

APPLICATION

Study field "Environmental Protection" for assessment

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| Study field | <i>Environmental Protection</i> |
| Title of the higher education institution | <i>Latvijas Lauksaimniecības universitāte</i> |
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Self-evaluation report

Study field "Environmental Protection"

Latvijas Lauksaimniecības universitāte

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1. Information on the Higher Education Institution/College

1.1. Basic information on the higher education institution/ college and its strategic development fields,.

Latvia University of Life Sciences and Technologies (LLU) is one of the four universities of sciences in Latvia (established in 1936 as an independent higher education institution) which implements studies and research for various industries of the national economy and which has developed relevant educational and research competence and expertise in:

- the following unique fields: agriculture, forestry, veterinary medicine, food technology and landscape architecture;
- the following universal fields: information technology, economics and social sciences, agricultural engineering, environmental sciences and civil engineering.

On 18 May 2022, the LLU Council adopted a decision to change the name of the university, and starting from 1 September 2022, its name in Latvian will be “**Latvijas Biozinātņu un tehnoloģiju universitāte**” (LBTU). The 2022/2023 study year is set as a transition period for the new name of the university. All regulatory documents approved by the university's previous name “Latvijas Lauksaimniecības universitāte” are valid at LBTU.

LLU:

Vision - Latvia University of Life Sciences and Technologies is one of the leading science and technology universities of the Baltic Sea region, with a specialisation in the sustainable use of natural resources to improve the life quality of society.

Mission - to build internationally competitive intellectual potential based on excellence in research, application of research results in the national economy, high quality of studies and effective university management.

LLU long-term goals:

1. Excellence in research that promotes technology and innovation and is integrated into the study process.
2. High-quality studies that provide the development of internationally competitive specialists.
3. Effective university management that ensures the targeted and efficient use of resources for high-quality studies and excellence-focused research.

LLU medium-term objectives are subordinated to the vision, the mission and the long-term goals and are as follows:

1. Excellence in research.
2. Application of research results in the national economy (research results are understood to mean the university's knowledge, technology and innovation accumulated and generated).
3. Integration of studies and research.
4. Internationalisation of studies and lifelong education.
5. High quality and competitive studies that meet the current demand.
6. Diversified supply of lifelong education that meets the current demand.
7. Effective university management at all the levels.

The LLU Development Strategy for 2015-2022 (<https://www.llu.lv/index.php/en/mission-and-vision>)

prescribes three action programmes with relevant targets to achieve the long-term goals:

1. Research Programme;
2. Education Programme;
3. Management Programme.

LLU is comprised of the following eight faculties:

1. **LF** – the Faculty of Agriculture (established in 1863);
2. **VMF** – the Faculty of Veterinary Medicine (established in 1919);
3. **MF** – the Forest Faculty (established in 1920);
4. **TF** – the Faculty of Engineering (established in 1944);
5. **VBF** – the Faculty of Environment and Civil Engineering (established in 1947);
6. **PTF** – the Faculty of Food Technology (established in 1948);
7. **ESAF** – the Faculty of Economics and Social Development (established in 1968 as the Faculty of Agricultural Economics; in 2013, the Faculty of Economics merged with the Faculty of Social Sciences);
8. **ITF** – the Faculty of Information Technologies (established in 2001).

Totally, the Faculties of LLU implement 61 study programmes within **15** study directions (as of October 1, 2021).

Number of students and programmes in LLU study directions

B – bachelor programmes; M – master programmes; D – doctoral programmes

| No | Study direction | Number of programmes | | | | Number of students (01/10/2021) | Faculties |
|----|---|----------------------|---|---|---|------------------------------------|-------------|
| | | Total | B | M | D | | |
| 1 | Agriculture, Forestry, Fishery, and Food Hygiene | 10 | 5 | 3 | 2 | 776 | LF, MF,VMF |
| 2 | Veterinary Medicine | 2 | 1 | | 1 | 407 | VMF |
| 3 | Architecture and civil engineering | 9 | 5 | 2 | 2 | 458 | VBF |
| 4 | Production and processing | 8 | 4 | 2 | 2 | 427 | PTF, MF, TF |
| 5 | Information technology, computer engineering, electronics, telecommunications, computer management and computer science | 4 | 2 | 1 | 1 | 314 | ITF |
| 6 | Environmental protection | 3 | 1 | 1 | 1 | 97 | VBF |
| 7 | Health care – a joint programme with LU and RSU | 1 | | 1 | | 21 | PTF |

| No | Study direction | Number of programmes | | | | Number of students (01/10/2021) | Faculties |
|----|--|----------------------|-----------|-----------|-----------|------------------------------------|-----------|
| | | Total | B | M | D | | |
| 8 | Mechanics and metal working, heat power engineering, heat engineering and mechanical engineering | 6 | 4 | 1 | 1 | 221 | TF |
| 9 | Power industry, electrical engineering and electrical technologies | 1 | 1 | | | 80 | TF |
| 10 | Sociology, Political Science, and Anthropology | 2 | 1 | 1 | | 70 | ESAF |
| 11 | Economics | 3 | 1 | 1 | 1 | 373 | ESAF |
| 12 | Management, administration and real estate management | 5 | 2 | 3 | | 298 | ESAF |
| 13 | Hotel and restaurant service, tourism and recreation organisation | 1 | 1 | | | 137 | PTF |
| 14 | Internal security and civil defence | 1 | | 1 | | 52 | MF |
| 15 | Education, pedagogy and sports - the direction to be closed in 2023 | 5 | 2 | 2 | 1 | 102 | TF |
| | Total | 61 | 30 | 17 | 12 | 3 833 | |

LLU personnel, job position and age group statistics (as of October 1, 2021)

| | Total | incl. women |
|---|------------|-------------|
| University personnel | 998 | 673 |
| incl. academic staff members who have been elected at LLU | 301 | 190 |
| professors | 58 | 34 |
| associate professors | 55 | 37 |
| assistant professors | 62 | 45 |
| lecturers | 39 | 30 |
| assistants | 0 | 0 |

| | | |
|--|------------|------------|
| leading researchers and researchers | 87 | 44 |
| Academic staff members – professors, associate professors, assistant professors, lecturers or assistants – who are also elected as leading researchers and researchers | 154 | 104 |
| Other personnel | 697 | 484 |
| Academic staff who have not been elected at LLU (visiting professors, visiting assistant professors, visiting lecturers) | 287 | 173 |
| of which foreign visiting professors, visiting assistant professors, visiting lecturers | 6 | 1 |
| Distribution of <i>academic staff members</i> by age: | | |
| under 25 years | 0 | 0 |
| 25-29 years | 5 | 3 |
| 30-34 years | 16 | 9 |
| 35-39 years | 46 | 26 |
| 40-44 years | 43 | 27 |
| 45-49 years | 44 | 33 |
| 50-54 years | 34 | 27 |
| 55-59 years | 29 | 20 |
| 60-64 years | 38 | 25 |
| 65 years and over | 46 | 20 |

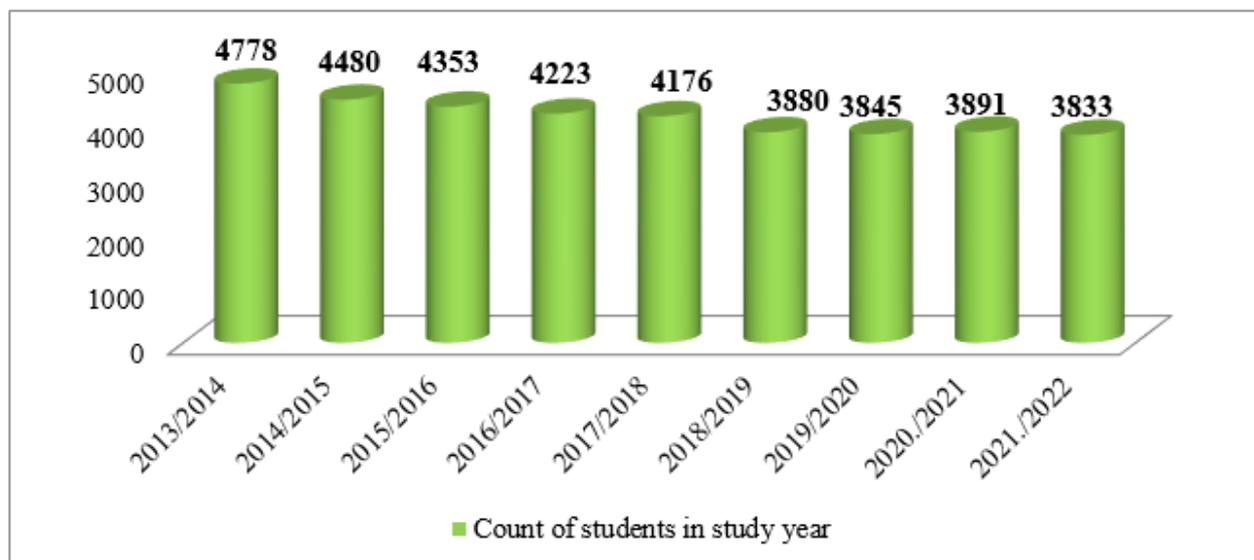
222 members of the total academic staff have a scientific degree (73.8%).

LLU promotes and supports the engagement of young teaching staff in academic work. Of the current academic staff, 51% are less than 50 years old, 34% are from 50 to 65 years old and only 15% are over 65 years old.

Changes in the number of students at LLU in the period 2013-2020 (October 1 of each year)

In the period from the academic year 2013/2014 to the academic year 2020/2021, the total number of students accounted for more than 4,000. The decrease in the number of students over the six-year period reflects overall negative demographic trends concerning natural increase of population and migration. The total number of students at LLU decreased by 13% over the six-year period, yet a positive fact is that the number of students tends to remain stable in last years. Overall, the total number of students was affected by the processes occurring in the country: 1) the number of individuals who finished the secondary school decreased by 20% in the reference period; 2) the number of individuals who finished their secondary school and continued their education at

university was very volatile from year to year: a 5% decrease in 2015 and 2017 and a 1-2% increase in 2014 and 2018. Currently (in 2021), the number of students has levelled off, and there has even been a slight increase or very minimal decrease in the total number of students studying at LLU compared with the previous year.



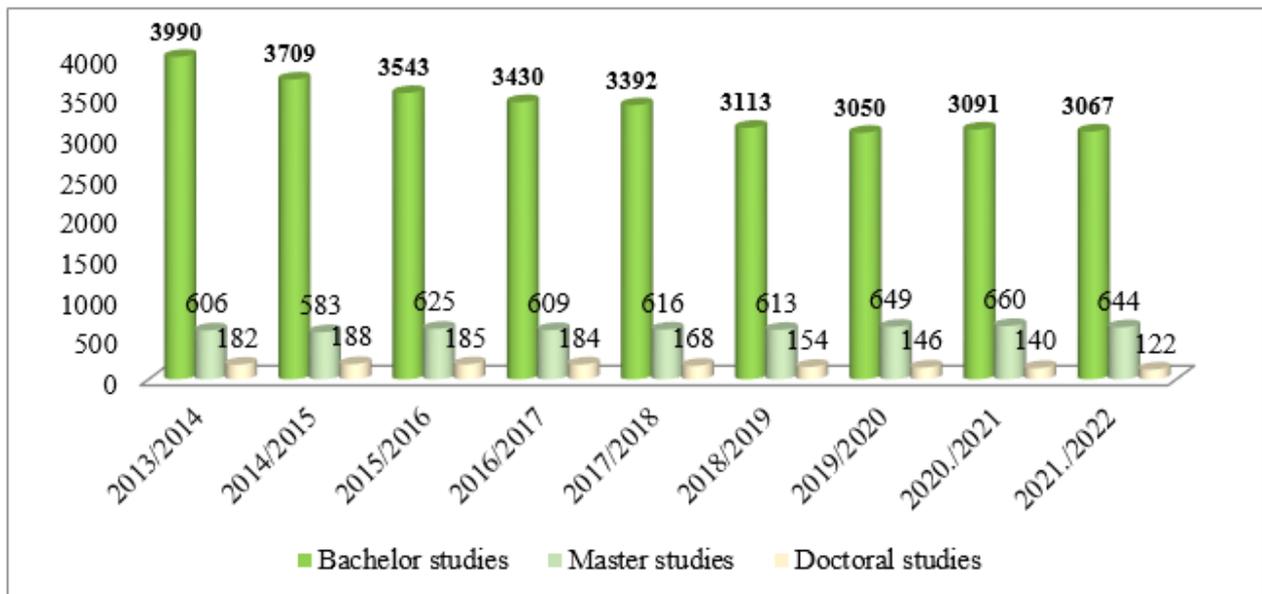
After the university had succeeded in tackling with the external factors affecting the number of students, a number of reasons for the decrease in the number of students were established; the reasons were identified from the analysis of the matriculation of students.

The major reasons are as follows:

1. There was a considerable increase in the amount of students who discontinued their studies during the first semesters owing to the wrong study programme or study direction chosen, their jobs, due to the limitations of COVID-19 or private life problems;
2. Some students could not continue their studies because of financial problems or due to the schedule requirements (especially working part-time students), since they could not combine studies with their working hours;
3. Master's degree students were unable to combine studies with their jobs;
4. Interest in doctoral studies tended to decrease because financial support for doctoral students was insufficient (a monthly scholarship determined by the state was EUR 113.83, since January, 2022 - EUR 140), and the availability of funding for research was limited.

The distribution of the number of students by level of studies at LLU in the reference period was as follows:

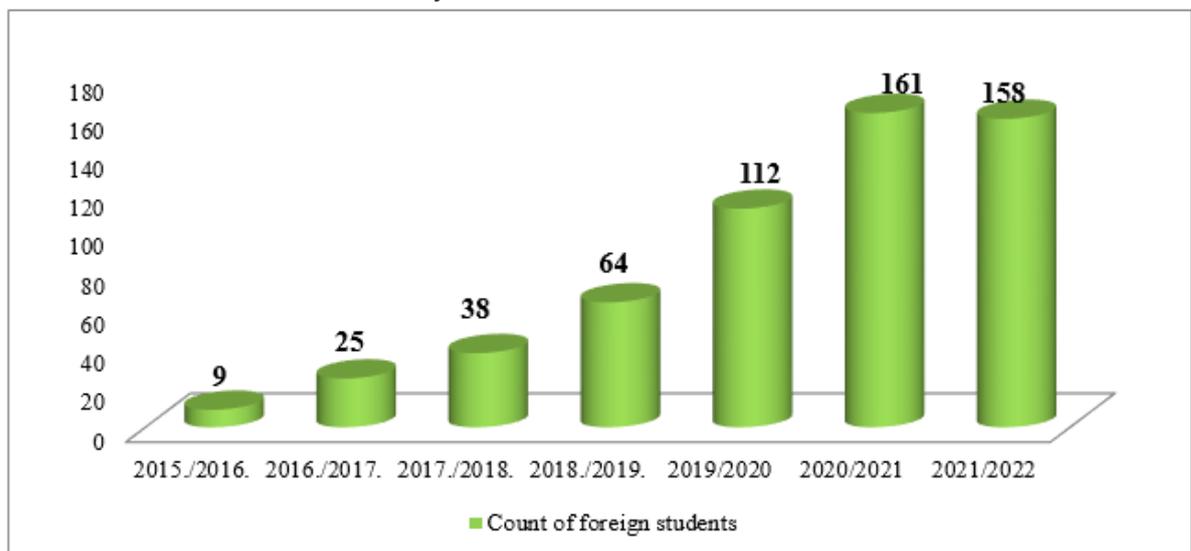
1. Bachelor's degree studies: 79-84%;
2. Master's degree studies: 13-17%;
3. Doctoral studies: 3-4%.



The analysis of changes in the number of students distributed by level of studies allows concluding that the numbers of undergraduate and doctoral students were the most volatile (a negative trend). The decrease in the number of undergraduate students could be rationally explained as follows: over the six-year period, several study programmes were consolidated, the regional affiliates of LLU were closed, the decrease in numbers of part-time students was observed in particular. The decrease in the number of doctoral students could be explained by the insufficient amount of funding allocated to science and research as well as the fragmented nature of that funding.

Main activities implemented by LLU to increase its number of students:

1. In the academic year 2015/2016, LLU began admitting international students for studying in English. Thus 158 international students studied at LLU in 11 study programmes (at all the levels of studies) in the academic year 2021/2022.



2. Students are given an opportunity to acquire a bachelor's degree of social sciences in sociology in the form of e-studies.
3. As regards the conventional study process, teaching staff members use the Moodle online system intensively as a support tool for e-studies (learning materials, multiple choice tests, tests, homework etc.).
4. Infrastructure for studies and research has been improved and modernised.
5. Opportunities to receive scholarships funded by patrons tend to increase.
6. LLU provides doctoral students with internal research grants.

Research activities and motivation measures for the academic staff are defined in the LLU Development Strategy, the relevant targets set have to be achieved by the Faculties, administrative centres and scientific institutes and laboratories. Each organisational unit of LLU approves these plans for an annual period. The decision-making bodies of the organisational units have to approve the targets set and the procedure to achieve the targets. Each organisational unit collegially reports on the progress to the LLU Rectorate.

1.2. Description of the management structure of the higher education institution/ college, the main institutions involved in the decision-making process, their composition (percentage depending on the position, for instance, the academic staff, administrative staff members, students), and the powers of these institutions.

The following key (collegial) institutions are involved in making **strategic decisions** at LLU:

The **Council** is a supreme collegial representation, management and decision-making body authorised by the personnel of LLU.

The **Council**:

- approves and amends the Constitution of LLU;
- elects and dismisses the members of the Senate of LLU;
- elects the rector of LLU;
- may encourage the removal of the Rector;
- elects the Academic Arbitration Court of LLU and dismisses its members;
- listens to the annual report on the activities of LLU prepared by the Rector;

The Council is composed of 200 members who are elected by the organisational units of LLU by secret ballot for three-year terms in the following composition:

- academic staff - 140;
- students - 40;
- other personnel - 20.

The Council functions in accordance with its Statute <https://www.llu.lv/lv/konvents> (only in Latvian).

LLU Supervisory Board is a collegial highest decision-making institution of LLU. The LLU Supervisory Board is responsible for the sustainable development, strategic and financial supervision of LLU, as well as ensures the operation of LLU in accordance with the goals set in the LLU strategy, protects the autonomy of LLU, as well as respects the academic freedom of academic staff and students and promotes its implementation.

The LLU Supervisory Board consists of 11 members (<https://www.llu.lv/lv/llu-padome>) (only in Latvian), of whom:

- five are nominated by the Senate;
- one is an outstanding representative of the academic environment not related to the activities of LLU and is nominated by the President;
- five are representatives of the public in accordance with the procedures specified by the Cabinet, and shall be appointed by the Ministry of Agriculture and nominated by the Cabinet.

The main responsibilities of the LLU Supervisory Board are:

- approves the Constitution of LLU and its amendments;
- approves the development strategy of LLU and monitors the progress of its implementation;
- approves the budget and financial plan of LLU;
- monitors the operation of the internal control and risk management systems, reviews their adequacy and effectiveness;
- upon the proposal of the Rector, decides on:
 - LLU structure,
 - LLU staff remuneration policy,
 - Adoption of LLU real estate development plan.
- nominates candidates for the post of Rector for the election of the Rector to the Council;
- determines the duties and remuneration of the Rector, evaluates the work of the Rector.

LLU Supervisory Board functions in accordance with its Statute.

The Senate is a collegial higher academic decision-making institution of LLU, which is responsible for the excellence, development and compliance of the education and research of LLU with internationally recognised quality standards. The Senate determines the areas of academic and scientific activity of LLU.

The Senate is approved by the Council for a period of three years. The Senate consists of 50 senators, of which:

- 38 are representatives of academic staff who represent all the Faculties (75%);
- 10 representatives of students who have been nominated by the Student Self-government (20%);
- the Rector of LLU;
- 1 other personnel.

The Senate functions in accordance with its Statute <https://www.llu.lv/lv/senats> (only in Latvian)

Regulations, decisions and procedures in relation to the matters pertaining to the basic activity of LLU are also passed, within the scope of competence, by:

1. Rector;
2. Vice-Rectors for studies and science;
3. Chancellor;
4. Director;
5. Deans of the Faculties.

Annex 1 - List of main internal documents of LLU.

Annex 2 - LLU Management Structure.

1.3. Description of the mechanism for the implementation of the quality policy and the procedures for the assurance of the quality of higher education. Description of the stakeholders involved in the development and improvement of the quality assurance system and their role in these processes.

Quality management system at the University

The quality management of study processes is part of the overall quality management system of LLU. Since 2016, the quality management system of LLU has been based on the international standards for excellence (see Investors in Excellence Standard, www.investorsinexcellence.com).

The quality management system of LLU is externally audited every two years (audits may be done by the organisations recognised by the Investors in Excellence organisation, which either grant or do not grant an Investors in Excellence certificate to the organisation audited). Such a certificate was granted to LLU both in 2016 (the first audit) and in 2018, 2020 (the repeated audit). The audit takes place every 2 years. The next audit will be at the end of 2022.

The quality management system of LLU is part of the overall LLU Development Strategy and covers a broad spectrum of matters. A short general description of the LLU Quality Management System and the Quality Assurance Plan is available at <https://www.llu.lv/index.php/en/mission-and-vision>

Quality management system in the context of studies

LLU has developed a detailed joint scheme of study processes that includes 90 major study processes, their sequence and interaction. Each of the 90 processes is described and arranged sequentially. The description contains the following parts: activities; responsible organisational units and employees; reference to the legislative or regulatory framework governing the activities. The detailed joint scheme of study processes provides a common approach to study processes across all the organisational units.

The descriptions of quality of studies at LLU are restricted access documents and are intended for internal use at LLU as well as are part of the management and strategic documents of LLU. The detailed information on the internal quality management system and its effectiveness is contained in Section 2.2 of the self-assessment report where the quality management system is described, assessed and defined in the context of a particular study direction.

The characteristics of stakeholders and their role in the development and improvement of quality assurance system

The quality management system of LLU covers all the spheres of LLU activity. The academic staff and other personnel of LLU are involved in the quality management system. The coordinating body of the quality management system is the Administrative Centre of LLU, which is subordinate to the Rector.

1.4. Fill in the table on the compliance of the internal quality assurance system of the higher education institution/ college with the provisions of Section 5, Paragraph 2(1) of the Law on Higher Education Institutions by providing a justification for the given statement. In addition, it is also possible to refer to the respective chapter of the Self-Assessment Report, where the provided information serves as justification.

| | | |
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| 1. | The higher education institution/ college has established a policy and procedures for assuring the quality of higher education. | Investor in Excellence certificate issued in 2016 Detailed information is provided in Section 1.3 of the report |
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| 2. | <p>A mechanism for the creation 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.</p> | <p>New study programmes are developed in accordance with the Regulation on Study programme Development, Approval and Amendment at LLU (No. 10-5 as of 13 March 2019) approved by the Senate.</p> <p>The Regulation stipulates that:</p> <ol style="list-style-type: none"> 1. A programme shall be developed by a Faculty, discussed by the Methodological Commission of the Faculty and approved by the Board of the Faculty; 2. The programme developed shall be discussed by the Board of Studies and recommended for approval by the Senate; 3. The Senate shall approve the programme and a director for the programme; 4. Relevant documents shall be submitted to the Academic Information Centre for being licensed; 5. New students shall be admitted to LLU and enrolled in the programme after the licence has been granted. <p>Every year, annual reports are drawn up for all study programmes; the reports are approved by the Senate and published on the LLU intranet.</p> |
| 3. | <p>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.</p> | <p>The students' learning outcome assessment system is described in:</p> <ul style="list-style-type: none"> • Regulation of Studies (bachelor's and master's degree studies). • Regulation of Doctoral Studies. <p>Both regulations are available in the section of the report "Other annexes" in the "LLU Documents in English".</p> <p>The requirements for assessing students' learning outcomes for each particular course are given in the descriptions of course study programmes available in Latvian and English in the LLU IS course register at https://lais.llu.lv/pls/pub/kursi.startup?l=1 (language change is possible using a flag at text "Main Menu").</p> |

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| 4. | Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed. | <p>LLU has developed procedures and regulations (approved by the Senate) to guarantee the qualifications and work quality of academic staff:</p> <ol style="list-style-type: none"> 1. The LLU Regulations on Academic Positions (File available in the section of the report "Other annexes" in the "LLU Documents in English"). 2. The Regulation regarding the Calculation of Academic Workload (File available in the section of the report "Other annexes" in the "LLU Documents in English"). 3. The Motivation System for LLU Academic Staff (File available in the section of the report "Other annexes" in the "LLU Documents in English"). 4. Classes for students are scheduled in accordance with the procedures approved by the Rector: classes are scheduled in a centralised way for full-time studies, while for part-time studies it is done by each Faculty. The schedules are publicly available two weeks before the beginning of a semester (for part-time studies - before the beginning of the examination period) - https://www.llu.lv/lv/nodarbibu-grafiki (only in Latvian) |
| 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. | <p>LLU uses an information system (LLU IS) that aggregates information about the entire study process of each student (decisions regarding the student, grades earned, payments made). Every semester, a survey of students is conducted to find out students' opinion regarding the courses taken, satisfaction with the way the courses are organised, the content of the courses, the teaching staff delivering the courses (an electronic questionnaire). The survey results are available to each teaching staff member, directors of study programmes, department/institute directors, deans of the Faculties and the Vice-Rector for studies in LLU IS and LLU intranet.</p> <p>For financial planning and accounting, LLU employs the accounting system Horizont that is a single system connected with the Ministry of Agriculture.</p> <p>The achievement of the goals and targets set by the LLU Development Strategy is reported each year at different levels:</p> <ul style="list-style-type: none"> Faculties - during the dean's office meetings; Administrative units - at the Board of Studies; The Vice-Rectors, the Chancellor and the LLU Director - during the Rectorate meetings; The Rector - during the Council meetings. <p>Annex - screenshots from LLU IS and LLU intranet MansLLU.</p> |

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| 6 | The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems. | Reports of the study directions are produced every year, reviewed by the Board of Studies and approved by the Senate. Once approved, the reports are made public on the LLU website https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi (only in Latvian) |
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2.1. Management of the Study Field

2.1.1. Aims of the study field and their compliance with the scope of activities of the higher education institution/ college, the strategic development fields, as well as the development needs of the society and the national economy. The assessment of the interrelation of the study field and the study programmes included in it.

The significance of the study direction “Environmental Protection” is reflected in the Constitution of Latvia University of Life Sciences and Technologies: “The tasks of Latvia University of Life Sciences and Technologies are to prepare academically educated specialists for the national economy, research, culture, education and public administration in the fields of agriculture, veterinary medicine, forestry and wood processing, food, landscape architecture, social and engineering sciences, as well as in other fields, giving new knowledge and skills to use it in the public interest, to carry out scientific activities and to publish collections of scientific articles, as well as to organise further education and retraining of specialists.” The environmental and water education block, which is closely linked to agriculture, forestry and engineering, plays an important role here. Significantly, study programmes of the environmental protection direction are included in the highest priority group of LLU. The uniqueness of the study direction of environmental protection is defined in the “Development Strategy” of LLU (available here <https://www.llu.lv/en/mission-and-vision>) . Environmental engineering science is mentioned among the specialisation fields and sub-fields of LLU, but in the block of engineering science special emphasis is placed on environmental and water management issues, paying special attention to research areas such as greenhouse gases (GHGs), agricultural runoff, etc. Research in these areas is carried out by implementing the research sections of the study programmes in the direction of environmental protection.

The Faculty of Environment and Civil Engineering of LLU has **accumulated many years of experience** in implementing the study direction “Environmental Protection”. The beginnings of the study direction in Latvia dated back to 1948, when the speciality of Hydromelioration was established at LLU. Since then, about 2.5 thousand specialists with various qualifications have obtained higher education in this direction. During this period, huge experience has been accumulated, which is evaluated, supplemented, developed, solving environmental issues, taking into account the special soil, climatic, industrial, social and other conditions of Latvia.

The study direction includes 3 study levels: professional bachelor’s study programme “Environment and Water Management”; the academic master's study programme “Environment, Water and Land Engineering” and the final doctoral study level with the doctoral study programme “Environmental Engineering”.

The aim and tasks of the study direction are based on the goals and action programmes (education, research, administration) specified in the LLU Development Strategy for 2015-2022; the shortcomings identified in the international evaluation of study directions (2011/2012) and the

proposals put forward; general tendencies of higher education development and industries in Latvia and Europe for the needs and development tendencies of the society and national economy.

The aim of the study programmes in the environmental protection direction is to prepare competitive specialists and scientists of various levels (engineers, masters and doctors) and to conduct research in the fields affecting the environment.

Main tasks:

- to provide students with a scientific basis for professional activity, developing scientific analysis skills and the ability to solve technical problems, as well as to prepare students for further research work and master's studies;
- to promote the development and use of students' theoretical knowledge, cognition and research skills for solving environmental, water management and land management issues;
- to develop the abilities of young scientists to be creative and to participate in solving national and international level scientific projects, as well as to develop the skills of pedagogical work;
- to implement the quality of the study and research environment, the management of the study direction promoting student-orientated studies.

The direction implemented by LLU plays an important role in the development of the Latvian economy, and it is related to international strategies, such as the UN General Assembly resolution of 25 September 2015 "Transforming Our World: The 2030 Agenda for Sustainable Development". This resolution set out 17 sustainable development goals, which include economic, social and environmental aspects. The principles of sustainable development and the green economy are included in a number of other international strategies, such as the "European Green Deal". These initiatives are also related to the provision of biodiversity, ecosystem services, development of solutions adapted to climate change (EU Biodiversity Strategy; EU Green Infrastructure Strategy, etc.). These principles, in turn, are included in the Latvian Sustainable Development Strategy and in several initiatives based on the introduction of the circular economy in Latvia (Latvian Bioeconomy Strategy, etc.).

The Ministry of Agriculture of the Republic of Latvia, State limited company "Ministry of Agriculture, Real Estate" (MARE), and other institutions and organisations are interested in professional education and research in this direction. The Latvian Rural Development Programme (2014-2020), which is still relevant, emphasised the special hydrological conditions of Latvia and the risk of water pollution. Weaknesses include the problems associated with unkept drainage systems and the importance of soil moisture regulation as an important factor influencing land productivity. One of the necessary measures is the need to reconstruct the drainage systems on agricultural and forest lands. Without the regulation of soil moisture and protection of areas from flooding, the development of intensive agriculture and forestry is not conceivable in Latvia, as the productivity of both crops and forest stands decreases significantly. The study programmes included in the study direction "Environmental Protection" **are the only ones in Latvia with an in-depth focus on water management, hydrology, hydrotechnical reclamation, etc.** It should be noted that one of the prerequisites for obtaining a professional activity certificate in the design and construction of drainage systems, which is awarded by the certification commission of the Latvian Society of Ameliorators, is a professional bachelor's degree in the study programme "Environment and Water Management".

The Latvian Society of Ameliorators regularly reminds one of the need for such an education direction in correspondence with the Ministry of Agriculture and the Ministry of Education and Science of the Republic of Latvia, where Society regularly emphasises that the lack of qualified specialists in the drainage industry is still felt, and there is an urgent need to take measures to address this issue, which is of significant importance to Latvian agriculture. The information report

prepared by the Ministry of Agriculture “Latvian Reclamation Policy” in the education and research section emphasises the special role of LLU in this field.

The study direction is emphasised in the context of the plan “Latvian National Plan for Adaptation to Climate Change until 2030” developed by the Ministry of Environmental Protection and Regional Development. This document analyses climate change, its potential risks and the analysis of the effects of the risks. This concerns in particular the assessment of possible climate change, water protection, agricultural run-off, the impact of changes in water quality on aquatic ecosystems in general, and so on. These issues are being addressed not only in the European Union but throughout the world. Considering the fact that these potential changes in environmental factors are very different in different regions, it is especially important to conduct research in specific (Latvian) climatic conditions. It is therefore crucial to prepare young scientists who will be ready to carry out research to solve these problems. This work is carried out by implementing the “Environmental Protection” study direction.

The Environmental Protection study direction and the programmes included in it are unique to the economy of Latvia. Linking Latvian environmental processes with agriculture, forestry, drainage issues, research of greenhouse gas emissions in relation to agricultural activities are only considered at Latvia University of Life Sciences and Technologies and they are only expanded in this direction of education.

The connection of the study programmes included in the direction is determined by the goals and tasks of the study direction. These tasks can only be accomplished if it is possible to offer quality education at different levels, where each is based on prior knowledge, complementing and developing it. The direction of “Environmental Protection” ensures such an approach.

2.1.2. SWOT analysis of the study field with regard to the set aims by providing explanations on how the higher education institution/ college expects to eliminate/improve weaknesses, prevent threats, and avail themselves of the given opportunities, etc. The assessment of the plan for the development of the study field for the next six years and the procedure of the elaboration thereof. In case there is no development plan elaborated or the aims/ objectives are set for a shorter period of time, information on the elaboration of the plan for the development of the study field for the next assessment period shall be provided.

