientific research papers, the scientific capacity of the university, and previous positive experiences in the mobility of doctoral students between RTU and the Kaunas University of Technology.

## **Conclusions. Strengths and weaknesses**

RTU has managed to create a strong network of collaborators (universities, private companies, governmental organizations, and NGOs) through which they have been utilizing in supporting their cooperation and internationalization strategy for the study field. However, what seems to be currently lacking maybe a more international outlook for the fields of study under evaluation. The exchange of knowledge and experiences among students and faculty members from different countries, although recognized by the University as important, still needs to be further reinforced and more systematically explored. RTU has set an ambitious target for increasing the numbers of their foreign students into their programmes of study under this study field.

Strengths:

1. A good network of national, local, and international collaborators has been established;
2. An Internship course has been available to students at the Bachelor's level as an elective;
3. The procedures that accompany the internship efforts are adequate.

Weaknesses:

1. Low Erasmus+ mobility activity among faculty (incoming and outgoing mobility);
2. Low outgoing mobility activity among undergraduate students;
3. Poor tangible support of outgoing mobility for undergraduate students.

## **6. Implementation of the Recommendations Received During the Previous Assessment Procedures**

### **Analysis**

RTU has received recommendations during the previous evaluation procedure for the whole field and for separate programmes. As all the previous programmes have been replaced with new ones for the recommendation of the programme made during the licencing process where evaluated.

There were three recommendations for the study field to consider. Two recommendations are fully implemented – studies take place in the new RTU Student Campus, which has improved the material and technical provisions. The funding for the studies and scientific activities has significantly increased since previous evaluations. The recommendation about joint programmes with other universities has been discussed but not implemented as the study programmes are different (there are more differences after implementation of three new study programmes).

During the licencing process, nine recommendations to implement were proposed. Recommendation on language skills is being continuously implemented by participation in conferences, staff exchange visits and participation in language courses. The language skills of staff are approved by the B2 and C1 knowledge levels. Recommendations on management of research equipment and support staff, transfer of library is still in the analysis phase and implementation just started. Representatives of the labour market, guest lecturers are already regularly invited to take part in study courses and cooperation will continue. The same is with cooperation with other scientific institutions (proved by joint projects and joint publications). Qualification of teaching staff is continuously raised, records of

that kept. The SSO project also is used to raise qualifications.

## Conclusions. Strengths and weaknesses

The recommendation for study field has been implemented or justification to not directly implement is given. Work on implementation of recommendations for study programmes has been started and some of them continuously implemented.

Strengths:

1. Studies are held in new buildings with modern equipment;
2. The financial situation of studies and research has significantly improved;
3. The qualification of teaching staff is regularly improved;
4. The studies are interconnected with the actual labour market.

Weaknesses:

1. There is no joint vision about the long-term planning for the maintenance and renewal of research equipment.

## 7. Assessment of the Requirements for the Study Field

- 1 R1 - Pursuant to Section 5, Paragraph 21 of the Law on Institutions of Higher Education, the higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study direction whilst implementing their internal quality assurance systems:

**Assessment of compliance:** Fully compliant

RTU has implemented a system to ensure continuous improvement and developments of the study field and this system is effectively used.

- 2 1.1. The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.

**Assessment of compliance:** Fully compliant

RTU has established a quality policy, made it publicly available. There are procedures for assuring the quality of higher education, for example, the internal quality management system (approved by RTU Senate, 25th September 2017).

- 3 1.2. A mechanism for the development and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof has been developed.

**Assessment of compliance:** Fully compliant

RTU has established a system for development and approval of study programmes (Approval of the new version of the Procedure of Application, Development and Amendment of Study programs, approved by RTU Senate, 21st April 2021) with specific requirements (Uniform requirements of RTU towards study programs, approved by RTU Senate, 30th March 2020).

- 4 1.3. The criteria, conditions, and procedures for the evaluation of students' results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and made public.

**Assessment of compliance:** Fully compliant

RTU has established procedures for evaluation of the students' results, for example, Regulation

on the assessment of Learning outcomes (Approved by RTU Senate, 29th May 2017).

- 5 1.4. Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.

**Assessment of compliance:** Fully compliant

RTU has established procedures for evaluation of qualification of the academic staff, for example, Procedure of Involvement and Employment of Visiting Academic Personnel at RTU (Internal rules, 26th November 2018), RTU nolikums par docent, lektoru un asistentu ievēlēšanas kārtību (approved by RTU Senate, 27th April 2015).

- 6 1.5. The higher education institution/ college ensures the collection and analysis of the information on the study achievements of the students, employment of the graduates, satisfaction of the students with the study programme, efficiency of the work of the academic staff, the study funds available and the disbursements thereof, as well as the key performance indicators of the higher education institution/ college.

**Assessment of compliance:** Fully compliant

RTU has implemented procedures to perform different questionnaires for students, graduates to collect data (for example, Regulation on student polling for assessment of the study process, approved by RTU Senate, 27th January 2014). There are special procedures on funds distribution, for example, Methodology for Allocation and application of basic budget, performance-based funding and tuition fees by RTU units in the academic year (approved RTU Senate, 28th September 2018).

- 7 1.6. The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study direction whilst implementing their quality assurance systems.

**Assessment of compliance:** Fully compliant

RTU has implemented procedures to evaluate and develop each study field included assessed study field. Each study field has its own committee, whose work is regulated by the Regulation of the committee of study direction, approved by RTU Senate, 26th April 2021.

- 8 R2 - The cooperation with different organisations from Latvia and abroad implemented within the study direction ensures the achievement of the aims of the study direction.

**Assessment of compliance:** Fully compliant

RTU has agreements with Latvian and foreign institutions, universities, companies on staff and students exchange, and cooperation on ensuring student practice.

- 9 R3 - Compliance of scientific research and artistic creation with the development level thereof (if applicable).

**Assessment of compliance:** Fully compliant

Teaching staff have scientific publications and scientific projects. Results of the research are integrated into study courses. Students are involved in scientific work.

- 10 R4 - Elimination of the shortcomings and deficiencies identified during the previous assessment of the study direction, if it has been conducted, or the implementation of the provided recommendations.

**Assessment of compliance:** Fully compliant

The recommendation for study field has been implemented or justification to not directly implement is given. Work on implementation of recommendations for study programmes has

been started and some of them continuously implemented.

## 8. Recommendations for the Study Field

### Short-term recommendations

Develop a plan for the improvement of communication strategy with students and study field/study programmes administration, especially with bachelor students

Synchronize the way how study course description common parts are written

Develop a dedicated liaison, other than the programme director, between the department and the university's Erasmus officer so that to enhance the outputs (in terms of a number of participants) of mobility schemes.

Identify specific courses (in the programmes of study) that could be suggested as being appropriate to be more readily taken by students who wish to engage in outgoing mobility schemes

### Long-term recommendations

Diversify management structure of the study field, involving different persons at separate management levels and not concentrating all management levels in one person.

Increase the number of the publications in the journals indexed in Web of Science Core collection database

Develop joint vision about the long-term planning for the maintenance and renewal of research equipment.

## II. "Environmental Engineering" ASSESSMENT

### II. "Environmental Engineering" ASSESSMENT

#### 1. Indicators Describing the Study Programme

##### Analysis

Title of the programme "The academic bachelor's level study programme "Environmental Engineering" was revised as Indicator according to Legal acts according to Regulations of the Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches and sub-branches Issued in accordance with the Law on Scientific Activity Article 13, second paragraph, point 3.1.:

1. The Regulations prescribe the branches and sub-branches of Latvian science.
2. The branches and sub-branches of Latvian science are specified in the Annex to these Regulations.

Latvian science branches and sub-branches Chapter No2. Engineering sciences and technologies include sub-branch 2.7. Environmental engineering and energy The fields of science include environmental and geological engineering, geotechnics, oil refining engineering (fuels, petroleum products), energy and fuels, remote sensing, mining and quarrying, marine engineering, marine vessels, marine (ocean) engineering.

Bachelor's degree LR education classification code (IKK) 43529 and content of the programme were revised as indicator according to Compliance with Latvian Regulations of the Cabinet of Ministers No. 322 from 13th of June 2017 Regulations on the classification of education in Latvia Described number corresponds to First classification level (4) "Higher education degree" and Second classification level (43) "Academic education (bachelor's degree), to be implemented after obtaining general or professional secondary education. Duration of full-time studies is three to four years" According to Latvian Qualifications Framework (LQF), the European Qualifications Framework (EQF) proposed program should be described and correspond to Level (6):

- Knowledge (knowledge and understanding);
- Skills (ability to use knowledge, communication, general skills);
- Competence (analysis, synthesis and evaluation).

Bachelor's degree programme objectives, tasks, learning outcomes were revised as Indicators according to Latvian Cabinet Regulation No. 240 from 13th of May 2014 Regulations on the State Academic Education Standard p.4. The main goal of the Bachelor's study programme is to provide a set of knowledge, skills and competence in accordance with the knowledge, skills and competence of the 6th level of the framework specified in the Latvian education classification. p.5. The content of the Bachelor's study programme ensures the achievement of scientifically substantiated broad profile study results.p.6. The volume of the Bachelor's study programme in full-time and part-time studies is 120 to 160 credit points, of which not less than 10 credit points is the development of the Bachelor's thesis. The duration of full-time studies is six to eight semesters. p.7. Study courses and study modules form the obligatory, limited optional and optional parts of study programs. p.8. The Bachelor's study program consists of the compulsory part (not less than 50 credit points), the limited elective part (not less than 20 credit points) and the optional part.

The study programme "Environmental Engineering" (Bachelor) includes Part A Compulsory study courses Environmental mathematics; Probability theory and mathematical statistics; Physics; Environmental engineering chemistry and materials science; Civil protection; Innovative product development and business; Introduction to the field of study; Introduction to environmental research methods and theory; Introduction to environmental system dynamics modelling; Sustainable development; Geographic information systems; Introduction to biotechnology; Air quality engineering; Water purification technology; Intelligent energy systems; which is sufficient to keep programme direction. Students also have a choice of B1 Professional specialization study courses on the insight level Heating systems. Basic course; Combustion processes; Energy consumer management; Basics of system modelling; Energy audit; Heating and cooling systems; Practice; Waste recycling concept and technologies; Raw materials and resources; Environmental monitoring; Carbon capture, storage and use; Metrology; Theoretical foundations of climate technologies; Air pollution control; Microbiology of engineering systems of wastewater treatment; Gas and liquid mechanics; Hydrological processes and their modelling; Artificial recharge of groundwater; Water resources risk analysis; Introduction to biology which practically covers all fields of environmental engineering specialist.

During interviews on 21.09.2021, some of the Bachelor level students mentioned that programme courses selection is too wide, but Master degree students confirmed that included courses in Bachelor level study programme are essential and needed in order to have a complete overview of the subject.

The academic bachelor's level study programme "Environmental Engineering" fully comply with legal act requirements.

## Conclusions by specifying the strengths and weaknesses

The programme corresponds to the described field of science including environmental engineering as per Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches. The proposed description of the programme corresponds to Academic education (bachelor's degree). The description includes LQF and EQF Level (6) descriptions. Classification of education and training sectors (ISCED-F 2013) No 0712. Duration of full-time studies is three years. The proposed description of the programme about skills and competence corresponds to the knowledge, skills and competence level (6) which corresponds to legal acts. The content of the Bachelor's study programme ensures the achievement of scientifically substantiated broad profile study results. The volume of the study programme (CP) is 120 - sufficient according to legal act requirements. Study courses and study modules include 15 compulsory courses, 30 elective and optional parts of study programmes. Content of the compulsory part and the limited elective part meets the requirements. Study programme "Environmental Engineering" (Bachelor) requirements are interrelated and comply with legal requirements.

### Strengths:

1. Well structured study programme corresponds to legal act requirements;
2. The content of the programme is broad and covering related topics;
3. Bachelor study programme is a good base for the further Master study programme;
4. The study programme is interconnected with the actual labour market.

### Weaknesses:

1. Most Professional specialization study courses B1 are planned only for a semester and are giving only insight into the related topics;
2. Bachelors student work plan load is with a high intensity which can cause diffused focus on the learning process.

## 2. The Content of Studies and Implementation Thereof

### Analysis

2.1. The University provided detailed information on the Programme of Study (PoS), including a semester-by-semester break-down of courses, an indication of the category of each course (e.g. free electives, restricted electives, technical electives/professional specialization study courses, etc.) and an outline of each course. During the site visit clarifications were provided by the programme's management as well as faculty, whenever required.

The course outlines submitted in the self-assessment package conform to a uniform standard and are adequate in content.

The Programme of Study (PoS) that leads to the BSc Degree in Environmental Engineering consists of 120 Credit Points (CPs) - where each CP corresponds to 1.5 European Transfer Credit System (ECTS), and it fully conforms to the State Education Standard, as this was explicitly indicated in the Self-Assessment report. The PoS provides broad coverage of many of the topics encountered in the field of Environmental Engineering (and Sciences).

As stated in the self-assessment report, the interdisciplinary academic Bachelor's study programme "Environmental Engineering" is the only one in Latvia, so the competitiveness of graduates is evaluated as very high. The curriculum of the study programme reflects development trends in the sector and ensures the preparedness of specialists. According to data provided by RTU, 68% of

graduates of this programme find employment in the industry as environmental engineers or environmental specialists.

The study programme is evaluated and, if needed, updated annually (as clearly stated in the self-assessment report). Any changes to the curriculum reflect external trends and ensure compliance with the industry and labour market situation, as this is ensured by the participation of industry partners in the pertinent academic programme committee.

The programme of study is strongly supported by competent faculty members and well-equipped laboratory facilities that are producing solid scientific research work. These facts can be supported by the vitae of faculty, as well as witnessed during the site visit of the expert panel.

Meetings with employers (during the site visit) have divulged several interesting elements such as the fact that the market may prefer engineers over scientists, and a professional degree may be preferred to an academic degree, although knowledge and skills are more essential to employers. A rudimentary evaluation of graduates of RTU by employers during the interviews reveals they have better soft skills than graduates of other faculties, who, in turn, have better numerical abilities.

Interviews with students contributed some unique views on the programme of study. For instance, students did not feel ready to enter the job market after graduation. Thesis topics (although adequate in content and extent) were chosen from a list of topics provided by the faculty members, rather than students being able to also suggest their own topics. Students felt that the programme of study gave them less than what they initially envisioned (offering a better description and weaker delivery), and they expressed the desire for more practical knowledge from courses. Also, many students felt that the programme of study lacks direction, yet others appreciated the broad perspective offered. Students felt that despite the description of courses that could lead to specialization, during the implementation of the programme of study, no real choices were provided, and instead, specialization courses were “dictated” to students. Finally, students expressed concerns with the course of “geophysics” (VAS004 – Concepts and Technologies of Waste Management) as having a course description that is disconnected from its actual content, and also expressed concern about the strong emphasis placed on thermodynamics and heat systems topics.

2.2. The study implementation methods (including evaluation methods) contribute to the achievement of the aims and learning outcomes of the study courses, as these are listed in the course outlines.

Courses are taught through a variety of approaches, including lectures, seminars and workshops/laboratories. Assignments and evaluation methods used in courses go beyond the standard examination paper but instead extend to widely include projects and presentations. Diverse methods of communication are used (as attested during interviews with students). Integrated into the learning process are elements and exercises that allow for critical thinking, gathering and analysis of information, presentations, group work, and preparation of alternative presentations such as posters and videos. The laboratory facilities available to students are of a high standard, and laboratory component is incorporated in courses.

2.3. The university conducts surveys among students, among graduates, and among employers (although the latter is in a more information ad-hoc manner). The results of these surveys are being used by the programme administration to improve the study process and content. According to the self-assessment report, surveys of students are being conducted at the end of every fall and spring semester. A criticism offered by students during the site-visit, was the fact that despite them participating in such surveys, the results of these were not made available to them, leaving them with suspicions that their input is not considered to the degree that it should. A summary of the results of these surveys was provided in the self-assessment report. Surveys of programme

graduates are conducted after each graduation round for the Bachelor's and Master's programmes of study. In parallel, regular polling of employers is also planned.

2.4. The experts confirm that the students avail themselves of the incoming and outgoing mobility opportunities, and the learning outcomes achieved during such mobility are recognized. However, the information provided by students during the site visit, it seems that students may be discouraged from participating in outgoing mobility programmes with the "pretence" that earned credits may be difficult to transfer into their programme of study, hence their studies would be prolonged by a semester. However, the university does have procedures in place for students who wish to take courses that count towards their programme of study.

### **Conclusions by specifying the strengths and weaknesses**

RTU has created a programme of study (PoS) in Environmental Engineering that is conducive to student-centered learning, and it employs a multitude of teaching methods and student evaluation methods. The programme of study provides a broad perspective of the field of environmental engineering, not unlike several other programmes of study offered by several universities internationally. The degree offered allows for careers of graduates in the private and public sector, as environmental specialists. The programme of study allows for the possibility for a student to specialize more in a given area of study (e.g. wastewater, air pollution, etc.). The courses included in the programme are supported by diverse teaching methods and by practical training in the form of laboratory work. There are some issues that may be present, related to the implementation of the programme of study, and not necessarily with its official description.

Strengths:

1. A multidisciplinary approach provides a wide view of the items revolving around environmental engineering;
2. The teaching methods employed allow for the better development of certain valuable skills (e.g. communication skills, ability to work in a group environment) among students;
3. The programme of study is overseen by a committee (that includes faculty members, employers and students) with a procedure to evaluate and update the programme annually;
4. The programme is supported by quality faculty members, as well as good facilities and laboratories.

Weaknesses:

1. Student mobility may not be encouraged much;
2. The delivery of the programme of study requires a better involvement of students (or better communication among the administration and students). This includes weakness in the manner in which specialization courses are made available to students, as well as the mechanism through which thesis topics are assigned;
3. Course outlines may not always reflect the true contents of courses.

### **3. Resources and Provision of the Study Programme**

#### **Analysis**

3.1. The Bachelor study programme "Environmental Engineering" study provision, scientific support, informative provision (including libraries), material and technical provision, and financial provision comply with the specific features and the conditions for the implementation of the study programme, create the prerequisites for the achievement of the learning outcomes, and indicate the possibility to ensure a high-quality study process also in the future.

What regards specifically Bachelor's programme "Environment engineering" the sources of funding of the programme are both state budget funds and the tuition fee paid by natural persons for studies. For the academic year of studies 2020/2021, RTU provided 35 state-funded study places for first-year students that were available for the programme.

The tuition fee for the academic bachelor's programme "Environmental Engineering" was 3000 EUR in the new 2021/2022 academic year. In this study year, the bachelor's programme "Environmental Engineering" has 25 budget places and the study fee is 3050 EUR. Tuition fee is the same as studying in Latvian or English.

During the student meeting, it became clear that all local students have received state budget places and only foreign students have to pay for them. For the academic year 2019/2020 Bachelor's programme more than 120 000 euros was received as a finance funding for the state budget places for students. During the last 7 years, the study funding for the Bachelor's programme "Environmental Engineering", has risen for 600 euros.

3.2. As stated beforehand, there are various kinds of laboratories that are being used for practical tasks on different courses and topics that help students to acquire practical insights on the topics they are taught. Students have access to 5 laboratories within the premises of their programme - Environmental Monitoring Laboratory (for solid energy source (including biofuel) testing services - ash content, moisture content, thermal heat capacity (higher and lower) and other services); Biosystem Laboratory (study of algae as a resource, production and study of innovative materials, study of biogas, study of electrolysis and methanation processes), Combustion Research Laboratory (optimisation of the combustion process), Solar Energy Systems Laboratory (simulate and develop solar heat systems. Studies performed in the laboratory are related to studies of solar collectors; study of heat storage systems and their control systems; modelling and improvement of systems using modelling programmes; study of phase change materials) or Building Energy Efficiency Laboratory (studies both the quality of construction materials and rooms and the possibilities to improve their energy efficiency), but not only. In case of research for their thesis or any other needed research, students can use laboratories in other RSU faculties which are not available on their own premises.

3.3. As it has been indicated in the resource provision of the whole study field, RTU ensures that all the necessary resources - databases, books are available to them to gain theoretical knowledge of the field. In the RTU ORTUS environment, students can access international databases such as Web of Science, EBSCO, SCOPUS, SCIENCE DIRECT, SpringerLink full-text journals and books, several databases and other information resources. At the RTU library students have access to the database of "Latvian Standard". Students of the study programme "Environmental Engineering" have access to the library of the Institute of Energy Systems and Environment, which has about 400 books in the field of environmental engineering, including doctoral theses and their abstracts. Students and academic staff are satisfied with all the resources they have been provided for. Regarding technical equipment, academic staff and students at the faculty have access to auditoriums equipped with the latest generation visual and audio equipment which are easily accessible.

Due to Covid -19, students did feel the impact from the inability to do the practical tasks in laboratories which seemed more complicated to understand the topic, although all of the students tried to find creative approaches with simulations and group work to provide at least the possible level of practical work. As the academic staff is rather young, during the transition period due to Covid - 19, no problems were faced regarding technical problems on the use of Microsoft Teams and Zoom online lectures. Students and academic staff during an on-site expert meeting pointed out that they appreciated the use and implementation of the Moodle system. All the materials in the

Moodle seem to be located and easily accessible in one place, final exams could be filled on the platforms, especially used during Covid -19. The RTU system called ORTUS portal, in their opinion, is good and well- built. During seminars students can easily upload the work in the system and they can review each other's work. Lecturers can easily see the work, both students and staff can see the grades. They have a system that generates the table of information that provides the grades, works, and students in one table. There is no mandatory requirement to add such information on ORTUS but it depends on the lecturer. The presentations, general basic info on the course has to be always uploaded on the system. There is no requirement to use ORTUS tasks, virtual materials.

Regarding practical skills, the best students are invited to help as scientific assistants of lecturers in various scientific projects because it provides a new perspective and development of personal skills.

Overall, students highly value the knowledge gained within their study process, but specifically during this last year due to the programme changes implemented in Bachelor's programme they have some uncertainties of the study courses provided as the name of the courses do not comply what is taught in the course (for example, in the new programme waste management and technologies(atkritumu pārstrādes process) has two parts - two separate courses fitted under one. In the old programme there was only one course - geophysics that seemed logical for the students). Another aspect is that students seem to lack English language knowledge and there are no courses currently that are provided.