SWOT analysis of the study direction “Environmental Protection”

| SWOT analysis | Activities |
|----------------------|--------------------------------------|
| STRENGTHS: | Planned actions to exploit strengths |

| SWOT analysis | Activities |
|--|---|
| <p>1. The uniqueness of the study direction “Environmental Science” and the high demand for graduates.</p> <ul style="list-style-type: none"> - Certain fields of study, such as drainage, can only be acquired at LLU. - The study programme is the only one in Latvia after the acquisition of which it is possible to obtain professional activity certificates. | <p>Continuously and actively use the uniqueness, accumulated experience and studies related to the professional environment to maintain and develop the recognition and prestige of study programmes.</p> <p>Involve the most capable students in science and course work and also maintain contact with them after graduation.</p> |
| <p>2. Significant experience in the implementation of the direction.</p> <ul style="list-style-type: none"> - The study direction is more than 70 years old, and more than 2.5 thousand specialists have completed it, many of whom work in the speciality. - The study direction is recognisable among industry institutions and professionals. | <p>Follow the topical issues in the field and adjust the range of study courses in accordance with the requirements of the field.</p> |
| <p>3. Diversity of programme content.</p> <ul style="list-style-type: none"> - Relatively diverse range of study courses, which allows one to choose areas of activity after studies. - The professional study programme includes study and professional practices that form a close connection with the profession. | |
| <p>4. The study direction includes three study levels.</p> <ul style="list-style-type: none"> - During the studies, students have the opportunity to continuously improve their knowledge, as well as to choose the direction of scientific activity. | |

| SWOT analysis | Activities |
|---|--|
| <p>5. Knowledgeable and qualified teaching staff.</p> <ul style="list-style-type: none"> - During the accreditation period, several lecturers have improved their qualifications by obtaining a scientific degree. New lecturers are involved in the implementation of the study direction. - The teaching staff has extensive experience in the implementation of research projects. - The teaching staff actively participates in the activities of the field in order to accumulate professional experience, works in international organisations, institutional commissions and working groups related to the study direction. - Teaching staff gains experience in “ERASMUS+” and “NordPlus” programmes | <p>Popularise the competence and qualification of the teaching staff as key elements in the implementation of high-quality studies and further education.</p> <p>Plan support tools for improving the qualification of teaching staff in professional development courses, internships in companies and scientific institutions, for participation in conferences and seminars.</p> <p>Plan the involvement of guest lecturers in the study process for the acquisition of specific topics, using grants from EU programmes and VBF funding.</p> |
| <p>6. Student-orientated studies</p> <ul style="list-style-type: none"> - The study process is organised in optimal groups of students according to the type of classes (lectures, practical work, laboratory work), which allows one to provide an individual approach to students, thus improving the quality of studies. - Use of modern technologies and e-environment for more efficient feedback in the study process. - LLU internal support grants for doctoral students - Available student mobility within the “ERASMUS+” and “NordPlus” programmes (for studies and internships). | <p>Involve students in improving the quality of studies, identify issues and actions to be addressed. Introduce curators to support students, get to know the study process and solve unclear issues.</p> <p>Regularly implement informative events for students to acquaint them with the possibilities to receive support (scholarships, LLU internal grants in science).</p> <p>Regularly implement informative events for students about mobility opportunities.</p> <p>Actively use the interactive tools offered by the e-learning environment to improve the study process. Provide professional development courses for teaching staff for the effective use of e-environment tools.</p> <p>Conduct regular student, graduate and employer surveys on the issues of improving the study process.</p> |

| SWOT analysis | Activities |
|---|---|
| <p>7. Developed study environment and modern teaching methods</p> <ul style="list-style-type: none"> - During the reporting period, by attracting EU funding, the study and science infrastructure was developed (computer classes with up-to-date software, laboratory equipment, laboratories and equipment for field research). - Good provision of scientific and practical literature, including free access to useful databases. - Students have access to premises for work in the VBF building 24 hours a day, 7 days a week. | <p>Taking into account the availability of specific software, to develop continuing education programmes in the acquisition of current digital tools (ArcGIS, AUTOCAD, etc.).</p> <p>Develop procedures for students to work in classrooms, laboratories and computer classes outside working hours.</p> <p>Improve the methodological room in the VBF study building, develop the infrastructure that students can use in the form of self-service (printers, the simplest equipment, etc.).</p> <p>Regularly review the information sources used in the study courses, supplement the collections of the Fundamental Library of LLU and the methodological room in the VBF with the latest literature in the field, including electronic.</p> |
| <p>8. Internal communication between academic staff, management students. Creating feedback. Examination and settlement of disputes</p> <ul style="list-style-type: none"> - Various tools have been developed to ensure internal communication (information sheets for LLU staff and students on current events of the week, working sessions at the faculty and LLU management level, meetings with students' self-government and each student course). - Commissions of various levels, Ethics Commission, Academic Arbitration Court. | <p>Further develop forms and tools for maintaining and improving internal communication.</p> <p>Develop student, graduate and employer surveys on the VBF website.</p> <p>Create and develop a question and answer section about studies, research and management on the LLU website.</p> <p>Once a year to inform students and staff about the possibilities and procedures for resolving disputes.</p> |

| SWOT analysis | Activities |
|--|---|
| <p>9. Cooperation with other Latvian educational institutions, other structural units of LLU</p> <ul style="list-style-type: none"> - Cooperation with RTU Institute of Environmental Protection and Heating Systems (VASSI), LU Faculty of Geography and Earth Sciences in organising promotion councils, participation in projects, organisation of conferences. - Technical schools, secondary schools, promoting the attraction of the best students to study at LLU. | <p>Regularly maintain cooperation with other Latvian higher education institutions, promote the regularity of activities to be implemented within the framework of cooperation.</p> <p>Regularly maintain cooperation with industry colleges and technical schools, planning annual joint activities (thematic schools, use of laboratories in the school teaching process, involvement of teachers in the field in the school learning process).</p> <p>Offer research topics for the development of scientific research work within the school programme.</p> <p>Continue to provide an opportunity for the best students of industry schools to start their studies in the direction programmes outside the competition.</p> |
| <p>10. Cooperation with industry and practical training</p> <ul style="list-style-type: none"> - Cooperation with entrepreneurs and local governments, giving students the opportunity to work on real projects within the framework of study courses and diploma projects. - Cooperation with leading institutions of the industry (MoA, MEPRD, Society of Ameliorators, etc.) in the evaluation of final theses. - Attracting guest lecturers from the industry. | <p>In cooperation with the industry, establish a working group to discuss current issues in the industry and necessary improvements to the study process. Implement employer surveys.</p> <p>In cooperation with industry companies, regularly organise guest lectures or seminars on specific topics.</p> |
| <p>11. The Lifelong Learning Centre of LLU has been established and is actively operating</p> | <p>Development of new continuing education programmes for existing professionals in the industry to increase their current competencies, implementation of these programmes in cooperation with the Lifelong Learning Centre of LLU.</p> |

| SWOT analysis | Activities |
|--|--|
| <p>12. Active and extensive scientific activity</p> <ul style="list-style-type: none"> - Cooperation with other structural units of LLU in research, use of scientific equipment and laboratories. - A unified database of LLU scientific equipment is available at https://www.llu.lv/lv/zinatniska-inventara-datubaze (Only in Latvian) - Cooperation with the industry for relevant research within the framework of the contract assignment. | <p>Purposefully strengthen and develop unique directions of scientific research.</p> <p>Promote the implementation of interdisciplinary research.</p> <p>Regularly exchange information and cooperate in the implementation of research</p> <p>Prepare a list of research services and place it on the internet resources of LLU, inform the industry about the topics of research implemented by LLU.</p> |
| <p>13. Student involvement in research</p> <ul style="list-style-type: none"> - Study programmes include study courses to promote research. - Student scientific conferences are organised. - Students are involved in research project activities | <p>Support and motivate students' involvement in research work</p> <p>Motivate doctoral students to apply for the LLU internal grant programme</p> |
| <p>14. Long-term experience of cooperation with other foreign educational institutions, industry organisations and state institutions in research, organisation of joint activities</p> | <p>Maintain and strengthen international cooperation in the implementation of joint projects, preparation of publications.</p> <p>Collaborate within the “ERASMUS+” mobility programme.</p> |
| <p>15. International activities of the teaching staff, good knowledge of English</p> <ul style="list-style-type: none"> - Leading lecturers work in international organisations of the industry, cooperate with foreign partners in the implementation of international projects and other activities. - Most of the teaching staff have good knowledge of English, which allows them to organise international courses of various levels, participate in “ERASMUS+” activities, participate in the implementation of the study programme in English. | <p>Purposefully plan activities for attracting foreign students to the doctoral study programme.</p> <p>Continue to strengthen cooperation with foreign partners in writing joint project applications.</p> <p>Jointly plan the involvement of foreign guest lecturers in the study process and research.</p> |
| <p>16. A doctoral study programme “Environmental Engineering” in English has been established</p> | <p>Popularise the study programme for attracting foreign students. Develop an action plan.</p> |
| <p>WEAKNESSES:</p> | <p>Planned actions to address weaknesses</p> |

| SWOT analysis | Activities |
|--|---|
| <p>1. Content and scope of study courses Some general study courses, which are implemented by other structural units of LLU, are more focused on the development of a common understanding rather than creating an industry-specific orientation.</p> | <p>Review study programmes, reducing the amount of general study courses, emphasising industry-specific study courses.</p> <p>In doctoral studies, taking into account the extensive research work, to consider the possibility of extending the implementation period to 4 years.</p> <p>Taking into account the competition in higher education and decrease in the number of students, it is important to identify the latest trends in the field and offer current topics within the study courses.</p> <p>Improvement of study courses by optimising them. This would include the intensified acquisition of study course materials, offering to acquire them in the form of modules (study courses are planned in blocks) or as integrated study courses (courses that complement each other are acquired simultaneously).</p> <p>Develop co-operation with other study programmes of LLU, which would allow one to develop multidisciplinary study courses in further education programmes. Such paid study courses could be suitable for existing specialists who would like to expand their knowledge in the speciality.</p> |

| SWOT analysis | Activities |
|--|--|
| <p>2. Decrease in the number of newly enrolled students due to demographic factors, attraction of students</p> | <p>Attract young people by providing information about the direction of study, its significance and future opportunities after obtaining education in a simple, attractive and understandable way.</p> <p>Cooperation with vocational secondary schools, which would include organising joint events with the students of the faculty, use of the laboratory of the faculty, exchange of experience.</p> <p>Events in faculties and schools, in cooperation with the Communication Centre of LLU, which would include an offer of activities for secondary school students, popularise the speciality at the same time, thus attracting secondary school graduates to the study direction.</p> <p>Regular publicity in social and sectoral networks, updating of the VBF website, which would allow prospective students to follow the activities at the faculty and get to know the study process in depth.</p> |
| <p>3. Students dropping out</p> <ul style="list-style-type: none"> - Students drop out in the first year of study because there is insufficient knowledge in the natural study courses, which are important for the acquisition of engineering sciences. - Students drop out in senior years of study because most students have jobs. Often, due to the inability to combine studies with work, students do not complete their studies. - Insufficient financial support in the form of scholarships for successful students, which would allow them to fully implement their studies without seeking additional financial support. | <p>Create an independent support system for strengthening natural knowledge for 1st year students (additional classes, courses).</p> <p>Cooperation with the industry, industry companies, promoting understanding of students-employees.</p> <p>In cooperation with the industry, work on support programmes (company scholarships) that would allow students to successfully complete their studies, and the company to attract qualified specialists, programme graduates.</p> |

| SWOT analysis | Activities |
|---|---|
| <p>4. Attracting industry professionals to the study process, attracting new teaching staff, improvement of current competencies</p> <ul style="list-style-type: none"> - The low competitiveness of teaching staff's remuneration limits the opportunities to attract well-known professionals to the study process, as well as new teaching staff. - Compared to the industry, low remuneration and a large amount of bureaucratic work reduce interest in working at a university. The amount of bureaucratic work limits the amount of time that teaching staff can devote to the implementation of the study process, scientific activity and professional development, studies of the latest literature. | <p>The issue of teaching staff remuneration should be addressed at the national level. The internal support tools of LLU (motivation system, bonus for the results of scientific activity) shall be improved in order to focus on increasing the quality of studies.</p> <p>Database and information storage systems need to be improved to reduce the amount of bureaucratic work.</p> <p>Regular support tools should be provided for the professional development of teaching staff.</p> |
| <p>5. Research succession, generational change</p> <ul style="list-style-type: none"> - Generational change is an ongoing process, however, the weakening of certain scientific fields may appear as a dangerous trend. Currently, in the structural units involved in the study process, these processes are controlled, there are young scientists who are ready to take over and develop the gained experience. However, the low teaching staff's remuneration competitiveness does not motivate new teaching staff to obtain a doctoral degree. | <p>The development plan of the academic staff should be carefully followed, making adjustments if necessary.</p> <p>All sections of the LLU Academic Work Regulations shall be planned: study work, methodological work, scientific work, organisational work and professional development.</p> <p>Renewal of the assistant-apprentice staff unit. Teaching staff members without a scientific degree for doctoral studies should be motivated to obtaining a scientific degree.</p> |
| <p>6. There is currently no serious interest in the offered study programme in English. There is only interest in studies without tuition fees.</p> <ul style="list-style-type: none"> - The study programme has recently been licensed - International activities are very limited due to the spread of Covid-19. - Insufficient marketing activities due to limited financial and human resources. - Insufficient information on websites, especially in English. | <p>Plan and implement marketing activities to attract foreign students.</p> <p>Supplement information in English about the study programme on the websites of LLU and VBF.</p> <p>Development of the VBF website, including already existing information about the faculty and departments, study programmes, regular information about the implemented activities, developed study materials, database of academic staff, scientific activities and other information.</p> |

| SWOT analysis | Activities |
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| <p>7. Insufficient organisational and financial support for the implementation of teaching staff's initiatives and ideas.</p> | <p>Develop a format in which teaching staff can submit their ideas and initiatives for the improvement of the study, science and management process of the direction.</p> <p>Find funding to attract, as far as possible, human resources for communication on social media and for updating information on websites.</p> |
| <p>8. Insufficient financial resources for the continuous improvement of the work and study environment.</p> | <p>Continue work on attracting funding for improvements to the VBF building, including work, study and leisure facilities.</p> |
| <p>OPPORTUNITIES</p> | <p>Take advantage of the planned activities</p> |
| <p>1. Recognition of LLU in the industry - Taking into account many years of experience in the implementation of the direction and the high level of graduates' knowledge, the study direction programmes are well known in the industry.</p> | <p>Continuously strengthen cooperation with the industry, develop joint activities to promote the industry and programmes.</p> |
| <p>2. Industry support and interest in improving the quality of education Cooperation with the industry allows to implement measures that significantly increase the quality of studies by linking the study process with internship and current events in the industry. In cooperation with state institutions and ministries there is the opportunity to receive information and support for current research and teaching work.</p> | <p>Organise regular meetings, seminars with industry representatives, the board of a professional organisation (Latvian Society of Ameliorators) in order to regularly discuss and update cooperation directions and opportunities.</p> <p>Search for new forms to popularise the connection of study programmes with the field among young people and increase interest in study programmes.</p> <p>Develop new study courses in cooperation with the industry, attracting industry professionals in their implementation. Offer the developed courses as continuing education courses.</p> |
| <p>3. Intensive use of the opportunities offered by available international mobility Taking over of the positive experience gained by students and teaching staff within the framework of "ERASMUS+" and "NordPlus" programmes in the improvement of study programmes of the direction.</p> | <p>Encourage (attract) students and teaching staff to use the available mobility programmes to supplement their knowledge, to develop cooperation with foreign partners in scientific projects and joint educational initiatives.</p> <p>Motivate teaching staff to get involved in developing applications for mobility programmes.</p> |

| SWOT analysis | Activities |
|--|--|
| <p>4. Available EU funds for projects and infrastructure</p> <p>The available funds can be purposefully attracted for the development of infrastructure, improvement of the quality of studies, raising the qualification of the teaching staff.</p> | <p>Timely and continuous evaluation and planning of the necessary infrastructure and study process development directions. Determining the amount of financial resources required for a specific planning stage.</p> <p>Develop motivation tools for more active attraction of EU funds, purposefully planning the involvement of human resources in this process.</p> |
| <p>5. Opportunity to cooperate with other Latvian scientific institutions, use their scientific infrastructure</p> | <p>Promote and expand the implementation of joint research activities with other Latvian and foreign scientific institutions.</p> |
| <p>6. Large selection of different digital tools for better communication</p> | <p>Identify digital tools to improve the management system, improve communication and provide feedback.</p> |
| <p>7. Cooperation with Latvian media, industry information and internet resources</p> | <p>Regular cooperation with the Latvian media is planned to promote the activities of the industry and the field of study.</p> |
| <p>THREATS</p> | <p>Planned actions to prevent threats</p> |
| <p>1. Changes in the higher education system and research in Latvia</p> <p>In recent years, there have been significant changes in the regulatory enactments related to the implementation of higher education and research (for example, a new classification of science fields, university typology, etc.).</p> | <p>Regular review of study programmes and, if necessary, adjustment, in accordance with trends in higher education in Latvia and Europe.</p> |
| <p>2. New threats of a pandemic or an emergency</p> <ul style="list-style-type: none"> - Covid-19 experience. - Financial crises affecting the industry and education in general. | <p>Improve programmes and study courses, as well as their implementation approaches, to be easily adaptable to work in emergency situations.</p> <p>Identify and test possible digital tools, develop a video lecture archive and database.</p> |

| SWOT analysis | Activities |
|---|---|
| <p>3. Heavy pace of adaptation to new initiatives The bureaucratic process of the regulatory framework, which hinders the rapid implementation of changes in education (for example, the creation of new study programmes) compared to the development of the industry.</p> | <p>Regularly follow the changes in the policy of the field and make the necessary improvements in the content of the study courses.</p> <p>Collaborate with industry to accelerate the implementation of current initiatives in programme content.</p> <p>Cooperate with industry to update programmes, taking the new professional standards into account.</p> |
| <p>4. Low competitiveness of teaching staff's remuneration compared to the industry Insufficient funding for the remuneration of teaching staff and teaching assistants, which endangers the retention of new specialists in the implementation of the study process and scientific activities.</p> | <p>The issue of remuneration is a matter for the country.</p> <p>Develop and maintain existing support programmes for teaching staff (motivation and science allowances for study and research).</p> |
| <p>5. Increasing competition between universities, driven by a decline in the number of local students</p> | <p>Regularly, in cooperation with the industry, work on updating the programmes, popularising the industry, participating in various student attraction campaigns, working in the professional organisations of the industry and in the industry commissions of state institutions.</p> |
| <p>6. Increasing competition between Latvian scientific institutions</p> | <p>Strengthen cooperation with other Latvian scientific institutions, seeking opportunities for cooperation in interdisciplinary research.</p> |
| <p>7. Threats posed by pandemics and other emergencies in the implementation of international activities</p> | <p>Develop alternative scenarios for changing the forms of implementation of international activities (video lectures, online consultations, seminars, etc.) in case of emergency.</p> |
| <p>8. Common changes in the management system of higher education institutions in Latvia, changes in regulatory documents may lead to changes in LLU's internal documents regulating the study process, affect the structure of budget places in the study directions implemented by LLU and the interest of students in choosing specific study programs.</p> | <p>Regularly follow the changes planned at the national level in the field of higher education. The following actions are within the competence of the LLU management.</p> |

The SWOT analysis provides an explanation of what actions are planned in order to use the opportunities in the future to improve the weak points and thus reduce possible threats in the

implementation of the study direction.

The development plan of the study direction "Environmental protection" reflects the main activities in order to involve highly qualified teaching staff in the implementation of the study direction, the activities to improve the study environment, to improve study courses, to involve students in research by developing cooperation with the industry and foreign cooperation partners, etc.

For example, the potential decrease in the number of students under the influence of various adjacent factors (dropout during the study process due to lack of motivation to study, the demographic situation affecting admission results, competition between educational institutions, etc.) is mentioned among the weaknesses. By successfully implementing the development plan of the study direction, cooperation with the industry and employers will be continued. By forming a good cooperation, by regularly informing the public about the achievements of graduates in the professional field, and about the need for such specialists in the state and disseminating this information in the public and in secondary education institutions, there is a greater probability that the number of students who want to study in this study direction will increase, students will increase their motivation to complete their studies, we will be able to successfully compete with other higher education institutions and reduce the threat that the number of students could significantly decrease. As graduates enter the industry as specialists and gain professional experience, there is an opportunity to involve them in the study process, thus giving students additional practical knowledge and creating a connection between former and current students.

It is very important to connect study work with research and in this field it is necessary to cooperate with various foreign and Latvian scientific institutions. Weaknesses include problems with insufficient financial support for teaching staff in their academic work. Using international mobility opportunities and available EU funds, the material and technical base has been improved, cooperation partners in scientific activities have been found, which allows participation in both local and international projects. These activities and the increased number of projects create opportunities for lecturers to be more actively involved in research work, thereby improving their material condition and competing somewhat with the salary in the industry, which allows to retain young, perspective scientists in the academic environment, maintaining research continuity.

At present, for the study direction "Environmental Protection", in accordance with the set general goal of the direction and the main tasks for achieving this goal, a 6-year development plan has been created, which includes the main actions to achieve the goals, including the prevention of threats and weaknesses (*Appendix 1*). The development plan of the study direction is closely related to the development strategy of LLU and the common tendencies in education and industry; therefore, it is updated every year. Currently, a new strategy of LLU is being developed, which is also based on changes in the Law on Higher Education Institutions, the introduction of typology of higher education institutions and other important settings.

Every year a work plan is prepared for the achievement of the indicators specified in the LLU development strategy in the research, study and administration programmes, as well as for the implementation of the actions specified in the study direction. The work plan for the current year, as well as the report on the implementation of the work plan of the previous year, is reviewed and approved by the VBF Council every year.

2.1.3. The structure of the management of the study field and the relevant study programmes, and the analysis and assessment of the efficiency thereof, including the assessment of the role of the head of the study field and the heads of the study programmes, their responsibilities, and the cooperation with other heads of the study

programmes, as well as the assessment of the support by the administrative and technical staff of the higher education institution/ college provided within the study field.

The management of the study direction Environmental Protection consists of several levels:

- the general management, administrative and support level of the LLU;
- the strategic level of the study direction;
- the action level of the study direction.

The levels of management and their main functions, as well as the structural units or leading staff involved in their implementation are summarized in Table of Appendix No. 2. The table shows the responsibilities (directly responsible or supportive) of the structural units or leading staff involved in the implementation of the functions / activities of each management level.

Taking into account the implementation of programmes of the study direction under the responsibility of the Faculty of Environmental and Civil Engineering, the strategic and action level of the study direction is closely related to the study, science and management processes at the VBF. Management structure of the study direction in the context of the Faculty of Environmental and Civil Engineering is provided in Figure of the Appendix No.2.

The planning of the development of the study direction takes place in close connection with the overall strategic goals and directions of LLU, in the development of which the deans of faculties also participate. The dean forms a strategic link between the study directions represented at the faculty and the strategic requirements for the overall development of LLU set by the LLU management, the involved services, the student self-government and the convention of advisers (industry representatives). Further, in accordance with the internal strategic and action levels of the study direction Architecture and Civil Engineering, the implementation of the direction is monitored and development planning is mainly carried out by the Dean of the Faculty of Environment and Civil Engineering, head of the study direction and directors of the study programmes. The Dean of the VBF mainly performs administrative and strategic functions and oversees the development of the faculty as a whole, including the study, research process, and economic activities, as well as management. Under the supervision of the Faculty of Environmental and Civil Engineering, two study directions are implemented. The head of the study direction, in turn, sees the mutual points of contact and interdisciplinary development opportunities of the fields represented by the specific study direction, and, together with the faculty management and the directors of the study programmes, it is possible to determine the strategic goals of the study direction and the actions necessary to reach these goals. More detailed solutions are within the competence of the director of each study programme. The directors of the study programmes closely cooperate with the heads of the departments, who are responsible for administrative issues related to the development of the work, study and research environment and technical provision, attraction and provision of academic and auxiliary staff, funding and planning for various activities. The VBF management, the head of the study direction and the directors of the study programmes work on the annual report of the study field, as well as on the development of the self-assessment report, which is discussed in joint working sessions, involving students' self-government and industry representatives.

The created management structure of the study direction is optimal and efficient, as it involves students, study program directors, head of the study direction and faculty management staff. Problematic and topical issues are dealt with in a balanced and collegial manner, looking for the best solutions. Current issues are discussed in student self-government, department meetings, the methodological commission and faculty Council meetings, excluding the possibility of ambiguous

decisions being made.

In general, the established and developed levels of management support can be evaluated positively and they provide real support and coordinated assistance in the implementation of the study process and related procedures. For example, LLU's administrative support in the E-study system can be evaluated highly positively, where courses for preparation of self-evaluation reports are placed, support courses for study program directors, prepared statistical data on the study process, compiled normative documents related to the study process, coordinated international cooperation, compiled possible cooperation offers and provided current information in structural units, etc.

2.1.4. Description and assessment of the requirements and the system for the admission of students by specifying, inter alia, the regulatory framework of the admission procedures and requirements. The assessment of options for the students to have their study period, professional experience, and the previously acquired formal and non-formal education recognised within the study field by providing specific examples of the application of these procedures.

Admission rules for all LLU study programmes are approved by the Senate in October every year and published on the LLU website. For those interested, the regulations in Latvian are available here <https://www.llu.lv/lv/uznemsana> (only in Latvian) and regulations in English - here: <https://www.llu.lv/en/degree-programmes>.

New Bachelor's, Master's and doctoral students are admitted on a competitive basis in accordance with the competition criteria set out in the admission rules.

Admission rules for undergraduate studies (<https://www.llu.lv/lv/pamatstudijas#uznemsana> (only in Latvian)

Professional Bachelor's study programme "Environment and Water Management" (<https://www.llu.lv/lv/pamatstudijas/vide-un-udenssaimnieciba> (only in Latvian), - **general secondary education or professional secondary education**. New students are admitted on a competitive basis based on the results of their centralized exams in Latvian, a foreign language (English, German, French or Russian), mathematics, physics.

Applicants can apply for the study programme using the e-service (in the portal latvija.lv) and a unified admission system, in which applicants' applications are processed simultaneously by 12 Latvian universities (Latvia University of Life Sciences and Technologies, University of Latvia, Riga Technical University, Daugavpils University, Liepaja University, Vidzeme University College, Rezekne Academy of Technologies, Ventspils University College, BA School of Business and Finance, EKA University of Applied Sciences, RISEBA University of Applied Sciences, ISMA). The unified system offers several advantages:

- For higher education institutions - to forecast the number of potential students who will enter into a study agreement
- For applicants - to confirm the application for studies closer to their place of residence, to follow their opportunities to study in the chosen study programme, to promptly receive the results of the competition.

Admission to undergraduate studies outside the competition

Outside the competition, full-time and part-time students are admitted if they have fulfilled the requirements of the above rules and:

- Winners of the first three places/stages of international and LR Olympiads, LR students' scientific research work competitions adopted by the Ministry of Education and Science of the Republic of Latvia over the past three years in the field/section of Earth and related environment sciences;
- conferences of regional students' scientific research works – winners of the competition, who have obtained LLU certification in the areas of Natural Sciences, Engineering Sciences and Technologies;
- Winners of the first three places of the environmental science competition organised by VBF with the confirmation of the faculties.

Admission rules for master's studies

Admission requirements for the academic master's programme “Environmental, Water and Land Engineering” (<https://www.llu.lv/lv/magistra-studijas/vides-udens-un-zemes-inzenierzinatnes>) (only in Latvian):

- an academic or professional bachelor's degree in environmental and water management, land management, geodesy, landscape architecture, agricultural sciences, forestry, environmental sciences, or other natural and engineering sciences, the duration of which in full-time studies is at least three years (120 CP);
- graduates of other study directions with a certificate from the workplace shall certify at least two years of professional work experience in the field related to the relevant specialisation of the chosen master's study programme. The certificate shall indicate the description of the position, length of service and job responsibilities.

New master's students are admitted on a competitive basis on the basis of a weighted average mark obtained in a bachelor's studies (or higher professional education studies). LLU graduates can apply for master's studies electronically, using the LLU Information System; graduates of other universities – in person at LLU.

Admission rules for doctoral studies

Admission requirements for the doctoral study programme “Environmental Engineering” (<https://www.llu.lv/en/doctoral-programme-environmental-engineering>) – **Master's degree of Science in Engineering in environmental sciences or hydro-engineering**. If the master's degree has been obtained in another field of science, an entrance examination may be determined in the sub-field chosen by the field of science of “Environmental Engineering and Energy” – “Water Management” or “Environmental Engineering”.

As the doctoral programme is also implemented in English, if the master's degree is obtained at a foreign university, the opinion of the Latvian Academic Information Centre is required. Foreign applicants need English language skills of at least at B2 level. The procedure for admitting foreign students and submitting the necessary documents is described here <https://www.llu.lv/en/how-to-apply>.

In the study programmes of the study direction, prospective students can also start studies in later study stages, if they have previously acquired knowledge, skills and competencies in formal education or in non-formal education. LLU has approved regulations and procedures for starting studies in later study stages and for the recognition of knowledge, skills, and competencies acquired outside formal education or through professional experience. In the study direction, recognition of knowledge, skills and competencies acquired through professional experience is

often used by students already working in practice, who mainly use the opportunity to study part-time. They have the opportunity to equate their practical activities and experience in industry companies with their professional practice in the professional bachelor's study programme "Environment and Water Management". The procedure for the recognition of knowledge, skills and competences acquired through professional experience is organised in cooperation with the Lifelong Learning Centre of LLU (<https://www.mc.llu.lv/pakalpojumi/pieredzes-atzisana>) (only in Latvian), establishing a special commission and in accordance with the procedures and other regulatory enactments of LLU. The document in Latvian is available in Appendix 1, in the section "Other appendices" of the report, the folder "LLU documents in Latvian".

Students who have previously studied and wish to start studies at later stages also use the opportunity to perform academic recognition for previously acquired study courses (the order of LLU on the Procedure for Academic Recognition is attached in Appendix 4). This opportunity is used by mobility students, students who have studied in other engineering sciences, who, after a shorter or longer study period in another study programme want to continue their studies in this study direction, or want to obtain another, additional higher education.

During the study process, situations arise when it is necessary to terminate studies for various reasons. After termination, there is a renewal of studies, performing academic recognition for those previously acquired study courses that are included in the current study programme plan. Since 2014, 136 students in the study direction have been renewed on the oldest courses (on average 17 students per each study year).

Study courses that have not been acquired can also be acquired through the LLU Lifelong Learning Centre as listeners.

2.1.5. Assessment of the methods and procedures for the evaluation of students' achievements, as well as the principles of their selection and the analysis of the compliance of the evaluation methods and procedures with the aims of the study programmes and the needs of the students.

LLU students' success evaluation criteria, conditions and binding procedures are described in the Study Regulations, which are available in Latvian in LLU intranet MansLLU (File available in the attachments section in the folder "LLU Documents in English") and in English: <https://www.llu.lv/en/study-guide-documents>. Available: https://www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf

Student evaluation criteria are defined in the description of each study course available to students electronically), as well as each lecturer introduces students to the evaluation criteria when starting the specific study course. The study results and the obtained assessments are explained by the lecturers, giving the students feedback on the submitted works. The theses are evaluated by a commission of at least 7 people, of which at least 4 are experienced professionals in the field (31. Regulation of Procedures for Thesis Writing and Final Examination is available in the attachments section in the folder "LLU Documents in English").

Assessment methods and procedures are applied to the specific study courses and study program, as well as in individual cases, taking into account the differences in students' perceptions and particular situations. For example, the evaluation of project-based study courses (course papers/projects) takes place in the form of an individual discussion, together with the lecturer

analyzing the positive aspects of the work and features should be improved, which the student must then carry out in order to obtain a final assessment.

Assessment methods in theoretical study courses are most often in the form of written examinations or tests. Different approaches are possible here, depending on the situation in the country, LLU, or the student's perception. For example, during the Covid-19 pandemic, course work, including paper evaluation, was organised in e-learning format. The assessment of project-based study courses and the provision of feedback in e-learning format are not able to ensure the appropriate quality of studies; therefore, they can only be performed as full-time studies.

2.1.6. Description and assessment of the academic integrity principles, the mechanisms for compliance with these principles, and the way in which the stakeholders are informed. Specify the plagiarism detection tools used by providing examples of the use of these tools and mechanisms.

Academic integrity - conducting academic work in accordance with the highest standards of professionalism and accuracy, objectivity and truthfulness, moral and ethical principles, honesty, including the prevention of plagiarism, truthful reporting and accuracy in academic publications, as well as in communication and publicity activities, representing the image of the academic environment.

Goal of the academic integrity of the university:

- to adhere to a high level of academic and scientific culture,
- to promote public confidence in the quality of education and the results of scientific research,
- to prevent and eliminate violations of the principles of academic integrity,
- to establish liability for unfair and unauthorized conduct.

Students and the academic, general, scientific and administrative staff of LLU are equally responsible for the observance of the principles of academic integrity and for the consequences of the violation of academic integrity.

The code of Ethics of LLU is available at LLU webpage (https://www.llu.lv/sites/default/files/2022-04/LLU_Etic_kodec_2005_English.pdf, and Academic Integrity Policy (https://www.llu.lv/sites/default/files/2019-12/Akad_godigums_2019.pdf) (only in Latvian).

LLU has developed and follows certain procedures for the examination of plagiarism in final theses, and course of action if such violations are identified:

- Rector's order - Procedures for submitting electronic copies of final theses and their verification in the plagiarism control system;
- Rector's order - Violations of academic integrity in final / doctoral theses.

In 2014, LLU concluded an agreement on the use of the inter-university unified computerized plagiarism control system (hereinafter - the System) and started the examination of all final theses for plagiarism in both undergraduate and Master's studies. Starting from 2017/2018, LLU ordered that the obligatory examination of plagiarism must also be performed for doctoral theses. The procedure stipulates that if the System finds in the thesis a 10% match with the text with another work, then the LLU work is reviewed by the Faculty Methodological Commission / Sectoral Doctoral Council and decides on the presence or absence of plagiarism, before receiving explanations from

the author and the supervisor.

In the period from 2014 to 2021, 149 final theses have been examined in the study direction "Environmental Protection". Of these, 1 work was recognised as plagiarism.

Starting with the principle of academic integrity of 2021/2022 – plagiarism in study papers – LLU examines the works developed and submitted by all students during their studies (reports, term papers, course work, etc.). The LLU e-learning system uses the plagiarism control tool "Ouriginal HE". The course works included in the study programmes of the "Environmental Protection" direction are mainly projects, term papers with specific input data and personalised calculation variants, where the risk of plagiarism is minimal. The first tests did not reveal any plagiarism.

At the beginning of the studies, students are introduced to the principles of academic integrity in the study course "Introduction to Environmental Engineering".

2.2. Efficiency of the Internal Quality Assurance System

2.2.1. Assessment of the efficiency of the internal quality assurance system within the study field by specifying the measures undertaken to achieve the aims and outcomes of the study programmes and to ensure continuous improvement, development, and efficient performance of the study field and the relevant study programmes.

In 2016, LLU achieved compliance with the "Investors in Excellence" standard. In December 2020, LLU was recertified for the second time and currently its operation is accredited according to this standard until December 2022. Within the framework of this initiative, LLU has developed a document "Description of the Quality Management System and Implementation Plan" (File available in the attachments section in the folder "LLU Documents in English"). Document contains the basic principles of ensuring the internal quality of the study direction.

The goals of the study direction Environment Protection, based on the common goals and action programmes set out in the LLU development strategy, are aimed at high-quality studies and further education opportunities, integration of studies and research, transfer of innovation into the national economy, scientific succession in environment and water management and environmental engineering, ensuring the recognition and competitiveness of the study direction and the programmes included in it. The goals of the study direction also include improvement of the quality of studies and research environment, student-oriented management of the study direction to promote learning. Subordinated to the strategic goals of the whole study direction, the goals of the study programmes and the results to be achieved are focused on the training of professional specialists (practitioners and scientists) required in the field, who are able to address current issues in the field and, at the same time, use their knowledge, competencies and skills to promote the prestige and recognition of the branch, the profession and LLU.

In order to achieve the set goals of the study direction and the study programmes, the following actions are performed in accordance with the common quality management system of LLU.

Table 2.