It was also noted that in the new programme implemented there are no courses on heating or ecology which are seen as important.

### **Conclusions by specifying the strengths and weaknesses**

Overall, the resource base for the use of academic staff and students complies with all the requirements of the implementation of the study programme. Students have access to various laboratories for research activities and practical tasks. Both academic staff and students have all the necessary resources for a successful study process with that meaning all the needed materials as books and databases for course materials, technical equipment for remote studies and visual material provision in on-site lectures. There is an existing Moodle platform as well as an ORTUS environment that is highly used, needed and appreciated for the study process.

Strengths:

1. Have access to 5 different laboratories and can gain practical skills;
2. Best of the students can participate as scientific assistants for research scientific projects;
3. Provided all the necessary resources for successful study process;
4. Financial funding has risen and it also helps to invest more of the finances in the resources;
5. All local students have been provided the possibility to study in state budget places;
6. Easily navigating and accessible ORTUS environment and MOODLE platform for study purposes.

Weaknesses:

1. Impact of Covid -19 on the practical task provision for students, especially the accessibility of laboratories.

## **4. Teaching Staff**

### **Analysis**

4.1. According to the strategy RTU IESE composes the academic staff accordingly to the main

competencies, which the programme should ensure. It means that programme modules composition should ensure adequate qualification for graduates.

According to the information provided in the self-assessment documents in the Bachelor programme "Environmental Engineering" participate 50 representatives of the academic staff. Mainly there are from the Department of Energy Systems and Environment, but also there are representatives from other RTU departments, industry representatives and invited lecturers. IESE scientific and academic staff with a doctoral degree – 24 doctors of science, of which 19 are experts of the Latvian Council of Science (LCS) in environmental engineering or environmental science and 15 European experts (CORDIS); teaching staff without a doctoral degree (doctoral students) – 8 persons. The selection of teaching staff is related to the experience of scientists, scientific research interests, scientific performance, etc., taking into account the specifics of the study programme and study courses.

As the discussion with the teaching staff and students revealed continuous monitoring and assessment of the programme modules, taking into account the newest research results and due to this, the changes made in teaching staff (higher competencies, invited lectures, industry representatives) have a positive impact on the development and the quality of implementation of the study programme.

4.2. RTU applies systemic criteria for admission of the teaching staff - doctoral or master's degree in the field of a study course and/or work experience in the specific programme related field. Analysis of the Self-assessment documents and Annexes revealed that all staff possess the required qualification and experiences depending on their research activities and modules, i.e all teaching staff involved in the study programme comply with the conditions of the study programme implementation and the requirements of the laws and regulations and enables of the achievement of the aims and learning outcomes of the programme and related study courses.

All lecturers involved in the implementation of the study programme are directly or indirectly related to any of the environmental sciences, engineering sciences or other logically related research areas, except for the lecturers involved in teaching general education courses.

All participating teachers have an English language level of at least B2 according to self-assessment using the Common European Framework of Reference for Languages (CEFR).

The scientists and young scientists involved in the implementation of the study programme specialise in environmental engineering and energy.

9 professors of RTU IESE participate in the implementation of the study programme – doctors of science, who have been elected professors by the Council of Professors of the Energy Industry and whose scientific and pedagogical activity meets the criteria for evaluation of scientific and pedagogical qualification of the candidate for the professor's position set in regulatory enactments.

4.3. The academic staff involved in the implementation does international level scientific research, improving own qualification and performing scientific research activities. The academic staff has the opportunity to supplement their professional knowledge and obtain valuable experience in a foreign higher education institution (using Erasmus, COST or project mobility opportunities), which is in harmony with the development strategy of the European Higher Education Area, as well as through traineeship in companies.

The academic staff members of the study programme actively participate in scientific research activities both at the national and international levels related to environmental protection, environmental and climate technologies and energy. Research in the following areas was conducted

within RTU IESE: energy change modelling, renewable energy sources, sustainable use of resources, biotechnologies, infrastructure resilience to disasters and risk analysis, energy efficiency, bio-economy, fuel technology, energy and environmental policy, environmental management and other. The research is closely related to the implemented study programmes at the Bachelor and Master level of studies:

- In the study programme, students obtain skills in research work analysing literature, different scientific databases and internet resources, work in the laboratories. The results became the basis for study papers and the Bachelor's thesis. Also, the students present the results of their research at student conferences.

RTU IESE staff, including Bachelor study programme, actively work in industry research. Research results and achievements are confirmed by participation in international conferences and acknowledgement for achievements;

- RTU IESE on all study levels not only participates in scientific conferences but also organises them. In the reporting period, the research results of the academic staff of the department were converted into 368 scientific publications.

4.3. During the teaching process, the regular meetings of the teachers are arranged to exchange experience on the topics of the course, improve the content by mutually agreeing on the topics, focuses, responsibilities and compliance with regulatory requirements. All teachers are involved in the process of the course coordination, thus ensuring that the topics covered in the study programme are constantly improved and updated in cooperation with the professionals of the relevant field.

The mechanisms to promote collaboration between teachers are selected according to the individual workload of the academic staff members, the thematic relationship (coherence, continuity, complementarity) of the study courses, and the experience of the teachers. The student to teaching staff ratio is 1 teaching staff member per 4 students.

All the above-mentioned activities are evident proof of the systematic approach of the university to ensure high-quality study programme functioning, which ensures the competence of the graduates.

### **Conclusions by specifying the strengths and weaknesses**

The qualification of teaching staff involved in the implementation of the Bachelor's study programme "Environmental Engineering" fully corresponds to the conditions of implementation of the study programme and the requirements of regulatory enactments, as well as ensures the achievement of aims and learning outcomes of the study programme and respective study courses.

The academic staff members of the study programme, both at the national and international level, are engaged in scientific research in the field of quality management and conformity assessment, and the acquired information and experience are integrated into the study process.

Strengths:

1. highly experienced and research-active staff;
2. implementation of national and international research projects;
3. annually organized research conference.

Weaknesses:

Not identified

## 5. Assessment of the Compliance of the Study Programme "Environmental Engineering"

### Requirements

1. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure by which state-recognised documents of higher education are issued.

**Assessment of compliance:** Fully compliant

The sample of the diploma provided as annex complies with regulation of Cabinet of Ministers Nb 202. (19.04.2013.) "Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinājošus dokumentus"

2. Documents confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued.

**Assessment of compliance:** Fully compliant

Agreement between Riga Technical University and University of Latvia has been signed on October 15th, 2019, providing students possibility to continue education at another accredited higher education institution

3. Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme.

**Assessment of compliance:** Fully compliant

Document Nb. 01000-2-2-1-e\_178.edoc added, confirming compensation for losses

4. The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of an official language.

5. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of a foreign language. According to the self-report, 64% of staff have a foreign language level of B2 and 36% of C1.

6. At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts.

**Assessment of compliance:** Not relevant

Not relevant as this is a bachelor programme

- 7 7. The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of elected professors (15) and associated professors (9) is larger than five.

- 8 8. The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

**Assessment of compliance:** Fully compliant

Samples of the study agreements provides as annexes to the self-report complies with the legal requirements and includes all the mandatory fields

- 9 9. The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 56.1, Paragraph two and Section 56.2, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

All study course descriptions are prepared in Latvian and English language. Course descriptions comply with requirements of Law on Institutions of Higher Education. There is information on course goals and objectives, competencies and skills, course content, learning outcomes, tasks of independent studies and recommended literature. Small inadequacy is a different form of writing the same parts by different course authors.

- 10 10. The study programme complies with the valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided that the completion of the study programme leads to a professional qualification.

**Assessment of compliance:** Not relevant

This is an academic study programme

- 11 11. Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of students is less than 250 and opinion of the Council for Higher Education has been received and added as annex (document Nb. 1.10/68, November 7th, 2019.)

- 12 12. The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard.

**Assessment of compliance:** Fully compliant

The title, duration, achievable results for the study programme complies with the State Academic Education Standard. Length of the programme is three years, 120 CP of which 15 CP is bachelor thesis. Programme has all necessary course groups (compulsory courses 70 CP, elective courses 31 CP, optional courses 4 CP), including courses on environmental protection

and civil protection.

- 13 13. The joint study programmes comply with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Institutions of Higher Education (if applicable).

**Assessment of compliance:** Not relevant

This is not joint programme

- 14 14. Each member of the academic staff has either publications published in reviewed editions within the last six years, including international editions (if they have worked for a shorter period of time, the number of publications shall be in proportion to the work period), or artistic creation achievements (for instance, exhibitions, films, theatre performances, and concert activity), or a five-year practical work experience (except for the experience in the implementation of the study programme) in accordance with the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Each member of the academic staff has scientific publications that are published during the last six years.

- 15 R5 - Overall rating

**Assessment of compliance:** Fully compliant

The study programme complies with all the legal requirements set for the academic bachelor programmes.

### **Requirements (R6-R8)**

- 1 R6 - The compliance of the study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of the learning outcomes.

**Assessment of compliance:** Fully compliant

The informative provision (libraries, electronic databases), auditoriums, scientific laboratories, and financial resources are appropriate to ensure bachelor studies and to ensure the achievement of the learning outcomes.

- 2 R7 - The compliance of the qualification of the academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments.

**Assessment of compliance:** Fully compliant

The qualification and scientific activities of the academic staff complies with the legal requirements and correspond to the study programme.

- 3 R8 - The study programme leading to the master or doctoral degree is based on the advances and findings in the relevant field of science or artistic creation.

**Assessment of compliance:** Not relevant

Not relevant as this is a bachelor programme

### **Conclusions by specifying the strengths and weaknesses**

The study programme complies with all the requirements for the bachelor programmes.

Strengths:

1. Well structured study programme, that corresponds to legal act requirements. Used teaching methods allow for the better development of certain valuable skills;
2. The content of the programme is broad, covering related topics, interconnected with the labour market;
3. The study programme has all the necessary resources;
4. The academic staff is competent, loyal and actively involved in scientific research. There is an ongoing process of renewal of academic staff.

Weaknesses:

1. Most professional specialization study courses give only insight into related topics;
2. Course outlines may not always reflect the true contents of courses;
3. Low students' mobility;
4. Impact of Covid -19 on the practical task provision for students, especially the accessibility of laboratories.

## Evaluation of the study programme "Environmental Engineering"

Evaluation of the study programme:

Good

## 6. Recommendations for the Study Programme "Environmental Engineering"

### Short-term recommendations

To implement notebook evaluation system also in Bachelor's programme

Find ways to better involve students (or create avenues of better communication between the administration and students) in the programme development and delivery. For instance, before scheduling the specialization courses to be offered in any given semester, a survey of students' choices can be conducted and their opinions, hence, considered.

Allow for students to suggest their own thesis topics, possibly through a specific template that will allow students to submit a mini-proposal of their topic.

The course outline and contents of Course VAS004 - Concepts and Technologies of Waste Management should be closely examined and possibly revisited for congruence

### Long-term recommendations

Establish cooperation with other European universities that would provide students ERASMUS+ mobility opportunities not worrying about not recognising credit points after returning back home.

Find ways to attract more foreign guest lecturers and foreign students for the study programme.

## II. "Environmental Engineering" ASSESSMENT

### II. "Environmental Engineering" ASSESSMENT

#### 1. Indicators Describing the Study Programme

## Analysis

Title of the programme "The academic masters level study programme "Environmental Engineering"" was revised as Indicator according to Legal acts according to Regulations of the Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches and sub-branches Issued in accordance with the Law on Scientific Activity Article 13, second paragraph, point 3.1.:

1. The Regulations prescribe the branches and sub-branches of Latvian science;
2. The branches and sub-branches of Latvian science are specified in the Annex to these Regulations.

Latvian science branches and sub-branches Chapter No2. Engineering sciences and technologies include sub-branch 2.7. Environmental engineering and energy The fields of science include environmental and geological engineering, geotechnics, oil refining engineering (fuels, petroleum products), energy and fuels, remote sensing, mining and quarrying, marine engineering, marine vessels, marine (ocean) engineering.

Master degree LR education classification code (IKK) 45529 and content of the programme were revised as Indicator according to Compliance with Latvian Regulations of the Cabinet of Ministers No. 322 from 13th of June 2017 Regulations on the classification of education in Latvia Described number corresponds to First classification level (4) "Higher education degree" and Second classification level (45) "Academic education (master's degree), to be implemented after obtaining a bachelor's or professional bachelor's degree. Duration of full-time studies one to two years. The total duration of full-time studies is at least five years" According to the Latvian Qualifications Framework (LQF), the European Qualifications Framework (EQF) proposed programme should be described and correspond to Level (7) Knowledge (knowledge and understanding), Skills (ability to use knowledge, communication, general skills), Competence (analysis, synthesis and evaluation).

Master degree programme objectives, tasks, learning outcomes were revised as Indicator according to Latvian Cabinet Regulation No. 240 from 13th of May 2014 Regulations on the State Academic Education Standard. According to Latvian Cabinet Regulation No. 240 from 13th of May 2014 Regulations on the State Academic Education Standard p.15. The main goal of the Master's study programme is to provide a set of knowledge, skills and competence in accordance with the knowledge, skills and competence of the 7th level of the framework specified in the Latvian education classification. Legal act requirements p.16. The content of the Master's study programme ensures the achievement of such study results, which include the acquisition of in-depth theoretical knowledge and the development of research skills and abilities in the chosen field of science or art. p.17. The volume of the master's study programme is at least 40 credit points, provided that the total duration of bachelor's and master's study programmes in full-time studies specified in the Law on Higher Education Institutions is observed. No less than 20 credit points from the volume of the master's study programme are the development of the master's thesis. p.18. A Master's thesis is a research work in the chosen field or sub-branch of science, in which the master's student has performed independent research and made science-based conclusions or developed research-based creative work. p.19. In full-time studies, not less than 30% of the volume of the master's study programme (except for practice, if such is specified, and the volume intended for the development of the master's thesis) consists of contact hours. p.20. The compulsory part of the master's study programme, except for the elaboration of the master's thesis, shall include research of theoretical findings in the chosen field of science or sub-branch and approbation of theoretical findings in terms of current problems in the chosen field of science or sub-branch in the amount of not less than 12 credit points 40 credit points, and not less than 24 credit points, if the volume of the master's study

programme is 80 credit points.

The study programme "Environmental Engineering" (Master) includes Part A Compulsory study courses Sustainable industrial processes and technologies, Environmental Management, Environmental policy and economics, Basics of Occupational Safety, Environmental Impact Assessment, Environmental Technologies, Ecodesign and life cycle analysis, Intersectoral and interdisciplinary research methods which are sufficient to keep programme direction. Master degree students deal with the energy technologies of various industrial processes, their technical and environmental aspects. The courses are focused on energy efficiency, emissions, application areas and practical case studies which correspond to the study programme description.

B section Elective's study courses are divided into two parts for Professional specialization study courses on professional level. Students have a choice B1 with Specialization "Environmental Engineering" which includes courses Experiment planning and simulation of processes, Energy Conversion and Efficiency, Renewable energy sources, Environmental Chemistry and Technology, Water Chemistry and microbiology, Circular economy and waste management, Geographic information systems, Water Treatment Technology, Biotechnologies, Energy Efficiency and Energy Audit of Buildings, Strategic planning, Innovations and ecomanagement, Adaptation to climate change which practically covers all fields of environmental engineering specialist topics. Students have a choice B1 with Specialization "Circular bioeconomy" which includes courses Modelling and simulation of dynamic processes, Case studies on Biobased products, Bioenergy technologies, Sustainable rural and urban development, Development and analysis of biotechnomy, Production of biobased resources, Geographic information systems, Energy Efficiency and Energy Audit of Buildings, Adaptation to climate change which practically covers all fields of environmental engineering Circular bioeconomy specialist topics. The study programme "Environmental Engineering" (Master) with section B2 covers Humanitarian and social study courses including Socio-economic aspects of energy supply, Presentation Skills, Business Sociology, Communication Psychology, Social Psychology, Latvian language for Foreign Students.

The study plan of the study programme includes the E part Final state graduation test Master Thesis.

During interviews on 21.09.2021 some of Master level students mentioned that programme courses selection is wide and covering all necessary directions of the interest in order to prepare Master Thesis for both specializations as "Environmental Engineering" as well as "Circular bioeconomy". Doctoral degree students confirmed that included courses in Master level study programme are essential and needed in order to have a complete overview on the subject.

### **Conclusions by specifying the strengths and weaknesses**

The programme corresponds to the described field of science including environmental engineering as per Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches. The proposed description of the programme corresponds to Academic education (master's degree). The description includes LQF and EQF Level (7) descriptions. Classification code and content of the programme as per Classification of education and training sectors (ISCED-F 2013) No 0712. The duration of full-time studies corresponds to legal requirements and is stated to be two years. The total duration of full-time studies is five years.

The proposed description of the programme about skills and competence corresponds to the knowledge, skills and competence comply and corresponds to level (7). The content of the Master study programme ensures the achievement of such study results, which include the acquisition of in-

depth theoretical knowledge and the development of research skills and abilities in the chosen field of science or art. The volume of the master's study programme (CP) is 80. Study courses and study modules include 8 obligatory, 26 limited optional and optional parts of study programmes. Elaboration of the master's thesis 24 credit points. Content of the compulsory part of the master's study programme meets the requirements.

Study programme "Environmental Engineering" (Master) requirements are interrelated and comply with legal requirements.

Strengths:

1. Well structured study programme corresponds to legal act requirements;
2. The content of the programme is broad and covering related topics;
3. Master study programme is divided into two main professional specialization study courses to focus on learning directions;
4. The study programme is interconnected with the actual labour market.

Weaknesses:

1. Master study programme specialization "Circular bioeconomy" includes study course VAS020 named Biotechnomy - the term needs to be clarified.

## **2. The Content of Studies and Implementation Thereof**

### **Analysis**

2.1. RTU offers a programme of study leading to the Master's Degree in Environmental Engineering, with two possible specialization tracts: Environmental Engineering and Circular Economy. The University provided detailed information on the Programme of Study (PoS), including a semester-by-semester breakdown of courses, an indication of the category of each course (e.g. free electives, restricted electives, technical electives/professional specialization study courses, etc.) and an outline of each course.

The course outlines submitted in the self-assessment package conform to a uniform standard and are adequate in content. The Programme of Study (PoS) that leads to the MSc Degree in Environmental Engineering consists of 80 Credit Points (CPs) - where each CP corresponds to 1.5 European Transfer Credit System (ECTS). Twenty of those credit points are devoted to the Master's Thesis.

The study programme's stated objective is to prepare systemically thinking highly skilled specialists focusing on preventive environmental prevention activities and the development and implementation of innovative zero pollution technologies with integrated academic education.

RTU supports the statement they made pertaining to the competitiveness of the programme by emphasizing that 86% of graduates of this programme find employment in the industry as environmental engineers or environmental specialists (as this data was gathered through the graduates' survey).

The curriculum of the study programme has been such so as to ensure compliance with the needs of the industry, labour market and research development trends. The study programme is evaluated and, if needed, updated annually. Any changes to the curriculum reflect external trends and ensure compliance with the industry and labour market situation.

The programme of study is strongly supported by competent faculty members and well-equipped laboratory facilities that are producing solid scientific research work. Despite the similar names of courses at the undergraduate and master's level programme of study, it was clarified during interviews with faculty members and the administration that these courses vary in their level of complexity.

Interviews with students corroborated information provided in the self-assessment report which states that students are well supported in all regards (including funding, access to necessary facilities and information). Despite the fact that students are guided as to the expectations of the programme of study, this is done primarily through ad-hoc/oral guidelines. The publication of "Graduate Student's Manual" may better serve as a common reference point for all students.

2.2. The Master study programme implementation methods (including evaluation methods) contribute to the achievement of the aims and learning outcomes of the study courses, as these are listed in the course outlines.

Courses are taught through a variety of approaches, including lectures, seminars and workshops/laboratories. Assignments and evaluation methods used in courses go beyond the standard examination paper but instead extend to widely include projects and presentations. Diverse methods of communication are used (as attested during interviews with students). Integrated into the learning process are elements and exercises that allow for critical thinking, gathering and analysis of information, presentations, group work, and preparation of alternative presentations such as posters and videos. The laboratory facilities available to students are of a high standard, and laboratory component is incorporated in courses.

Students come from varied backgrounds. There seems to be some confusion (that resulted from conflicting information provided during student interviews, administration interviews, and faculty interviews) concerning the mechanisms through which a student who comes from a non-engineering background can cope with the requirements of the programme of study.

Impressions about the programme of study from student interviews are positive.

2.3. The university conducts surveys among students, among graduates, and among employers (although the latter is in a more information ad-hoc manner). The results of these surveys are being used by the programme administration to improve the study process and content.

According to the self-assessment report, surveys of students are being conducted at the end of every fall and spring semester. A summary of the results of these surveys was provided in the self-assessment report.

Surveys of programme graduates is conducted after each graduation round for the Bachelor's and Master's programmes of study. In parallel, regular polling of employers is also planned.

2.4. The Master study programme students, in accordance with the conviction of experts, avail themselves of the incoming and outgoing mobility opportunities, and the learning outcomes achieved during such mobility are recognized. Testimonies of students during the site visit say that "MSc programme studies abroad was a great opportunity". This comment was made with specific reference to outgoing mobility opportunities in Vilnius Gediminas Technical University and the Technical University of Denmark.

## **Conclusions by specifying the strengths and weaknesses**

RTU has created a programme of study (PoS) in Environmental Engineering that is conducive to student-centred learning, and it employs a multitude of teaching methods and student evaluation methods. The programme of study provides a broad perspective of the field of environmental engineering, and at the same time, it allows one to specialize in one of two areas (environmental engineering or circular economy). The degree offered allows for careers of graduates in the private and public sector, as environmental specialists. The courses included in the programme are supported by diverse teaching methods.