Ensuring the internal quality of the study direction in accordance with the 19 main processes defined in the Quality Management System of LLU (in 3 thematic groups)

includes the following activities

| No. | The main processes defined in the Quality Management System of LLU | Activities for internal quality assurance |
|-----------|--|---|
| 1. | Management processes | |
| 1.1. | Decision making, implementation and execution control | Decision-making related to the development of the study direction and programmes is ensured in a hierarchical order, involving various stakeholders. Initiatives for changes in study programmes or development of new study programmes are discussed at the meeting of the department supervising the specific study programme. If the changes also affect the work of the academic staff members of other departments, then the changes are also considered in these departments. The decision of the department meeting and all accompanying documents are further reviewed in the VBF Methodological Commission, in which all VBF department heads, deputy deans participate, other interested parties (students, industry representatives) are invited, if necessary. If clarifications are required, the documents are returned to the department for improvement. If the Methodological Commission supports the planned changes, then the issue is further considered and approved by the VBF Council. The procedure is confirmed in the LLU internal document "Regulations for the development of study programmes" (File available in the attachments section "LLU Documents in English", annex 12) |
| 1.2. | Strategy development, updating and execution control | The study direction "Environmental protection" is provided by the Faculty of Environmental and Civil Engineering, which in total implements two study directions. In accordance with the goals set in the LLU Development Strategy for 2015-2022 (pieejams https://www.llu.lv/sites/default/files/2020-12/strategija_isa_novembris_spreads_17_12_labota.pdf (only in Latvian)), the Faculty of Environmental and Civil Engineering annually prepares a work plan for achieving these goals within the framework of its implemented study directions and programmes. The work plan for the current year and the report on the implementation of the previous year's work plan are developed in cooperation with the directors of study programmes, heads of departments, heads of study directions, students, and are reviewed and approved by the VBF Council. The procedure and deadlines for the development of the work plan and report are determined in the internal documents of LLU. In accordance with the LLU Development Strategy for 2015-2022, a development plan for the study direction "Environmental protection" for the next 6 years has also been developed. It will be updated in accordance with the new LLU Development Strategy. |
| 1.3. | Ensuring the management system improvement process | For the control of the study direction management, study direction reports are developed every year, which are hierarchically reviewed and approved by the VBF Council, LLU Study Council and Senate. Academic staff, study programme directors, head of study direction, dean and deputies participate in the preparation of reports. During the preparation of the reports, the improvements implemented during the year are identified, as well as the shortcomings that should be eliminated. The reports are freely available on the LLU website https://www.llu.lv/lv/studiju-virzientu-parskati-un-pasnovertejuma-zinojumi (only in Latvian). The procedure and deadlines for the preparation of reports are specified in the internal documents of LLU. |
| 1.4. | Ensuring internal control | In order to ensure the internal control of the implementation of the study programmes, the students' surveys results. Surveys evaluated every study year, which the students fill in after each semester for the study course acquired in the specific semester. The director of the study programme is responsible for reviewing the shortcomings and necessary improvements indicated in the surveys. Thus, the director of the study programme has the opportunity to participate in the classes of the academic staff members involved in the programme in order to ascertain the quality of the implemented study course. The director of the study programme communicates with the students' representatives and provides feedback on the progress of the specific issue and possible solutions.. |
| 2. | Principal activity | |

| No. | The main processes defined in the Quality Management System of LLU | Activities for internal quality assurance |
|------|--|---|
| 2.1. | Provision of the basic study process | The internal quality of studies implemented in the study direction is ensured by the documents directly related to the study process. Documents for lecturers are available in the LLU intranet MansLLU (Files available in the attachments section, Annexes 7_LLU_Regulations_on_Academic_positions_EN, 12_Regulations on Study Programme Development, 16_Studiju_nolikums_2021 (only in Latvian)) |
| 2.2. | Provision of scientific research work | The internal quality of the scientific activity implemented in the study direction is ensured by the annual evaluation of the scientific work of the academic staff members in accordance with the data submitted by them, according to which the bonus for scientific work is also calculated and paid. Such a motivation system enables the academic staff members to be more actively involved in research, to use the findings obtained in research in the improvement of the content of the study courses, to involve students in research (Files available in the attachments section, Annex 9_LLU Academic Staff Motivation System). According to the profile of the academic work, the academic staff members has the opportunity to perform both academic work with students and do research. It is also one of the conditions for applying for an elected position, such as a professor. |
| 2.3. | Provision of distance learning process | Distance learning programmes are not offered in the study direction, however, in 2019-2021, the possibilities of using the e-environment (https://estudijas.llu.lv/?lang=en) were significantly improved and improved in connection with the restrictions of the Covid 19 pandemic for full-time studies. Online tools have been developed, video lectures have been prepared, a wide base of study materials has been created. Also, when resuming full-time studies, it is planned to use certain tools for more implementation of the study programme (for example, consultations or video lectures, inviting foreign visiting professors; publication of study materials, tests, etc.). The evaluation of the quality of the e-environment is provided by the students of the programme together with the evaluation of the whole study course at the end of the specific semester. Also, the activity of the academic staff members in the e-learning environment together with other activities of the study process and qualification improvement is evaluated every year in accordance with the procedure established by LLU. According to the activities of the academic staff member, the motivational bonus to the salary is calculated. |
| 2.4. | Ensuring the lifelong learning process | Lecturers of the study direction cooperates with the Lifelong Learning Center of LLU within the framework of various activities. These are both the lifelong learning courses (for example, in the field of the Soil and Water Conservation) and cooperation for the recognition of non-formal education for students already working and experienced in the field (for example, the professional work in industry of the students of professional bachelor study programme is recognized and equated to practice before diploma). The activities of the academic staff members and participation in lifelong learning activities evaluated every year in accordance with the procedure established by LLU. According to the activities of the academic staff member, the motivational bonus to the salary is calculated. |
| 2.5. | Attracting, admitting and ensuring the study process of foreign students | Attracting, admitting and organizing the study process of foreign students takes place in cooperation with the LLU Centre for International Cooperation, which has developed certain procedures for the implementation of these processes to ensure internal quality; these are available on the LLU website (https://www.llu.lv/en/degree-studies , https://www.llu.lv/en/exchange-studies). Within the study direction, the work with foreign students is organized with the help of the international coordinators of the faculties (for students of mobility programmes) and the directors of study programmes (for students of programmes offered in English). Foreign students fill in questionnaires about the study process, which are used to improve the study process. |

| No. | The main processes defined in the Quality Management System of LLU | Activities for internal quality assurance |
|-----------|--|--|
| 2.6. | Ensuring international cooperation | Various international activities are implemented in the study direction: international cooperation projects, organized conferences and seminars, trainings within BOVA and other programmes. The academic staff members annually prepare a report on study and research activities, including international ones. After the evaluation of the submitted reports, motivation allowances are calculated and paid to the academic staff members. Such a motivation system promotes the international activity of the academic staff, which is essential for the development of the field of study. |
| 3. | Support processes | |
| 3.1. | Human resource management and development | Human resource management and development planning, as well as the selection of appropriate staff (academic, research staff and teaching support staff) are essential to ensure the internal quality of the study direction. Therefore, a 6-year development plan for academic and scientific staff is being developed (for internal use only), which indicates the planned changes in the positions (growth opportunities according to vacancies, generational change, succession of thematic areas, need for new positions). Elections for positions (professor, associate professor, assistant professor, lecturer, leading researcher, research assistant) are planned according to the plan. This plan is not made public and is for internal use only. However, the staff development plan is reviewed annually and, if necessary, updated according to the current situation. The staff development plan helps to ensure an even representation of the directions of study The staff development plan helps to ensure an even representation of the field of study and the levels of academic positions. The director of the study programme purposefully addresses the appropriate candidatures from among the branch or from doctoral students, taking into account the compliance of each candidate's professional or research field with the announced vacancy. The further personnel selection and management procedure is performed by the Human Resources Department of LLU in accordance with the regulatory documents of Latvia and LLU. The director of the study programme in cooperation with head of department annually holds discussions with the academic staff members about the workload planned for the next study year in accordance with the work opportunities and needs of the lecturer, as well as taking into account the assessment of the quality of the lecturer's work in the previous study year. |
| 3.2. | Financial resource management | The financial resources of the study direction are managed in two directions. One aspect consists of centrally administered funding (staff salaries, total LLU maintenance and administration expenses), which is planned and supervised by the LLU Financial Planning Centre in accordance with the LLU internal regulatory documents. The second part of the funding is planned within the VBF for the development and maintenance of the infrastructure necessary for the faculty, study direction and programmes, and for the implementation of the study and research process. In accordance with the funding available to the VBF, an estimate of revenue and expenditure is prepared each year, in which the items to be included are discussed and agreed with the heads of departments. The prepared estimate, as well as the financial utilization report for the previous year is reviewed and approved by the VBF Council, which ensures transparent management of financial resources. |

| No. | The main processes defined in the Quality Management System of LLU | Activities for internal quality assurance |
|------|--|---|
| 3.3. | Provision and maintenance of infrastructure | <p>The provision and maintenance of the infrastructure is implemented in two blocks. One is the centrally planned maintenance of the infrastructure, the other is the provision and maintenance of the specific infrastructure (laboratories, computer classrooms, etc.) required for specific study programmes. The planning and maintenance of the infrastructure necessary for the study direction and programmes takes place at the departmental level. Departments planning the necessary works and procurements for the development and maintenance of infrastructure. The Dean of the VBF conducts discussions with the heads of the departments in order to identify priority works that would need to be budgeted within the current year or in the coming years. According to the available funding, a procurement plan is prepared, which includes the infrastructure works to be implemented in the particular year. The procurement plan is coordinated by the Chancellor of LLU, if necessary, other services are involved. The further procurement process is organized and ensured by the Procurement Department of LLU in accordance with the internal regulatory documents of Latvia and LLU</p> <p>In recent years, significant infrastructure development has taken place through the implementation of several EU programme projects</p> |
| 3.4. | Documents management | <p>LLU has established procedures for document management, it has developed internal normative documents, which are also observed in the context of study direction and programmes.</p> |
| 3.5. | Examination of applications and complaints | <p>LLU has established procedures for reviewing applications and complaints (for more details, see Subsection 2.2.3). The review of applications and complaints in the context of programmes of the study direction takes place primarily at the level of the study programme director. If the issue cannot be resolved at this level, then it is considered by the VBF Methodological Commission, inviting the involved parties if necessary.</p> |
| 3.6. | Provision of communication | <p>Provision of communication in the context of the study direction takes place in two directions - external and internal communication. External communication with the public in general is provided in cooperation with the LLU Communication and Marketing Centre, using LLU and VBF websites, social media and other media. It ensures the representation of a unified image and information of LLU to the public. Communication with partners and stakeholders is ensured according to the importance and topic of the issue, involving an employee of the appropriate level or area. Internal communication of the study direction is ensured within the department meetings and various working groups and commissions. Communication also takes place by e-mail; each LLU employee and student is provided with their own e-mail address. Communication within the study course is also provided in the e-learning environment. For information circulation, monthly LLU Newsletters have been created for the employees and students to learn the latest news (events and decisions).</p> <p>The culture of internal communication is regulated by the LLU Code of Ethics https://www.llu.lv/index.php/en/study-guide-documents</p> |
| 3.7. | Maintenance and updating of the Fundamental Library | <p>The process of maintenance and updating of the Fundamental Library is supervised by the library staff. Every year, the Fundamental Library of LLU conducts surveys on the acquisition of literature necessary for the implementation of the programmes of the study direction. The necessary sources of information (books, magazines, databases, etc.) are compiled at the departmental level from the academic staff members involved in the implementation of the programmes. At the same time, two methodological classrooms are maintained by the VBF (in the VBF building and Valdeka Castle) to replenish the Fundamental Library collection - funding is allocated each year for the maintenance of the thematic library. Information about the books available for the programmes of the study direction in the Fundamental Library of LLU and in methodological classroom is published and available on the VBF website http://www.vbf.llu.lv/lv/informacijas-centrs (only in Latvian)</p> |

| No. | The main processes defined in the Quality Management System of LLU | Activities for internal quality assurance |
|------|--|---|
| 3.8. | Ensuring the procurement process | Procurement planning for the study direction takes place at the departmental level. Departments prepare and prioritize the necessary procurements. The Dean of the VBF conducts discussions with the heads of the departments in order to identify the necessary procurements that would need to be budgeted within the current year or in the coming years. According to the available funding, a procurement plan is prepared, which includes the procurements to be implemented in the particular year. The procurement plan is coordinated by the Chancellor of LLU, if necessary, other services are involved. The further procurement process is organized and ensured by the Procurement Department of LLU in accordance with the internal regulatory documents of Latvia and LLU. |
| 3.9. | Provision of paid services | The pricing of the paid services provided by any study direction or programme is negotiated by the order of the Rector in order to ensure the provision of transparent, fair competition-based paid services (e.g. rental of premises for educational events, copying, research services, etc.). The provision of the paid services is overseen by the LLU Director's Office and Chancellor's Office. |

Table 3.

Implementation of the internal quality assurance of the study direction in cooperation with the stakeholders

| Stakeholders | Role and tools in internal quality assurance |
|--|---|
| Existing students, prospective students, graduates | Feedback from students and graduates is important for the evaluation of the study direction and the internal quality of the programmes. Surveys of prospective and current students and graduates are regularly conducted. The results are evaluated and taken into account for the improvement of programmes, as well as for the improvement of the study environment. Student representatives are included in the Council of the Faculty of Environment and Civil Engineering, in the LLU Study Council and LLU Senate. |

| Stakeholders | Role and tools in internal quality assurance |
|--|--|
| Employees | <p>Discussions and interviews with the employees involved in the implementation of the study direction (both academic staff members and support staff) mainly take place within the framework of the meetings of the department supervising the specific study programme. Meetings of the department are organized with a certain regularity, but not less than once in two weeks. At the meetings of the department, issues related to the quality of studies, the employee's work environment, opportunities for professional development and scientific work are considered. In some cases, if the employee is from another department, but the issue concerns the implementation of the study programme, then the employee is invited to participate in the meeting of the department. Matters related to employees are the responsibility of the head of the department and the director of the programme. In case of certain problematic issues, the dean of the faculty or the head of another structural unit may also take part in the discussions, if the employee is not from VBF.</p> <p>Employees are represented in the VBF Council, LLU Convention and Senate, as well as in various commissions directly involved in internal quality assurance.</p> |
| Other educational institutions (secondary education, secondary professional and higher education institutions) both in Latvia and in the Baltic States | <p>Regular exchange of experience and transfer of good practice from other educational institutions is essential for ensuring the internal quality of the study direction. Cooperation with other educational institutions is maintained both by mutually strengthening cooperation agreements, which include the implementation of joint activities, and the exchange of experience. The agreements concluded by the study direction with Riga Technical University on the transfer of the study programmes of the study direction, if it will not be possible to implement the specific programmes of the study direction, are very important. This requirement also complies with the regulatory framework for the implementation of programmes, which provides for the possibility to continue studies in another programme if the specific programme is no longer implemented.</p> |

| Stakeholders | Role and tools in internal quality assurance |
|---|--|
| Research institutes and other organizations involved in scientific activities | To ensure the internal quality of the study direction, there is an important scientific component that affects both the qualification of the academic staff (for example, the requirements set for the position of professor) and the status of LLU as a science university. Therefore, the performance of the academic staff in research is evaluated every year according to the indicators submitted by them. According to the submitted indicators, a bonus for scientific work is calculated for the academic staff member. Linking the findings gained in research with the study process, the involvement of students in research increases the quality of study programmes (especially in doctoral studies). In order to provide the research component, collaborations are established with other scientific institutions, which provide an opportunity to work in an interdisciplinary group and to use the scientific infrastructure of both parties. |
| Employers | In order to evaluate and ensure the internal quality of the study direction, employer surveys are regularly conducted, the results of which provide an opportunity to improve the study programmes in accordance with the demand of the industry. There are also regular meetings with employers in the field in connection with the provision of internships for students, co-operation in the implementation of guest lectures and study tours, co-operation in research projects. |
| Industry experts and organizations | Discussions with industry experts take place within various industry commissions and working groups, in which the academic staff members involved in the study direction also participates (for example, meetings, seminars, educational events organized by the Latvian Land Reclamation Association). The industry also initiates the development of professional standards in accordance with the Latvian regulatory framework, which are binding for changes or improvement of the content of the specific study programme. The quality of implementation of the requirements included in the professional standard in the specific study programme can be evaluated by industry experts by participating in these commissions, as well as the programme evaluation (for example, within the ESF project No. 8.2.3.0/18/A/009 "Improvement of the Latvia University of Life Sciences and Technologies"). Thus, industry experts can provide their vision for the improvement of the study programme. |
| State | The influence of the branch ministries on ensuring the internal quality of the study direction is related both to the development of professional standards and various regulatory documents of the field, as well as setting new requirements in the context of the specific industry in line with the latest trends in the industry. For example, co-operation with the Ministry of Agriculture, National SIA for the Ministry of Agriculture Real Estate (ZMNI) regarding the emphasizing of individual issues in study programmes, etc. |

2.2.2. Analysis and assessment of the system and the procedures for the development and review of the study programmes by providing specific examples of the review of the study programmes, the aims, and regularity, as well as the stakeholders and their responsibilities. If, during the reporting period, new study programmes have been developed within the study field, describe the procedures of their development (including the process of the approval of study programmes).

The development of new study programmes at LLU takes place in accordance with the regulations "Regulations for the Development, Approval and Change of Study Programmes at LLU" approved by the Senate (Appendix No.16). The development of a new programme is led by a potential study programme director. The regulations stipulate that before the study programme is approved by the Senate, it is discussed and analyzed in the Methodological Commission of the Faculty, the Council and the Study Council of LLU. Documents related to the studies and study programmes available: <https://www.llu.lv/lv/ar-studijam-saistitie-dokumenti> (only in Latvian) (<https://www.llu.lv/en/study-guide-documents> (in English)).

Existing study programmes are regularly reviewed every study year, as a result of which an annual report of the study direction is prepared. The directors of the study programmes participate in the development of the annual report of the study direction, the process is led by the head of the direction. The reports are analyzed by the Faculty Council, the Study Centre, the Study Council and approved by the Senate. The reports are available on the LLU website <https://www.llu.lv/lv/studiju-virzientu-parskati-un-pasnovertejuma-zinojumi> (only in Latvian).

In order to review and improve the study programmes, the findings expressed of the surveys of employers, students and graduates are evaluated. Also, in the implementation of study programmes there is regular communication with the representatives of the field, who are involved in the study process as invited guest lecturers, provide internships, welcome students in their companies during study tours, participate in thesis commissions. Also, the representatives of the industry, together with the academic staff members of the study direction participate in various industry commissions and working groups. During the cooperation, the latest trends in the field and the necessary improvements in the content of study programmes are highlighted. In the period from 2018 to 2021, all study programmes are evaluated in detail within the framework of the LLU project "Improvement of the Management of the Latvia University of Life Sciences and Technologies". Foreign experts and representatives of the respective industry (employers) participate in the evaluation of the programmes. Based on the recommendations of the experts, study programme improvement plans will be developed and implemented, which in turn will be included in the development plan of the entire study direction "Environmental Protection".

2.2.3. Description of the procedures and/or systems according to which the students are expected to submit complaints and proposals (except for the surveys to be conducted among the students). Specify whether and how the students have access to the information on the possibilities to submit complaints and proposals and how the outcomes of the examination of the complaints and proposals and the improvements of the study field and the relevant study programmes are communicated by providing the respective examples.

During their studies, students have the opportunity and the right to submit proposals and complaints about the study process and related matters. Students can submit proposals:

- in writing or orally at the faculty level - to the curator, director of the study programme, vice-dean or dean;
- in writing or orally at the management level of LLU - at the Study Centre, to the Vice-Rector for Studies, the Study Council and the Senate, reviewing and approving various internal normative documents.
- anonymously, using the Whistleblowing option at LLU website: <https://www.llu.lv/lv/trauksmes-celsana> (in Latvian)

The LLU Study Regulations, which are available to all students at My LLU, determine the procedure for submitting and reviewing complaints.

If a student has submitted a written complaint, then after reviewing it, they will receive a written response if the review of the complaint has taken place without the student's presence.

For example, a student disagrees with an unsuccessful final evaluation of a study course and turns to the director of the study program with verbal complaints. The director of the study program, together with the responsible lecturer, explains the evaluation criteria to the student. If there are reasonable doubts about the evaluation, it may be corrected, based on the completed study work, or a re-examination may be ordered before the commission established by the head of the department. If a written complaint is submitted, for example dissatisfaction with the attitude of a member of the final study commission towards the student, these issues are considered at the department meeting, decisions are made (for example, guidelines are developed to clarify the work of the final commission, or a decision is made to change the composition of the commission) and herewith decision presented to the complainant. If the student is not satisfied with the decisions made, he can contact the faculty management level or act in accordance with the procedures set out in the study regulations.

At the beginning of studies, the study program director informs students about the possibilities and procedure for submitting complaints and proposals.

The student can also submit a complaint to the Arbitration Court of LLU, which operates in accordance with its regulations.

2.2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of data to be collected, the regularity of collection, and the way the information is used to improve the study field. Describe the mechanism for obtaining and providing feedback, including with regard to the work with the students, graduates, and employers.

LLU centrally collects statistical data in different cross-section and with different regularity.

Once a month:

1. Number of students by study programme, types and forms of studies, study directions and faculties - the collected statistics are sent to the management of LLU and deans of faculties. Statistical data is used to follow the dynamics of the number of students at LLU.
1. Fulfillment of state-funded study places - data is collected by study programme in order to

follow the fulfillment of state-funded study places. These statistical data is used to forecast the number of new state-funded study places and the number of places available for student rotation in each semester (competition for state-funded study places) - the collected statistics are sent to LLU management and deans of faculties, vice-deans of faculties as needed.

Once every academic year:

1. Number of graduates by study programme, study directions and faculties, types of financing - data is used for preparation of various reports (for example, LLU annual report https://www.llu.lv/sites/default/files/2022-05/2022_LLU-publiskais-parskats_FIN.pdf) (only in Latvian)
2. Admission results - admission results in different cross-sections. Admission results are used to plan admission limits and forecasts for each subsequent year.
3. LLU Statistical Data Collection *University-1* for the Central Statistical Bureau (CSB) Data collection is based on the forms specified by the CSB. The collected data is also sent to the Ministry of Education and Science and is available to all interested parties (<https://izm.gov.lv/lv/publikacijas-un-statistika/statistika-par-izglitibu/statistika-par-augstako-izglitibu> (only in Latvian). The data is also used for the preparation of various reports (for example, the annual report of LLU https://www.llu.lv/sites/default/files/2022-05/2022_LLU-publiskais-parskats_FIN.pdf). (only in Latvian)

Once a year:

1. Summary of statistics by study direction - the summary is made for the previous study year - number of students by study programme, types and forms of studies, graduates, dropouts and reasons for termination of studies, statistics of foreign students. These summaries are received by all directors of study programmes and the data is used for the preparation of annual reports of study directions for evaluation (available at <https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi> (only in Latvian)).
2. Fulfillment of state-funded study places by year - data is used for preparation of LLU, MoA and MES contract execution reports.
3. LLU Development Strategies 2015-2022. Summary of the performance indicators of the educational programmes - the data is used for the annual reports on the implementation of the Development Strategy and for the cascading of the performance indicators for the next year. Strategy implementation reports by faculties take place in face-to-face meetings.

Feedback to students is consistently maintained throughout the study process. It focuses on the growth and achievable results of study programmes and courses. Feedback to students is provided in the form of formative assessments, such as self-assessment tests. The results of formative assessment in the study process are discussed, the strengths and weaknesses of the students in relation to the results to be achieved in the *course/programme* are identified. Students provide feedback on study courses in the LLU information system LAIS by filling in the course evaluation questionnaire. The results of these questionnaires are analysed and decisions are made on the improvement of study courses.

Graduates provide feedback by filling in surveys on the usefulness of skills and knowledge acquired in the study process while working in the profession. The obtained results are analysed in order to make conclusions about the topicality of the study programmes in the training of new specialists.

Feedback from employers in the form of surveys is obtained at various events, seminars, and gatherings. The information obtained is analysed and used to improve study programmes.

As specific examples of the impact of the survey data, improved study programs can be mentioned,

by updating the content of study courses and the distribution of study courses by semesters, in all study programs included in the study direction.

2.2.5. Specify the websites (e.g., the homepage) on which the information on the study field and the relevant study programmes is published (in all languages in which the study programmes are implemented) by indicating the persons responsible for the compliance of the information available on the website with the information published in the official registers (State Education Information System (VIIS), E-platform).

Information on study directions and study programmes is published on the website of the Latvia University of Life Sciences and Technologies <https://www.llu.lv/en>, including regarding current events in the respective study programmes, as well as basic information about each study programme. Detailed information (descriptions of study programmes) is available in the section: *Studies / Degree programmes* -> <https://www.llu.lv/lv/studiju-programmas> (only in Latvian)

Information in **English** about the study programmes is available on the English language site of the Latvia University of Life Sciences and Technologies: *Studies / Degree Studies / Degree Programmes* -> <https://www.llu.lv/en/degree-programmes>

All descriptions of study programmes can also be accessed through the home page of the Faculty of Environment and Civil Engineering of LLU: <http://www.vbf.llu.lv/lv> *Studies / Study opportunities* -> <http://www.vbf.llu.lv/lv/studiju-iespejas> (only in Latvian)

Information about study programmes is also available in **electronic informative materials** (booklets), incl. information about the study programme and feedback from graduates.

- Graduate studies: <https://www.llu.lv/lv/buklets/llu-pamatstudiju-buklets> (only in Latvian)
- Master's studies: <https://www.llu.lv/lv/buklets/llu-magistra-studijas-buklets> (only in Latvian)

The **structural units responsible** for the compliance of the information available on the LLU website with the information available in the official registers:

- Study centre - for 1st level, undergraduate and Master's study programmes,
- Study centre - for doctoral study programmes,
- Centre for International Cooperation - for study programmes in English.

The information on the LLU website has been prepared in cooperation with the director of each study programme.

Information about LLU study programmes is also available on the portal **www.prakse.lv**: <https://www.prakse.lv/edu/profile/84/latvijas-lauksaimniecibas-universitate> (only in Latvian)

Person responsible for posting the information: Lifelong Learning Centre project manager.

Information about LLU study programmes is also available in the **National Database of Educational Opportunities** [www.niid.lv: http://niid.lv/niid_search?qy=Latvijas%20Lauksaimniec%C4%ABbas%20universit%C4%81te&level_1=7](http://niid.lv/niid_search?qy=Latvijas%20Lauksaimniec%C4%ABbas%20universit%C4%81te&level_1=7) (only in Latvian)

The LLU website provides information on the conditions and procedures of academic mobility in accordance with the Erasmus + University Charter and the programme guidelines:

- <https://www.llu.lv/lv/stnacionaliska-mobilitate>- (only in Latvian)
- <https://www.llu.lv/en/exchange-studies>- in English
- LLU subscribes to study e-marketing sites:
- <https://www.masterstudies.com/universities/Latvia/LLU/>
- <https://www.educations.com/search/jelgava>

For foreign students

The LLU website provides comprehensive and detailed information to potential and existing full-time students from abroad:

- on the offer of LLU study programmes in English, see <http://www.llu.lv/en/degree-programmes>, where the description of each programme is described in detail, including the study plan, for example, https://www.llu.lv/en/landscape_architecture
- on the step-by-step admission process, see <http://www.llu.lv/en/how-to-apply>
- on immigration procedures, see <http://www.llu.lv/index.php/en/immigration>
- on study and living conditions, see <http://www.llu.lv/sites/default/files/2018-11/LLU-Celvedis-EN-2018-17.10.pdf>; <http://www.llu.lv/index.php/en/before-arrival> ; <http://www.llu.lv/index.php/en/about-university-0> ;
- feedback from foreign students, - <http://www.llu.lv/en/student-testimonials-7>
- The director of the study programme or the external relations coordinator of the faculty is responsible for the compliance of the content of the information posted on the websites or the changes in the official information, but the external communication coordinators of the LLU Centre for International Cooperation (SSC) are responsible for posting on these websites.

The LLU Centre for International Cooperation has prepared and published informative booklets “Erasmus+ Mobility Information Handbook” “Degree Studies”, information sheets and other materials that are used to advertise study programmes and exchange studies in marketing events.

From 2015, it is also possible to find out about the activities of the study direction with the help of social networks. **Sub-sector pages created on Facebook** and **Instagram** are actively used for information circulation

- LLU VBF Environment and Water Management

<https://www.facebook.com/videvbf> (361 followers) (only in Latvian)

- Instagram <https://www.instagram.com/videunudens/@videunudens> (572 followers) (only in Latvian)

To ensure the publicity of the fields of the study direction Environmental protection articles, video stories and interviews created by journalists, cooperation partners and academic staff members are also published.

2.3. Resources and Provision of the Study Field

2.3.1. Provide information on the system developed by the higher education institution/ college for determining and redistribution of the financial resources required for the implementation of the study field and the relevant study programmes. Provide data on the available funding for the scientific research and/or artistic creation activities, its sources and its use for the development of the study field.

The total funding of the programmes of the study direction consists of:

- State funding in accordance with the tripartite agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA) and the Latvia University of Life Sciences and Technologies (LLU) on the amount of state-funded study places in the programmes of the study direction.
- VBF's own funding (tuition fees and other income, such as rent for premises, research or study services, etc.).
- Scientific base funding granted to VBF according to the intensity and quality of research work.

The number of state-funded study places in each programme is coordinated in a tripartite agreement between the Ministry of Education and Science (MES), the Ministry of Agriculture (MA) and the Latvia University of Life Sciences and Technologies (LLU). The tripartite agreement on financing for **year 2022** stipulates that the **base costs of one study place are 1630.11 EUR**. Further costs are determined by the coefficient of the study level (Bachelor's, Master's or doctoral), the social security of the study place corresponding to each study level and the cost coefficient of the thematic area. The coefficients for each thematic area of education are different, they are stipulated in the regulations of the Cabinet of Ministers "Procedures for financing higher education institutions and colleges from the state budget". Available at: <https://likumi.lv/ta/en/en/id/149900-procedures-for-financing-institutions-of-higher-education-and-colleges-from-the-funds-of-the-state-budget>. Additional available funding consists of tuition fee revenues. Every year the tuition fee is reviewed according to the economic situation in Latvia and approved by the order of the Rector of LLU.

Available funding per study place per year (2022)

| Programme | According to the tripartite agreement between MES, MoA, LLU | | | | Tuition fee for Latvian students / foreign students per study year |
|---|---|---|---|------------------------|--|
| | Study level coefficient | Social security of the study place in EUR | Study cost coefficient of the thematic area | Costs per student, EUR | |
| Professional bachelor`s study programme "Environment and Water Management" | 1 | 164.34 | 1.94 | 3 328.80 | 1 960 PL,* 1 400 NL * |
| Academic master`s study programme "Environmental, Water and Land Engineering" | 1.5 | 164.34 | 1.94 | 4 911.03 | 2 400 |
| PhD study programme "Environmental Engineering" ** | 3 | 1009.53 | 2.06 | 11 106.73 | 2 500 /4 200 |

* PL - full time, NL - part time

** programmes are implemented or will be implemented in English

The costs of the study program are different for studying in Latvian and English.

Every year, the LLU Senate approves the distribution of revenues and expenditures of the general budget structure of the LLU, prepared in accordance with the Law on the State Budget, passed annually by the Parliament and the annual order of the LLU Rector "On Planning the General Budget of the LLU". The control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate.

Before approving the distribution of the LLU general budget revenues and expenditures in the Senate, it is reviewed, discussed and approved by the Working Group on Resource Use and Development, which consists of the Rector, Vice-Rectors, Chancellor, LLU Director, Deans of all faculties, Head of Resource Accounting Center / Chief Accountant Head of the Planning Centre, key economists, key specialists in real estate and legal issues.

The distribution of income and expenses approved by the LLU Senate determines that 80% of the funding allocated from the state consists of compensation costs and 20% are other costs. 60% of the paid study funding consists of remuneration costs and 40% are other costs, of which 20% are directly at the disposal of the faculty that implements the respective study programme. The amount of funding for the scientific base is calculated and allocated annually from the active research activities. Science base funding in the amount of 50% is at the direct disposal of the faculty and 50% is used to cover centralized costs. Research funding consists of funding attracted for the implementation of projects.

The remaining funding from tuition fees and other paid income, as well as the scientific base funding allocated to the faculty is used for the implementation of research activities, including publicity of research results in conferences and scientific journals, as well as for creative and other activities (e.g. student plein airs, thematic schools for prospective students, etc.).

2.3.2. Provide information on the infrastructure and the material and technical provisions required for the implementation of the study field and the relevant study programmes. Specify whether the required provision is available to the higher education institution/ college, available to the students, and the teaching staff.

The study programmes of the study direction "Environmental Protection" are mainly implemented by the Faculty of Environment and Civil Engineering (VBF) of LLU; however, resources of other faculties as well as centralised resources of LLU, such as the LLU Fundamental Library, are used to provide separate study courses. Classes are also held at the Faculty of Engineering, the Faculty of Agriculture, the Faculty of Information Technology, the Faculty of Forestry, and the Faculty of Food Technology. As VBF provides the specific infrastructure and material and technical base of the study direction, the infrastructure available in VBF, which is located in the main building of VBF, is described in detail below.

During the reporting period, the study and science infrastructure of the study direction "Environmental Protection" was significantly improved, attracting funding from the Faculty of Environment and Civil Engineering's own earnings (tuition fees, etc.), ERDF projects "Strengthening the research and development infrastructure and institutional capacity of LLU and the scientific institutions under its supervision" (No. 1.1.1.4./17/I/003) and "Modernisation of STEM study programmes" (No. 8.1.1.1.0/17/I/001), as well as from various other projects implemented at the

faculty. Significant repairs have been made to improve auditoriums and laboratories; purchased high-performance computer equipment that supports the development of digital skills, including BIM; equipment, tools and room equipment. Within the framework of the ERDF project “Modernisation of LLU study infrastructure” implemented by LLU, environmental accessibility was implemented in the academic year 2013/2014 by rebuilding the entrance to the faculty, replacing the entrance door with automatic door, replacing one lift with a lift that meets the requirements of environmental accessibility, as well as rebuilding the sanitary facilities on the first floor of the faculty.

The use of **auditoriums** at LLU is planned centrally; the study process of the direction is implemented in all 20 auditoriums of the main building of VBF. The auditoriums are equipped with interactive displays and whiteboards, which provide an opportunity for teaching staff to explain the study material and tasks using versatile and interactive methods, and for students to present their course work. The auditoriums are equipped with internet access. Free Wi-Fi is available for students and teaching staff. The internet is also available to participants of short-term seminars, guest lectures and conferences. In the auditorium of Professor Bushman (number of seats 220), it is possible to show educational movies, organise conferences and thematic seminars.

The following study and scientific laboratories, computer classes, etc. are involved in the implementation of the study direction programmes.

VBF Infrastructure used in implementation of the study direction “Environmental Protection”

| Infrastructure and logistical support | Study programme | | |
|---|--|---|---|
| | Professional bachelor`s study programme “Environment and Water Management” | Academic master`s study programme “Environmental, Water and Land Engineering” | PhD study programme “Environmental Engineering” |
| Irrigation and drainage laboratory. Equipped with computerised drainage and filtration visualisation study equipment, sediment flow measuring equipment, hydrological process study equipment for laboratory and practical work, student research, demonstrations. | X | X | |
| Pump Laboratory and Hydraulic Modelling Laboratory. Equipped with a water flow gutter, which can be adapted for various laboratory and scientific research work. | X | X | |
| Water supply and sewerage laboratory with visual aids for teaching work: pumps, oxygen meter, oximeter, fittings, pipes, fasteners, etc., of various materials, year of manufacture and type. | X | | |

| | | | |
|---|---|---|---|
| Building materials training laboratory for the study of the composition and properties of building materials. | X | | |
| Surveying training laboratory with modern measuring instruments. | X | | |
| Photogrammetry laboratory Equipped with 13 workstations, which perform photogrammetric processing of various photo (ortt-photo and 3D products) scenes and laser scanning data. | X | X | |
| GIS Competency Centre with 12 workstations equipped with “ArcGIS Pro” software, various remote sensing tools (unmanned aerial vehicles, photogrammetry cameras and laser scanners) and accessories used for study and scientific work. | X | X | X |
| Geodetic instrument calibration laboratory For testing optical and digital geodetic instruments and their systems, development and testing of new geospatial solutions | X | X | |
| Geospatial modelling computer class with 20 workstations equipped with “Microstation”, “ArcGIS Pro” software, 3D modeling. Processing and analysis of various types of spatial data. | X | X | |
| Forest and Water Scientific Laboratory Equipped with a greenhouse gas (GHG) emission measuring device, hydroacoustic flow meters, field multi-meters for determining water quality parameters, a set of equipment for measuring nitrogen oxide isotopes and concentrations, etc. equipment and facilities for scientific research. | X | X | X |

Field monitoring stations (Auce, Mellupīte, Bērze, Flour, Staļģene, Oglaine, Vienziemīte, Mežacīruļi) are equipped with sensors, data loggers, measuring equipment and other equipment for research.

X

X

Scientific laboratories and equipment are also available to other LLU structural units for the performance of specific research by LLU researchers and doctoral students, upon prior agreement. Information on available scientific equipment at LLU is compiled in a single database and is freely available at <https://www.llu.lv/lv/zinatniska-inventara-datubaze> (only in Latvian).

The existing infrastructure is used for cooperation with the industry, jointly organised thematic seminars and conferences to present topical issues of the industry to industry professionals, students and other interested parties. The infrastructure is also used to attract new students by organising “open door” events, collaborating with vocational secondary schools and technical schools, and demonstrating experiments in the faculty laboratories to school students. In cooperation with other Latvian and foreign higher education institutions, researchers of LLU and other higher education institutions mutually use the research infrastructure, taking into account the specific directions developed in each higher education institution.

Future plans for the development of infrastructure are related to the development of outdoor laboratories and monitoring stations, which would allow for the more efficient and practical implementation of various practical works and scientific research.

2.3.3. Provide information on the system and procedures for the improvement and purchase of the methodological and informative provision. Description and assessment of the availability of the library and the databases to the students (including in digital environment) and their compliance with the needs of the study field by specifying whether the opening times of the library are appropriate for the students, as well as the number/area of the premises, their suitability for individual studies and research work, the services provided by the library, the available literature for the implementation of the study field, the databases available for the students in the respective field, the statistical data on their use, the procedures for the replenishment of the library stock, as well as the procedures and possibilities for the subscription to the databases.

The study and scientific literature required for the implementation of the programmes of the study direction Environmental Protection is available in the Fundamental Library of LLU, as well as in the VBF Information Centre and the Methodical Classroom of Valdeka Castle.

Suitability of the working time of the Fundamental Library of LLU for the needs of students

The working hours of the library are adjusted to the needs of the main users of the library - students and academic staff. On weekdays, the library is open to users from 8.30 to 19.00, on Fridays - from 8.30 to 17.00. The library is also open to users on the first Saturday of each month from 9.00 to 14.00. The working hours of the library reading rooms and the Reference and Information Centre are extended until midnight during individual study and examination period. The catalog and online databases are available indefinitely.

Information about the service premises at the Fundamental Library of LLU

| Telpas Nr. | Nosaukums | Platība, m ² |
|------------|--------------------------------|-------------------------|
| 161. | Subscriptions | 26.9 |
| 254. | Reading room | 396 |
| | Reading room balcony | 223 |
| 255-1 | Quiet reading room | 34.3 |
| 255. | Inquiry and information center | 57.6 |
| 76. | Study literature subscription | 49.3 |
| Kopā | | 787.1 |

The reading room has comfortable workspaces both in the hall and on the balcony. Internet and WI-FI are available. The reading room also has a seating area with comfortable sofas. There is also the quiet reading room available. The reference and information centre has desktop computers and the services of a qualified consultant are provided.

Services offered by the library

The following free services are available at LLU FB:

- use of a computer with internet connection and wireless internet,
- possibilities to use Autodesk EDU Master suite 2018 (AutoCAD, AutoCAD Structural Detailing, Autodesk Robot Structural Analysis professional, etc.), CorelDRAW X7, SPSS Statistics v21, VISIO 2013,
- 24/7 use of online databases created, subscribed by the library or free of charge,
- submitting / receiving books, serials and other documents,
- training in working with full-text and bibliographic databases, consultations in working with computers and the Internet,
- training for the academic staff members of LLU, including online training on search, retrieval of information online, creating personal account, adding publications to the LLU academic staff and researcher publication database, creation of the LLU IS personal account, Mendeley, researcher identification number ORCID and Research ID etc.,
- training for doctoral students, Master's students, undergraduate students, incl. in English,
- support materials for each target audience (scientists, students, other users) and provision of such materials on request,
- conducting inquiries and consultations on the library and its possibilities of use,
- editing bibliographies, sending examples of descriptions by e-mail upon request,
- creation of exhibitions according to additional agreement..

The following paid services are available at LLU FB:

- copying (color, black and white),
- prints (color, black and white),
- scanning,
- preparation of written thematic references,
- SBA and SSBA services (postal costs to be covered),
- delivery of copies of documents (according to suppliers' pricing),

- spiral binding..

The library offers the following e-services:

- 24/7 use of electronic catalog,
- 24/7 electronic book reservation, extension,
- use of PRIMO DISCOVERY unified search engine,
- 24/7 use of the library's online, subscribed and free online databases (both full-text and bibliographic), the possibility to use the "Ask the Librarian" service in the EBSCO database,
- possibilities to connect to the subscribed e-journal and e-book databases outside the LLU network, using the EZproxy and LLU IS user account 24/7, use of the Mendeley scientific information search engine, opportunities to use other online information resources from the library's website, opportunities to connect from the library's website to the electronic catalogs of the information centres and information rooms of LLU faculties (BIS ALEPH500), opportunities to use information resources and support materials prepared both by LLU FB and offered by database maintainers, accessing from the library website,
- electronic delivery of documents,
- "Skype a librarian",
- "Book request form" on the library's website.

Available databases in the relevant field, statistics of their use

The Fundamental Library of LLU offers users various online databases and databases on other media. The library has purchased the search engine PRIMO DISCOVERY, which provides simultaneous search in subscribed and open access online databases, in the electronic Joint Catalog of libraries of national significance, in databases created by LLU FB (publications of LLU lecturers and researchers, LLU Master's theses, etc.). By registering with the LLU IS user account, you can view your user account and extend the deadlines for issued books, order publications, access full texts in subscribed online databases, save your search results. "Guidelines to searching information on PRIMO" are available on the library's website. Access to online databases is provided 24/7 in the LLU network, as well as to authorized users outside the LLU network, using the EZproxy and LLU IS user accounts.

Before offering databases to users, they are analyzed for search capabilities, thematic coverage, chronological coverage, and access options. Information about databases is prepared and their descriptions are published on the LLU FB website.

LLU FB users have the opportunity to search for information on topics of the Environmental Protection study direction in the following subscribed foreign and Latvian online databases:

- CAB Abstracts,
- CRC Press e-books,
- EBSCO eBook Academic Collection database, which covers a wide range of multidisciplinary topics and contains more than 228515 e-books,
- EBSCO host databases Academic Search Complete, MasterFILE Premier and others,
- ScienceDirect Journals,
- Scopus,
- Web of Science,
- Wiley Online Journals.

Use of foreign databases subscribed to by LLU FB in 2021

| Database | Number of connection sessions | Number of searches |
|------------------------|-------------------------------|--------------------|
| CAB Abstracts | 2143 | 6697 |
| EBSCO | 37022 | 107694 |
| EBSCO e-book | 7125 | 20598 |
| Science Direct Journal | 10546 | 33101 |
| Scopus | 18499 | 23963 |
| Web of Science | 4368 | 15088 |
| Wiley Online Journals | 6166 | 8569 |

In cooperation with the Cultural Information System Centre, various online databases are also regularly offered for a trial period.

Readers are also offered databases created by the employees of the LLU Fundamental Library:

- Publications of lecturers and researchers of the Latvia University of Life Sciences and Technologies,
- Doctoral theses defended at the Latvia University of Life Sciences and Technologies,”
- Conference materials of Latvia University of Life Sciences and Technologies”,
- Publications of lecturers and researchers of the Latvia University of Life Sciences and Technologies”,
- Publications about Latvia University of Life Sciences and Technologies”.

LLU FB as the deposit library of the Food and Agriculture Organization of the United Nations and the AGRIS National Centre participates in the development of the international AGRIS database.

Library replenishment procedure and database subscription procedure and options

The library collection is mainly compiled according to the recommendation of the academic staff. “Book request form” on the library’s website. Taking into account the requests of academic staff and other library users, LLU FB purchases the requested publications. A “Collection Acquisition Policy” has also been developed for the Fundamental Library of LLU, which determines that the main priority in the acquisition of the collection is given to the LLU study programmes and research directions. In accordance with the Law on Compulsory Copies, the LLU FB, as a library of national significance, receives one copy of each printed work and electronic publication in the fields corresponding to the LLU profile. In cooperation with the Cultural Information Systems Centre, LLU FB offers its users to try out many databases available in the world. LLU FB employees carefully evaluate the statistics of the use of both subscribed and trial databases. As a result, taking into account the test statistics and based on the recommendations of the academic staff, a decision is made regarding which databases the library subscribes to.

A specific range of literature purchased from VBF or project funding is available at the **VBF Information Centre**. Here one can find also the gifts from the industry representatives, foreign partners and former employees. Information on the available literature by the theme of the programmes of the study directions is published on the VBF website <http://www.vbf.llu.lv/lv/informacijas-centrs> (only in Latvian).

Students in the e-learning environment of LLU also have electronic access to several **teaching aids developed by the academic staff** - books, methodological instructions, etc. Following materials (mostly in Latvian) were developed within the reporting period:

- Remediation of brownfields. Research. Scheduling. Use (2019) (Bērziņa M., Grīnfelde I., Īle U., Jankava A., Katlapa A., Turks M., Ņitavska N., Paršova V., Pilsecka J., Skujāne D., Spāģe A., Straupe I.) Jelgava: LLU, p. 133. (only in Latvian).
- Lagzdiņš Ainis, Handbook on the installation of environmentally friendly elements in drainage systems (2018) / authors of the text: Ainis Lagzdiņš, Linda Grinberga, Artūrs Veinbergs, Alise Trifane; editors: Kristīna Veidemane and Ingrīda Brēmere; cover photo: Ainis Lagzdiņš. [Jelgava]: Zemgale Planning Region, p. 96. The resource is also available online. (only in Latvian).
- Possibilities for Reducing Greenhouse Gas Emissions with Climate-Friendly Agriculture and Forestry in Latvia (2018): monograph / editor-in-chief Pēteris Rivža; monograph authors Bērziņa Laima, Degola Lilija, Grīnberga Linda, Ritvars Sudārs [and 8 other authors] Jelgava: Latvia University of Life Sciences and Technologies, p. 304. (only in Latvian).
- Design of student works (2017): methodological instructions / developed and compiled by: Uldis Kļaviņš, Ritvars Sudārs, Anda Jankava, etc.; Latvia University of Life Sciences and Technologies. Faculty of Environment and Civil Engineering. Reissued, supplemented edition. Jelgava: LLU, p. 46. (only in Latvian).
- Kļaviņš U., Sudārs R. Teaching aid "Drainage" (2016), LLU, p. 239. (only in Latvian).
- Valujeva K., Grīnfelde I., Straupe I. Phytoremediation: possibilities of use in Latvia; Latvia University of Life Sciences and Technologies (2016). Forest and Water Resources Scientific Laboratory Jelgava: Latvia University of Life Sciences and Technologies, p. 112. (only in Latvian).
- Climate change in rural areas: teaching aids in the e-learning environment (2016). Compiled by N. Pauliņš, N. Ņitavska, M. Markova, S. Rubene, D. Zigmunde, K. Vugule, U. Īle, S. Štrausa, K. Valujeva, V. Baumane, A. Celms, Dz. Kreišmane, D. Šterna. (only in Latvian).
- Ieviņa D., Kondratenko J. (2014) Guidelines for Sustainable Rainwater Drainage Management, (only in Latvian). p. 70 <http://www.bauska.lv/allfiles/files/Projekti/Lietuvas%20parrobezu%20projekti/water/llgtspejigas%20lietusudenu%20kanalizācijas%20vadlīnijas%20g93-final.pdf>.
- Tilgalis Ē. Village water supply and sewerage (2014) (teaching aid), p. 254. (only in Latvian).
- Grinberga, L., Jansons V. (2012). Constructed wetlands to reduce water pollution, SIA "Drukātava", p. 42. (only in Latvian).

2.3.4. Provide a description and assessment of information and communication technology solutions used in the study process (e.g., MOODLE). If the study programmes within the study field are implemented in distance learning, the tools specially adapted for this form of study must also be indicated.

The study direction takes place on-site or off-site, taking into account the specified number of contact classes in each study course, according to the amount of work (CP). The LLU e-learning platform Moodle (<https://estudijas.llu.lv/?lang=en>) is widely used as a support system in the study process. In this platform, it is possible to create a website for each study course, where it is possible to place study materials, assign independent work, receive such for evaluation, create tests of various complexity and other examinations, send e-mails.

The BBB (BigBlueButton) tool is integrated in the LLU e-learning system, which allows the provision of online lectures, practical classes, seminars, conferences, and, if necessary, the defence of final theses. LLU offers to use the online platform ZOOM for the organisation of various conferences and work (lectures, practical work, consultations) with foreign students, who will start their studies at LLU only remotely without coming to Latvia.

E-learning support has been set up to maintain the system and provide assistance in the case of problems, which provides consultations and promptly helps to eliminate the problems that have arisen.

The e-learning system of LLU includes instructions, video instructions, which are available to teaching staff and students in the use of various tools; plagiarism testing of study papers submitted in e-studies is possible.

The Moodle platform is widely used in studies, and practically every study course has its own website, so that the study process is not interrupted during the study restrictions (for example, epidemics).

2.3.5. Provide information on the procedures for attracting and/or employing the teaching staff (including the call for vacancies, employment, election procedure, etc.), and the assessment of their transparency.

The process of attracting and employing the teaching staff of the LLU (incl. announcing vacancies, hiring process, election procedure, etc.) is regulated by the regulations approved by the Senate of the LLU - Regulations of the academic positions of the Latvia University of Life Sciences and Technologies (Document is available in the No.7 in attachments section in the folder "LLU Documents in English")

Selection

The number of positions of professors, associate professors and assistant professors in the relevant branches of science in accordance with the funding opportunities and the need for the implementation of appropriate study programmes is determined by the LLU Senate following the decision of the faculty council. Occupation of an academic position at LLU takes place in accordance with the procedure of an open competition, which is specified in the Regulations of the academic positions of the Latvia University of Life Sciences and Technologies.

Requirements

Applicants for an academic position need a scientific or academic degree specified for the specific position. Requirements for applicants for academic positions are determined by the Law on Higher Education Institutions.

The common requirements for all applicants for academic positions are:

- knowledge of the state language in accordance with the requirements of regulatory enactments;
- knowledge of foreign languages at the level required for the performance of the duties of the academic position (including conducting classes in these languages);
- continuous improvement of one's academic and scientific qualification.

Election

Based on the received suggestions of the academic structural units regarding the vacant academic positions, the LLU Human Resources Department prepares a draft announcement and submits it to the LLU Academic Personnel and Structural Policy Commission for consideration (hereinafter - the Commission). After the decision of the meeting of the Commission, the Human Resources Department prepares a draft on the vacant academic positions and submits it to the LLU Senate for approval. After the decision of the Senate is made, the Human Resources Department announces an open competition for vacant academic positions by publishing an advertisement in the newspaper "Latvijas Vēstnesis" and on the LLU website.

Elections are held by secret ballot: for the position of a professor and an associate professor - in the relevant sectoral professors' councils not later than within four months from the day of announcing the competition; for the position of an assistant professor, leading researcher, researcher, lecturer, assistant and research assistant - in the faculty councils not later than within three months from the day of announcing the competition; in the position of a leading researcher, researcher and scientific assistant - in the scientific councils of scientific institutes not later than within two months from the day of announcement of the competition.

The contract of employment for an academic post is concluded by the rector for the period of election.

If LLU has a vacant academic position, the LLU Senate may decide not to announce a competition upon the proposal of the faculty council. In this case, the rector may hire a visiting professor, associate visiting professor, visiting lecturer, guest lecturer or visiting assistant for a period of up to two years.

The **individual academic work of the academic staff members is planned** in each study year in accordance with the LLU academic work calculation regulations (Document is available in No.8 in the attachments section in the folder "LLU Documents in English") and the Rector's order On planning, accounting and control of the individual workload of the academic staff in the study year (Document is available in the attachments section in the folder "LLU Documents in English" Annex 8), which determines the academic staff work components, regulations, procedure for recording and controlling the work.

Remuneration

Academic position remuneration at LLU consists of 3 components:

- *remuneration* based on the regulations of the Cabinet of Ministers "*Regulations on Teachers' Remuneration*": - <https://likumi.lv/ta/en/en/id/283667-regulations-regarding-remuneration-of-teachers> and the Rector's Order "*On Teachers' Remuneration*";
- *bonus from the motivation system* - LLU has developed and implemented a motivation system that allows the compiling and evaluating of academic work activities of each lecturer that are not included in the workload. The system provides a points system based on 16 criteria. The description of the system and the procedure for compiling the data of the motivation system are attached in Annex 9. in the description section "Other appendices" in the folder "LLU Documents in Latvian";
- *bonus for scientific performance* - every year LLU compiles and evaluates the performance of scientific activities of the academic staff, leading researchers, researchers and scientific assistants of LLU in points according to 7 criteria. The description of the criteria and the procedure for compiling the data are attached in the attachments section in the folder "LLU Documents in English" Annex 11.

2.3.6. Specify whether there are common procedures for ensuring the qualification of the academic staff members and the work quality in place and provide the respective assessment thereof. Specify the options for all teaching staff members to improve their qualifications (including the information on the involvement of the teaching staff in different activities, the incentives for their involvement, etc.). Provide the respective examples and specify the way the added value of the possibilities used for the implementation of the study process and the improvement of the study quality is evaluated.

The professional development of the academic staff includes both the acquisition of appropriate professional development programs and the exchange of experience and participation in conferences and seminars, which is confirmed by the documents issued at the end of them.

The procedure for professional development is determined by the Regulations of the Cabinet of Ministers "On the Education and Professional Qualification of Teachers and the Procedure for Improving the Professional Competence of Teachers (<https://likumi.lv/ta/id/301572-noteikumi-par-pedagogiem-nepieciesamo-izglitibu-un-profesionalo-kvalifikaciju-un-pedagogu-profesionalas-kompetences-pilnveides>) (only in Latvian). These regulations determine that the pedagogical qualification required for university academic staff must be obtained in further education in professional development programs on innovations in the higher education system, university didactics or educational work management in the amount of 160 academic hours (including at least 60 contact hours) until the end of the academic term. The LLU has established a professional development program for higher education teachers "Innovations in the didactics of the higher education institution". The aim of the program is to improve the knowledge of higher education teachers in the didactics of higher education and the possibilities of their use in pedagogical activities. After mastering this program, a certificate is issued.

The teaching staff of the study direction have the opportunity to develop professionally in various activities, which are provided from various projects or VBF funding. Every year, professional development is implemented by about 15-20 teaching staff members participating in various activities:

- professional development courses and seminars with training (10-12 different professional development courses per year);
- courses related to the supplementation of knowledge in the field of pedagogical skills, didactics, information technology (20-30 activities per year);
- conferences and seminars as participants (10-20 conferences/seminars per year);
- international professional exhibitions as visitors (on average 3 exhibitions per year);
- internship in companies within the framework of ESF project No. 8.2.2.0/18/A/014 "Perfection of academic staff" (3 lecturers).

The professional **development** of the teaching staff **is closely related to the increase of the quality and efficiency of the study courses they implement**. For example, lecturers who teach professional study courses related to the field of drainage regularly (every year) participate in seminars for raising the professional competence of drainage systems and hydraulic engineering construction specialists organised by the Latvian Society of Ameliorators, seminars on the maintenance of drainage systems organised by the Farmers' Parliament, etc. Participation in professional development activities provides an opportunity to follow current events in the industry, providing quality professional education.

In 2019-2021, attracting ESF project No. 8.2.2.0/18/A/014 "Perfection of Academic Staff" funding, teaching staff had the opportunity to participate in professional development courses in connection with the acquisition of modern presentation approaches, as well as the improvement of English language skills. Good knowledge of English is essential for working with foreign students, as well as for mutual cooperation with foreign partners.

In order to motivate the teaching staff to improve regularly, in recent years LLU has developed a motivation system, which envisages an annual evaluation of the activities implemented by the teaching staff (including professional development) and the granting of a motivation bonus in accordance with the evaluation.

2.3.7. Provide information on the number of the teaching staff members involved in the implementation of the relevant study programmes of the study field, as well as the analysis and assessment of the academic, administrative (if applicable) and research workload.

62 lecturers participate in the implementation of the study direction "Environmental Protection", which makes up a total of 6.4 full-time equivalent (FTE) staff positions. The average academic workload per lecturer is 0.4. When assessing the workload of the academic staff in the study work, it should be taken into account that the teaching staff also participates in the implementation of other study programmes, carries out research work, and works in the field of lifelong learning. Some of the teaching staff also work in the professional field and perform administrative work. Appendix 7 contains basic information about the teaching staff involved in the implementation of the study direction – degree/qualification, election status at the university, study programmes and study courses in the implementation of which the teaching staff participates, as well as the level of English language proficiency (if applicable).

Out of the total number of lecturers, 34 are from the departments of the Faculty of Environment and Civil Engineering, but 28 lecturers are from other structural units of LLU. This is related to the thematic areas of study courses approved by LLU, for which certain faculties and departments are responsible, for example, lecturers from the Faculty of Economics and Society Development participate in the implementation of economics and business courses; in turn, physics and mathematics courses are taught by lecturers from the Faculty of Information Technology. Such a division of fields has been created in order to ensure the increased quality of the study courses to be acquired.

On average, 66% are elected academic staff in the study direction. In study programmes this indicator differs. In the master's programme it is 73.1%, but in the doctoral programme – 100%. In the professional bachelor's programme, the teaching staff with a doctoral degree makes up 51%, in the academic master's programme – 54%, but in the doctoral programme 100%. Faculty members with a master's degree participate more in the management of practical and laboratory work.

34 teaching staff, or 54.8%, work at LLU also as scientific personnel, working on research projects. The characteristics of the teaching staff involved in the study direction in the study year 2021/2022 are shown in the table.

Table 8.

Characteristic of academic staff (incl. guest lecturers) involved in the study direction in the academic year of 2020/2021

| Position | Number | Percentage distribution of the total number,% |
|--|---------------|--|
| Professors, including Emeritus | 12 | 19.4 |
| Associate professors, including Emeritus | 8 | 12.9 |
| Assistant professors | 12 | 19.4 |
| Lecturers | 28 | 45.2 |
| Assistants | 2 | 3.1 |
| Total | 62 | 100.0 |
| incl. teaching staff who are scientific staff. Total: | 34 | 54.8 |
| Leading researchers | 18 | 29.0 |
| Researchers | 14 | 22.6 |
| Research assistants | 2 | 3.1 |

The teaching staff of the study direction **were also active in the commissions, committees and councils related to education, research and industry issues** (Table 9). As a result, lecturers know the current issues in the industry and follow the policy of the industry. Also, on average, 5-10 lecturers are invited every year as guest lecturers to professional organisations in the industry, which indicates their competence and high assessment outside LLU.

9. tabula

The work of the teaching staff in commissions and councils

| No. | Name of the council, commission | Number of teaching staff |
|------------|---|---------------------------------|
| 1 | LCS experts (Engineering sciences and technologies - Environmental engineering and energy; Engineering sciences and technologies - Electrical engineering, electronics, information and communication technologies, Engineering sciences and technologies - Construction and transport engineering sciences; Engineering sciences and technologies - Other engineering sciences and technologies, including food and beverage technologies; Humanities and arts - Music, visual arts and architecture, Social sciences - Economics and business; Agricultural, forestry and veterinary sciences - Other agricultural, forestry and veterinary sciences; Agricultural, forestry and veterinary sciences - Animal and dairy science. | 10 |

| No. | Name of the council, commission | Number of teaching staff |
|-----|--|--------------------------|
| 2 | Members of the Councils of Professors (LLU Council of Professors of Environmental Engineering and Energy; LLU and RTU Joint Council of Professors of Architecture; RTU Council of Professors of Environmental Engineering) | 7 |
| 3 | Members of the Promotion Councils (LLU Construction and Transport Engineering Promotion Council; LLU Information Technology Promotion Council; LLU Environmental Engineering and Energy Promotion Council; LLU Agricultural Industry Promotion Council; LLU Forestry Promotion Council; RTU Environmental Engineering Sciences Promotion Council; LLU Landscape Architecture Sub-field Promotion Council; RTU Architecture Promotion Council) | 12 |
| 4 | Members of the Latvian Academy of Sciences, Latvian Academy of Agricultural and Forest Sciences | 14 |
| 5 | Members of state institutions, ministries, local government commissions (Latvian Council of Environmental Science and Education; Drainage Advisory Council of the Ministry of Agriculture; Climate Change Adaptation Expert Working Group of the Ministry of Environmental Protection and Regional Development; Study programme accreditation commissions of the Ministry of Education and Science, etc.) | 8 |
| 6 | Members of the Scientific Committees, Editorial Boards and Conference Organising Committees | 6 |
| 7 | Members of the boards, councils, commissions of professional organisations (Latvian Society of Ameliorators; Latvian Society of Geneticists and Breeders; Latvian Association of Econometricians; Latvian Society of Surveyors; Latvian Association of Civil Engineers and Latvian Association of Cartographers and Surveyors, GIS Association, etc.) | 11 |
| 8 | Members of international organisations (Nordic Association of Agricultural Scientists, the American Society of Agricultural and Biological Engineers, the International Association of Hydrological Sciences, the International Union of Geodesy and Geophysics (IUGG), International Association for Bridge and Structural Engineering - IABSE, etc.) | 6 |
| 9 | Members of the State Examination Commissions for the final thesis (LLU study programme commissions; RTU study programme Geomatics, Heat, Gas and Water Technologies) | 8 |

| No. | Name of the council, commission | Number of teaching staff |
|-----|---|--------------------------|
| 10 | Members of competition juries, commissions (Competition Best Construction of the Year; European Innovation Partnership (EIP) project idea evaluation committee, etc.) | 3 |

The qualification and contribution of teaching staff is also assessed by the industry, the state and local governments, giving teaching staff awards and certificates of appreciation. Awards and certificates received during the reporting period:

- Latvian Academy of Sciences, SIA “ITERA LATVIJA” and RTU Development Fund awards;
- Medals of the Ministry of Agriculture of the Republic of Latvia “For diligence” and certificates of appreciation;
- Certificates of appreciation from the Ministry of Environmental Protection and Regional Development.

During the reporting period, the **teaching staff** of the study direction **implemented mobility** within the framework of several activities:

- “ERASMUS+”, “NordPlus” or other mobility programmes for lectures or experience exchanges;
- Within the intensive courses of BOVA (Baltic Association of Forestry, Veterinary and Agricultural Higher Education Institutions);
- Lectures and classes within international summer schools;
- Participation in international conferences, exhibitions and workshops;
- Within the framework of international project activities (seminars, workshops, thematic excursions, etc.);
- Within internships at foreign universities.

More detailed information about each lecturer involved in the study direction can be found in their Curriculum Vitae (CV), which are attached in Appendix 8.

The departments also carry out activities to establish long-term cooperation with foreign universities. It provides an opportunity to also attract foreign guest lecturers within the framework of other activities (“ERASMUS+”, “NordPlus” mobility programmes, Swiss grant, international projects). During the reporting period, 15 foreign guest lecturers have taught classes for students of the study direction.

For more detailed information on attracting foreign guest lecturers, see section 5.2 Attracting foreign students and lecturers to the study direction. Statistics on **incoming and outgoing mobility of lecturers** during the reference period are attached in Annex 16 of the 2nd part of this report. Assessing the activity of lecturers for the implementation of mobility to foreign universities and other institutions, it shall be concluded that the possible financial tools and programmes are sufficient. The biggest challenge is the planning of mobility activities, as most lecturers (including foreign ones) are very busy with their daily academic and research work.

2.3.8. Assessment of the support available for the students, including the support provided during the study process, as well as career and psychological support by specifying the support to be provided to specific student groups (for instance, students from abroad, part-time students, distance-learning students, students with special needs,

etc.).

Support for students in the study process, career development, as well as financial and information support are provided to full-time and part-time and foreign students.

Support in the study process

Support for students in the study process is based on a student-centered education approach:

- Respecting the needs of students, the study environment accessible to each student is ensured, the accessibility of the environment in the premises is also ensured. Students have the opportunity to attend classes and use study and scientific equipment, to use the study infrastructure also outside of classes.
- Lecturers are available for students for communication not only during classes, but also during consultation hours, as well as for communication in e-studies and by e-mail.
- The review of student complaints is regulated by the LLU Study Regulations https://www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf , but complaints are also reviewed by the commission. In addition, students are invited to seek assistance by escalating the issue, starting from the director of the study programme, the head of the department, vice-dean, dean and, finally, the vice-rector for studies.
- In order to ensure the participation of students in the improvement of the study process, the director of the study programme regularly listens to the students' suggestions and explains possible solutions for improving the studies.

Career and psychological support

In all study programs of the study direction Environmental Protection there is a close cooperation with companies and organizations in the field. Study trips to companies, guest lectures with the participation of industry professionals and other activities are organized, that help to find the most suitable specialization and direction, where to work after graduation of the study programme. Also, in cooperation with companies, students are provided with traineeships, where they often continue to work even after graduation.

There is no separate Psychological Service at LLU, but students have the opportunity to discuss current study issues with the director of the study program, head of the department, vice dean or dean, as well as to participate in LLU Student's Self-Government, where joint student activities are organized and support is provided. LLU Student Self-Government (LLU SP) is an organization representing university students, which deals with important issues of academic, social, cultural and sports life, represents and defends students' opinions and rights. Student self-government provides significant support in student involvement, adaptation and the study process.

Accessibility to environment

Accessibility to the environment for students and employees with movement and visual impairments is ensured in the study building of the Faculty of Environment and Civil Engineering. Information about the accessibility in LLU is available: <http://www.vbf.llu.lv/lv/vides-pieejamiba-personam-ar-invaliditati> (only in Latvian).

Financial support

During the studies, financial support for students is provided in the form of scholarships (<https://www.llu.lv/stipendijas> (only in Latvian)). Students may apply and compete for:

1. State scholarship - in Master's and undergraduate studies the monthly scholarship until 31.12.2021 was 200 EUR, starting from 01.01.2022 - 140 EUR per month, in doctoral studies 113.83 EUR per month (during COVID-19 it was increased to 200 EUR per month), in doctoral studies - 140 EUR;
2. One-time scholarship - during the semester the student can apply for a one-time scholarship in the amount of 2 minimum scholarships;
3. Scholarship for obtaining a scientific degree - it is a scholarship equivalent to a loan in the amount of 85.37 EUR (the award of new scholarships has been terminated as of March 1, 2020);
4. Social scholarship "Studēt gods" for students from multi-child families - the monthly scholarship is 160 EUR;
5. LLU Development Fund (LLU AF) scholarship - the fund offers students a total of 18 scholarship programmes (from 40 to 1500 EUR). Scholarships are both monthly and one-time.

Scholarships offered to students in the study programmes of the study direction "Environmental Protection"

| Scholarship / study level | Bachelor's studies | Master's studies | PhD studies |
|---|---------------------------|-------------------------|--------------------|
| State scholarship | x | x | x |
| Social scholarship "Studēt gods" | x | | |
| LLU Senate scholarship | x | x | |
| Jānis Čakste scholarship | x | x | |
| Kārlis Ulmanis scholarship | x | x | |
| Jāņa Biķa scholarship | x | | |
| Artūra un Ērikas Gerhardu scholarship | x | | |
| Jāņa un Millijas Kāvušu scholarship | x | x | x |
| Mirdzas Oškalnes scholarship | x | x | |
| Jāņa Rūvalda scholarship | x | | |
| Vagner family scholarship | x | | |
| LLU Student Self-Government scholarship | x | | |

Tuition fee discounts

LLU offers tuition fee reductions (50-100%) for the following successful students:

- LLU employees who study in doctoral study programmes.
- For the children of LLU employees.

- People with first and second degree disability.
- For orphans or surviving dependents.
- For student athletes.

Sports lessons

The LLU “Sporta nams” offers **free lessons** in several types of sports to all students:

- In fitness suite;
- In gym;
- In sports hall;
- In the swimming pool.

Students are offered several training times per week, see more here <https://www.llu.lv/en/sport-for-students>.

LLU provides **support to students from abroad** in the following matters:

- application for studies is implemented using the e-admission system “Dream Apply”, which provides partially formalized admission procedures and thus significantly facilitates the communication with the LLU for the applicant; SSC coordinators individually answer specific questions of interest to applicants;
- all foreign students are provided with places in well-equipped student service hotels;
- in order to acquaint the foreign full-time and exchange students with the study and living environment of LLU and the cultural environment of Latvia, a “Welcome Week” is organized for them in the first week of each semester, during which corporate teambuilding events take place;
- LLU SSC provides technical support in obtaining / extending visas, residence permits, as well as helps resolving insurance issues;
- LLU SSC and faculty external relations coordinators, as well as study programme directors inform students from abroad about LLU internal regulations and their application practice, provide consultations on study and household issues, help to draw up documents, help to solve problems, etc.
- The LLU has an Erasmus Student Network group and also the LLU Student Self-Government, which organizes students' leisure and cultural events.
- LLU external relations coordinators inform foreign students about the available health care at family doctors' practices and Jelgava polyclinic, and if necessary, perform the functions of a companion;
- starting from 2019/2020, a survey of foreign students on the courses they have acquired is introduced every semester. Survey shows their satisfaction with the quality of the courses.

2.4. Scientific Research and Artistic Creation

2.4.1. Description and assessment of the fields of scientific research and/or artistic creation in the study field, their compliance with the aims of the higher education institution/ college and the study field, and the development level of scientific research and artistic creation (provide a separate description of the role of the doctoral study programmes, if applicable).

The direction of scientific research in the study direction is closely related to current events and trends in the field of the environment in Latvia and abroad. This is fully in line with the common goals and development vision of LLU. The development strategy of LLU (<https://www.llu.lv/lv/llu-pamatdokumenti>) (only in Latvian) identifies priority research directions in the blocks of life sciences, engineering and social sciences. Environmental engineering science is among the specialisation fields and sub-sectors of LLU, but among the priority research directions “Research on climate change mitigation and environmental technologies, hydrology and agricultural wastewater”, with the main research tasks: to develop new and approve the existing technologies for reducing climate change for the conditions of Latvia; to carry out research in the field of development of environmental technologies, paying special attention to technologies that reduce water pollution caused by agricultural activities; to carry out fundamental research in the field of hydrology and hydrochemistry; to carry out research on the composition and variability of agricultural wastewater at different intensities of agricultural activity from point and diffuse sources of pollution, as well as to provide recommendations for the reduction of pollution. In addition, several research directions are being implemented and their implementation is only possible at Latvia University of Life Sciences and Technologies, taking into account the specialisation and work of LLU for several decades.

During the reporting period, in the research work of the study direction, the following were studied:

- dynamics of the qualitative composition of agricultural runoff;
- GHG emission reduction opportunities in agriculture;
- environmentally friendly elements of drainage systems;
- modelling of hydrological and hydrochemical processes.