Strengths:

1. A multidisciplinary approach provides a wide view of the items revolving around environmental engineering;
2. The teaching methods employed allow for the better development of certain valuable skills (e.g. communication skills, ability to work in a group environment) among students;
3. The programme of study is overseen by a committee (that includes faculty members, employers and students) with a procedure to evaluate and update the programme annually;
4. The programme is supported by quality faculty members, as well as good facilities and laboratories.

Weaknesses:

1. Absence of a graduate manual forces students to rely on oral guidance on important elements of their studies.

### **3. Resources and Provision of the Study Programme**

#### **Analysis**

3.1. Regarding sources of funding of the Master's study programme "Environmental Engineering", there are two types of funding - state budget funds and the tuition fee paid by natural persons for studies. For the academic year of 2020/2021 for first-year Master's students, there were provided 40 state-funded study places. The Master's programme is implemented in Latvian and English languages. For both language programmes, the study fee is the same. The tuition fee for the academic study programme "Environmental Engineering" is EUR 4400. Funding per study place has increased by 12% in the year of studies 2019/2020 compared to the year of studies 2013/2014 according to statistics provided in SAR p. 286.

In the SAR p. 284 there is provided data regarding the division of study programme funding, it can be seen that all Master's students that are Latvian nationals have been provided a state-funded place in the last 7 years. The good trend that is being noticed is that in the last few years, especially the academic year 2019/2020, there is an increase of foreign students and thus the funding as well. The state budget amounts to more than 200 000 EUR while foreign students funds around 40 000 EUR.

3.2. For the purpose of study programme implementation Institute of Energy Systems and Environment, the teaching staff is involved. For a variety of courses, other organizational units participate as well. For example, humanities and social study courses part (part B2) or part C ("Elective study courses").

Students of the study programme "Environmental Engineering" conduct their scientific research for their Master's thesis, as well as laboratory works in one of five RTU IESE laboratories: Environmental Monitoring Laboratory, Biosystem Laboratory, Combustion Research Laboratory, Solar Energy 285 Systems Laboratory or Building Energy Efficiency Laboratory. They are the same laboratories that are also available for Bachelor's students - Environmental Monitoring Laboratory (for solid energy

source (including biofuel) testing services – ash content, moisture content, thermal heat capacity (higher and lower) and other services); Biosystem Laboratory (study of algae as a resource, production and study of innovative materials, study of biogas, the study of electrolysis and methanation processes), Combustion Research Laboratory (optimisation of the combustion process), Solar Energy Systems Laboratory (simulate and develop solar heat systems. Studies performed in the laboratory are related to studies of solar collectors; study of heat storage systems and their control systems; modelling and improvement of systems using modelling programmes; study of phase change materials) or Building Energy Efficiency Laboratory (studies both the quality of construction materials and rooms and the possibilities to improve their energy efficiency), but not only. In case of research for their thesis or any other needed research, students can use laboratories in other RTU faculties which are not available on their own premises.

In the period from 2013 to 2019, RTU purchased infrastructure for laboratories, practical classes (e.g. modelling software) and lectures (e.g. Scientific literature, databases of scientific articles), computer equipment (monitors, computers, presentation lasers), laboratory equipment (data loggers, barometers, air humidifiers, gas analyser, set of cold cameras, a climate station, weights, muffle furnace, drying cabinet, detector, gas sensor adapter, etc.) for the needs of the study field “Environmental protection” to ensure the study process. Students of the study programme “Environmental Engineering” have access to the library of the Institute of Energy Systems and Environment, which has about 400 books in the field of environmental engineering, including doctoral theses and their abstracts in the field of environmental engineering and energy sciences, as well as methodological materials for students of the study field “Environmental protection”.

In the RTU ORTUS environment, students can access international databases: Web of Science, EBSCO, SCOPUS, SCIENCE DIRECT, SpringerLink full-text journals and books, several databases and other information resources. At the RTU library, students have access to the database of “Latvian Standard”. Students during on-site meetings provided that they have access to all the necessary materials and are happy with the databases, literature provided to them.

3.3. The RTU Design Factory includes an open-type laboratory “theLAB ” in which the students can materialise their inventions by using technological possibilities offered by 3D printing, laser cutting and engraving, plotting, large-format printing and other tools. In turn, FEEE has created a LATVENERGO student creative laboratory, where students can use the latest technologies to develop their products. This is the possibility of students to act and use the obtained theoretical knowledge in practice.

The experts state that the study provision, scientific support, informative provision (including libraries), material and technical provision, and financial provision comply with the specific features and the conditions for the implementation of the Master study programme “Environmental Engineering”, create the prerequisites for the achievement of the learning outcomes, and indicate the possibility to ensure a high-quality study process also in the future.

### **Conclusions by specifying the strengths and weaknesses**

Overall, the resource base for the use of academic staff and students complies with all the requirements of the implementation of the study programme. Students have access to various laboratories for research activities and practical tasks. Both academic staff and students have all the necessary resources for a successful study process that meaning all the needed materials like books and databases for course materials, technical equipment for remote studies and visual material provision in on-site lectures. There is an existing Moodle platform as well as an ORTUS environment that is highly used, needed and appreciated for the study process. The only shortcomings that seem

lacking is due to Covid -19 that is not the fault of the RTU.

Strengths:

1. Have access to 5 different laboratories and can gain practical skills;
2. Provided all the necessary resources for successful study process;
3. Financial funding has risen and it also helps to invest more of the finances in the resources;
4. All local students have been provided with the possibility to study in state budget places;
5. Easily navigating and accessible ORTUS environment and MOODLE platform for study purposes.

Weaknesses:

Not identified.

#### **4. Teaching Staff**

##### **Analysis**

4.1. RTU IESE scientific and academic staff are involved in the implementation of the Master's study programme "Environmental Engineering": with a doctoral degree - 27 doctors of science, of which 23 are experts of the Latvian Council of Science (LCS) in environmental engineering or environmental science and 15 European experts (CORDIS); teaching staff without a doctoral degree (doctoral students) - 9 persons.

The main research interest fields of the scientists involved in the implementation of the study programme are environmental engineering and energy. The justification of the selection of teaching staff is related to the experience of scientists, scientific research interests, scientific performance, etc.

As the discussion with the teaching staff and students revealed continuous monitoring and assessment of the programme modules, taking into account the newest research results and due to this, the changes made in teaching staff (higher competencies, invited lectures, industry representatives) have a positive impact on the development and the quality of implementation of the study programme.

It is important to highlight that in the teaching process of the "Environmental Science" programme and other RTU departments will be involved to ensure high study quality. The choice of the teaching staff was made, taking into account their experience, research interests, and scientific performance, which allows us to offer a high-quality study programme.

4.2. RTU applies systemic criteria for admission of the teaching staff - doctoral or master's degree in the field of a study course and/or work experience in the specific programme-related field. Analysis of the Self-assessment documents and Annexes revealed that all staff possesses the required qualification and experiences depending on their research activities and modules, i.e all teaching staff involved in the study programme comply with the conditions of the study programme implementation and the requirements of the laws and regulations and enables of the achievement of the aims and learning outcomes of the programme and related study courses. RTU's elected teaching staff, visiting teaching staff, and leading industry specialists are involved in the implementation of the Master's study programme "Environmental Engineering".

The teaching staff of the Master's study programme "Environmental Engineering" participate on a regular basis in the upskilling activities organized by the RTU Trade Union Organisation, the Student Parliament, the Study Department, as well as RTU IESE organizes its own upskilling activities for its employees.

All lecturers involved in the implementation of the study programme are directly or indirectly related to any of the environmental sciences, engineering sciences, or other logically related research areas.

All participating teachers have an English language level of at least B2 according to self-assessment using the Common European Framework of Reference for Languages (CEFR). Candidates for the professor's position set in regulatory enactments.

The academic staff involved in the implementation does international level scientific research, improving own qualification and performing scientific research activities. The academic staff has the opportunity to supplement their professional knowledge and obtain valuable experience in a foreign higher education institution (using Erasmus, COST, or project mobility opportunities), which is in harmony with the development strategy of the European Higher Education Area, as well as through traineeship in companies.

The RTU IESE academic staff involved in the implementation of the Master's study programme "Environmental Engineering" is highly qualified and has extensive scientific experience: in 2015-2020, the teaching staff involved in the implementation of the RTU academic Master's study programme "Environmental Engineering" published 466 SCOPUS indexed scientific publications, which were cited 2750 times. The teaching staff published SCOPUS-indexed articles in 2015-2020 and made a contribution to the development of fields of science in the following fields of science: Engineering (7.6 %), Environmental science (21.3 %), Energy (52.2 %), Agriculture, and biology (5.5 %), business and management (2.2 %) and other sectors (11.2 %). The Figure below shows the breakdown of publications by research areas (188 areas in total).

Annual cooperation for the attraction of visiting teaching staff in the implementation of the study programme has been established between RTU IESE and Vilnius Gediminas Technical University (Lithuania).

In general, the qualification of teaching staff involved in the implementation of the study programme fully corresponds to the conditions of implementation of the study programme and the requirements of regulatory enactments, as well as ensures the achievement of aims and learning outcomes of the study programme.

4.3. RTU IESE research directions mainly focus on environmental protection, environmental and climate technologies, and energy. Research areas of RTU IESE staff are energy change modeling, renewable energy sources, sustainable use of resources, biotechnologies, infrastructure resilience to disasters and risk analysis, energy efficiency, bio-economy, fuel technology, energy, and environmental policy, environmental management. The research results and conclusions are integrated into the study process in different forms - books, laboratory tasks, practical examples. The research and study process is organized in a way that study and research work topics of the students would include actual environmental protection issues.

In the study programme, students obtain skills in research work analyzing literature, different scientific databases and internet resources, work in the laboratories. The results became the basis for study papers and the Bachelor's thesis. Also, the students present the results of their research at student conferences.

RTU IESE staff actively work in industry research. Research results and achievements are confirmed by participation in international conferences and acknowledgment of achievements.

RTU IESE not only participates in scientific conferences but also organizes them. In the reporting period, the research results of the academic staff of the department were converted into 368 scientific publications.

4.4. During the teaching process, the regular meetings of the teachers are arranged to exchange experience on the topics of the course, improve the content by mutually agreeing on the topics, focuses, responsibilities, and compliance with regulatory requirements. All teachers are involved in the process of the course coordination, thus ensuring that the topics covered in the study programme are constantly improved and updated in cooperation with the professionals of the relevant field.

The Master's study programme "Environmental Engineering" has been created with two specializations - Environmental Engineering and Circular Bioeconomy. Study courses and their development and implementation were also planned considering the thematic belonging of the specializations.

The cooperation of teachers in ensuring the interconnection of study courses is based on an understanding of the thematic structure of the study programme. Mechanisms for promoting collaboration are selected based on the individual workload of the academic staff members, the thematic relationship (coherence, continuity, complementarity) of the study courses, and the experience of the teachers.

The student to teaching staff ratio is 1 teaching staff member per 4.5 students (in the 1st and 2nd years of studies together).

### **Conclusions by specifying the strengths and weaknesses**

The qualification of teaching staff involved in the implementation of the study programme fully corresponds to the conditions of implementation of the study programme and the requirements of regulatory enactments, as well as ensures the achievement of aims and learning outcomes of the study programme and respective study courses.