In the process of conducting, expanding and developing research, the material and technical base has been developed, and the network of monitoring stations has been expanded and modernised. The importance of the research process is characterised by many years of participation in a number of international programmes, such as:

- “INTERREG” Baltic Sea Region Transnational Cooperation Programme 2014-2020, in the project “Responsible water management for rural development at the local level and in the Baltic Sea region” – “WATERDRIVE”;
- “LIFE” programme project “Implementation of Latvian river basin management plans to achieve good surface water status” – “LIFE GOODWATER”;
- “LIFE” programme project “Demonstration of climate change mitigation measures in the management of fertile ameliorated organic soils in the Baltic States and Finland” – “LIFE OrgBalt”;
- “Horizon 2020” project “Impact of increased drainage on soil properties and water quality” etc.

In order to implement the research work, the project of the Rural Support Service of the Ministry of Agriculture of the Republic of Latvia “Surface water and groundwater quality monitoring in particularly sensitive territories and agricultural lands in the agricultural runoff monitoring programme” is being carried out for a long time. These examples illustrate the very high level of national and international research in the direction of “Environmental Protection”. Detailed information on the implemented projects is included in Sections 4.2, 4.3, 4.4. The list of projects implemented by the teaching staff of the study direction is attached in Annex 11.

The doctoral study programme “Environmental Engineering” plays an important role in the development of research areas of the study direction, as the research topics of doctoral students are closely integrated into the research activities of the direction. Teaching staff of the study direction often involve doctoral students in their research, gradually developing scientific

succession and creating recognisable scientific schools. It is also possible to apply for LLU internal grants, where doctoral students work on their research topics under the guidance of research supervisors. The “Forest and Water Resources Scientific Laboratory” has been established at LLU, where the lecturers responsible for the implementation of the “Environmental Protection” direction, work in research. This allows one to involve not only doctoral students, but also master's and bachelor's students in the research work, implementing research projects, thus stimulating interest in research work.

During the reporting period, doctoral theses on the following topics were developed and defended: Leakage analysis of nitrogen and phosphorus compounds in areas used for agriculture; Modelling of hydrochemical parameters in river basins, that have been less studied hydrologically; Analysis of the impact of point source pollution from agricultural production on the quality of surface water in particularly sensitive areas; Pre-treatment and use of municipal waste for energy production; Evolution of the cumulative effect of air pollution by the use of environmental parameter and bioindication methods.

2.4.2. The relation between scientific research and/or artistic creation and the study process, including the description and assessment of the use of the outcomes in the study process.

Linking the scientific research of the study direction Environmental Protection with the study process is implemented through the following activities::

- integration of fundamental knowledge and findings approbated in research into the content of study courses, improvement of study programmes in accordance with current events in the field;
- guidelines or other materials prepared within the framework of the projects are included in the list of sources of information to be used in the study courses;
- promoting international cooperation and recognition by cooperating with foreign scientific institutions by publishing research results in international journals and presenting them at conferences;
- development of the infrastructure and material and technical provision necessary for the implementation of studies and research within the framework of research projects;
- involvement of students in research, creating a succession of science, motivating students to continue their studies in Master's and doctoral study programmes, to build an academic or research career;
- attracting new academic staff members from among students. Often, interest in the academic work is formed by participating in the research work of the department or by studying for a doctorate.

The research work of the academic staff in the projects has not only facilitated the acquisition of new knowledge and its

inclusion in the content of the study programme, but also the development of laboratories, attracting funding for the purchase of new equipment and facilities. **For example, within the framework of ERDF programme sub-activity 2.1.1.3.1 “Development of scientific infrastructure”, renovation of scientific infrastructure premises and the purchase of scientific equipment for the Forest and Water Resources Scientific Laboratory (MURZL) were performed. An insight into the equipment can be found on the MURZL website**

http://www.murzl.llu.lv/?page_id=25 (only in Latvian). **Improvements in infrastructure have made it possible to develop the research direction related to the impact of agricultural activities on changes in greenhouse gas (GHG) emissions, to carry out more extensive hydrological modelling of waters and to carry out hydrological and hydrochemical research, which, in turn, allowed students to be widely involved in research both for the acquisition of the study course “Basics of Scientific Research” and for the implementation of scientific research topics.** The equipment is also used in teaching practices that increase students' general scientific competence.

Within the framework of several projects, summarising the acquired knowledge, study materials are prepared, which are included in the list of literature sources to be used in the study courses.

Some examples.

Based on the work of the State Research Programme “Value of Latvian Ecosystems and Its Dynamics under the Influence of Climate” (EVIDEnT) project “Analysis of GHG Emissions in the Agricultural Sector and Economic Assessment of Emission Reduction Measures”, a collective monograph was published, which is offered for the acquisition of various study courses in master's and doctoral studies. Doctoral students and doctoral candidates were also involved in the preparation of the monograph.

Within the framework of the project “Practical measures in the integrated management of drainage systems with the aim to reduce the inflow of nutrients into the Baltic Sea (NUTRINFLOW project)” co-financed by the Central Baltic Programme, the “Handbook on the Installation of Environmentally Friendly Elements in Drainage Systems” was prepared, which also serves as a teaching aid for students of the direction of “Environmental Protection”, acquiring special courses on drainage. Students also participated in the implementation of this project and in the preparation of the book.

A group of researchers from the Forest and Water Resources Scientific Laboratory (MURZL), which involved master's students, prepared the teaching aid “Phytoremediation. Possibilities of use in Latvia”. The book was presented in the BOVA courses “BOVA Intensive PhD, MSc and BSc Courses “Waste to Resource in the Baltic States”” (2016). In 2017, Lineaus University (Sweden) organised the courses “Glass Mining in Practice 2017”, where LLU VBF environment and water management students participated in the development of the educational phytoremediation park concept and, in 2017, a group of environmental and water management students participated in the establishment of the first educational phytoremediation park in the Swedish village of Orrefors. In autumn 2017, LLU VBF participated in the project “PECEC; Knowledge in Inter Baltic Partnership Exchange for Future Regional Circular Economy Cooperation” financed by the Swedish Institute, where the leading partner was Lineaus University of Sweden and partners from Latvia, Lithuania, Estonia, Georgia and Russia. At the beginning of 2018, the LASUWAMA project, funded by the Swedish Institute and led by Lineaus University in Sweden, was launched: Strengthening BSR Universities Network on Landscape Sustainability and Waste Management, where partners were from Latvia, Lithuania, Estonia, Finland, Ukraine, Georgia and Armenia. The aforementioned projects enabled 8 students to participate in international courses. 9 publications were prepared, in which students were involved. On this basis, it was possible to participate in INTEREG projects “Innovative brownfield regeneration for the sustainable development of cross-border regions (BrownReg)” and “Sustainable use of water resources for tourism development in Latvian-Russian border cities – Rezekne and Ostrov (Sticky urban areas)”, in the implementation of which students participated and guidelines for “Remediation of Brownfields” were developed.

The students involved in the project are involved in the study process and successfully study in the doctoral study programme of “Environmental Protection” direction.

In cooperation with the professionals in the field of land reclamation and obtaining the most up-to-date information on the processes in the field in Latvia and neighbouring countries, the teaching aid “Drainage” was prepared, which is not only used in the Environmental Protection study process, but also in practice.

Thanks to the connection between such research and studies, young researchers, who have developed an interest in science, become involved in studies as lecturers and start doctoral studies after obtaining a master's degree.

2.4.3. Description and assessment of the international cooperation in the field of scientific research and/or artistic creation by specifying any joint projects, researches, etc. Specify those study programmes, which benefit from this cooperation. Specify the future plans for the development of international cooperation in the field of scientific research and/or artistic creation.

Within the study direction, international cooperation in research is implemented:

- within research projects;
- in the development of joint scientific articles;
- organising international scientific conferences and reviewing scientific articles.

International co-operation within the framework of projects mainly involves the implementation of joint activities, sharing experience and knowledge or inviting foreign experts to address specific topics. Lecturers and researchers of the Department of Environment and Water Management have developed extensive international cooperation in the field of research, in which students of all programmes in the field of Environmental Protection are intensively involved. This cooperation is implemented within the framework of long-term international projects involving a wide range of cooperation partners.

An example of cooperation is the “INTERREG” Baltic Sea Region Transnational Cooperation Programme 2014-2020 project “Water driven rural development in the Baltic Sea Region” (WATERDRIVE). 01.01.2019 – 30.06.2021 The project partners are the Swedish University of Agricultural Sciences, Sweden; South Baltic Water District Authority / Kalmar County Administrative Board, Sweden; Swedish Board of Agriculture, Sweden; Västervik Municipality, Sweden; Baltic Environmental Forum Lithuania, Lithuania; Natural Resources Institute Finland, Finland; Finnish Environment Institute, Finland; Finnish Field Drainage Association, Finland; Stockholm Environment Institute Tallinn Centre, Estonia; Agricultural Advisory Service in Brwinow, Poland; European Regional Centre for Ecohydrology, Poland; PhenoHorizon OLP SP. zO.O., Poland; L&F SEGES, Denmark; Baltic Sea Action Group (BSAG), Finland. In addition to researchers from the Department of Environment and Water Management, the best students of bachelor's, master's and doctoral study programmes also participated in the project.

International cooperation is also taking place within the framework of other programmes and projects, such as the “Horizon 2020” project “Increased drainage effects on soil properties and water quality” (IDESoWa) (2019 - 14.07.2021), BONUS programme “MIRACLE” project (Mediating integrated actions for sustainable ecosystem services in a changing climate), implemented in cooperation with partners from Sweden, Denmark, Germany, Latvia and Poland (2015 - 2018), Central Baltic Sea region Programme in the project “Practical actions for holistic drainage management for reduced nutrient inflation in the Baltic Sea” (NUTRINFLOW) (2014-2020).

Researchers of the study direction “Environmental Protection”, in cooperation with the teaching staff of the study direction “Architecture and Construction”, participated in the project “Increasing the Capacity of Electronic Materials on Climate Change in Rural Areas” of the European Economic Area Financial Instrument Programme “National Climate Policy”. The collaboration took place with the “Innovation Circle Network” (Norway) and the Norwegian University of Life Sciences. In cooperation with the association, the project provided an opportunity to meet with Norwegian spatial planners and gain valuable knowledge about climate change mitigation tools in spatial planning. The obtained knowledge was integrated into other study directions within several study programmes. The modules created in the project are available to LLU students in E-studies.

These examples describe the most important research areas of the study direction and show that international cooperation is planned purposefully, covers the entire reporting period and is not incidental.

International cooperation is also planned in the future. Implementation can be described through the already started cooperation projects: “LIFE” project “Demonstration of climate change mitigation potential of nutrients rich organic soils in the Baltic States and Finland” (LIFE OrgBalt) (with the implementation period 2019-2023) and “LIFE” programme project “Implementation of River Basin Management Plans of Latvia towards good surface water status ”(LIFE GOODWATER IP (2020-2027). Participation in projects is also valuable because there are opportunities to involve students of master's and doctoral programmes in international research. Information on the implemented scientific projects is provided in Annex 11.

Various international cooperation activities allow one to improve the quality of studies and allow research-orientated students to gain more international research experience. For example, during the reporting period, students of the bachelor's study programme have acquired knowledge about innovations in aquaculture and algae farming within the framework of the project “Sustainable Water Bodies and Coasts (SuWaco)” in Iceland, participated in international courses and research in Sweden on the establishment of a phytoremediation park in an abandoned landfill, and participated in activities organised by the German non-governmental organisation “NABU” – Nature And Biodiversity Conservation Union, which aimed to develop “LIFE” project guidelines for the measurement and monitoring of greenhouse gases, etc.

The Sustainable Water Bodies and Coasts (SuWaCo) network web page - <https://suwaco.wordpress.com/> Nature And Biodiversity Conservation Union (NABU) web page - <https://en.nabu.de/>

International research collaboration is the basis for joint publications. In this work, especially close cooperation has been established with scientists from Estonia (Tartu University of Life Sciences and Tallinn Technical University), Lithuania (Kaunas Technical University), Ukraine (Kiev Technical University), Sweden (Linneaus University). The obtained research results and publications contribute to the industry's broader and more comprehensive analysis of current issues.

During the last 10 years, the department's international cooperation activities have developed and improved in the field of scientific research implementation. The most significant benefits of international cooperation are the common development of scientific publications, which are the preparation of research applications of international importance and approval for the implementation of projects. These benefits are significant in the context of the development and growth of academic staff, as well as the involvement of students in the implementation of projects. In addition, international cooperation promotes mutual mobility of teaching staff and students. Over time, the intensity of cooperation at the international level have increased the ability to create successful communication between representatives of different cultures, traditions and mentalities and to solve various challenges related to mutual cooperation.

2.4.4. Specify the way how the higher education institution/ college promotes the involvement of the teaching staff in scientific research and/or artistic creation. Provide the description and assessment of the activities carried out by the academic staff in the field of scientific research and/or artistic creation relevant to the study field by providing examples.

During the reporting period, the research quality of the study direction has significantly increased, which has been promoted by the common Latvian state policy in the field of higher education, emphasizing the role of synergy between science and studies. At the national level, funding (science-based funding) is allocated to higher education institutions each year according to each research activity. LLU further uses the science funding allocated to it to achieve its goals, including providing motivation bonuses for academic staff members for research work activity. The part of the science base funding that remains at the disposal of the Faculty of Environment and Civil Engineering (VBF) is used to support the academic staff in participation in international conferences and publication of scientific articles, development of research infrastructure. During the reporting period, the number of EU-funded programme projects has increased, in which the academic staff members of the study direction can successfully prepare project applications and apply for funding for their implementation.

The academic staff members of the study direction are actively involved in the research work in the following activities:

- European Union funded research and methodological projects;
- Publicly funded projects (National Research Programme, Ministry of Agriculture and Ministry of Environmental Protection and Regional Development projects, Rural Support Service projects, etc.);
- Contract research for companies, municipalities and other institutions;
- LLU internal research projects;
- In the preparation of scientific articles (lists of publications by academic staff are attached in Appendix 5);
- In editorial boards of scientific articles and journals, as reviewers;
- In organizing scientific conferences.

The directions of scientific activity, implemented projects, published journals and organised conferences are also summarised on the VBF website <http://www.vbf.llu.lv/lv/zinatne-un-inovacija> (only in Latvian). Information on the research directions of the study field is provided in Section 4.1. The list of implemented projects is summarised in Annex 11, as well as the description of the connection of the implemented projects with the study process is included in the description of the study programme in Part III “Description of study programmes” of the report. The research work of the academic staff in the projects has not only facilitated the acquisition of new knowledge and its inclusion in the content of the study programme, but also the development of laboratories, attracting funding for the purchase of new equipment and facilities.

During the reporting period, the total number of articles prepared and published by the teaching staff involved in the study field is 721, including 195 scientific articles in the SCOPUS/Web of Science databases. The dynamics of publications in the reporting period shows that the number of publications included in the SCOPUS/Web of Science databases in the last three years ranges from 26 to 33 publications per year, compared to 3 to 10 at the beginning of the reporting period. At present, special attention is paid to the publication of prepared articles in highly valued scientific

journals.

The teaching staff involved in the study direction actively participates in various international conferences with their research results, as evidenced by 290 publications in the collections of international conference materials (Abstract).

The number of implemented projects and scientific contract research works is 86. The list of projects is attached in Annex 11. The number of publications and implemented projects is summarised in Table 11.

Tabele 11

Distribution of the number of publications, reports, patents and projects (2013-2021)

| Publication / projects | <i>Number</i> |
|---|---------------|
| <i>Publications total</i> | 721 |
| International, peer-reviewed scientific publications included in Web of Science or Scopus scientific literature databases | 195 |
| Publications in anonymously-reviewed international scientific journals, incl. proceedings | 174 |
| Published scientific monographs | 6 |
| Materials of international conferences (Abstracts) | 290 |
| Popular science and scientifically-methodical publications | 56 |
| Number of internationally approved or maintained patents, licenses and know-how | 2 |
| <i>Scientific projects total</i> | 86 |
| International projects | 13 |
| Other EU funded projects | 8 |
| State, state institution (ministry) projects | 44 |
| Contract research | 18 |
| LLU internal grants | 3 |
| including projects involving students | 65 |

The study direction is represented in the scientific conferences organised by LLU and in the collections of articles published by them:

- Engineering for Rural Development <https://www.tf.llu.lv/conference/index.php?topicID=0> (only in English)

Extensive international annual scientific conference. One of the main directions of the conference is related to greenhouse gases and waste management issues.

- Research for Rural Development

https://www2.llu.lv/research_conf/ (only in English)

Extensive international annual scientific conference with environmental engineering and water management sections.

The academic staff participates in international, professional and scientific organisations and working groups, which allows one to identify current issues in the industry and the experience of foreign partners in the implementation of research. The academic staff of the programme works in organisations such as the Nordic Association of Agricultural Scientists; Nordic Association for Hydrology; International Association of Hydrological Sciences; American Society of Agricultural and Biological Engineers; International Association for Bridge and Structural Engineering (IABSE); International Union of Geodesy and Geophysics (IUGG).

2.4.5. Specify how the involvement of the students in scientific research and/ or applied research and/or artistic creation activities is promoted. Provide the assessment and description of the involvement of the students of all-level study programmes in the relevant study field in scientific research and/ or applied research and/or artistic creation activities by giving examples of the opportunities offered to and used by the students.

Students of the study direction are involved in research and artistic creation within the following areas:

within the study courses included in the study programme plan, working on study or course papers, research papers, final theses (Bachelor's, Master's and doctoral theses);

- local governments and other stakeholders within the framework of research study courses;
- by participating in research projects implemented by the academic staff of the study direction.

Professional bachelor's study programme "Environment and Water Management".

The study programme separately includes the research study course "Basics of Scientific Research", within which the research work is developed. Research topics and development directions may be different. Certain issues are studied both within the research topics implemented at the Department of Environment and Water Management, and in cooperation with local governments, companies and researching a set of issues of interest to these institutions. This study course is compulsory for all students in the study programme.

Elements of the research work are also contained in the developed diploma projects, in which attention is also paid to innovative solutions when solving specific engineering issues.

Some examples.

In the diploma project "Wetland project on the farm "Mežacīruļi"", solutions were used in which foreign scientific research in this field was adapted to the climatic conditions of Latvia. The basis of the diploma project was used for the construction of the first artificial wetland in Latvia. Using the results of scientific research conducted during the studies and analysing foreign scientific literature, a 3D model for the Lielupe section from Dubulti to the estuary was created in the diploma project "Lielupe flood risk mitigation measures project", which helped to select optimal Lielupe left bank pre-erosion measures. Innovative solutions for remediation works in contaminated areas were

developed in the diploma project “Remediation project in the territory of Reservoir 36 of “Ventspils nafta termināls Ltd””, where it was proposed to combine traditional remediation methods with phytoremediation fields, which allows a reduction of pollution risks in soil and groundwater. A number of research results of Latvian and foreign scientists were used in the diploma project “Project for Construction of Environmentally Friendly Drainage System Elements in the Svēte River Basin, Jelgava Region”, where innovative recommendations for ensuring the sustainability of drainage systems were developed. In Latvia, new hydroponics technologies were developed in the diploma project “Renovation of the Mores watermill hydro junction and hydroponics construction project in Sigulda region”, which combines production and environmental pollution reduction technologies to increase production efficiency. In-depth research work was carried out in the development of the diploma project “Methodology for Developing Technical Solutions for Environmentally Friendly Drainage Elements”, where for the first time in Latvia the methodology for the calculation of environmentally friendly drainage elements was tested, which will be used in the development of design regulations in the future.

Research work is also carried out within the framework of separate term papers and study practices, in which students work on both research and creativity. For example, within the study course “Hydrometry and Limnology” the issues of the hydrological regime of Lake Usma were studied, in the results of which the local government was interested. The research work is also related to study courses such as “Mathematical Statistics”, “Geographic Information Systems”, which also include parts of creativity.

Academic master's study programme “Environmental, Water and Land Engineering”.

The study programme includes research study courses, which are related to the development of the master's thesis, including both the research and creative part, such as “Preparation of research works”, “Investigation of building deformations”, “Modelling of hydraulic structures”, “Modelling of hydrological processes”.

The development of research work takes place in cooperation with industry companies, local governments, other interested parties. For example, within the framework of master's theses in cooperation with Jurmala Municipality, the collection and reuse of rainwater in residential areas has been studied, but in Jelgava Municipality – rainwater flooding problems and solutions using elements of green infrastructure in the urban environment. In cooperation with drainage construction companies, research has been carried out on the replacement of dolomite rubble with other materials in bearing reinforcements, while in cooperation with a plastic waste recycling company, the efficiency of biofilters in the treatment of polymer waste processing wastewater has been studied.

Master's students have the opportunity to get involved in research projects that are carried out in the "Department of Environmental Engineering and Water Management" and the "Forest and Water Resources Scientific Laboratory", and to use the obtained results in the development of a master's thesis, as well as to prepare scientific publications. Information on the number of projects in the development of which students participated is included in Annex 11.

Doctoral study programme “Environmental Engineering”.

In the study programme, all study courses are based on the development of research work and doctoral thesis. The study programme includes study courses (Research Methodology, Research), within which research is being performed on the doctoral thesis.

Doctoral students are involved in research projects implemented at the Department of Environment and Water Management and the Forest and Water Resources Scientific Laboratory, for example, doctoral students were and are involved in the “INTERREG” Baltic Sea Region Transnational

Cooperation Programme 2014-2020 project “Responsible water management for rural development at the local level and in the Baltic Sea region” – “WATERDRIVE” (INT10); “LIFE” programme project “Demonstration of climate change mitigation measures in the management of fertile ameliorated organic soils in the Baltic States and Finland” – “LIFE OrgBalt” (LIFE01); In the project “Assessment of the Impact of Land Reclamation on Climate Change (Flood Risk) Mitigation” funded by the Rural Support Service and the Ministry of Agriculture, and many others.

All students present the results of their research work at the scientific and practical conference of environmental and water management students. The best works are directed to the annual international scientific students conference “Students on Their Way to Science” (<https://www.sws.llu.lv/>). A collection of summaries is published electronically within the conference (<https://www.sws.llu.lv/proceedings>).

2.4.6. Provide a brief description and assessment of the forms of innovation (for instance, product, process, marketing, and organisational innovation) generally used in the higher education institution, especially in study field subject to the assessment, by giving the respective examples and assessing their impact on the study process.

Taking into account the growing competition in the education market, the declining demographic situation and the constantly changing approaches and settings in higher education in Latvia, one of the biggest challenges is attracting students and maintaining their interest in studies. To address this, innovative approaches are being sought both in marketing activities and in the study process.

It is important for today's young people to be aware of the role and place of their future profession in the overall economy. Therefore, the study programmes of the study direction see these innovative approaches in close connection with practice and work-based higher education. In order to implement it, the study direction constantly maintains close ties with industry companies and non-governmental organizations.

Various activities are implemented to **attract students**.

- Work is being done to develop a real understanding of the profession for potential students. Guest lectures in schools, seminars, study tours, educational events are organised for students at the Faculty of Environment and Civil Engineering, thus promoting the versatility of environmental and water management studies. For example, in cooperation with “JSC ZAAO”, an environmental school programme has been prepared and representatives of the Faculty of Environment and Civil Engineering are going to the environmental school class established by “JSC ZAAO”, and organise laboratories and fieldwork related to environmental quality assessment and improvement for Vidzeme children. During the career week, Environmental Technology Workshops were organised, where students are introduced to the physical models of hydraulic processes, etc.

In order to promote the studies in the offered programmes, videos have been created, which are placed on municipal websites and YouTube, for example: videos about the Faculty of Environment and Civil Engineering <https://www.youtube.com/watch?v=bjBwgQlmtMY&list=PLbC75iZGigBeEz-hp31pbd6WhXHIX26A>; (only in Latvian) short promotional video about the speciality:

<https://www.facebook.com/videvbf/videos/398231124967943>; (only in Latvian) a video of graduates within the LLU career days <https://www.facebook.com/videvbf/videos/255637656115221>;

(only in Latvian) a virtual tour of the Faculty of Environment and Civil Engineering within the framework of the "Open Door" event at the LLU <https://my.matterport.com/show/?m=RUfxXCXm5T7>. (only in Latvian) "Open day" story on YouTube <https://www.youtube.com/watch?v=Fa8CxsuggwQ>; story about the environment and water management programme in the show "What if I were?" ("Kas es būtu ja būtu?"); <https://www.facebook.com/latvijaslauksaimniecibasuniversitate/videos/iepaz%C4%ABsti-studiju-programmu-vide-un-%C5%ABdenssaimniec%C4%ABba/650196125877095/>, (only in Latvian) and others.

- By cooperating with secondary schools and technical schools, young people are already given the opportunity to get acquainted with the study programme and study environment during school. For example, 10th and 11th grade students of Jelgava Secondary School of Technology visit the faculty every two weeks and perform laboratory work related to various fields of environmental and material sciences.

To maintain the interest of the existing studies to continue their studies, the following activities are implemented:

- Close connection with the profession within the study courses, solving real situations, presentation to the involved parties. For example, the work of the students on the research and planning / project development for a specific location or site, presentation of the project to the municipality, industry etc. representatives;
- Involvement of students in research, which increases the interest to continue studies in Master's and doctoral studies.

Innovations also enter the study process with the development of information technologies in both the industry and education. The development of study and science infrastructure is also important:

- IT solutions are actively used in the study direction programmes. For example, the latest software is being mastered, GIS technology is being actively used, modern computer classes and the GIS Competence Centre have been developed.
- The tools of the e-learning environment (interactive testing and self-assessment tools, online lectures and consultations, etc.) are actively used, which is especially important during the Covid-19 pandemic, when the distance learning process was implemented.

Future plans of the study direction are related to the development of outdoor laboratories in monitoring stations, creation of demonstration objects, which would practically allow one to perform various measurements outside the faculty facilities, to get acquainted with various innovations in the technical solutions of developed projects; for example, in connection with environmentally friendly drainage system elements.

As an example of the conclusion of organizational activities, we can mention the contests at the information days organized by LLU, where the winners of the contests get budget places in the chosen study program. Each year, several (3 - 5) potential students are offered such opportunities, and some of the candidates also take advantage of such opportunities.

Activities of a research (innovations) create a deeper interest in study programs and research. Thanks to the relatively large number of implemented projects, students are also offered to participate in these projects. There are students who are attracted by it, they continue their studies at higher study levels, start building their academic career and add to the ranks of the department's research and academic staff. Thanks to these activities, it has been possible to renew and strengthen the composition of the academic staff of the Department of Environment and Water Management. The content of individual study courses is supplemented with the results obtained in research.

The development of information technology provides opportunities to make the study process more interesting and to acquire useful digital skills for further academic or professional work.

2.5. Cooperation and Internationalisation

2.5.1. Provide the assessment as to how the cooperation with different institutions from Latvia (higher education institutions/ colleges, employers, employers' organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study field contributes to the achievement of the aims and learning outcomes of the study field. Specify the criteria by which the cooperation partners for the study field and the relevant study programmes are selected and how the cooperation is organised by describing the cooperation with employers. In addition, specify the mechanism for the attraction of the cooperation partners.

Within the study direction, there is active cooperation with various Latvian and foreign institutions, which is aimed at achieving the goals of the study direction and study results.

The aim of the study direction is related to high-quality studies, further education opportunities, training of competitive specialists in the study direction. Cooperation with employers, industry organisations and state institutions (including ministries and professional organisations) is essential to achieve this goal. Also, the goals of the study direction are aimed at training scientists, which can be implemented by linking studies with research, working on scientific succession and innovation transfer to the national economy. Here, too, cooperation with industry companies is important, as well as cooperation with other Latvian and foreign scientific and academic institutions.

Cooperation with companies and organisations of the industry (undergraduate internships, contract research with the involvement of students, etc.) creates the recognition of study programmes, promoting the rapid integration of graduates into the labour market. Often, employers are also graduates of LLU study programmes who know the quality of study programmes offered by LLU.

Below is an insight into the various aspects of cooperation and a description of the main partners and activities.

Cooperation with other Latvian universities, LLU faculties and structural units

Organisation of conferences, review of conference scientific articles

VBF lecturers cooperated with the Technical Faculty of LLU in reviewing scientific articles for the collection of articles of the 19th International Scientific Conference "Engineering for Rural Development".

LLU cooperates with RTU in reviewing scientific articles for the RTU scientific journal "Environmental and Climate Technologies".

Cooperation in the final work commissions and evaluation, evaluation of the study process

Representatives of the Faculty of Geography and Earth Sciences of the University of Latvia are

invited as members and reviewers of the Master's examination commission of the academic master's programme "Environmental, Water and Land Engineering", but cooperation regarding the doctoral dissertation (work in doctoral councils, review of doctoral theses) takes place with scientists of the Institute of Environmental Protection and Heating Systems (VASSI) of Riga Technical University and lecturers of the Faculty of Geography and Land Sciences of the University of Latvia.

Organising the study process and other study activities

A cooperation agreement has been concluded with RTU on the possibilities of continuing the study programmes, if the existing programmes of LLU are no longer implemented. There is an exchange of information with RTU and LU about the offered opportunities for students and teaching staff to participate in scientific conferences, seminars and various study activities.

Participation in doctoral and professor councils

There is cooperation between LLU and RTU Institute of Environmental Protection and Heating Systems in the work of RTU Professors' Council and RTU Environmental Science Promotion Council.

Research Work

Extensive cooperation with various institutions has been developed in the research work during the reporting period. A small insight into the activities of recent years:

- Cooperation with RTU Institute of Environmental Protection and Heating Systems in the State Research Programme "Energy and Climate Modelling Towards Carbon Neutrality".
- Cooperation with LLU training and research farm "Vecauce", Latvian State Forest Research Institute "Silava" in the LFE project "Demonstration of climate change mitigation potential of nutrient rich organic soils in the Baltic States and Finland (LIFE OrgBalt)" and project "Improvement of the accounting system for greenhouse gas (GHG) emissions and carbon dioxide (CO₂) capture from arable land and perennial grassland management and development of appropriate methodological solutions".
- Cooperation with the State Ltd "Latvian Environment, Geology and Meteorology Centre", University of Latvia, Latvian State Forest Research Institute "Silava", Institute of Food Safety, Animal Health and Environment BIOR LIFE in the project "Implementation of River Basin Management Plans of Latvia towards good surface water status (LIFE GOODWATER IP)".
- Cooperation with "LLU training and research farm "Vecauce" and Daugavpils University agency - Latvian Institute of Hydroecology in the project "Surface water and groundwater quality monitoring in particularly sensitive areas and agricultural lands within the framework of the agricultural runoff monitoring programme".
- Cooperation with LLU training and research farm "Vecauce", LLU training and research farm "Pēterlauki" and Latvian State Forest Research Institute "Silava" in the project "Assessment of land reclamation impact in climate change (flood risk) mitigation".
- Cooperation also takes place with the Forest Faculty of LLU in scientific projects and doctoral research work, with the Forest and Water Resources Scientific Laboratory of LLU, with the Departments of the Environment and Water Management and Landscape Architecture and Planning of the Faculty of Environment and Civil Engineering in project implementation, development of scientific articles, research (Intereg Latvia - Lithuania cross-border cooperation projects).

Cooperation with the industry and local governments in ensuring the quality of studies and exchanging information

Description of activities:

- Regular and long-term co-operation in the provision of study and undergraduate internships (the list of internships is attached in Annex 13, the internship regulations in "Other annexes" in Annex 20). In total, 82 companies in Latvia have provided internships. Industry companies are participating in the "Internship Day" event.
- Specialists from industry companies and organisations are involved in the final work evaluation commissions and work review. Every year, about 80% of professional bachelor's theses are reviewed by specialists from industry companies and organisations.
- Cooperation in providing study tours. During the reporting period, 43 study tours were organised (up to the limits of Covid-19). On guest lectures on current topics in the industry during the reporting period, industry specialists have read more than 40 lectures.
- Lecturers of the study direction, participating in various educational seminars, training programmes organised by the Latvian Rural Consultation Centre, have read more than 50 lectures (or conducted classes) to specialists of industry companies, representatives of local governments, farmers.
- In cooperation with the professional organisation of the industry "Latvian Society of Ameliorators" and the leading design institution of the industry in the field of drainage VSIA "Meliorprojekts", the organisation of guest lectures and seminars, improvement of the study process, etc. is implemented.
- Cooperation takes place with Latvian municipalities (Ludza Municipality, Rēzekne Municipality, Jelgava Municipality, etc.) and companies in the development and implementation of international project applications (Latvian-Lithuanian, Latvian-Russian cross-border cooperation projects, practical projects, etc.).
- In cooperation with the Ministry of Agriculture, VSIA "Ministry of Agriculture Real Estate" (ZMNĪ), the Ministry of Environmental Protection and Regional Development, the topicality of research areas is evaluated, and contract work is performed.

There is cooperation with graduates of the study direction. Examples of activities:

- Graduates are involved in the evaluation of graduation theses both as members of the commission and as reviewers.
- Within the framework of several study courses, graduates participate with guest lectures on current events in the industry.
- Graduates provide admission to industry companies and municipalities within the framework of study tours, internships.
- Graduates are involved as lecturers in the management of certain professional study courses.
- Graduates participated in the process of improvement of the study programme by participating in surveys and work discussions, including within ESF project No. 8.2.3.0/18/A/009 "Improvement of the management of Latvia University of Life Sciences and Technologies".
- With the support of graduates, the industry and industry education are promoted.

The cooperation agreements concluded with the state, local government institutions, educational institutions, industry organisations and industry companies are reflected in Appendix 13. The list does not include 14 cooperation partners with whom agreements have been concluded during the reporting period, but whose contract term has not been extended.

Taking into consideration international circumstances, the cooperation within the project "Latvian-Russian cross-border cooperation" has been stopped and its renewal is not planned.

The main criteria in the selection and attraction of cooperation partners are common background and interests in the research directions implemented and their development (for example, research in water quality and greenhouse gas emissions, etc.)

For cooperation with professional organizations and employers such partners are selected who can participate and help to improve the study process (for example, study materials, lectures), provide internships, be involved in update the content of study courses and who are interested in improving the quality of studies.

Initiation of cooperation usually takes place through communication at conferences, seminars, and working groups of various levels, in which representatives of LLU are involved. Taking into account that the study direction has relatively high recognition in professional communities, the representatives of companies and organizations related to the specialty often approach with offers for cooperation.

2.5.2. Provide the assessment as to how the cooperation with different institutions from abroad (higher education institutions/ colleges, employers, employers' organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study field contributes to the achievement of the aims and learning outcomes of the study field. Specify the criteria by which the cooperation partners suitable for the study field and the relevant study programmes are selected and how the cooperation is organised by describing the cooperation with employers. In addition, specify the mechanism for the attraction of the cooperation partners.

Important aspects in the implementation of the goal of the study programmes in the direction of environmental protection are the development of students' theoretical knowledge, cognition and research skills, to create and develop the ability of young scientists to be creative and participate in solving national and international level scientific projects. In order to ensure this process, various types of international cooperation are implemented within the study direction, which increases the competence of lecturers, creates new opportunities in the development of research, and allows students to gain international experience in studies and research.

Lecturers and researchers of the Department of Environment and Water Management have developed extensive international cooperation in the fields of research, student exchange and education, which continues today. Lecturers and researchers are involved in international organisations, associations, networks: Nordic Association of Agricultural Scientists; Nordic Association for Hydrology; American Society of Agricultural and Biological Engineers; International Association of Hydrological Sciences. This cooperation is directly related to the development of the study direction, gaining contacts, cooperation partners and planning joint activities in the field of research.

To describe the cooperation, a little insight into the activities implemented so far.