The academic staff members of the study programme, both at the national and international level, are engaged in scientific research in the field of quality management and conformity assessment, and the acquired information and experience are integrated into the study process.

The strengths:

1. highly experienced and research-active staff;
2. implementation of national and international research projects;
3. annually organized research conference.

The weaknesses:

Not identified.

## **5. Assessment of the Compliance of the Study Programme "Environmental Engineering"**

### **Requirements**

1. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure by which state-recognised documents of higher education are issued.

**Assessment of compliance:** Fully compliant

The sample of the diploma provided as annex complies with regulation of Cabinet of Ministers Nb 202. (19.04.2013.) "Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus"

- 2 2. Documents confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued.

**Assessment of compliance:** Fully compliant

Agreement between Riga Technical University and University of Latvia has been signed on October 15th, 2019, providing students possibility to continue education at another accredited higher education institution

- 3 3. Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme.

**Assessment of compliance:** Fully compliant

Document Nb. 01000-2-2-1-e\_178.edoc added, confirming compensation for losses

- 4 4. The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of an official language.

- 5 5. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of a foreign language. According to the self-report, 58% of staff have a foreign language level of B2 and 42% of C1.

- 6 6. At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts.

**Assessment of compliance:** Not relevant

Not relevant as this is a master programme

- 7 7. The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of elected professors (10) and associated professors (8) is larger than five

- 8 8. The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

**Assessment of compliance:** Fully compliant

Samples of the study agreements provides as annexes to the self-report complies with the legal requirements and includes all the mandatory fields

- 9 9. The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 56.1, Paragraph two and Section 56.2, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

All study course descriptions are prepared in Latvian and English language. Course descriptions comply with requirements of Law on Institutions of Higher Education. There is information on course goals and objectives, competencies and skills, course content, learning outcomes, tasks of independent studies and recommended literature. Small inadequacy is a different form of writing the same parts by different course authors.

- 10 10. The study programme complies with the valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided that the completion of the study programme leads to a professional qualification.

**Assessment of compliance:** Not relevant

This is an academic study programme

- 11 11. Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of students is less than 250 and opinion of the Council for Higher Education has been received and added as annex (document Nb. 1.10/69, November 7th, 2019.)

- 12 12. The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard.

**Assessment of compliance:** Fully compliant

The title, duration, achievable results for the study programme complies with the State Academic Education Standard. The length of the programme is two years, 80 CP of which 20 CP is a master thesis. The programme has all necessary course groups (compulsory courses 36 CP, elective courses 20 CP, optional courses 4 CP). Courses on environmental protection and civil protection should be acquired by students additionally if they have not taken those courses as bachelor students.

- 13 13. The joint study programmes comply with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Institutions of Higher Education (if applicable).

**Assessment of compliance:** Not relevant

This is not joint programme

14 14. Each member of the academic staff has either publications published in reviewed editions within the last six years, including international editions (if they have worked for a shorter period of time, the number of publications shall be in proportion to the work period), or artistic creation achievements (for instance, exhibitions, films, theatre performances, and concert activity), or a five-year practical work experience (except for the experience in the implementation of the study programme) in accordance with the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Each member of the academic staff has scientific publications that are published during the last six years.

15 R5 - Overall rating

**Assessment of compliance:** Fully compliant

Study programme complies with all the legal requirements set for the academic master programmes.

### **Requirements (R6-R8)**

1 R6 - The compliance of the study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of the learning outcomes.

**Assessment of compliance:** Fully compliant

The informative provision (libraries, electronic databases), auditoriums, scientific laboratories, and financial resources are appropriate to ensure master studies and to ensure the achievement of the learning outcomes.

2 R7 - The compliance of the qualification of the academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments.

**Assessment of compliance:** Fully compliant

The qualification and scientific activities of the academic staff complies with the legal requirements and correspond to the study programme.

3 R8 - The study programme leading to the master or doctoral degree is based on the advances and findings in the relevant field of science or artistic creation.

**Assessment of compliance:** Fully compliant

The teaching staff have publications, are involved in various projects, and use the latest achievements and conclusions from the projects in the study courses. Master students are also involved in projects and scientific research.

### **Conclusions by specifying the strengths and weaknesses**

The study programme complies with all the requirements for the master programmes.

Strengths:

1. Well structured programme, corresponds to requirements. The content of the programme is broad and interconnected with the labour market;
2. The appropriate teaching methods are used;

3. The programme is supported by quality faculty members;
4. The study programme has all the necessary resources;
5. The academic staff is actively involved in scientific research.

Weaknesses:

1. Master study programme specialization "Circular bioeconomy" include study course VAS020 named Biotechnomy - the term needs to be clarified;
2. A different form of writing the same parts of the course descriptions by different course authors;
3. There is no graduate manual for the master students.

## Evaluation of the study programme "Environmental Engineering"

Evaluation of the study programme:

Excellent

## 6. Recommendations for the Study Programme "Environmental Engineering"

### Short-term recommendations

Clarify in the course description the term "biotechnomy".

Update course descriptions to use unified principles for the same parts of the course descriptions.

### Long-term recommendations

Prepare in written form "guide" for the master students on all requirements, deadlines, needed document forms, etc. during the studies to have one common source of information

## II. "Environmental Engineering" ASSESSMENT

### II. "Environmental Engineering" ASSESSMENT

#### 1. Indicators Describing the Study Programme

##### Analysis

Title of the programme "Doctoral scientific degree level study programme "Environmental Engineering"" was revised as an Indicator according to Legal acts according to Regulations of the Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches and sub-branches Issued in accordance with the Law on Scientific Activity Article 13, second paragraph, point 3.1:

1. The Regulations prescribe the branches and sub-branches of Latvian science;
2. The branches and sub-branches of Latvian science are specified in the Annex to these Regulations.

Latvian science branches and sub-branches Chapter No2. Engineering sciences and technologies include sub-branch 2.7. Environmental engineering and energy, The fields of science include environmental and geological engineering, geotechnics, oil refining engineering (fuels, petroleum products), energy and fuels, remote sensing, mining and quarrying, marine engineering, marine vessels, marine (ocean) engineering.

Doctoral scientific degree LR education classification code (IKK) 51529 and content of the programme were revised as Indicator according to Compliance with Latvian Regulations of the

Cabinet of Ministers No. 322 from 13th of June 2017 Regulations on the classification of education in Latvia Described number corresponds to First classification level (5) "Higher education degree" and Second classification level (51) "Doctoral studies (doctoral degree), to be implemented after obtaining a master's or professional master's degree or as a continuation of the educational programme with code 49. Duration of studies in full-time studies three to four years" According to Latvian Qualifications Framework (LQF), European Qualifications Framework (EQF) proposed program should be described and correspond to Level (8); Knowledge (knowledge and understanding); Skills (ability to use knowledge, communication, general skills); Competence (analysis, synthesis and evaluation).

Doctoral scientific degree programme objectives, tasks, learning outcomes were revised as Indicator according to Latvian Higher Education Law and Higher education councils' statement No1.10/74 from 5th of December 2019 where it was stated:

p.1. For the implementation of the programme, it is planned to attract many training personnel of various levels - starting with assistants (but with experience in international projects such as "Horizon 2020", FP6, FP7, ERA-NET), and ending with professors.

p.2. The programme is of high importance for both regional and national development. The purpose of the programme is to carry out the educational process of a high level, to prepare high-level, highly and widely specialized specialists in the engineering field.

p.3. In other countries of the Baltic region, a similar environmental engineering programme is not being implemented. At Kaunas University (KTU) the doctoral programme focuses on landscape protection, at Vilnius University (VGTU) on environmental protection with focus on water management.

p.4. Integration of the program into other areas in an already existing higher education institution is impossible since this environmental engineering program is interdisciplinary.

p.5. The demand for specialists in this sector of science is growing. Specialists of the "Environmental Engineering" program can professionally use the acquired knowledge and skills (show competence) both in Latvia and on the international market.

p.6. The cost of training one student from the state budget does not exceed the cost of training a student of a similar speciality in the European Union. According to Regulations of the Cabinet of Ministers No.1000 From December 27, 2005, Regulations regarding the delegation of the right to award a doctoral degree (promotion) to higher education institutions. Riga Technical University has the right to award a doctoral degree (promotion) for the period of accreditation of doctoral study to programmes: environmental biotechnology; environmental engineering and energy.

The study programme "Environmental Engineering" (Doctoral Studies) includes Part A Compulsory study courses Doctoral Garage: Analysis and Publication of Scientific Research Results, which is sufficient for related scientific communication starting from the preparation of a scientific paper until paper's acceptance in a peer-reviewed, international, scientific journal. Another course Environmental Assessment is available to give insight into different types of environmental assessment, to introduce students to those methods and to give knowledge on using the different assessment tools. Students also have a choice of Part C as a free option for Environmental Politics. Theoretical Aspects of Climate Technologies; Ecological Aspects of Energy Technology; Modern Environmental Problems. Solutions. Modelling; Solar Energy Systems; Life Cycle Analysis; Biohydrogen. System Analysis practically provides deep knowledge in related topics.

E part Final/state graduation test Research Work is provided to develop Scientific work as the original research work of the author in selected areas that are related to environmental science. The work includes a practical part of the research, which is based on the original methods and technology development. During the elaboration of research work is foreseen that the lecturers'

practice, as well as participating in local and international scientific conferences. If necessary, as additional classes, it is possible for students to acquire specialized study courses offered by RTU, in accordance with the requirements specified in the Law on Environmental Protection and Civil Protection and Disaster Management. During interviews on 21.09.2021 most Doctoral scientific degree level students mentioned that the programme and selection of the courses are essential and needed to have a complete overview on the subject.

### **Conclusions by specifying the strengths and weaknesses**

The programme corresponds to the described field of science including environmental engineering as per Cabinet of Ministers No. 49 From January 23, 2018 Regulations on Latvian science branches. The proposed description of the programme corresponds to Academic education (doctoral scientific degree) and corresponds to legal acts requirements. The description includes LQF and EQF is in accordance with Level (8) description. Classification of education and training sectors as per Classification of education and training sectors (ISCED-F 2013) No 0712. The duration of full-time studies corresponds to legal requirements and is stated to be four years. The proposed description of the programme about skills and competence corresponds to the knowledge, skills and competence level (8). The content of the Doctoral scientific degree study programme ensures for the student to acquire a doctoral scientific degree in the field of environmental engineering and energy science. Programme prepares scientists with internationally competitive higher qualifications for academic and scientific work in universities, research centres, as well as organizational work in public and private institutions. The volume of the Doctoral scientific degree study programme (CP) 192 complies with standards. Study volume for obligatory courses 15 CP, 26 CP for optional study programmes; promotion work 150 CP. Study programme "Environmental Engineering" (Doctoral scientific degree) requirements are interrelated and comply with legal requirements.

Strengths:

1. Well structured study programme corresponds to legal act requirements;
2. The content of the programme provides deep knowledge in related topics;
3. Volume of the Doctoral scientific degree study programme is well planned for students to complete promotion work;
4. The study programme is interconnected with the actual labour market.

Weaknesses:

Not identified.

## **2. The Content of Studies and Implementation Thereof**

### **Analysis**

2.1 RTU Doctoral research programme of study in Environmental Engineering uses four key principles, as these were established by the European University Association as a common understanding of the fundamental principles for doctoral education and PhD.

RTU has designed its doctoral programme to be delivered in four years, which is designed to ensure a sequential development of knowledge skills and competencies based on the scientific work of individuals and groups (doctoral candidates and their leaders).

· 48 credit points (CP) are incorporated into the first year of study. A 6-CP course entitled "Doctoral garage: Analysis and publication of results of scientific research" introduces students to the scientific communication concepts revolving around the publication of scientific work. This course sets the scene for the programme of study, emphasizing the importance of publishing at this level of study. This emphasis is further placed through the requirement that as early as the first year there is

a requirement for preparing and submitting at least one publication, as well as a presentation at an international conference. The first year is concluded with free-choice courses equivalent to 21 CP. Several examples of such courses are detailed in the self-assessment report.

- Another 48 CP are incorporated into the second year of study. This includes the mandatory course of “Environmental Assessment” and another 6-CP free-choice study course. The remaining 33 CP are related to scientific work, as this is reflected by the requirement to prepare and submit two additional publications.

- The third year focuses on scientific work, research, publishing research results, and participation in experience exchange projects. More publications are expected to be prepared by the end of the 3rd year of study.

- The fourth (and final) year concludes with the preparation for submission to the Promotion Board.

The implementation of the study programme is elaborated in the self-assessment report, and it essentially places a strong emphasis on research and publication. This approach is analogous to doctoral programmes in leading universities worldwide.

2.2 The study implementation methods (including evaluation methods) contribute to the achievement of the aims and learning outcomes of the programme of study.

Courses are taught through a variety of approaches, including lectures, seminars and workshops/laboratories. Scientific work entails continuous coordination of a student with their doctoral advisor, as well as a guided road that seeks to produce quality publications. The laboratory facilities available to students are of a high standard and support such scientific work. The publication records of programme graduates (as this is presented in the self-assessment report) is an attestation of the high level of this programme of study.

Students come from varied backgrounds, however, this is not uncommon in doctoral programmes of study worldwide. There seems to be some confusion (that resulted from conflicting information provided during student interviews, administration interviews, and faculty interviews) concerning the mechanisms through which a student who comes from a non-engineering background can cope with the course requirements of the programme of study. However, since there are no strict course requirements for the doctoral programme of study (other than the environmental assessment course), this element should not present any problems.

2.3 The university conducts surveys among students (i.e. annual and doctoral survey of candidates), the results of which feed into the updating of the programme as well as into the improvement of the study process and the content of the course of study. Details of this feedback procedure are provided at length in the self-assessment report.

2.4 Doctoral students are given the opportunity to participate in mobility programs. Outgoing mobility opportunities were used by only 10% of doctoral candidates (between 2015/2016 and 2019/2020). These mobilities were primarily due to the active involvement of doctoral candidates in the implementation of various research projects, including international missions and works abroad. The low outgoing mobility usage may also be attributed to the fact that many doctoral candidates are professionals who maintain full-time work and families, hence cannot afford long periods of time abroad. However, mobility opportunities are not sufficiently exploited by doctoral candidates. More active participation of doctoral candidates in mobility and the development of support instruments for improving this mobility of doctoral candidates should be implemented by the university. Inbound mobility opportunities were not used during the reporting period. However, considering the close cooperation of RTU with several universities abroad the university believes that in the future mobility opportunities will be used more.

## **Conclusions by specifying the strengths and weaknesses**

RTU has created a doctoral programme of study that is no different from many similar programmes of study in leading international universities. This programme of study places a strong emphasis on

research and the publication of scientific results. Scientific work is well supported by faculty members and by well-equipped laboratories. The positive outlook of this programme of study is attested by the good publication records of certain doctoral students (as these were presented in detail in the self-assessment report).

Strengths:

1. A strong emphasis on scientific research and publications;
2. Good coordination and guidance of candidates by the program director and their scientific advisors;
3. A clear set of guidelines set for graduation;
4. The programme is supported by quality faculty members, as well as good facilities and laboratories.

Weaknesses:

1. Absence of a graduate manual forces students to rely on oral guidance on important elements of their studies.

### **3. Resources and Provision of the Study Programme**

#### **Analysis**

3.1. The study provision, scientific support, informative provision (including libraries), material and technical provision, and financial provision comply with the specific features and the conditions for the implementation of the study programme, create the prerequisites for the achievement of the learning outcomes, and indicate the possibility to ensure a high-quality study process also in the future.

The source of funding for the doctoral programme "Environmental Engineering" is both the resources of the state budget and the fees of physical individuals for studies. The number of budget places in the doctoral program is governed by annual agreements between RTU and MESRL, so the number of places allocated to the program varies by year.

According to SAR p. 231- 233. and onsite meeting, the tuition fee for the Doctoral programme "Environmental Engineering" in the new 2021./2022. the study year is 9350 EUR. The tuition fee is the same as studying in Latvian or English. In the academic year of 2019/2020, all students were provided state budget places in the amount of 300 000 EUR. The resources available for the implementation of the study programme are successfully complemented by research budgets, thereby ensuring that the results presented in the study programme are achieved at present and in the long term.

The study base for students in doctoral programmes, as well as teachers and employees, is primarily available in an electronic study environment ORTUS. The system is a comprehensive system of common identity and application. The portal provides an e-study environment, a career section, a virtual class and session plan system, a system of support for scientific activities, information for employees, a legislative base and a project management system. Extensive information resources are available to ORTUS students and teaching staff, including library resources, which are constantly being restored.

In 2014, RTU created a separate room for doctoral students - The doctoral garage. It is a room where students, teachers, dissertation job leaders can come together and carry out scientific discussions, studies.

Doctoral students have the access to 5 laboratories located within the faculty - Environmental

Monitoring Laboratory (for solid energy source (including biofuel) testing services - ash content, moisture content, thermal heat capacity (higher and lower) and other services); Biosystem Laboratory (study of algae as a resource, production and study of innovative materials, study of biogas, the study of electrolysis and methanation processes), Combustion Research Laboratory (optimisation of the combustion process), Solar Energy Systems Laboratory (simulate and develop solar heat systems. Studies performed in the laboratory are related to studies of solar collectors; study of heat storage systems and their control systems; modelling and improvement of systems using modelling programmes; study of phase change materials) or Building Energy Efficiency Laboratory (studies both the quality of construction materials and rooms and the possibilities to improve their energy efficiency), but not only. In case of research for their thesis or any other needed research, students can use laboratories in other RSU faculties which are not available on their own premises. Doctoral candidates for the “Environmental Engineering” study programme may carry out their research in one of the 5 laboratories as well.

RTU Research Department manages the Research Support Fund, which provides support for research activities, provides the maintenance and availability of research infrastructure and provides financial support for the publication of Open Access Journals and RTU scientific newspapers in open access.

International databases are available for students in the RTU ORTUS environment: Web of Science, EBSCO, SCOPUS, SCIENCE DIRECT, SpringerLink full-text journals and books, multiple databases and other informative resources. Students shall be provided with the literature required for specialisation by a profiled department. The library which includes around 400 books in the field of environmental engineering, including thesis works and summaries thereof in the field of environmental engineering and energy sciences, as well as the methodological materials “Protection of the Environment”, is available for use by students of “Environmental Protection” field of study of “Environmental Engineering” study programme.

3.2. The study provision and the scientific support, including the resources provided within the cooperation with other scientific institutions and institutions of higher education, comply with the requirements for the implementation of the doctoral study programme, create the prerequisites for the achievement of learning and research outcomes, and indicate the possibility to ensure a high-quality study process also in the future.

Major cooperation partners for the realisation of a doctoral program between Latvian universities is The University of Latvia, Latvia University of Life Sciences and Technologies. The most important partners for the realisation of the doctoral program between foreign universities are the University of Alto (Finland), Bergen University (Norway), the Danish Technical University (Denmark), Tallinn University of Technology (TalTech), Estonia, KTH (KTH Royal Institute of Technology, Sweden). All collaborative universities share scientific and informative resources, exchange of knowledge and experience, summer schools, intensive study programmes, doctoral and teaching traineeships, project implementation, joint publication.

Doctoral candidates are involved in research projects. According to students, they feel like acquiring skills through modern research methods, performing high-quality scientific research and are provided with necessary assistance and advice on climate and environmental technologies, as well as energy supply systems. Additional skills are gained through the development of promotion work, practical and laboratory work, which is carried out in close cooperation with other institutions and businesses.

## **Conclusions by specifying the strengths and weaknesses**

Overall, the resource base for the use of academic staff and students complies with all the requirements of the implementation of the study programme. Students have access to various laboratories for research activities and practical tasks. Both academic staff and students have all the necessary resources for a successful study process that meaning all the needed materials like books and databases for course materials, technical equipment for remote studies and visual material provision in on-site lectures. There is an existing Moodle platform as well as an ORTUS environment that is highly used, needed and appreciated for the study process.

Strengths:

1. Have access to 5 different laboratories and can gain practical skills;
2. Provided all the necessary resources for successful study process;
3. Financial funding has risen and it also helps to invest more of the finances in the resources;
4. All local students have been provided with the possibility to study in state budget places;
5. Easily navigating and accessible ORTUS environment and MOODLE platform for study purposes;
6. Close cooperation with other universities regarding scientific research and studies.

Weaknesses:

Not identified.

#### **4. Teaching Staff**

##### **Analysis**

4.1. RTU IESE scientific and academic staff involved in the implementation of the study programme – 25 science doctors, 20 of whom are experts from the Latvian Council of Science (LCS) in environmental engineering or environmental science and 18 European experts (CORDIS). The main fields of research interests are environmental engineering and energy. The selection criteria of the teaching staff are the experience of scientists, research interests, scientific performance, etc. related to the content and goals of the study programme.

To the study programme the guest lecturers (industry experts, business executives), which hold Ph.D. degrees are invited to lead practical or laboratory work.

The teaching staff of the study programme “Environmental Engineering” is mostly the same teaching staff who participated in the implementation of the study programme “Environmental Science” that is discontinued. Activities are taken regularly in the “Environmental Engineering” study programme in order to have a positive impact on the quality of the implementation of the study programme and to ensure that the study programme complies with the requirements specified in regulatory enactments. However, due to the tendency of the older generation is the majority it is highly recommended to invest in the academic and research staff attraction activities, including involvement of young researchers in research projects; increase the amount of RTU doctoral and post-doctoral grants.

The specific attention should be given to the involvement of doctoral students in academic work at RTU, employment of foreign academic staff at RTU, improvement of the competence of existing academic staff, including traineeships of academic staff with an undertaking, teaching of business English to academic staff and specialized training for academic staff. Also, efforts to attract foreign lecturers and researchers' research mobility and joint research projects should be widely considered and supported.

4.2. As one of the essential indicators for the high-quality survey of RTU IESE, the high number of publications could be indicated during the reference period, e.g. 2012-2014. Compared to other FEEE institutes, the Institute of Energy Systems and Environment publishes the biggest amount of

scientific publications annually, demonstrating that the teaching staff at the Institute are highly qualified and will be able to provide strong support for the new doctoral candidates under the Environmental Engineering study programme.