International cooperation in research takes place by implementing joint projects, preparing joint publications, reviewing scientific articles, organising joint workshops, and organising guest lectures. In recent years, international co-operation in research has been characterised by the "INTERREG" Baltic Sea Region Transnational Co-operation Programme 2014-2020 project "Water Driven Rural Development in the Baltic Sea Region" (WATERDRIVE), where partners are the Swedish University of Agricultural Sciences, Sweden; South Baltic Water District Authority/Kalmar County Administrative Board, Sweden; Swedish Board of Agriculture, Sweden; Västervik Municipality, Sweden; Baltic Environmental Forum Lithuania, Lithuania; Natural Resources Institute Finland, Finland; Finnish Environment Institute, Finland; Finnish Field Drainage Association, Finland; Stockholm Environment Institute Tallinn Centre, Estonia; Agricultural Advisory Service in Brwinow,

Poland; European Regional Centre for Ecohydrology, Poland; PhenoHorizon OLP SP. zO.O., Poland; L&F SEGES, Denmark; Baltic Sea Action Group (BSAG), Finland.

Cooperation within the project “NUTRINFLOW – Practical actions for holistic drainage management for reduced nutrient inflation to the Baltic Sea” took place with ProAgria Southern Finland, Finland; Swedish Institute for Agricultural and Environmental Engineering, Sweden; Country Administrative Board of Ostergotland, Sweden; City of Loviisa, Finland, but within the project “PONICS VET: Hydroponics Agricultural Technician” with Eurocrea Merchant SRL, Italy; Aintek Simvouloi Epicheiriseon Efarmoges Ypilis Technologias Ekpaidefsi Anonymi Etaireia, Greece; Business Innovation Centre Innobridge, Bulgaria; Association for Vertical Farming e.V., Germany; FarmTech Society, Belgium.

Successful cooperation has been established with Lineaus University (Sweden) in the field of recultivation of brownfields using environmental technologies and phytoremediation. There is cooperation with the Ukrainian Institute of Agroecology in conducting scientific research in the field of phytoremediation and preparing joint publications. Cooperation has been established with the University of Arahuz in Denmark in the field of ammonia emission calculations, the Technical University of Berlin and the German Environmental Agency for the preparation of joint projects and exchange of experience, the Estonian University of Life Sciences (implementation of circular economy principles in waste management). There is collaboration with the “Farming Systems Ecology” Research Group at the University of Wageningen in the Netherlands.

Professors from the Norwegian Institute of Bioeconomy and the Estonian University of Life Sciences participated as experts in the development of the doctoral study programme “Environmental Engineering”.

In 2015, the LLU Internationalisation Plan was developed, which sets out the goals, priorities and performance indicators of the university's international cooperation in the fields of exchange studies, full-time studies of foreigners and living conditions of foreigners.

In 2016. The plan determines priority cooperation with higher education institutions with a similar study and research profile in the EU member states and partner countries, whose direction of study corresponds to those implemented by LLU.

In 2017. The plan envisages priority co-operation with international university associations whose active members are LLU – Association for European Life Science Universities (ICA), Baltic University Programme (BUP), Baltic and Nordic Agricultural University Network (BOVA – NOVA), Nordic Association of Agricultural Scientists (NJF), etc., and pursuing their academic activities in similar study and research directions.

In 2018. As the offer of international cooperation from foreign universities is wide, LLU focuses its activities on those partners with whom such cooperation is long-lasting and productive. Also, at the level of LLU study directions there are foreign partner universities or their faculties with which there is a regular exchange of students and lecturers (Erasmus+ programme, etc.), participation in joint projects both in the field of studies (for example, SAM 8.2.3) and research, mutual participation in scientific and methodological conferences, etc.

Institutions of higher education with which LLU has concluded Erasmus+ inter-institutional agreements are summarised here:

(https://www.llu.lv/sites/default/files/2018-10/LLU%20ligumi%20_Erasmus%2B%20partneraugstskolas_HEIs%2027.03.18.xls)

The main criteria in the selection and attraction of cooperation partners are common background and interests in the research directions implemented and their development (for example, research

in water quality and greenhouse gas emissions, etc.). This allows to successfully cooperate in the preparation of joint international project applications (see Appendix 11 “Participation of academic staff of the study direction of “Environmental Protection” in research projects (2013 – 2021”). The implementation of comparable study directions is also an important criterion, which is necessary, for example, to implement international exchange of students and academic staff.

The mechanisms used by the university to attract partners are in accordance with the Internationalization Plan of LLU. In addition, international connections have been established in the field of research during the last 30 years, which continue to be maintained as generations of researchers has changed. New cooperation partners are obtained by communicating at international conferences, seminars, extended working groups. When initial cooperation is established, the interested parties turn to the International Cooperation Center of LLU, where a cooperation agreement is elaborated and signed. The center also informs about cooperation offers of foreign interested parties in specific areas (sectors).

2.5.3. Specify the system or mechanisms, which are used to attract the students and the teaching staff from abroad. Provide the assessment of the incoming and outgoing mobility of the teaching staff in the reporting period, the mobility dynamics, and the issues which the higher education institution/ college faces with regard to the mobility of the teaching staff.

In order to attract foreign students, LLU first provides information about its offer, which can be found on the websites (see the section *Availability of information about the study direction*). LLU implements various marketing activities to attract foreign students: agreements are concluded with recruitment agents, providing for the evaluation of their work efficiency, e-marketing, participation in international education fairs and agent forums, webinars, etc. LLU is a member of the Higher Education Export Association of Latvia (AIEA) and participates in its organised activities.

The involvement of foreign students in bachelor's and master's study programmes was not planned during the reporting period. The newly established doctoral study programme is also intended for the admission of foreign students. This process is in its infancy, as the programme of “Environmental Protection” direction is included in 2022. Restrictive measures related to the spread of COVID-19 also introduced adjustments to the offer of this study programme.

In order to ensure the inclusion of the latest findings and current events in the study process, guest lecturers from foreign universities are invited. Foreign guest lecturers are invited within specific topics or international activities. For example, by inviting foreign guest lecturers, several thematic, intensive training courses for master's, doctoral students and teaching staff have been organised in the study direction during the reporting period within the framework of the BOVA (Baltic Forestry, Veterinary and Agricultural University Network) programme. Foreign guest lecturers are also involved in international summer schools and thematic courses. As far as possible, foreign guest lecturers are involved in an employment contract in the areas of study from the Faculty of Environment and Civil Engineering's own earned funds (tuition fees) or within the framework of projects. One such agreement has been concluded in the direction of “Environmental Protection” studies, however, the Faculty of Environmental Protection and Civil Engineering has had a total of 13 such agreements, and students of the Environmental Protection direction were also offered to supplement their knowledge with the issues covered in several separate lectures. During the reporting period, guest lecturers have been from Artvin Çoruh University, Faculty of Engineering,

Department of Environmental Engineering (Turkey) (Wastewater Treatment Methods); FarmTech Society, Belgium (Hydroponics method and circular economics), Wageningen University & Research (Agriculture in the context of climate change); University of Florida (USA) (Environmental issues, latest digital technologies and tools in the field of water chemistry and analysis); Karlsruhe University of Applied Sciences (Germany) (lecture topics related to GNSS positioning capabilities), etc. A total of 15 foreign guest lecturers have participated in the study direction with guest lectures during the reporting period (in Annex 14).

The opportunities offered by the ERASMUS+ exchange programme have been actively used. Within the framework of ERASMUS+ activities, the most active cooperation partners where the lecturers involved in the study direction have gone to read lectures are Utena University of Applied Sciences, Lithuania; Kaunas University of Applied Sciences, Lithuania; Klaipeda State University of Applied Sciences, Lithuania; National University of Life and Sciences of Ukraine; Wroclaw University of Environmental and Life Sciences (Poland); Estonian University Life Sciences (Estonia); Alexander Stulginski University (ASU) (Lithuania); Technical University of Zvolen (Slovakia); Agricultural University of Iceland (Iceland); University of Debrecen (Hungary); Wageningen University and Research (Denmark); Malta College of Arts, Sciences and Technology (Malta) and others. Total activities implemented by the teaching staff involved in the study direction during the reporting period: lecturing – 45; exchange of experience – 20 (Annex 15 and 16).

During the reporting period, students of the “Environmental Protection” direction most often chose to study at Wroclaw University of Environmental Sciences (Poland); Jan Evangeliste Purkyne University Usti nad Labem (Czech Republic) and studied at the University of Tartu (Estonia); Agriculture University of Iceland (Iceland), Swedish University of Agricultural Sciences (Sweden), within the framework of ERASMUS+ activities.

Cooperation in the study process takes place by organising various events, for example:

- Students of the academic master's study programme had the opportunity to participate in the Nordplus intensive course “Study visit in Iceland – Sustainable Water Management”, Isafjordur, Iceland.
- Student mobility to Westfjords University Centre has been organised within the framework of the Nordplus programme SuWaCo (Sustainable Water bodies and Coasts). Name of the event – Nordplus intensive course “Innovation in Aquaculture”, Tálknafjörður, Iceland.
- In cooperation with the University of Latvia, the Swedish Institute, the Linnaeus University in Sweden, the Estonian University of Life Sciences; Akaki Tsereteli State University of Georgia and Kiev State University, international student courses “Environmental Technologies in Circulation Economics” were organised.
- In cooperation with the Estonian University of Life Sciences and Alexander Stulginski University (Lithuania), an international student course “Packaging Waste Recycling Policy” was held.
- In cooperation with the University of Latvia, the Swedish Institute, the Linnaeus University in Sweden, the Estonian University of Life Sciences; Akaki Tsereteli State University of Georgia and Kiev State University, an international student course “Revitalisation of Brownfields and Sustainable Tourism Development in the Border Areas of the European Union” was held, etc.

During the reporting period, 49 students studied at foreign universities, 163 students completed the study courses offered in the direction of Environmental Protection (Annex 15).

These examples provide an insight into activities at the international level that help ensure the achievement of the goals and learning outcomes of the direction, giving students and researchers the opportunity to supplement their knowledge and develop competencies.

2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures

2.6.1. Assessment of the fulfilment of the plan regarding the implementation of the recommendations provided by the experts during the previous accreditation of the study field, as well as the assessment of the impact of the given recommendations on the study quality or the improvement of the study process within the study field and the relevant study programmes.

In the 2011/2012 academic year, the evaluation of the study direction “Environmental Protection” of LLU and the study programmes included therein took place within the framework of the European Social Fund project “Evaluation of Higher Education Programmes and Suggestions for Quality Improvement”, Agreement No. 2011/0012/1DP/1.1.2.2.1/11/IPIA/VIAA/001) with the participation of international experts. 3 study programmes were evaluated. According to experts, study programmes at all levels were divided into the second group, which are sustainable but need specific improvements. The programmes were characterised by a relatively small share of weaknesses, dominated by programme strengths. The quality of studies was assessed the highest; the remarks made by experts were related to study resources and certain aspects of sustainability.

During the reporting period, the recommendations of experts have been taken into account; a lot of work has been done to improve the study programmes, closing some of the existing ones and creating new ones instead. By significantly transforming the professional bachelor's study programme “Environment and Water Management”, its implementation time has been reduced from five to four years, but master's and doctoral study programmes have been re-licensed after merging with other, similar ones. The Faculty of Environmental and Civil Engineering implemented several master's study programmes with a small number of students. During the reporting period, four master's study programmes were merged, representing the study directions of Environmental Protection and Architecture and Construction. The newly developed master's programme “Environmental, Water and Land Engineering” was licensed in the direction of Environmental Protection. Experts also pointed to the fragmentation of doctoral programmes at the Faculty of Environment and Civil Engineering. The doctoral study programme Hydroengineering, which represented the direction of Architecture and Construction, was added to the doctoral programme in the direction of Environmental Protection, and the combined programme is licensed under the title “Environmental Engineering”, including it in the direction of Environmental Protection studies.

The experts' recommendations also include the need to establish cooperation with other Latvian and foreign

higher education institutions and to be more active in research, linking it with the study process. During the reporting period, the staff involved in the study direction has significantly increased their research activities by implementing internationally and nationally significant research projects (such as the National Research Programme Projects “Latvian Ecosystem Value and Its Dynamics under Climate Influence (EVIDEnT)”; “Sustainable management of land resources and landscapes: assessment of challenges, methodological solutions and proposals (LandLat4Pol)”; “Energy and climate modelling towards carbon neutrality”, etc.), published research results in scientific journals indexed in Scopus and WoS databases. Cooperation with foreign higher education institutions also takes place within the framework of projects, as well as other international activities (intensive study courses, organisation of international conferences, review of scientific articles).

In order to ensure the sustainability of the study programme, special attention is paid to the age structure of lecturers and researchers of the Department of Environment and Water Management, which is responsible for the implementation of study directions. When attracting new researchers and lecturers, 88% of lecturers and researchers in the structural unit are in the age group up to 45 years old. The experts' recommendations also included the need to improve the English language skills of teaching staff and the attraction of foreign academic staff, which was given increased attention during the reporting period.

Foreign lecturers were attracted for almost every year of study (except for the last ones – problems were caused by Covid-19 restrictions), using both the funding available to the VBF and the opportunities of various programmes (ERASMUS+, NordPlus, BOVA network). Work on attracting foreign researchers continues.

The existing teaching staff has improved their English language skills within the framework of several activities: English language courses organised by the LLU Language Centre for LLU employees, several lecturers have undergone internships abroad or participated in international programmes or seminars, ERASMUS+ programme mobility, English language courses within the framework of the EU project “Perfection of LLU academic staff”. Practically all lecturers and researchers of the structural units (“Department of Environment and Water Management” and “Forest and Water Resources Scientific Laboratory”) responsible for the study direction have a good knowledge of English.

An overview of the implementation of previous recommendations provided by accreditation experts is attached in Annex 17.

In general, implementation of the recommendations given during the previous evaluation process has had a positive effect on the quality of studies. This is especially applicable for cooperation (either internationally or in Latvia) in the fields of research and professional development, which has been achieved by developing and improving study programmes and courses, and by increasing the number of projects implemented in long-term and creating more opportunities for students to get involved in these projects. As a result of cooperation the qualification and research competence of academic staff have increased, which has been reflected in increase in the number of high quality publications. The academic staff's knowledge of the English language has significantly improved. The consolidation of several academic master's study programmes into one has given a positive result. By increasing the number of students in the academic master's study programme “Environmental, Water and Land Engineering”, the study process has improved and become more organized. The shortening of study duration for the professional bachelor's study programme “Environment and Water Management” from 5 to 4 years is not so unambiguous. The shortening of study duration has been positively evaluated by students, while employers indicate that although the level of preparation of graduates from this study programme is good after completing the five-year programme the level of understanding and knowledge of graduates in certain aspects has been higher. It should be added here that the situation is changing in recent years as repeated adjustments to the content of the study programme has been completed, for example, the State Examination Commission has noted that the quality of diploma projects developed by students has improved in recent years.

2.6.2. Implementation of the recommendations given by the experts during the evaluation of the changes to the study programmes in the respective study field or licensed study programmes over the reporting period or recommendations received during the procedure for the inclusion of the study programme on the accreditation form of the study field (if

applicable).

During the reporting period, two new programmes were licensed in the study direction Environmental Protection, but significant changes were made to one programme (Table 12)

Tabele 12

New licensed study programmes and study programmes with significant changes during the reporting period

| No. | Programme | Date of licensing or change | Type of studies | CP | Degree and / or qualification to be obtained |
|-----|---|--|---------------------------------|-----|--|
| 1. | Environment and Water Management | changes approved by the study accreditation commission meeting decision Nr.52-A 29.05.2017. | Full time Part time | 160 | Professional Bachelor Degree in Environmental Management and Environmental Engineering and qualification of Environmental Engineer |
| 2. | Environmental, Water and Land Engineering | licensed on 08.06.2016. | Full time | 80 | Master Degree of Engineering |
| 3. | Environmental Engineering | licensed on 25.02.2020. Includes in study direction om virzienā 30.03.2022 | Full time (Latvian and English) | 120 | Doctoral degree Doctor of Science (Ph.D.) in Environmental Engineering and Energetics |

The experts evaluating the changes in licensing and the study programme suggested the following as the main recommendations: the need to evaluate the volume of study courses (CP); clarification of the names of study courses; optimisation of the structure of the offered study programme; to supplement the lists of used literature sources in the study course programmes; to continue the successfully implemented scientific activity; to develop co-operation at the Latvian and international level; to improve the quality management system of the study process.

The last recommendations mentioned here were defined as long-term recommendations.

The proposed recommendations have been implemented by reviewing and analysing study programmes. Some recommendations were defined as long-term measures, their implementation has started and is being developed every year.

Reports on the implementation of the experts' recommendations for the licensed programmes and the programme with significant changes are attached in Annex 17. The

implemented recommendations as implemented measures (for example, changes in the parameters of study programmes, development of cooperation with various stakeholders, improvement of infrastructure, development of research and connection with the study process) are also included in the report of each study programme.

Annexes

| I - Information on the Higher Education Institution/ College | | |
|--|---|---|
| Information on the implementation of the study field in the branches of the higher education institution/ college (if applicable) | | |
| List of the governing regulatory enactments and regulations of the higher education institution/ college | 1_dala_1_pielikums_EN_Main internal legal acts and regulations.docx | 1_dala_1_pielikums_Galveno_normativo_dokumentu_saraksts.docx |
| The management structure of the higher education institution/ college | 1_dala_2_Pielikums_LLU_management_structure_EN.docx | 1_dala_2_Pielikums_LLU_parvaldibas_shema_LV.docx |
| II - Description of the Study Field - 2.1. Management of the Study Field | | |
| Plan for the development of the study field (if applicable) | 01_appendix_Study_direction_development_plan_EN.xlsx | 01_pielikums_Virziena_attistibas_plans_LV.xlsx |
| The management structure of the study field | 02_appendix_Study_direction_management_EN.docx | 02_pielikums_Virziena_parvaldibas_limeni_LV.docx |
| A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated. | 2_dala_03_Vienošanās_LLU un RTU_Vides aizsardziba_ENG.docx | Vienosanas_LLU un RTU_Vides_aizsardziba.edoc |
| A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme. | LLU_apliecinajumi_Vides_aizsardziba_EN.docx | LLU_apliecinajums_studiju_virzienam_Vides_aizsardziba.edoc |
| Standard sample of study agreement | 2_dala_05_Study_Agreement_2021_LV_ENG.pdf | 2_dala_05_Studiju_ligums_2021_LV.pdf |
| II - Description of the Study Field - 2.2. Efficiency of the Internal Quality Assurance System | | |
| Analysis of the results of surveys of students, graduates and employers | 2_dala_06_Studeejosho_absolventu_darba_deveeju_aptauja_ENG.docx | 2_dala_06_Studeejosho_absolventu_darba_deveeju_aptauja_LV.docx |
| II - Description of the Study Field - 2.3. Resources and Provision of the Study Field | | |
| Basic information on the teaching staff involved in the implementation of the study field | 2_dala_07_Macibspeku_saraksts_ENG.XLSX | 2_dala_07_Macibspeku_saraksts_LV.XLSX |
| Biographies of the teaching staff members (Curriculum Vitae in Europass format) | 2_dala_08_macibspeku_CV_ENG.rar | 2_dala_08_macibspeku_CV_LV.rar |
| A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties. | LLU_apliecinajumi_Vides_aizsardziba_EN.docx | LLU_apliecinajums_studiju_virzienam_Vides_aizsardziba.edoc |
| A statement of the higher education institution/ college on the respective foreign language skills of the teaching staff involved in the implementation of the study programme at least at B2 level according to the European Language Proficiency Assessment levels (level distribution is available on the website www.europass.lv, if the study programme or part thereof is implemented) | LLU_apliecinajumi_Vides_aizsardziba_EN.docx | LLU_apliecinajums_studiju_virzienam_Vides_aizsardziba.edoc |
| II - Description of the Study Field - 2.4. Scientific Research and Artistic Creation | | |
| Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the study field in the reporting period. | 2_dala_11_Istenoto_projektu_saraksts_ENG.docx | 2_dala_11_Istenoto_projektu_saraksts_LV.docx |
| List of the publications, patents, and artistic creations of the teaching staff over the reporting period. | 2_dala_12_Macibspeku_publicaciju_saraksts_LV_ENG.xlsx | 2_dala_12_Macibspeku_publicaciju_saraksts_LV_ENG.xlsx |
| II - Description of the Study Field - 2.5. Cooperation and Internationalisation | | |
| List of cooperation agreements, including the agreements for providing internship | 2_dala_13_Sadarbības_līgumi_ENG.docx | 2_dala_13_Sadarbības_līgumi_LV.docx |
| Statistical data on the teaching staff and the students from abroad | 2_dala_14_piesaistītie_ārstu mācībspēki_ENG.docx | 2_dala_14_piesaistītie_ārstu mācībspēki_LV.docx |
| Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes) | 2_dala_15_studejoso_mobilitāte_ENG.docx | 2_dala_15_studejoso_mobilitāte_LV.docx |
| Statistical data on the incoming and outgoing mobility of the teaching staff | 2_dala_16_mācībspēku_mobilitāte_ENG.docx | 2_dala_16_mācībspēku_mobilitāte_LV.docx |
| II - Description of the Study Field - 2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures | | |
| Report on the implementation of the recommendations received both in the previous accreditation and in the licensing and/ or change assessment procedures and/ or the procedures for the inclusion of the study programme on the accreditation form of the study field. | 17_lepriekšējas_akreitaācijas_rekomendāciju_izpilde_EN.pdf | 17_lepriekšējas_akreitaācijas_rekomendāciju_izpilde_LV.pdf |
| An application for the evaluation of the study field signed with a secure electronic signature | IESNIEGUMS_Studiju_virziena_novertesana_Vides_aizsardziba_EN.docx | IESNIEGUMS_Studiju_virziena_novertesana_Vides_aizsardziba_LV_precizets.edoc |
| III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme | | |
| Sample of the diploma and its supplement to be issued for completing the study programme | | |
| For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable) | | |
| Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable) | | |
| Statistics on the students in the reporting period | | 4_LV_studejoso_skaita_raksturielumi (45529).docx |
| III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof | | |
| Compliance with the study programme with the State Education Standard | 5_Atbalstiba_izglitiba_standartam_Eng.docx | 5_Atbalstiba_izglitiba_standartam_LV.docx |
| Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable) | | |
| Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable) | | |
| Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme | | |

| | | |
|---|----------------------------|--|
| The curriculum of the study programme (for each type and form of the implementation of the study programme) | | |
| Descriptions of the study courses/ modules | | |
| Description of the organisation of the internship of the students (if applicable) | 11_Praksu_nolikums_ENG.pdf | |
| III - Description of the Study Programme - 3.4. Teaching Staff | | |
| Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable) | | |
| Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable) | | |

Other annexes

| Name of document | Document |
|--|---|
| LLU Galvenie dokumenti latviešu valodā | Dokumenti latviešu valodā-20220729.zip |
| LLU Documents in English | Documents in English-20220729.zip |
| 26 dokumenti - galveno dokumentu sarakstā angļu valodā | 26_On tuition fees in study the academic year_2022_2023.pdf |
| LBTU_IS_mansLLU_ekransavini_LV.pdf | LBTU_mansLLU_ekransavini_LV.pdf |
| LBTU_IS_mansLLU_screenshots_EN.pdf | LBTU_mansLLU_screenshots_EN.pdf |

Environment and Water Management (42853)

| | |
|---|---|
| Study field | <i>Environmental Protection</i> |
| ProcedureStudyProgram.Name | <i>Environment and Water Management</i> |
| Education classification code | <i>42853</i> |
| Type of the study programme | <i>Professional bachelor study programme</i> |
| Name of the study programme director | <i>Inga</i> |
| Surname of the study programme director | <i>Grīnfelde</i> |
| E-mail of the study programme director | <i>inga.grinfelde@llu.lv</i> |
| Title of the study programme director | <i>Mg. sc.ing.</i> |
| Phone of the study programme director | <i>+37129442763</i> |
| Goal of the study programme | <i>The purpose of education is to create and develop, think and create a capable professional personality who would be able to solve problems related to the construction of environmental engineering structures, hydrotechnical structures, amelioration systems, water supply and sewer systems at the engineer level.</i> |
| Tasks of the study programme | <i>The aim is to promote students during their studies, acquire knowledge that allows them to be well orientated in environmental, water management, land reclamation, wastewater treatment problems, as well as waste management, environmental protection and sustainable use of natural resources, organisation and management of construction and design works, where knowledge of exact and natural sciences is essential.</i> |

| | |
|--|--|
| Results of the study programme | <p>1. Able to organise and perform the tasks of designing environmentally protective and environmentally friendly technologies, constructing equipment, assembling and ensuring its operation, environmental monitoring and control.</p> <p>2. Able to participate in the engineering improvement of technological processes in accordance with the requirements of environmental legislation and environmental standards.</p> <p>3. Able to systematically raise personal qualifications, improving knowledge and skills, incl. on the preparation and implementation of projects co-financed by EU funds.</p> <p>4. Able to participate in the preparation, management or monitoring of policy documents, projects, opinions or other documents in the field of environmental protection.</p> <p>5. Able to manage lower level specialists.</p> <p>6. Able to demonstrate comprehensive and specialised knowledge and understanding of facts, theories, laws and technologies relevant to the field of reclamation and environmental engineering.</p> <p>7. Able to perform practical tasks in the field of land reclamation and environmental engineering based on an analytical approach, demonstrate skills that allow creative solutions to land reclamation and environmental engineering problems to be found, discuss practical issues and solutions in the field of land reclamation and environmental engineering with colleagues, clients and management in a reasoned manner, with an appropriate degree of independence to learn further, improving their competences.</p> <p>8. Able to evaluate and improve personal and other people's performance, work in cooperation with others, plan and organise work to perform tasks in the reclamation and environmental engineering profession, perform or supervise such work activities in which unpredictable changes are possible.</p> <p>9. Able to formulate, describe and analyse practical problems in the reclamation and environmental engineering profession, select the necessary information and use it to solve clearly defined problems, participate in the development of the reclamation and environmental engineering field, show that he/she understands the place of reclamation and environmental engineering in a wider social context.</p> |
| Final examination upon the completion of the study programme | Diploma Project |

Study programme forms

Full time studies - 4 years - latvian

| | |
|-------------------------------------|---------------------|
| Study type and form | Full time studies |
| Duration in full years | 4 |
| Duration in month | 0 |
| Language | latvian |
| Amount (CP) | 160 |
| Admission requirements (in English) | Secondary education |

| | |
|---|---|
| Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english) | <i>Professional Bachelor Degree in Environmental Management and Environmental Engineering</i> |
| Qualification to be obtained (in english) | <i>Environmental Engineer</i> |

Places of implementation

| Place name | City | Address |
|---|---------|--------------------------------|
| Latvia University of Life Sciences and Technologies | JELGAVA | LIELĀ IEĻA 2, JELGAVA, LV-3001 |

Part time extramural studies - 5 years - latvian

| | |
|---|---|
| Study type and form | <i>Part time extramural studies</i> |
| Duration in full years | <i>5</i> |
| Duration in month | <i>0</i> |
| Language | <i>latvian</i> |
| Amount (CP) | <i>160</i> |
| Admission requirements (in English) | <i>Secondary education</i> |
| Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english) | <i>Professional Bachelor Degree in Environmental Management and Environmental Engineering</i> |
| Qualification to be obtained (in english) | <i>Environmental Engineer</i> |

Places of implementation

| Place name | City | Address |
|---|---------|--------------------------------|
| Latvia University of Life Sciences and Technologies | JELGAVA | LIELĀ IEĻA 2, JELGAVA, LV-3001 |

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

Since the last accreditation, the professional bachelor's study programme "Environment and Water Management" has undergone a whole series of improvements resulting from the recommendations of the previous accreditation commission, global climate and environmental policy, sustainable development guidelines, recommendations of industry leading organisations, labour market demand and student self-government proposals. The changes were prepared on the basis of the requirements set forth in Cabinet Regulation No. 512 "Regulation on the State Standard of Second Level Professional Higher Education" of 26 August 2014, based on Cabinet Regulation No. 264 of 23 May 2017 "Regulations regarding the Classification of Professions, Essential Challenges and Essential Qualification Requirements for Professions", the resolution of the European Parliament of 23 September 2008 on the Bologna process and student mobility (2008/2070(INI)), professional - environmental engineer (The number of profession standard 2143 01), LLU study regulations and other binding laws and regulations.

Volume of Studies

The total study volume of the professional bachelor's study programme "Environment and Water Management" was reduced from 200 CP to 160 CP, which corresponds to the requirements set forth in Cabinet Regulation No. 512 "Regulation on the State Standard of Second Level Professional Higher Education" of 26 August 2014, and also meets the Professional Standard - Environmental Engineer (The number of profession standard 2143 01). The scope of the study programme was reduced by 40 CP, in order to carry it out; the plan of the study programme and usefulness of each study course were carefully evaluated. Below is an overview of the rationale for reducing the scope of the study programme, while detailed information on the exclusion, reduction, transformation or creation of new study courses is provided in Annex (42853_VUS_1_1_1_Changes_in_Study_Program)

Excluded study courses

Several study courses are excluded from the study programme plan for several reasons. Analysing the study courses of the study programme, it was concluded that part of the content of the study courses is included in the curriculum of general education schools, for example, Information science.

Evaluating the compliance of the study programme with the basic requirements set out in Cabinet Regulation No. 512 "Regulation on the State Standard of Second Level Professional Higher Education" of 26 August 2014, and when evaluating the requirements of the profession standard, some study courses were excluded from the study programme because they do not directly meet the aforementioned requirements of the standards. An example is the study course Philosophy and Forest and Wetland.

By in-depth analysis of the plans of the study courses included in the study programme and the topics included within them, it was concluded that some study courses overlap with other study

courses, for example, Hydrology and Limnology practices.

The volume of study courses has been reduced

The reduction in the number of study courses is related to the requirements set forth in Cabinet Regulation No. 512 “Regulation on the State Standard of Second Level Professional Higher Education” of 26 August 2014, which determine the total amount of credit points in each part of the study programme. In the section of general education study courses, the amount of Professional English was reduced from 6 CP to 2 CP; at the same time training in English is integrated into professional study courses (theoretical material, terms, etc.). The study course Principles of Scientific Work was reduced from 4 CP to 2 CP, as the focus on the development of scientific work is integrated into the study courses Introduction to the Speciality, and Mathematical Statistics. The scope of developing and defending the diploma project was reduced from 15 CP to 12 CP.

The volume of study courses has been increased

After consultations with industry experts and the latest trends in the field of environmental engineering, the amount of credit points for the study courses Bioengineering, Hydrotechnical Structures, Environmental Engineering and Geographic Information Systems was increased.

New study courses have been created

The creation of new study courses is related to the recommendations of industry experts, especially the “Reclamation Association”, and recommendations of the Faculty of Environment and Civil Engineering student self-government, as well as the introduction of new technologies and requirements in the field of land reclamation and environmental engineering. New study courses Basics of Law and Entrepreneurship Laws were included in the general education course section of the study programme to promote the improvement of business and professional competence. The Management of Environmental Projects study course was included in the study plan to develop project management skills. The Land Reclamation Project Management covers the steps and plans of the construction process until the object is put into operation. The Indicator Species of Environmental Quality study course was developed with the aim of promoting the ability to assess the quality of the environment. The Environmental Chemistry and Mechanics of Soils study course was included in the study programme to provide a theoretical basis for solving complex environmental engineering issues; see Annex (42853_VUS_1_1_1_Changes_in_Study_Program)

for more information on newly created study courses.

Type of Implementation

The professional bachelor's study programme “Environment and Water Management” has been implemented in full-time studies until now. Based on the recommendations of experts in the field, especially the “Reclamation Association”, and the recommendations of the Faculty of Environment and Civil Engineering student self-government, the study programme will be implemented in two ways:

Full-time studies, which last for 4 years, with eight semesters and each semester having planned study courses in the volume of 20 CP. Studies are organised on-site according to the division of the LLU study year. The study programme plan is provided in Annex (42583_VUS_2_1_4_Full_time_study_plan).

Part-time studies, which last for 5 years, with ten semesters and each semester having planned study courses in the volume of 16 CP. Part-time studies are organised in the form of examinations in late autumn and early spring, which are determined by the order of the dean of the Faculty of Environment and Civil Engineering. Such an approach was chosen based on industry

recommendations, and also corresponds to a student-centred approach, as it allows practising specialists to improve their qualifications in a period when intensive construction works are not taking place. In Annex (42583_VUS_2_1_5_Part_Time_Study_Plan).

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The name of the professional bachelor's study programme "Environment and Water Management" reflects the regulatory framework and multifaceted nature of the environmental protection industry, which is included in the study programme plan in the form of study courses and topics. The "Environment and Water Management" speciality implemented by LLU has more than 70 years of experience in the education of water management, reclamation, and hydrotechnical structures, initially developing as a field of hydrotechnical reclamation. The study programme is the only one in Latvia with an in-depth focus on water management, hydrology, hydrotechnical reclamation.

The aim of the study programmes in the environmental protection direction is to prepare competitive specialists and scientists of various levels (engineers, masters and doctors) and to conduct research in the fields affecting the environment.

The professional bachelor's study programme "Environment and Water Management" complies with Cabinet Regulation No. 512 "Regulation on the State Standard of Second Level Professional Higher Education", and in terms of content corresponds to the mandatory content of the bachelor's programme specified in the regulation (Annex (42853_VUS_1_2_1_Correspondance to regulations). The amount of the programme is 160 CP, which meets the standard. Graduates of the professional bachelor's study programme "Environment and Water Management" are awarded a professional bachelor's degree in environmental management and environmental engineering and the qualification of an environmental engineer.

The goal of education is to form and develop, think and create a capable professional personality who would be able to solve construction-related problems at the level of an engineer. Therefore, in the admission rules, emphasis is placed on maths and physics grades upon graduating from high school. It leads to the selection of students with the ability to think exactly, which corresponds to the direction of engineering. During their studies, students acquire knowledge that allows them to be well orientated in environmental, water management, land reclamation, wastewater treatment problems, as well as waste management, environmental protection and sustainable use of natural resources, organisation and management of construction and design works, where knowledge of exact and natural sciences is essential. Graduates of the study programme become environmental engineers who meet the professional standard - environmental engineer (The number of profession standard 2143 01), the 5th professional qualification level (5.PQL) and 6th level of the Latvian qualifications framework (6.LQF). Detailed information is provided on the compliance of the qualification to be obtained in the professional bachelor's study programme "Environment and Water Management" with the professional standard "Environmental Engineer".

The main achievable study results are as follows: able to organise and perform the tasks of designing environmentally protective and environmentally friendly technologies, constructing equipment, assembling and ensuring its operation, environmental monitoring and control, participating in the engineering improvement of technological processes in accordance with the requirements of environmental legislation and environmental standards, systematically raising personal qualifications, improving knowledge and skills, incl. on the preparation and implementation of projects co-financed by EU funds. Able to participate in the preparation, management or monitoring of policy documents, projects, opinions or other documents in the field of environmental protection. Able to manage lower level specialists. Able to demonstrate comprehensive and specialised knowledge and understanding of facts, theories, laws and technologies relevant to the field of reclamation and environmental engineering.

Able to perform practical tasks in the field of land reclamation and environmental engineering based on an analytical approach, demonstrate skills that allow creative solutions to land reclamation and environmental engineering problems to be found, discuss practical issues and solutions in the field of land reclamation and environmental engineering with colleagues, clients and management in a reasoned manner, with an appropriate degree of independence to learn further, improving their competences. Able to evaluate and improve personal and other people's performance, work in cooperation with others, plan and organise work to perform tasks in the reclamation and environmental engineering profession, perform or supervise such work activities in which unpredictable changes are possible.

Able to formulate, describe and analyse practical problems in the reclamation and environmental engineering profession, select the necessary information and use it to solve clearly defined problems, participate in the development of the reclamation and environmental engineering field, show that he/she understands the place of reclamation and environmental engineering in a wider social context.

Full-time, study year should cover 40 CP and 20 CP each semester. Study courses are planned to ensure the preparation of successful environmental engineers. In the early stages of studies there are general basic engineering courses, specialisation will increase over the coming years, leading to the strengthening of knowledge in an practical training integrated in the working environment and in a diploma project.

The study programme plan is provided in Annex (42583_VUS_2_1_4_Full_time_study_plan).

Part-time studies lasting 5 years, ten semesters, with 32 KP and 16 KP in each semester. Study courses by semester are arranged in a logical order to move from general knowledge to specialisation. In the working environment, integrated practices and a diploma project help to strengthen knowledge learned. Part-time study programme plan in Annex (42583_VUS_2_1_5_Part_Time_Study_Plan).

Graduates are in demand as certified engineers in the water management industry and reclamation design companies, utility companies and municipalities, LEGMC, State Environmental Service and thematically related departments of ministries.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The professional bachelor's study programme "Environment and Water Management" is related to

several sectors.

First of all, we should mention the field of hydro-ameliorative construction of reclamation systems, where one of the prerequisites for obtaining a certificate of professional activity in the design and construction of reclamation systems, which is awarded by the certification commission of the Latvian Reclamation Association, is a professional bachelor's diploma in the "Environment and Water Management" study programme. The study programme is unique in Latvia due to long-term experience in the preparation of drainage system design and construction engineers. According to the estimates of the Latvian Reclamation Association, all reclamation systems are very valuable assets, and their total value is at least 7 billion euros. It is indicated in the audit report of the State Audit Office of 2020 "Is the management of drainage systems sustainable and effective?" (https://www.lrvk.gov.lv/lv/getrevisionfile/uploads/reviziju-zinojumi/2018/2.4.1.-18_2018/Revizijas_zinojums_Melio_25.03.2020.pdf (only in Latvian)) that hydro reclamation construction specialists certified for the design of reclamation systems and hydrotechnical structures, construction management and construction supervision, also play an important role in the field of land reclamation. The average age of certified specialists exceeds 60 years old in mid-2019 and reaches 68 years old in the design of hydrotechnical structures. This indicates the need to solve the problem of the availability of specialists in the market, so that it will be possible to ensure the implementation of projects for the restoration and reconstruction of drainage systems in the future. The survey of local governments conducted by the State Audit Office shows that for more than half of the surveyed municipalities, the development planning document in the field of land reclamation is important in order to find answers to questions about the possibilities of organising land reclamation systems, including funding, provision of specialists, priorities, division of responsibilities between the institutions involved in the field. The role of local governments in the monitoring of drainage systems is increasing, as from 1 July 2020, administrative control over violations in the field of drainage is fully implemented by local governments.

Secondly, the water supply and sewerage sector in Latvia is ageing rapidly (<https://www.lsm.lv/raksts/zinas/zinu-analize/miljards-kanalizacija-specialistu-trukums-udenssaimnieciba-draud-klut-kritisks.a406193/> (only in Latvian)). In 2018, the average age of employees in the industry was 49.6 years old, and in 2019 - already 51.9 years old, according to statistical data. Looking across various industries, it is the second highest indicator in Latvia. The average age of employees in the water supply and sewerage sector is over 50 years old, and it is increasing every year. Therefore, at least 400 new specialists should be attracted in the near future in order to have people working in this sector in the future. This is clear proof of the need to involve knowledgeable and interested young specialists in the industry.

The above-mentioned sectors are already experiencing a shortage of specialists; however, looking into the future, according to the forecast of the Ministry of Economy, the demand for specialists in the sector will increase, and an even greater shortage will develop. Analysing the employment data of graduates, it can be seen that the employment of LLU graduates of "Environmental Protection" is higher than the national average, which indicates a lack of specialists; a more detailed analysis of the employment of graduates is provided in Annex (42853_VUS_1_3_1_Graduate_employment).

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The total number of students of the professional bachelor study programme “Environment and Water Management” has decreased by 49% in the reporting period from 108 students in the study year of 2012/2013 to 53 students in the study year of 2021/2022. There are several reasons for the decrease in the number of students. The sharpest drop in the number of students was observed in the period from the study year of 2012/2013 until 2016/2017. After that, the number of students stabilises and fluctuates between 45 and 60 students; detailed analysis is provided in Annex (42853_VUS_1_4_1_The_Dynamics_of_Students). As a positive point, it should be mentioned that in the study year of 2021/2022, the number of students increased by 18% compared to the study year of 2020/2021.

The reduction in the number of students until the study year of 2017/2018 is partly related to the study duration of 5 years, which is too long, and other study programmes are chosen, which allow higher education to be obtained in a shorter period of time. The duration of studies was also one of the shortcomings pointed out by the experts of the previous accreditation period, and was eliminated. Since the study duration was changed to 4 years, the number of students has stabilised, and in the last year there is a tendency for it to increase.

The pronounced drop in the number of students in the study year of 2020/2021 is due to the fact that the last 5-year study group graduated in 2019/2020; therefore, the total number of students in the study programme decreased by the amount of students of one course.

A large role in the decrease in the number of students is played by student dropouts, which have a tendency to increase. At the beginning of the reporting period, student dropout was 8%, which has a tendency to increase, and the highest student dropout of 31% was in the study year of 2020/2021, which was largely due to the transition to distance learning due to the restrictions during the COVID-19 pandemic.

Analysing student dropouts by course, it can be concluded that the highest dropout rate is in the first year, which is 63% of the total number of dropout students. Analysing the reasons for the student dropouts in the first year, the largest proportion is related to breaking the contract, for which there can be several reasons, for example, the impossibility of combining work and studies, the desire to study in another study programme, etc. The next largest group of student dropouts is formed by student dropouts due to a failure to fulfil the obligations of the study contract, without concluding the supplementary agreement to the study contract on the change of funding. In this case, students stop their studies because they are deprived of a subsidised place based on the competition procedure and are forced to study using their own funding; a large proportion of student dropouts in the reporting period did not start studies, which is less often observed since unified admission.

Analysing the number of graduates since the beginning of the reporting period, there has been a tendency for the number of graduates to decrease, but since the study year of 2017/2018 the number of graduates has stabilised, but has a pronounced amplitude. This instability was formed during the diploma project development period, which is in the eighth semester, and some of the students, due to a lack of time and insufficient self-discipline, are unable to prepare a sufficiently high-quality diploma project and are forced to postpone the defence of their final thesis for a year. In order to prevent the postponement of the defence of the diploma project, a control system was introduced, where students must report on the progress of the development of the diploma project every month.

Analysing the number of students by form and type of studies, the number of students in the full-time stream has stabilised and has a tendency to increase, where in the study year of 2021/2022, the number of students increased by 8%. The number of part-time students is increasing year by year in general; however, it should be noted that this form of study was available from the study

year of 2017/2018, but the first group was organised in the study year of 2019/2020. In the next study year of 2020/2021, the group was not organised, while in the study year of 2021/2022, 8 students started their studies, which shows that this type and form of studies is gaining popularity, but the demand is not stable.

The dynamics of the number of students were significantly affected by the student dropout caused by the COVID-19 pandemic, which was mainly related to the inability to move to a remote form of study, insufficient self-discipline and lack of social contact with fellow students.

A whole series of activities are being carried out to promote the study programme, which can be divided into several groups. The first group consists of marketing measures to attract students, where by means of using the LLU portal, media and social networks, the possibilities offered by the professional bachelor's study programme "Environment and Water Management" are highlighted. The second group involves work on reducing the dropout of existing students, which includes the introduction of a mentoring programme, the appointment of a curator, as well as other types of support for students.

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

In recent years, active work has been carried out on the development of the sector's map of professions and standards of professions. Currently, based on the initiative of the industry, a group of experts is working on a new professional standard "Environmental and Water Management Engineer", in which the knowledge, skills and competences required for each of the duties and tasks of water supply and sewerage networks and drainage systems defined in the labour market are presented in detail. Considering the fact that the new professional standard are still in the development stage, the requirements included within it have already been partially incorporated into the improved and updated professional bachelor's study programme "Environment and Water Management", but the study programme's compliance with the standard was analysed based on the requirements made by the actual official professional standard - environmental engineer (The

number of profession standard 2143 01).

When making changes to the study programme, at the same time, a map of study courses has been developed, where the necessary knowledge, skills and competences for each study course are presented; it is also indicated to what extent the study courses must be acquired in accordance with the professional standard (Annex 42853_VUS_2_1_2_Standard_compliance). An environmental engineer organises and performs the tasks of designing environmentally protective and environmentally friendly technologies, constructing equipment, assembling and ensuring their operation, environmental monitoring and control, participates in the engineering improvement of technological processes in accordance with the requirements of environmental legislation and environmental standards, systematically raises his/her qualifications, improves knowledge and skills, including preparation and implementation of the projects co-funded by the EU funds, project-cycle, funding available for the implementation of environmental projects, a set of laws and regulations for these processes, procurement and the impact on the environment evaluation procedure. An environmental engineer participates in the preparation, management or supervision of policy documents, projects, opinions or other documents in the field of environmental protection. An environmental engineer supervises lower-level specialists.

In the first year of study, students learn the basics of engineering in study courses such as “Physics”, “Environmental Chemistry”, “Higher Mathematics”, “Surveying”, “Construction” and “Geology and Soil Science”, which will provide fundamental knowledge in environmental engineering and allow them to successfully master subjects of the professional specialisation. In addition, “Professional English” and “Communication Psychology” will be acquired. To promote an understanding of environmental issues, the study courses “Ecology” and “Landscape Architecture and Planning” will provide insight into natural and human-modified systems, which will allow an environmental engineer to look at environmental problems from a systemic point of view. In the first year of study, students start working on scientific research work and gain an understanding of how to work with scientific literature.

In the second year of study, studies in engineering hydrology, hydraulics and underground water hydrology are started, which form the necessary basic knowledge in the development of the reclamation course project. At the same time, students acquire skills for working with AutoCad and MicroStation, as well as develop a course project to strengthen geographic information system skills. Environmental engineering knowledge is complemented by practical skills in waste management and species and habitat protection. Throughout the study year, they work on developing the methodology of scientific research work and collecting the necessary data.

In the third year, students strengthen and deepen their knowledge in the field of drainage and irrigation, as well as acquire basic skills in the operation of drainage systems. Get acquainted with the basic issues of environmental policy and test their abilities in managing environmental projects, as well as strengthen their knowledge and competences in the field of water management, especially in the field of water supply systems and wastewater management, in which a course project is developed. To understand the various biological processes that can be successfully used in the improvement of the environment, coursework in bioengineering is developed. Develop skills in science and research, culminating in the presentation of their research at an international scientific conference.

In the fourth year of study, in the first semester, students acquire practical skills during internship, and in January they present the knowledge gained during the internship, as well as start working on the development of a diploma project. At the same time, business skills are developed, and labour law is studied in depth, which provides the basis for the successful start-up of a business. Get acquainted with the stages of management of land reclamation projects from conception to putting

the site into operation. At the beginning of June, the defence of diploma projects takes place and after a successful defence, the professional bachelor's degree in environmental sciences in environmental management and environmental engineering, and the qualification of environmental engineer, are awarded.

Such learning of study courses ensures the realisation of the goals of the study program. Mapping of study courses in connection with the implementation of program goals and tasks is added to Annex (42853_VUS_2_2_1_Maping). The description of the allocation of part-time study courses by semester is set out in the Annex (42853_VUS_2_1_3_Part_time_allocation)

3.2.2. In the case of master's and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The study programme implementation methods for full-time and part-time studies are based on the sequential, theoretical and practical acquisition of knowledge, skills and competences, which is realised through the following principles: Study courses are designed according to the thematic principle, as well as in such a way that each subsequent course complements and continues the previous ones. Acquisition of knowledge, skills and competences in the design of reclamation systems and water supply and sewerage networks, as well as other study courses, takes place through the study courses.

Organisation of study courses for full time students lectures are combined with practical or laboratory work, as well as study and course work, which allows students to strengthen the acquired theoretical knowledge in practice. New learning approaches were implemented using the possibilities of the LLU Moodle e-study environment. Therefore, study course materials are currently available in the e-study environment; they have been improved and the lists of information sources have been renewed according to modern trends and the available literature in the LLU Library and the Information Centre of the Agriculture Faculty of Rural Engineering.

The organisation of study courses in part-time correspondence studies is organised in the form of examinations, which take place twice per academic year for three weeks. Lectures, laboratory and practical work or seminars take place during the examination period. During the period between examinations, students independently complete assigned tasks, the acceptance and evaluation of

which take place in accordance with the instructions of the teaching staff - either before the next examination period or during the next examination period. Faculty staff are available for consultations both during the examination period and between the examination periods in the e-study environment, by e-mail or in person. During the examination period, lectures are combined with practical or laboratory work, as well as study and course work, which allows the acquired theoretical knowledge to be strengthened in practice.

In order for students' theoretical knowledge to be based on practice, guest lectures by specialists working in companies are widely used in the study process. Each academic year, students listen to about 10-15 guest speakers on topics related to the study plan and theoretical study courses.

To learn study courses, lecturers and students use LLU Moodle e-studies, which helps in placing materials for students, video lectures, implementing online lectures and seminars, students submitting developed works and lecturers posting ratings, as well as providing feedback and communicating individually with each student.

For the evaluation of the acquired knowledge, as well as for self-examination, various tests are placed in e-studies, the question bank of which is regularly updated. The Moodle e-study tool Attendance is used to control lecture attendance. Other digital tools are also used in certain study courses, for example, separate tests have been developed in the Kahoot application. To facilitate communication, every student and lecturer has an LLU e-mail; it is also possible to communicate in the e-study environment.

The study environment is organised to maximally ensure the consolidation of theoretical knowledge in practice. High-performance computer classes for learning the necessary software have been created, study and scientific laboratories have been developed, free access to library resources has been ensured, including when outside the LLU premises.

The principles of student-centred education are implemented in the study programme as follows:

Taking into account and respecting the diversity of the student contingent and their needs, when creating appropriate study approaches, an individual approach is often used in the studies, which is possible by working in small work groups or consulting students individually. Individual study courses are also offered through the Lifelong Learning Centre of LLU. Study methods are also adapted in situations where face-to-face studies are not possible.

Respecting the students' circumstances, they are offered a study environment that is accessible to every student, and the availability of the environment on the premises is ensured. Respecting the students' ability to attend studies and use study and science equipment, as well as study infrastructure, access to it is also provided outside working hours.

Lecturers are not only available to students for communication during classes, but also during consultations, as well as for communication - in e-studies and by e-mail.

Students' independent works are planned and structured, and students are provided with both mandatory and additional consultations, with support of the teacher. Consultation times are available in the LLU information system section of each lecturer.

Students who go on mobility have an opportunity to take missed courses for another semester after their return, and it is also possible to take study courses remotely while on mobility. Before going on mobility, an individual Protocol of Intentions is drawn up with each student, which provides for the procedure for equating study courses upon returning from mobility.

Review of students' complaints is regulated by the LLU study regulations. In addition, students are invited to turn to the director of the study programme, the head of the department, the vice-dean,

the dean and the vice-rector of studies for help.

In order to ensure mutual respect and cooperation between students and lecturers, the LLU Code of Ethics has been developed.

Students participate in surveys, discussions and evaluate the study process. In order to ensure student participation in the improvement of the study process, the director of the study programme regularly listens to student suggestions and explains possible solutions for improving studies. Students have an opportunity to participate in the improvement of the study process through the Student Self-Government, which delegates its representatives to the Faculty Council, Scholarship Commission, and LLU Convention.

Student valuation criteria are defined in the description of each study course, as well as each lecturer introduces students to the valuation criteria for each study paper when starting the study course. The study results and obtained ratings are explained by the lecturers, providing students with feedback on the submitted works. The final papers are evaluated by a commission made up of several commission members, which helps avoid a subjective rating.

LLU has developed the Study Regulations, which provide for the valuation of the papers developed by students using

qualitative and quantitative valuation methods.

A 10-point scale criteria or a pass/fail rating is used for the qualitative valuation. The quantitative indicator is the volume of the study course in credit points (1 CP=1.5 ECTS). In total, the study programme has been mastered if study courses in the volume of 160 CP (240 ECTS) have been successfully completed.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

The study plan of the professional bachelor study programme “Environment and Water Management” includes four internships. Three study internships Surveying 2 CP, Geology and Soil Science 1 CP and Hydrometry and Limnology 1 CP are implemented at LLU to strengthen theoretical knowledge.

A mandatory part of the professional bachelor's study programme “Environment and Water Management” is a professional internship outside the educational institution, in accordance with Cabinet Regulation of the Republic of Latvia No. 512 “Regulation on the State Standard of Second Level Professional Higher Education” (<https://www.llu.lv/lv/studiju-prakses>). Environmental engineering internship of the programme “Environment and Water Management” is planned for full-time and part-time students in the amount of 20 CP.

The general goals of the internship are: to ensure the combination of students' theoretical knowledge with practical work in order to assess the possibility of applying the knowledge acquired

at the university in practice; introduce students to the real situation in companies and employers to the potential workforce. Enable the companies to involve students in the performance of daily work duties, thereby assessing the potential of their work abilities. Promote cooperation between companies and educational institutions, in order to be able to more fully learn the wishes and needs of companies regarding young specialists. Familiarise himself/herself with the organisation, its organisational scheme, the scope of work performed, the organisation's place in the labour market of Latvia, acquire the necessary skills in environmental engineering, strengthen, expand and systematise theoretical and practical knowledge. Collect the necessary materials for the development of the diploma project, according to the "individual tasks" - both the individual task (issued by the head of internship of the organisation) and the individual task (issued by the head of the diploma project). In order to more successfully reach the set goals, students are involved in the daily work of the company, entrusting them to perform various independent duties and tasks related to the internship, involving them in paid work.

When going on an internship, the Rector's order is prepared and issued, students are given an internship, and a tripartite contract is prepared (LLU - Internship company - student). After the internship, the student submits an internship report by the deadline set by the teaching staff and defends the internship within the time set by the teaching staff. Internship reports are accepted by at least two members of teaching staff, one of whom is the director of the study programme.

In the autumn semester of the 4th year, during the internship of Environment Engineering, students of the professional bachelor's study programme "Environment and Water Management", in accordance with the requirements of the study programme, develop an internship report/overview and defend it at the end of the internship. The purpose of developing an environmental engineering internship report is to acquire skills and abilities in the systematisation and practical application of theoretical knowledge. The environmental engineering internship report/overview is developed during the internship period and submitted in writing in accordance with its content, presentation and set requirements.

The internship report is a reflection of individual, practical and cognitive work. In accordance with the programme of the study course, students in the above works are able to: select and compile data from statistics and various other reports; analyse and evaluate various indicators important for companies; compile, analyse and evaluate the economic performance and development indicators of companies (organisations, institutions); demonstrate the ability to apply the information technologies and theoretical knowledge available for this purpose in relevant subjects; draw conclusions and make proposals.

Works meet the following requirements: reflect the knowledge of environmental engineering special literature, economic information and other sources; reflect the ability to gather and analyse information using appropriate research methods and technical means; contain specific, current problems for independent or group research; contain an accurate, clear and logical presentation of the research process and results, the author's conclusions and proposals resulting from the research results; demonstrate the ability to use methods and information technologies of construction, marketing, accounting, logistics, personnel management, etc., as well as foreign experience in solving specific issues; demonstrate the ability to work creatively, conducting research and developing activity programmes. After the internship, the student has: strengthened, expanded and systematised theoretical and practical knowledge and a critical understanding of environmental engineering work processes, technology, planning, organisation and management of hydro reclamation construction works at a construction site, acquired the necessary skills in managing and organising construction works at a construction site, acquired skills in organising construction works at construction sites, competences in cooperation with the head of the diploma project to prepare for the development of the diploma project, collect the materials necessary for

the development of the diploma project in accordance with the individual task, as well as develop the individual task issued by the head of the organisation.

Environmental engineering internship is one of the targeted and consistent work environment-based study activities of the LLU Faculty of Environment and Civil Engineering. LLU supports students in achieving the tasks set within the framework of study internships by offering internships in the largest cooperation partner companies (VSIA Meliorprojekts, A/S Rīgas Ūdens, etc.), as well as allowing students to choose internships themselves, according to their professional activity and the internship programme. In cooperation with the reclamation and water supply and sewerage industry and municipalities, several activities are implemented in providing places for environmental engineering internships. Every year, internships are provided by industry companies in Latvia. During the last three years, a trend has been observed that LLU is unable to fill all the requested intern positions. Certain companies also have representative offices abroad; during the reporting period 2 students use the mobility opportunities of the ERASMUS+ programme for internships abroad, which allows students in the programme to supplement their knowledge, skills and competences in the international environment as well. The full list of internships is available in Annex (42853_VUS_2_4_1_Full_List_of_Practical_Training_Enterprises).

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

During the reporting period, 121 students successfully defended their final thesis of the professional bachelor study programme "Environment and Water Management". The final work of the studies is a diploma project, as part of which a technical solution is developed on various issues related to environmental engineering. The topics of diploma projects are summarised in Annex 42853_VUS_2_6_1_Themes_of_diploma_projects. When evaluating the diversity of the topics of the diploma projects, a pronounced influence of the labour market on the problems addressed in the diploma projects is visible, which reflects the demand in the labour market of the given year. Projects of water supply and sewerage systems are developed every year, which provide a technical solution for both internal and external water supply and sewerage networks. A significant proportion of diploma projects is made up of projects of reclamation systems, which include both the reconstruction and renovation of drainage systems, as well as projects for the restoration of water drains of national importance. The share of hydrotechnical construction projects has a tendency to decrease, as a large number of diploma projects were dealing with the reconstruction of small hydroelectric power plants or the construction of fishways, but currently the latest trends in environmental engineering are to free the riverbed by demolishing unprofitable dams and other obstacles to ensure smooth flow and promote fish migration. A small number of diploma projects deal with issues related to environmental remediation, pollution abatement and waste management, which require an innovative approach to solving complex environmental engineering issues. A more detailed breakdown of diploma projects by thematic groups can be found in Annex

In the process of developing diploma projects, students not only have the opportunity to use the solutions defined in the current regulatory frameworks, but also to use solutions approved in other countries and based on scientific research in solving complex environmental issues. Some of the diploma projects are indicated in Section 2.4.5, but several more diploma projects should be mentioned, where students have demonstrated their ability to apply innovative non-standard solutions.

Innovative tools for solving water management issues were used in the diploma project “Water management development project and hydraulic model of the water supply system of the city of Smiltene”, where a modelling tool developed in the USA was used in the calculations of hydraulic losses of the water supply networks of the city of Smiltene. For the design of internal water supply and sewerage networks, 3D design practice was approved, and a 3D model of common networks was developed as part of the diploma project “Water management development project of the study building of the Dobele Craft and General Secondary School and the adjacent territory”. The circular economy model, which envisages the use of resources in a single circular cycle, was introduced in the diploma project “Full-cycle project for self-supplying the fish farm with electricity in Šļukums, Alūksne Municipality”, where hydropower production was combined with fish farming in a single comprehensive solution. The use of new sewage treatment technology in Latvia was studied in the diploma project “A/S “Grindeks” sewage collection and treatment system reconstruction project”. An innovative fishway solution was developed in the diploma project “Analysis of possibilities and solutions for the construction of the fishway of the Riga Hydroelectric Power Plant”, where several fishway technologies were combined. Innovative solutions for ensuring the sustainability of heat network elements were sought in the diploma project “Project for mitigating the impact of chlorination on heat exchanger equipment”. Research and implementation of innovative solutions was carried out in the diploma project “Kūkova drainage project in Viļaka and Baltinava counties”, where part of the river is on the border of Latvia and Russia. In-depth research works and scientific literature studies were used in the diploma project “Production waste disposal storage project at RAAS “Daibe””, where innovative solutions were introduced. Complex and innovative hydrotechnical solutions, which were combined with the circular economy concept, were developed in the diploma project “Renovation of Metupīte ŪSIK 354471, reconstruction of land plot “Meti” reclamation systems and restoration of summer fish ponds and their hydrotechnical structures in Aizpute and Durbe parishes”. Using the experience of studies conducted in Latvia and internationally, an innovative protective breakwater solution was developed in the diploma project “Straumvirze protective pier reconstruction project at the inlet of the River Ogre in Daugava”. Environmental protection issues related to the reconstruction of decentralised sewerage systems were addressed in the diploma project “Sewerage network project in the Parka Street area of Livāni”, where a scientifically based and environmentally friendly solution was developed for the construction of a sewage pumping station in the river protection belt. Based on the solutions developed in Sweden and the USA in the field of rational use of water resources, in the diploma project “Project of internal and external water supply and sewerage networks for an apartment building at Kaļķu iela 1, Jēkabpils”, a project was developed for water recirculation for secondary use by separating sewage wastewater flows. Rainwater collection, use and recirculation solutions were used in the project “Rainwater, domestic and industrial wastewater drainage system reconstruction project of the Riga municipal SIA Rīgas Satiksme 6th Bus Park”, which not only benefits the environment but is also economically justified. Innovative osmosis filter technologies were used in the diploma project “Renovation of waste water treatment facilities in the city of Bauska”, which allows saving of underground water resources and reuse of water.

During the reporting period, three female graduates received a diploma of excellence. Analysing

the breakdown of the final thesis scores, 27% - 7 (good), 31% - 8 (very good) and 30% - 9 (excellent) of the total number of defended diploma projects prevail. Scores of 6 (almost good) and 5 (average) were received by 6% and 2% of graduates, respectively, which are mainly related to an unsuccessful defence process and technical deficiencies in the diploma project. It should be especially noted that 4% of diploma projects have been rated with a grade of 10 (excellent), which indicates the use of innovative solutions, excellent quality of work and the student's ability to defend their work in front of the commission. A more detailed breakdown of scores by year can be found in Annex 42853_VUS_2_6_3_Diploma_projects_scores

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (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 the learning outcomes to be achieved by providing the respective examples.

Study programme resources consist of three groups - study and science equipment, software and literature. Industry publications for studies and research work are available in the LLU Fundamental Library Subscription, Educational Literature Subscription, Reading Room, and United Nations Food and Agriculture Organization Deposit Library. Bibliographic information on various issues related to environmental protection, land reclamation, water management and other sectors can be obtained in the bibliographic information department. To search for information sources that are not available in the library collection, students can use the subscribed databases in the LLU network or outside the LLU network, using personal accounts in the LLU Information System (LLU IS). Information can be obtained at the Reference and Information Centre of the LLU Fundamental Library, and interlibrary subscription services can also be used. The search engine LLU Primo Discovery, online databases BIS Aleph500, online databases created in the LLU Fundamental Library (8 databases of different meanings) are available for searching scientific literature. When using the LLU IS user account, a number of subscribed databases are available: CAB Abstracts; CRC Press e-books; EBSCO databases; EBSCO eBook Academic Collection; ScienceDirect journals; Scopus; Web of Science and other databases. The faculty and students are informed about the databases to which access is granted temporarily. Databases of lecturers' publications and doctoral theses have also been created.

The staff of the library provides consultations on current events, as well as advises students on searching for scientific information. The informative and methodological base of Latvia University of Life Sciences and Technologies is detailed, transparent, and structured so that students can quickly obtain all information related to studies, get acquainted with the study course materials and study course requirements in the LLU e-learning environment, and the LLU Fundamental Library provides students with a very wide range of teaching and scientific literature as well as access to a variety of databases. The LLU Fundamental Library regularly adds to the range of different publications, in which it is possible to find literature for mastering the study programme "Environment and Water Management", as well as for research. The annex (42853_VUS_3_1_1_New_Study_Materials) contains books and study materials that have added to the range of materials used in the course of

study during the reporting period.

Students at the Faculty of Environment and Civil Engineering can use the Faculty of Environment and Civil Engineering Information Centre, which provides free access to the database of the LLU Fundamental Library, available specific industry literature - books, standards, scientific and industry practical journals; it is possible to print large-format prints, such as the study projects (Annex 42853_VUS_3_1_2_Study_materials_VBF_Information_center).

During the reporting period, the study and science infrastructure of the area of environmental engineering was significantly improved, attracting funding from the Faculty of Environment and Civil Engineering's own earnings (tuition fees, etc.), ERDF projects "Strengthening the research and development infrastructure and institutional capacity of LLU and the scientific institutions under its supervision" (No. 1.1.1.4./17/I/003) and "Modernisation of STEM study programmes" (No. 8.1.1.1.0/17/I/001), as well as from various other projects implemented at the faculty.

Significant repairs have been made to improve study auditoriums and laboratories; high-performance computer equipment has been purchased that supports the development of digital skills, including BIM; equipment, tools and room equipment. All the auditoriums required for the study work are equipped with the necessary technical means - multimedia equipment, computer equipment, appropriate software and internet access - for conducting the lessons.

In general, several study and scientific laboratories are involved in the implementation of the study process of the programme:

Irrigation and drainage laboratory. Equipped with computerised drainage and filtration visualisation study equipment, sediment flow measuring equipment, hydrological process study equipment for laboratory and practical work, student research, demonstrations.

In the Laboratory of Pumps and the Laboratory of Hydraulic Modelling, laboratory work is carried out in the study courses Hydraulics, Hydrostructures, Pumps and Pumping Stations. The laboratory is equipped with a water flow chute, which can be adapted for various laboratory and scientific research works, a water flow visualisation table, three-level falls, shaft-shaped municipal construction and rapid flow models, a CAM85/25 water supply machine, as well as a pump stand, where pump flow, pump efficiency and laboratory works of different types of connection are being done.

In the water supply and sewage laboratory, various visual aids are available for study work: pump 0.33 kw CTM61-5AC, oxygen meter (DO-meter), pH meter portable AD 1402, pump BIOX 400-12 Nocchi, oximeter GOX-20, fittings, pipes and fasteners of different materials, years of manufacture and types, in order to demonstrate such to students in addition to lectures and practical work.

Building materials training laboratory is equipped according to the study of the composition and properties of building materials.

GIS Competence Centre, where 12 workstations are equipped with ArcGIS Pro software. A large-format scanner for scanning cartographic images, as well as a plotter and a 3D printer are located in the GIS Competence Centre, which students can use in the process of developing scientific and diploma projects.

New measuring instruments were purchased in the surveying teaching laboratory, because the existing working base of measuring instruments had worn out and it was necessary to renew it. 7 optical theodolites Fet 500, Geo-Fennel; rotary leveller EL 515 Plus SEt, Geo-fennel; 7 optical theodolites with electronic display Stonex STT 402L; GNSS equipment kits were purchased with the funds of the Faculty of Environment and Civil Engineering Information Centre.

Forest and Water Scientific Laboratory. Equipped with a greenhouse gas (GHG) emission measuring device, hydroacoustic flow meters, field multi-meters for determining water quality parameters, a set of equipment for measuring nitrogen oxide isotopes and concentrations, etc., equipment and facilities for scientific research.

Physics and chemistry laboratories.

Computer equipment and software. Two computer classrooms with 49 (24 workstations in room 803, 25 workstations in room 702) high-performance computers equipped with the latest versions of BIM support software, Autodesk computer programs AutoCAD are available for those studying at the Faculty of Environment and Civil Engineering, which are used in the design of drainage systems and hydrotechnical structures, modelling elements in a 3D environment. Geospatial modelling computer classroom with 20 workstations equipped with MicroStation, ArcMap and ArcGIS Pro software for creating maps, Mathcad for performing various mathematical calculations.

The auditoriums are equipped with interactive displays and whiteboards, which provide an opportunity for teaching staff to explain the study material and tasks using versatile and interactive methods, and for students to present their course papers.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The amount of state-funded study places is coordinated in a tripartite agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA) and Latvia University of Life Sciences and Technologies (LLU). The tripartite agreement on funding for 2021 sets forth that the base cost of one study place is EUR 1,630.11, the study level coefficient for bachelor's programmes is 1 and the social security of the study place for the bachelor's programmes is EUR 164.34; the study cost coefficient of the thematic field of education for the professional bachelor's programme "Environment and Water Management" is 1.94 (coefficients for each thematic area of education are different, they are stipulated in the regulations of the Ministry of Education and Culture "Procedure in which universities and colleges are financed from state budget funds"); the cost per student in the professional bachelor's programme "Environment and Water Management" is EUR 3,328.80. Changes in costs allocated annually by the state per student in the professional bachelor's study programme "Environment and Water Management" in the period from 2013 to 2022, are provided in Annex (42853_VUS_3_2_1_Budget_per_student). In order to ensure the cost-effectiveness of the study programme, the minimum number of students in full-time and part-time

studies shall be five students. If the actual number of students is smaller, the group shall not be completed in the first course. In later courses, if the drop-out group has fewer than five students from the general budget of the LLU, the implementation of the study programme shall be ensured.

The tuition fee in the programme per semester for full-time studies is EUR 980 or EUR 1,960 per year, and for part-time studies EUR 700 or EUR 1,400 per year.

Every year, the LLU Senate approves the distribution of revenues and expenses of the LLU general budget structure, prepared in accordance with the Saeima annual Law on the State Budget and the annual LLU Rector's Order "On LLU General Budget Planning". Control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate of LLU.

Before approving the distribution of LLU general budget revenue and expenses in the Senate, it is reviewed, discussed, and approved by the Working group on resource use and development, which consists of the Rector, vice-rectors, chancellor, LLU director, all deans of faculties, head of the resource accounting centre/chief accountant, head of the financial planning centre, key economists, and key specialists in real estate and legal issues.

The distribution of income and expenses approved by the LLU Senate determines that 80% of the funding allocated from the state consists of compensation costs, and 20% other costs. 60% of the paid study funding consists of reimbursement costs, and 40% other costs, of which 20% is directly at the disposal of the faculty that implements the respective study programme. The amount of funding for the science base is calculated and allocated annually from active research activities. The science base funding in the amount of 50% is at the direct disposal of the faculty, and 50% is to cover centralised costs. The science funding consists of funding attracted for the implementation of projects.

The overall distribution of the total LLU budget is formed by the estimates of structural units/faculties, where the costs are estimated by type of expenditure. In 2022, the share of costs of the bachelor's study programme "Environment and Water Management" consists of: remuneration - 71%; scholarships - 7%; goods and services - 19%, incl. utility services - 8%; share capital formation - 3%.

Additional financial support opportunities are available for those studying in the programme.

State scholarships are awarded to an average of 13 students in a professional bachelor's study programme in one study year; according to the number of successful students, scholarships are distributed proportionally to the students of each study year who received the highest scores.

Those studying in the programme have the opportunity to apply for several scholarships managed by the LLU Development Fund (Senate, Jānis Čakste, Kārlis Ulmanis, etc.), as well as the J. Biķis scholarship of the Faculty of Environment and Civil Engineering. During the reporting period, 6 students of the programme have received such scholarships, incl. 1 student received the Kārlis Ulmanis scholarship, 1 student received the Jānis Čakste scholarship, 1 student received the Mirdza Oškāle scholarship and 3 students received the J. Biķis scholarship.