The academic staff involved in the study programme performs scientific research at the international level, raise their qualifications and gain research experience, which consequentially turns into the development and execution of national and international research projects.

The teaching staff has great experience which helps young scientists to develop the capacity to independently raise the idea of research, to plan, structure, and manage large-scale scientific projects in business and the economy, including international.

Since the study programme and the study courses included therein are student-centered, and the diversity of students, their past knowledge, skills, and experience is taken into account and respected, the diversity of doctoral needs and the assessment of studies are based on an overall achievement assessment approach, where the results of the evaluation are designed to give students an insight into the extent to which they are expected, the results of studies, then the feedback of teaching staff and in-depth involvement of each doctoral candidate provide an opportunity to achieve the results of studies.

4.3. Teaching staff of the doctoral programme “Environmental Engineering” carries out regular scientific activities. They include complicated weather conditions, economic situations, and awareness about sustainability. The indicator about the number and citation of scientific publications is applied also.

RTU IESE staff published 61 publications (14.6 % of all the publications published in 2015-2020) which became the top 10 % most cited scientific publications worldwide. The main thematic areas of the journals, in which scientific articles were published, are energy (58.4 %), engineering (6.9 %), environmental science (21.9 %), and agricultural sciences and biology (3.9 %).

For the period 2015-2020, in total 417 publications of the teaching staff of the RTU doctoral programme were published and SCOPUS-indexed, of which 297 in Open Access publications. It should be noted that these publications of teaching staff included in the doctoral program have been quoted 402 times.

Other important issues are:

- Keeping and motivating human resources, improving corporate culture (including increase the number of international staff);
- Development of the research ecosystem, renewal of software and hardware.

4.4. RTU IESE teaching staff participate in a variety of scientific research projects at both local and international levels.

Currently, RTU IESE teachers act as project managers in 23 International research projects, which a budget ranges from 27.000 up to 385.000 EUR. Managers of the above-mentioned projects have a doctoral scientific degree and experience in managing international scientific projects.

4.5. The academic staff of the study programme is involved in the research activities at the national and international levels. The experience they gained was integrated into the study process and in the development of new academic and scientific projects.

The added value is the fact, that the staff actively participates in academic exchange and mobility programs. Also, RTU IESE researchers actively participate in the international conferences as the presenters and organizers and involve in these activities PhD students as well.

4.6. The study programme is designed seeking to ensure continuous development of knowledge,

skills, and competencies based on individual and group work, continuous communication between doctoral candidates and their leaders.

There is a system in the study programme, which ensures cooperation between teaching staff and contributes to the development and interlinking of study courses by organizing teaching staff seminars and discussions on the results of studies and the basic principles for quality assurance. The development of study courses takes place on a regular basis. The following measures used to improve the content and quality of the study programme, as well as to ensure mutual cooperation between teaching staff, the exchange of experience and information related to study work:

- Teacher meetings (not less than 1 in semester);
- meetings of the Scientific Commission (not less than 1 time in 2 months);
- meetings of the Board of Promotion (if necessary but less than 4 times a year);
- within the framework of the Doctors' Certification Unit (each week, when the teachers change - average for one teaching member 2 x semester) and the faculty;
- Scientific conference (once a year);
- Seminars, conferences, think tanks, etc.

The number of students in the last 3 academic years of the study programme "Environmental Science" was the following (2016/2017) - 61 (all courses together), (2017/2018) - 64 (all courses together), and (2018/2019) - 62, which means that there are an average of almost 3 students per teacher. All students from previous study programme will have the possibility to continue studies in the study programme "Environmental Engineering".

## **Conclusions by specifying the strengths and weaknesses**

The doctoral study programme "Environmental engineering" is the logical continuation of bachelor and Master programmes in the field and will ensure the potential of research and academic staff in RTU.

The qualification of teaching staff involved in the implementation of the study programme fully corresponds to the conditions of implementation of the study programme and the requirements of regulatory enactments, as well as ensures the achievement of aims and learning outcomes of the study programme and respective study courses.

The academic staff members of the study programme, both at the national and international level, are engaged in scientific research in the field of quality management and conformity assessment, and the acquired information and experience are integrated into the study process.

The strengths:

1. highly experienced and research-active staff;
2. implementation of national and international research projects;
3. annually organized research conference.

The weaknesses:

Not identified.

## **5. Assessment of the Compliance of the Study Programme "Environmental Engineering"**

### **Requirements**

1. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure by which state-recognised documents of higher education are issued.

**Assessment of compliance:** Fully compliant

The sample of the diploma provided as annex complies with regulation of Cabinet of Ministers Nb 202. (19.04.2013.) "Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinājošus dokumentus"

- 2 2. Documents confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued.

**Assessment of compliance:** Fully compliant

Agreement between Riga Technical University and University of Latvia has been signed on October 15th, 2019, providing students possibility to continue education at another accredited higher education institution

- 3 3. Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme.

**Assessment of compliance:** Fully compliant

Document Nb. 01000-2-2-1-e\_178.edoc added, confirming compensation for losses

- 4 4. The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of an official language.

- 5 5. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language.

**Assessment of compliance:** Fully compliant

The letter of the vice-rector of RTU to foundation "Academic Information Centre" (Nb. 02000-2.2.1-e/22, 15.02.2021) confirms that all teaching staff have at least B2-level knowledge of a foreign language. According to the self-report, 60% of staff have a foreign language level of B2 and 40% of C1.

- 6 6. At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts.

**Assessment of compliance:** Fully compliant

According to self-report and CV information, all of the 25 members of the teaching staff have doctoral degrees. At least three of them are experts approved by the Latvian Science Council

- 7 7. The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of elected professors is nine and the number of associated professors is four.

- 8 8. The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

**Assessment of compliance:** Fully compliant

Samples of the study agreements provides as annexes to the self-report complies with the legal requirements and includes all the mandatory fields

- 9 9. The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 56.1, Paragraph two and Section 56.2, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

All study course descriptions are prepared in Latvian and English language. Course descriptions comply with requirements of Law on Institutions of Higher Education. There is information on course goals and objectives, competencies and skills, course content, learning outcomes, tasks of independent studies and recommended literature. Small inadequacy is a different form of writing the same parts by different course authors.

- 10 10. The study programme complies with the valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided that the completion of the study programme leads to a professional qualification.

**Assessment of compliance:** Not relevant

This is an academic study programme

- 11 11. Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Number of students is less than 250 and opinion of the Council for Higher Education has been received and added as annex (document Nr. 1.10/74, December 5th, 2019.)

- 12 12. The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard.

**Assessment of compliance:** Not relevant

- 13 13. The joint study programmes comply with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Institutions of Higher Education (if applicable).

**Assessment of compliance:** Not relevant

This is not joint programme

14 14. Each member of the academic staff has either publications published in reviewed editions within the last six years, including international editions (if they have worked for a shorter period of time, the number of publications shall be in proportion to the work period), or artistic creation achievements (for instance, exhibitions, films, theatre performances, and concert activity), or a five-year practical work experience (except for the experience in the implementation of the study programme) in accordance with the Law on Institutions of Higher Education.

**Assessment of compliance:** Fully compliant

Each member of the academic staff has scientific publications that are published during the last six years.

15 R5 - Overall rating

**Assessment of compliance:** Fully compliant

The study programme complies with all the legal requirements set for PhD programmes

### **Requirements (R6-R8)**

1 R6 - The compliance of the study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of the learning outcomes.

**Assessment of compliance:** Fully compliant

The informative provision (libraries, electronic databases), auditoriums, scientific laboratories, and financial resources are appropriate to ensure PhD studies and to ensure the achievement of the learning outcomes.

2 R7 - The compliance of the qualification of the academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments.

**Assessment of compliance:** Fully compliant

The qualification and scientific activities of the academic staff complies with the legal requirements and correspond to the study programme.

3 R8 - The study programme leading to the master or doctoral degree is based on the advances and findings in the relevant field of science or artistic creation.

**Assessment of compliance:** Fully compliant

The teaching staff have publications, are involved in various projects, and use the latest achievements and conclusions from the projects in the study courses. PhD students are also involved in projects and scientific research.

### **Conclusions by specifying the strengths and weaknesses**

The study programme complies with all the requirements for the doctoral programmes.

Strengths:

1. The programme is well structured and corresponds to legal act requirements;
2. The content of the programme provides knowledge in related topics, it is interconnected with the labour market. There is a strong emphasis on scientific research and publications;
3. The study programme has all the necessary resources;

4. The academic staff is actively involved in scientific research.

Weaknesses:

1. A different form of writing the same parts of the course descriptions by different course authors;
2. Absence of a graduate manual forces students to rely on oral guidance on important elements of their studies.

### Evaluation of the study programme "Environmental Engineering"

Evaluation of the study programme:

Excellent

### 6. Recommendations for the Study Programme "Environmental Engineering"

#### Short-term recommendations

Update course descriptions to use unified principles for the same parts of the course descriptions.

#### Long-term recommendations

Divide study course EAS009 "Research work" into smaller parts (courses) according to study plan (for example, separate courses for each semester), to provide better guidance on achievable results in each step.

Prepare in written form "guide" for the PhD students on all requirements, deadlines, needed document forms, etc. during the studies to have one common source of information.

## III. Assessment of the Requirements for the Study Field and the Relevant Study Programmes

### III. Assessment of the Requirements for the Study Field and the Relevant Study Programmes

#### Assessment of the Requirements for the Study Field

Requirements	Requirement Evaluation	Comment
R1 - Pursuant to Section 5, Paragraph 21 of the Law on Institutions of Higher Education, the higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study direction whilst implementing their internal quality assurance systems:	Fully compliant	RTU has implemented a system to ensure continuous improvement and developments of the study field and this system is effectively used.

<b>Requirements</b>	<b>Requirement Evaluation</b>		<b>Comment</b>
R2 - The cooperation with different organisations from Latvia and abroad implemented within the study direction ensures the achievement of the aims of the study direction.	Fully compliant		RTU has agreements with Latvian and foreign institutions, universities, companies on staff and students exchange, and cooperation on ensuring student practice.
R3 - Compliance of scientific research and artistic creation with the development level thereof (if applicable).	Fully compliant		Teaching staff have scientific publications and scientific projects. Results of the research are integrated into study courses. Students are involved in scientific work.
R4 - Elimination of the shortcomings and deficiencies identified during the previous assessment of the study direction, if it has been conducted, or the implementation of the provided recommendations.	Fully compliant		The recommendation for study field has been implemented or justification to not directly implement is given. Work on implementation of recommendations for study programmes has been started and some of them continuously implemented.

#### **Assessment of the Requirements for the Relevant Study Programmes of the Study Field**

<b>No.</b>	<b>Study programme</b>	<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>	<b>Evaluation of the study programme (excellent, good, average, poor)</b>
1	Environmental Engineering (43529)	Fully compliant	Fully compliant	Fully compliant	Not relevant	Good
2	Environmental Engineering (45529)	Fully compliant	Fully compliant	Fully compliant	Fully compliant	Excellent
3	Environmental Engineering (51529)	Fully compliant	Fully compliant	Fully compliant	Fully compliant	Excellent

## The Dissenting Opinions of the Experts

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