In general, it can be concluded that the study base, scientific base, informative base, material-technical base and financial base correspond to the specifics of the study programme, implementation conditions, as well as the principles of student-centred education, creating prerequisites for achieving study results and indicating the possibility of ensuring a quality study process in the future.

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

The qualifications of the teaching staff involved in the programme fully meet the conditions of the implementation of the study programme and the requirements of the laws and regulations; see Annex 42853_VUS_4_1_1_Qualification_teaching_staff). The mechanism for the qualification and quality assurance of teaching staff is described in Chapter 2.3.6. Regular improvement of the qualifications of teaching staff helps in achieving study results.

Teaching staff involved in the implementation of the study programme regularly improve their professional qualifications. At least once every six years, teaching staff attend the professional development programme for higher education teachers “Innovations in University Didactics” (160 h). During the reporting period, 10 teaching staff members completed the teacher professional development programme and obtained a certificate. During the reporting period, 8 teaching staff members increased their qualifications in English language courses. Also, teaching staff improve their English language skills by going to partner universities abroad and participating in international conferences as part of ERASMUS+ mobility, as well as cooperating with international partners within the framework of various research projects and other activities.

During the reporting period, in addition to the professional development opportunities offered by LLU, teaching staff have actively visited other institutions within the framework of various projects, as well as at their own initiative, such as the Competence Development Centre of Zemgale region, the DVS Namejs User Support Centre, the Latvian Construction Engineers Union, and other organised professional development courses. The main topics of courses and seminars are related to the latest regulatory framework, innovations and technical solutions, environmentally friendly elements of reclamation systems, and increase of digital skills. Within the framework of the project “Development of Academic Staff of LLU” implemented by LLU, teaching staff had an opportunity to participate in a traineeship in industry companies. Teaching staff also raise their qualifications by participating in the Academic Conference of LLU, where topics relevant to the implementation of the study process are discussed. The qualifications of the teaching staff meet the conditions for the implementation of the study programme and the requirements of the laws and regulations. This is evidenced by the request for them to hold lectures/seminars for industry specialists.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

During the reporting period, the total number of lecturers involved in the Professional Bachelor's

study programme “Environment and Water Management” has changed to a minimum extent. The gradual recruitment of new teaching staff for the implementation of the study process is rated positively. The total number of participants - 48 teaching staff members (33 - from the Faculty of Environment and Civil Engineering, 15 - from other LLU faculties) (Annex 42583_VUS_4_2_1_Teaching_Staff). 39% of teaching staff members are elected to academic or scientific positions. During the reporting period, 27 teaching staff members have been elected to academic and scientific positions as lecturers and research assistants, associate professors and professors; 12 teaching staff members have been promoted. 5 teaching staff members have terminated their employment either due to choosing another job, retiring, or passing away. 8 new teaching staff members have started new work relations and have become part of the teaching staff.

Some of the teaching staff members who teach specialisation study courses, besides working at the university, also work in manufacturing companies. This means that students receive up-to-date information about production processes, and this improves the acquisition of theoretical knowledge. Since the study programme is professional, the connection of teaching staff with production improves the choice of real topics both in course projects and in the selection of topics for final theses.

During the reporting period, a total of 6 teaching staff members, who are also doctoral students of the LLU doctoral study programme, were involved in the implementation of the professional bachelor's study programme “Environment and Water Management”. Thus, the replacement of academic and scientific staff in the field of environmental engineering is gradually being formed. Also, doctoral students are closely related to research and the development of innovative solutions, which allows the knowledge gained to be integrated into study courses and passed on to future specialists.

During the reporting period, foreign guest lecturers, as well as guest lecturers from the industry, were attracted to the extent possible. The involvement of guest lecturers in the study process is very important, because guest lecturers often introduce students and teaching staff to a very specific or narrow topic, which cannot be included in the study programme plan, but which provides important additional information. It is also important to learn about foreign experience, showing current trends in the industry at the international level. The attraction of foreign and local guest lecturers is not paid for by state funding for the study programme, so external funding sources are needed. A positive experience is the possible mobility of foreign guest lecturers to LLU as part of the ERASMUS+ programme.

Guest lectures for students of the programme are organised every year in cooperation with industry companies and graduates. Specialists mainly present the latest technologies in the field of environmental engineering, as well as the provision of internships and jobs. During the reporting period, the number of industry guest lectures in the programme is on average 10-15 per study year.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field

of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

Due to the main common goal of the study programme: to prepare good environmental engineers for the country, the cooperation of teaching staff within the programme is very close. Considering the fact that the topics in the study courses are planned to be cross-cutting, each study course is based on the knowledge and skills acquired in the previous courses, so the teaching staff must cooperate to improve the quality of work.

The knowledge, skills and competences necessary for the promotion of cooperation, the interconnection of study courses, the design of reclamation systems and water supply and sewerage networks are provided by gradually progressing and by creating and strengthening the competences necessary for an environmental engineer within each subsequent study course. This cooperation at the level of teaching staff already starts when working with the first year students, and continues until the final thesis.

Cooperation also takes place by organising joint scientific and scientifically-practical conferences. In general, teaching staff collaborate with professionals at the national, professional and university levels. The teaching staff members are experts of the Latvian Science Council, full and honorary members of the Latvian Academy of Agricultural and Forestry Sciences, and have been experts in the evaluation and accreditation of the study programmes organised by the Ministry of Education and Science and the "Academic Information Centre" foundation. Teaching staff work in commissions at the Promotion Council of Riga Technical University. Teaching staff of the programme are members of editorial boards and scientific committees, as well as committees of various international conferences. Cooperation also takes place within the framework of various professional industry organisations. Within the framework of cooperation, the teaching staff of the programme acted as a competition jury, and commission members, in events such as the Zemgale Regional Student Scientific Research Conference.

The teaching staff of environmental engineering also cooperate with the teaching staff of other LLU faculties within the study programme. For example, when learning hydrological and hydraulic calculations both as part of course projects and research work, the teaching staff cooperate with the teaching staff of the Department of Physics, using the department's laboratory equipment and special computer software. Working on the development and practical application of new environmental technologies, the teaching staff of the Environmental Engineering study programme cooperate with the teaching staff of the Faculty of Agriculture. Cooperation with the Faculty of Forestry takes place in several directions. A group of researchers from the Forest and Water Resources Scientific Laboratory (MURZL), which involved master's students, prepared the teaching aid "Phytoremediation. Possibilities of use in Latvia". The book was presented in the BOVA courses "BOVA Intensive PhD, MSc and BSc Courses "Waste to Resource in the Baltic States"" (2016). In 2017, Lineaus University (Sweden) organised the courses "Glass Mining in Practice 2017", where LLU FEC environment and water management students participated in the development of the educational phytoremediation park concept and, in 2017, a group of environmental and water management students participated in the establishment of the first educational phytoremediation park in the Swedish village of Orrefors. In autumn 2017, LLU FEC participated in the project "PECEC; Knowledge in Inter Baltic Partnership Exchange for Future Regional Circular Economy Cooperation" financed by the Swedish Institute, where the leading partner was Lineaus University of Sweden and partners from Latvia, Lithuania, Estonia, Georgia and Russia. At the beginning of 2018, the LASUWAMA project, funded by the Swedish Institute and led by Lineaus University in Sweden, was launched: Strengthening BSR Universities Network on Landscape Sustainability and Waste Management, where partners were from Latvia, Lithuania, Estonia, Finland, Ukraine, Georgia and Armenia. The aforementioned projects enabled 8 students to participate in international courses; 9 publications were prepared, in which students were involved. On this basis, it was possible to participate in the INTEREG projects "Innovative brownfield regeneration for the sustainable development of cross-border regions (BrownReg)" and "Sustainable use of water resources for tourism development in Latvian-Russian border cities - Rezekne and Ostrova (Sticky urban areas)", in the implementation of which students participated, and guidelines for "Remediation of Brownfields" were developed.

As of 1 September 2021, the ratio of the number of students and the number of teaching staff of the professional bachelor's study programme "Environment and Water Management" was 13.3, and the average number at the LLU was 13.0.

Annexes

| III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme | | |
|---|---|--|
| Sample of the diploma and its supplement to be issued for completing the study programme | Prof_Bakalaura_diploms_pielikums_Vide_EN.7z | Prof_Bakalaura_diploms_pielikums_Vide_LV.7z |
| For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable) | | |
| Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable) | | |
| Statistics on the students in the reporting period | 42853_VUS_1_4_1_The_Dynamics_of_Students.docx | 42853_VUS_1_4_1_Studejoso_skaita_dinamika.docx |
| III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof | | |
| Compliance with the study programme with the State Education Standard | 42853_VUS_1_2_1_Correspondance_to_regulations.docx | 42853_VUS_1_2_1_Atbalstiba_MK_Noteikumiem.docx |
| Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable) | 42853_VUS_2_1_2_Standard_compliance.docx | 42853_VUS_2_1_2_Atbalstiba_standartam.docx |
| Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable) | | |
| Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme | 42853_VUS_2_2_1_Maping.xlsx | 42853_VUS_2_2_1_Kartejums.xlsx |
| The curriculum of the study programme (for each type and form of the implementation of the study programme) | 42583_VUS_2_1_4_Full_time_study_plan.xlsx | 42853_VUS_2_1_4_Pilna_laika_studiju_plans.xlsx |
| Descriptions of the study courses/ modules | Profesionaalaa_bakalaura_studiju_kursu_programmas_ENG.rar | Profesionaalaa_bakalaura_studiju_kursu_programmas_LV.rar |
| Description of the organisation of the internship of the students (if applicable) | 11_Praksu_nolikums_ENG.pdf | 11_Praksu_nolikums_LV.pdf |
| III - Description of the Study Programme - 3.4. Teaching Staff | | |
| Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable) | | |
| Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable) | | |

Environmental, Water and Land Engineering (45529)

| | |
|---|--|
| Study field | <i>Environmental Protection</i> |
| ProcedureStudyProgram.Name | <i>Environmental, Water and Land Engineering</i> |
| Education classification code | <i>45529</i> |
| Type of the study programme | <i>Academic master study programme</i> |
| Name of the study programme director | <i>Artūrs</i> |
| Surname of the study programme director | <i>Veinbergs</i> |
| E-mail of the study programme director | <i>arturs.veinbergs@llu.lv</i> |
| Title of the study programme director | <i>Ph.D., docents</i> |
| Phone of the study programme director | <i>+37126139243</i> |
| Goal of the study programme | <i>The aim of the academic higher education master's study programme Environmental, Water and Land Engineering (hereinafter referred to as the Study Programme) is to prepare highly qualified specialists for scientific, pedagogical, as well as professional and management work who are well-versed in scientific research and are competent in solving scientific and practical problems related to the environment, water management, land management and geodesy.</i> |
| Tasks of the study programme | <i>Tasks of the study programme:</i> <ul style="list-style-type: none"> <i>• to ensure the acquisition and development of in-depth theoretical knowledge suitable for the student group and individual interests in an interdisciplinary engineering perspective in fields related to the environment, water management, land management and geodesy;</i> <i>• to develop research skills and abilities that can be used to identify and solve both practical and scientific problems;</i> <i>• to develop the student's creative abilities and promote the development and integration of innovative solutions for sustainable and balanced territory development planning, use and management of natural resources.</i> |

| | |
|--|--|
| Results of the study programme | <p>1. Knowledge</p> <ul style="list-style-type: none"> • knows and understands in-depth the current development stage, development trends and possible future challenges of environmental, water and land engineering sciences; <p>2. Skills:</p> <ul style="list-style-type: none"> • can present ideas and work results understandably and engage in constructive discussions; • can organize a structured interdisciplinary research process, solve and discuss issues existing in engineering sciences; • is able to organize effective individual and group work and solve interdisciplinary engineering issues; <p>3. Competencies:</p> <ul style="list-style-type: none"> • is able to constructively and critically evaluate the existing environmental and natural resource management model, applied methods and solutions, and their strengths and weaknesses; • is able to develop sustainable and innovative solutions for developing local and regional territories and using natural resources. |
| Final examination upon the completion of the study programme | Master Thesis |

Study programme forms

Full time studies - 2 years - latvian

| | |
|---|---|
| Study type and form | Full time studies |
| Duration in full years | 2 |
| Duration in month | 0 |
| Language | latvian |
| Amount (CP) | 80 |
| Admission requirements (in English) | Academic or professional bachelor's degree in environmental and water management, land management, geodesy, landscape architecture, agricultural sciences, forestry, environmental sciences, or other natural and engineering sciences, the duration of which in full-time studies is at least three years (120 CP). If graduates of other study directions with a certificate from the workplace shall certify at least two years of professional work experience in the field related to the relevant specialisation of the chosen master's study programme |
| Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english) | Master Degree of Engineering in Environmental Engineering |
| Qualification to be obtained (in english) | - |

Places of implementation

| Place name | City | Address |
|---|---------|--------------------------------|
| Latvia University of Life Sciences and Technologies | JELGAVA | LIELĀ IELA 2, JELGAVA, LV-3001 |

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

The educational classification code (ECC) is changed from 45526 to 45529, corresponding to the educational thematic group 'Environmental Engineering'. Following the Cabinet of Ministers' regulation no. 240 (2014) graduates of the programme obtain the degree 'Master Degree of Engineering in Environmental Engineering'.

Admission rules are changed providing that applicants who have not obtained a Bachelor's degree in natural and engineering sciences or who have obtained a second-level higher education can apply for studies in the master's study programme if they have accumulated at least two years of professional or research experience in the field, related to the study programme 'Environmental, Water and Land Engineering'.

The master's study programme has a redefined mission. Following the mission of the study programme and the regulations of the Cabinet of Ministers no. 240 (2014) the strategic goal was revised and redefined, tasks and achievable results were adjusted that correspond to contemporary scientific trends, achievements and unresolved issues.

The mission of the Academic higher education master's study programme 'Environmental, Water and Land Engineering' is to develop research skills and abilities, provide in-depth knowledge and promote creative thinking in order to ensure balanced and sustainable environmental development with the help of fields related to environmental protection, water management, land management and geodesy, and to provide opportunities for graduates of the study programme to continue research work and doctoral studies. The academic master's study program's strategic aim is to acquire theoretical and practical knowledge, skills and competencies corresponding to the 7th level of the EQF (MK No. 240, 2014).

The master's study programme 'Environmental, Water and Land Engineering' is relatively new and was licensed for the first time in 2016 and included in the study field "Environmental protection". The first students have been admitted starting from the 2016/2017 study year. The previous recommendations of the accreditation and licensing commission (Part 2, Appendix 17 and 18) are integrated into the study programme in order to prepare highly qualified specialists capable of competing on the Latvian and international level, attracting a more significant number of students, and involving students in local and international scientific activities. Environmental engineering specialists are trained in the current study programme, in the process of consolidation, replacing the three master's study programmes "Hydroengineering Science", "Environmental Engineering Science", and "Land Survey" previously implemented in the Faculty of Environment and Civil Engineering.

In the newly created master's study programme 'Environmental, Water and Land Engineering', general engineering topics are learned in mandatory theoretical courses. According to the student's individual interests and abilities, the student develops knowledge, skills and competencies in one of the four chosen specializations "Environmental Engineering", "Hydrotechnics and Water

Management", "Land Management", or "Geodesy".

Since the creation of the study programme, minor changes have been gradually made to the study course planning until the 2021/2022 study year (Part 3, Appendix 14). Relatively extensive structural and substantive changes were introduced in 2022 (Part 3, Appendix 15), updating the study courses included in the study programme plan, their content and mutual continuity, as well as increasing the proportion of relatively larger study courses in the programme plan. The changes are binding on students who start their studies in the study programme in the 2022/2023 study year or later.

When implementing the academic master's study programme, the minimum requirements specified in the binding regulatory enactments are observed (Part 3, Appendix 16). The total duration of full time studies is two years (80 CP). In accordance with the requirements set out in the Law on Higher Education Institutions, the total duration of master's and bachelor's full time studies shall be no less than five years (Law on Higher Education Institutions, 1995). It should be noted that the total duration of full time bachelor's studies is three to four years, or not less than 120 CP, as determined by the Law on Higher Education Institutions. Accordingly, the duration of a previously completed bachelor's study programme does not limit the opportunities to study in the master's study programme 'Environmental, Water and Land Engineering'.

Accreditation sheet No. 2020/31 (Part 3, Appendix 17) specifies the type and form of the implementation of the study programme for full time and part time intramural. Starting from the 2022/2023 study year, it is not planned to accept students for part-time intramural studies. Accordingly, only full time studies will be implemented.

Below, the changes described in the text, or the programme plan updated in 2022, have been compared with the binding plan for students who started their studies in the 2021/2022 study year. The updated study programme plan is designed to gradually introduce the student to academic master's studies, learn about scientifically significant issues, acquire theoretical knowledge and practical skills, as well as develop scientific research to solve current problems. The study courses are organized in such a way that the acquired knowledge is meaningful for the students of each speciality the study process is efficient both in terms of the acquired lasting knowledge and the time spent.

When making changes to the study programme plan, the succession of study courses was observed, starting the studies with general education courses, continuing with topicalities and problems in the industry, followed by the learning of modern methods and tools relevant in science and topics that promote innovative thinking. In parallel with all current affairs, the student is systematically guided, supported and advised to apply its knowledge, skills and competencies in the master's thesis. Thus, the changes made in the study programme will ensure the gradual growth of master's students, as well as make it easier for the lecturers involved to work, as their students will be knowledgeable and interested in the topic.

After the changes were made, the total amount of studies dedicated to the master's thesis was increased from 20 to 24 CP (Table 1). Accordingly, the amount of theoretical courses has been reduced from 60 to 56 CP. The amount of contact hours for learning theoretical courses has been reduced from 16 to 12 contact hours for each CP. The exceptions are the study courses "Application of Mathematical Methods" and "Environmental Chemistry", where the amount of the courses has remained unchanged with 16 contact hours per CP. The largest number of contact hours (on average 15.5 contact hours per week) are planned in the first semester for all the students and the second semester for students of Environmental engineering specialization. Thus, the number of contact hours has been reduced compared to 2021/2022. annual programme plan. A reduced number of contact hours allows for scheduling classes during normal working hours, including an

hour-long lunch break. The process of developing the master's thesis with a low intensity begins in the 1st semester, integrating it into the study course "Scientific Actualities". Accordingly, additional consultations with the teaching staff involved and the selected master's thesis supervisor can be organized after individual coordination between the teaching staff and the student.

Table 1. The extent of the master's study program and the number of planned contact hours for students starting their studies in the 2022/2023 study year.

| Semester | Study amount, CP | | Contact hours for studying theoretical courses, h | | |
|----------|-----------------------------------|---------------------------------|---|------------------|-----------------|
| | Development of master's thesis*** | Studying of theoretical courses | In total in semester | Average per week | Average per day |
| 1 | 0 | 20 | 248* | 15.5 | 8 |
| 2 | 0 | 20 | 240** | 15 | 8 |
| 3 | 4 | 16 | 192 | 12 | 6 |
| 4 | 20 | 0 | 0 | 0 | 0 |
| Total | 24 | 56 | 680 | - | - |

* In the study program, 12 contact hours are organized for all students to learn 18 KPs, except for the study course "Application of Mathematical Methods", where additional 8 contact hours are organized for learning 2 KPs

** In the VIZ specialization, the total amount of contact hours in the 2nd semester is 248, because an additional 8 contact hours are organized for the study course "Environmental Chemistry"

*** There are no organized contact hours for the development of the Master's thesis. The development of the master's thesis is coordinated and evaluated by the supervisor of the master's thesis, as well as the commission involved in the defense

By making changes to the study programme, 28 new study courses were created, of which nine are included in the compulsory courses list. The compulsory courses list includes four courses from the previously implemented study programme plan for the 2021/2022 study year. The "Environmental Engineering" specialisation includes three new study courses (Masters level Part 3, Appendix 9). The specialisation "Hydrotechnics and Water Management" includes six new study courses, of which the study course "River Basin Management II" in the 3rd semester continues to study in depth the topics discussed in the course "River Basin Management I" included in the 2nd semester. The specialisations "Land Management" and "Geodesy" each include six new study courses.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme

implementation) and evaluation of its usefulness.

After graduating from the study programme 'Environmental, Water and Land Engineering', a master's degree of engineering in environmental engineering can be obtained. Guided by the regulations on the state academic education standard (Cabinet Regulation No. 240, 2014), the master's degree in engineering is awarded according to the thematic group of education determined in the Latvian Classification of Education. The degree obtained in the study programme 'Environmental, Water and Land Engineering' corresponds to the thematic group of education 'Environmental Engineering' determined in the Latvian Classification of Education (Cabinet Regulation No. 322, 2017). Considering the academic master's classification level of the study programme and the thematic group of education, the appropriate education classification code (ECC) is 45529.

The name of the study programme reflects the interdisciplinary nature of the programme, emphasising the environmental theme and the main engineering fields related to it. Environmental protection and balanced sustainable development are some of the central aspects that, according to the European Green Deal (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_lv) (Only in Latvian). and Latvia's Sustainable Development Strategy until 2030 (Cross-sectoral Coordination Centre, 2012) permeates future development plans for ensuring the needs, interests and well-being of economic sectors, society, individuals and future generations.

The term "environment" emphasises the environmental theme in a broader sense, including the nature protection complex considered in the study programme and related aspects of air, water, land, biological diversity, sustainable resource and waste management, and climate change. The terms 'water' and 'earth' used in the title of the study programme emphasise the main directions of activity included in the study programme, related to issues of water and land quality, quantity and assessment, management and planning. The term "engineering" indicates a scientifically and technically based approach to identifying, evaluating and solving modern and future problems.

The content of the master's programme and the study courses included in it are planned so that as a result of the studies, the student gradually achieves the aim of the study programme and realises the set tasks and acquires the knowledge, skills and competencies corresponding to level 7 of the European Qualification Framework (EQF) defined in the Latvian Classification of Education. Accordingly, the master's programme has set goals and tasks that ensure the acquisition of knowledge, skills and competencies necessary for identifying, predicting and solving problems. The structure and content of the programme are based on the acquisition of the necessary fundamental knowledge, the latest scientific discoveries and solutions, the development of creative abilities and the development of competencies for the creation, approval and implementation of innovative engineering methods and solutions.

The structure of the study programme with the selected specialisations, study course planning, succession and content allows the student to get to know modern problems and their interdisciplinary nature. The content of compulsory study courses, practical and group work and the knowledge acquired by students in different fields at the bachelor's level develop the student's ability to work in groups and provide a wide interdisciplinary experience. The structure and specialisations of the study programme, and the content of study courses and seminars allow the student to explore its individual interests better, motivate the student and develop individual abilities. The content of the study courses and the master's thesis develops the student's creative abilities and skills, which are theoretically and scientifically based on engineering techniques to

solve complex tasks, perform systematic and structured necessary research work and draw scientifically based conclusions.

In accordance with the admission rules, in the master's study programme, graduates with a bachelor's degree in engineering who studied in the study programmes "Environment and Water Management" and "Land Survey and Geodesy" implemented at the Faculty of Environment and Civil Engineering of LLU and, who received an additional 2 points in the competition, are primarily provided with the opportunity to apply for studies. However, graduates with other bachelor's degrees in natural and engineering sciences can also apply for studies without additional requirements. By fulfilling additional requirements with at least two years of professional or scientific work experience in the field related to the study programme 'Environmental, Water and Land Engineering', graduates of other fields of education who have obtained a bachelor's degree or second-level professional higher education in other fields can also apply for studies. Accordingly, the student core in the master's study programme consists of graduates of bachelor's study programmes closely related to the master's study programme, as well as graduates who obtained another bachelor's degree in engineering. As already mentioned above, the different previous education and acquired knowledge in the interaction between students and in group work develop the skills to work in interdisciplinary groups, contribute to the acquisition of interdisciplinary knowledge, the development of creative abilities, and the development of innovative solutions.

Compared to the content in the bachelor's degree programmes "Environment and Water Management" and "Land Management and Surveying", the content of the courses in the master's study programme is unique and conceptually different, considering mainly science-orientated issues and the necessary fundamental knowledge. Therefore, the structure of the study programme and the content of the study courses and the interaction between students also provide students of other engineering sciences and experienced specialists with the necessary knowledge, skills and competencies to fulfil the requirements set in the study courses and to successfully develop and defend a master's thesis.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The results of the graduate surveys show that 71% work in the industry or in fields related to the industry (Part 2, Appendix 6). The results of surveys of both graduates and employers show that specialists are in demand and needed for the Latvian economy, and the knowledge, skills and competencies acquired during studies open up wide opportunities in the labour market. Of all the surveyed graduates, 70% work in municipalities, private companies, design organisations and construction companies. The direct work responsibilities of 65% of surveyed graduates include administrative work, design, production, control and monitoring. Pedagogical and scientific activities are carried out by 7%, and the work of 10% is related to consulting. An important component of the work responsibilities of 8% of respondents is solving strategic problems. After studies, 86% of survey participants assessed their level of preparation to perform their duties as a medium to high, of which 47% have a high self-assessment. Similarly, the results of employers' surveys show that the level of preparation of 40% of graduates is high. Employers' surveys also clearly indicate the necessity of the education provided in the field of study for the Latvian economy.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

During the implementation period of the master's study programme 'Environmental, Water and Land Engineering' from 2016/2017 to the 2021/2022 study year, an average of 17.4 students per year have been enrolled (Master`s level part 3 "Other annexes" annex 3.1.4. Figure 1). The number of enrolled students tends to grow by an average of 2.5% per year. However, a pronounced decrease in the number of enrolled students, with the lowest number of enrolled students during the implementation period of the programme, occurred in the 2020/2021 study year, which can be explained by the negative impact of the Covid-19 pandemic.

The proportion of women in the number of enrolled students is slightly higher, making up 54% of the total number of enrolled students. During the considered period, only full time studies took place. During the considered study period, only one student has paid for its studies in the 2019/2020 study year.

The total number of students studying in the 1st and 2nd year of the study programme has gradually increased during the implementation period of the programme. Excluding the 2016/2017 study year, when the first students were enrolled (there are no students in the 2nd year yet), the total number of students was 29 in only one year, but in the other years, it has exceeded 30. Excluding the 2016/2017 study year, the number of students gradually increased by an average of 6% per year (Master`s level part 3 "Other annexes" annex 3.1.4. Figure 2). Regarding the study programme, the total number of students has not decreased, even during the Covid-19 pandemic. Perhaps due to the impact of the Covid-19 pandemic, the growth rate of the number of students has been reduced.

Of all the enrolled students who started their studies in the period from 2016/2017 to 2020/2021 study year, 52% graduated from the programme by the 2021/2022 study year. The number of graduating students tends to grow by an average of 5% per year (Master`s level part 3 "Other annexes" annex 3.1.4. Figure 3), which is associated with the increase in recognition of the programme and the increase in the number of students, as well as the decrease in the number of dropouts or students who have stopped their studies. Student dropout tends to decrease (Master`s level part 3 "Other annexes" annex 3.1.4. Figure 4), which is influenced by the experience gained in the implementation of the programme, the gradual improvement of the study programme plan and the course schedule, as well as regularly planned and implemented pre-defences of master's theses. However, it should be noted that the largest number of graduating students was registered in the 2020/2021 study year.

In the future, it is planned to improve the indicators of the dynamics of the number of students. It is expected that the structural and substantive changes in the programme plan made in 2022 will improve students' knowledge, skills and competencies, increase students' interest and motivation, enable more efficient learning of the planned content, and promote the development of high-quality master's theses. A higher volume of scientific results supported content and continuity of study courses, as well as support mechanisms integrated into study courses, will indirectly increase the time devoted to the master's thesis and other scientific activities and improve the quality of work. In order to attract students, increased attention will also be paid to the promotion of the study programme, regularly publishing current events and facts on social networks, and participating in widely recognised events, such as "World Water Day", "Latvian Forest Days", "Scientists' Night" and

other events.

In order to attract students, it is planned to develop additional prerequisites with a list of additional study courses which are necessary so that even those whose bachelor's level education does not initially meet the requirements to enrol in the master's study programme 'Environmental, Water and Land Engineering' can successfully study in the study programme.

The numerical characteristics of students are summarised in Masters level Part 3, Appendix 4 "Studējošo skaita raksturlielumi".

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The developed study programme is relevant because it prepares qualified specialists in an important interdisciplinary practical and scientific field of the national economy related to the assessment of the state of the environment, water and land resources, and sustainable management. The proposed study programme's achievable results correspond to current affairs in Latvia, the Green Deal set by the European Union, and the sustainable and balanced development goals of the Baltic Sea region set by the Helsinki Commission and UN (see also section 2.5). Thus, the study programme prepares specialists who are able to realise the problems relevant to the region from both modern and future perspectives. Specialists acquire the necessary knowledge, which is competitive not only in the Latvian but also in the foreign labour market.

In the labour market of Latvia, there is currently a shortage of top-level engineering specialists who are able to identify modern and forecast future scientific and practical problems and adapt appropriate solutions according to local and regional conditions, which balance interdisciplinary interests, including economic, environmental protection, social and cultural. Also, in the context of sustainable development, it is necessary to evaluate the current situation, predict changes in the future, evaluate the effectiveness of solutions suitable for the current and future climate and changes in other environmental factors, develop innovative solutions and plan solutions locally and regionally.

At the current stage of scientific development, the results of experimental measurements of a local nature, comprehensive results of remote sensing, observations obtained in laser scanning, as well as the results of local and international studies are available, and there are wide possibilities for digital data processing in order to use existing knowledge and available measurement results to identify challenging issues and for the complex planning of suitable measures and development of territories.

The relevance of the study programme is determined by the need for qualified specialists who could be involved in the assessment of environmental conditions and territories, forecasting changes, planning the development of territories and transformations of land use, solving land survey and property problems, maintaining and improving the geodetic support system, engineering research and design work, in the development and installation of modern, innovative and sustainable engineering water management solutions, the integration of environmentally friendly technologies and in providing conditions appropriate to the type of land use.

The Latvia University of Life Sciences and Technologies is the only higher education institution in Latvia that has historical experience in training specialists in water and land management (designers of drainage systems and hydro-technical structures, construction managers and construction supervisors). Similarly, highly qualified real estate and land resource management specialists are of national importance. Land management is a comprehensive concept that includes land administration and development activities based on defined objectives and the systematic acquisition of information and experience to sustain these activities. Therefore, there is an urgent need for highly qualified specialists who are familiar with these activities.

The need for highly qualified land reclamation and land management specialists is also indicated by the reviews of professional organisations (Part 3, Appendix 18).

The interdisciplinary structure of the study programme with the specialisations "Environmental Engineering", "Hydrotechnics and Water Management", "Land Management", and "Geodesy" ensures the training of highly qualified and knowledgeable specialists who are able to comprehensively identify, evaluate, predict and solve problems of practical and scientific content typical of today's and future challenges.

3.2.2. In the case of master's and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

Following the mission, aim, tasks, and achievable results of the master's study programme 'Environmental, Water and Land Engineering', the content of the study courses and their mutual succession have been carefully planned to ensure an educational, effective, motivating and creative study process for the acquisition of the necessary theoretical and practical knowledge, skills and competences, as well as for the development of research skills and creative abilities. The study programme balances the general education required for environmental engineering with the content included in the special study courses and necessary for the development of the master's thesis. The content of the study courses introduces the methodology recognised and approved in Latvia and the world, the findings obtained in the latest research and the proposed solutions to problems.

At the end of the studies, in communication with the involved teaching staff and the supervisor of the master's thesis, the student uses its knowledge, skills and competencies to conduct actual, scientifically based, structured research, which is confirmed by the developed master's thesis, which is defended against the Master's Examination Commission.

In the 1st semester of studies, only compulsory general education courses are planned in which student gradually:

- acquires general knowledge about the nature and history of the development of scientific research and future challenges, discusses scientific research and becomes familiar with the terminology used (the courses to be studied: "Philosophy of Science" and "English Language for Masters' ");
- acquires general knowledge and skills for the application of mathematical methods in solving scientific problems (course to be studied: "Application of Mathematical Methods");
- acquires a general understanding of the aims, tasks, structure and importance of the master's study programme 'Environmental, Water and Land Engineering' in the educational system (the course to be studied: "Scientific Actualities"), which develops the ability to cooperate in interdisciplinary groups, and allows the realisation of personal interests and development of individual abilities;
- acquires an insight into current scientific research and achievements, problems, unanswered questions and prospective research topics in related interdisciplinary sectors (the course to be studied: "Scientific Actualities");
- understands the interdisciplinary nature of contemporary problems and acquires the skills to plan sustainable measures that promote the development and management of territories and the extraction of natural resources (courses to be studied: "Territorial Development and Spatial Planning" and "Sustainable Resource Management");
- aware of his interests, and gets to know potential master's thesis supervisors (course to be studied: "Scientific Actualities");
- chooses a specialisation that matches its interests and defines the topic of the master's thesis relevant to the national economy, and sets the research goals and tasks (course to be studied: "Scientific Actualities");
- understands the interdisciplinary nature of contemporary problems, which is especially highlighted in such study courses as "Sustainable Resource Management", "Territorial Development and Spatial Planning", "Geographic Information Systems", "Scientific Actualities", and "Philosophy of Science".

Starting from the 2nd semester, students start studying courses related to the chosen specialisation, supplemented by study courses in the compulsory section. After completing the courses included in the 2nd semester, the student:

- acquire general knowledge about current trends in the industry and the current situation and problematic issues (courses to be studied in the chosen specialisation);
- acquire knowledge and develop skills to apply methods known in the industry and competencies to assess deficiencies in existing knowledge and applied practice (courses to be studied in the chosen specialisation);
- acquire knowledge about the basic principles of research data acquisition and processing (the courses to be studied: "Statistical Methods" and "Geographic Information Systems");
- has collected the data necessary for the development of the master's thesis and prepared the fundament for a master's thesis and/or a scientific publication (course to be studied: "Research Methodology");
- acquire knowledge about the basic principles of the development of scientific works (course to be studied: "Research Methodology").

In the 3rd semester, the aim is to promote the solution of current problems in the industry, the development of creative abilities and the creation of innovations. During the 3rd the main task of the courses included in the compulsory section is to provide practical support in the acquisition, processing and visualisation of scientific data, which are useful in scientific activity and the development of a master's thesis. After completing the courses included in the 3rd semester, the student:

- knows and is able to apply innovative Latvian and internationally recognised methods, techniques and tools (e.g. mathematical models and modern equipment) for solving scientific problems corresponding to modern scientific practice (courses to be studied in the chosen specialisation);
- has developed his creative abilities to apply existing knowledge, contemporary methods and tools in order to develop new, innovative solutions that correspond to goals and tasks set, as well as to develop measures promoting sustainable development of territories and resource management (courses to be studied in the chosen specialisation);
- has supplemented the database, carried out statistical processing and visualization of the data necessary for the development of the master's thesis (the courses to be studied: "Statistical Methods and Applications" and "Application of Geographic Information Systems");

In the 4th semester, the studies are devoted only to the development of the master's thesis and relevant scientific research in the specialisation chosen by the student. The development process is coordinated by the master's thesis supervisor and the consultants involved. Additional support is provided by the commission's recommendations in the pre-defences scheduled during the semester.

In the developed master's thesis and in the defence process, the master's student demonstrates (in relation to the topic of the master's thesis, as well as acquired throughout the study process):

- in-depth knowledge in the field corresponding to the chosen specialisation and the topic of the master's thesis;
- skills to systematically and critically analyse problem situations and find suitable solutions;
- skills to critically evaluate the strengths and weaknesses of existing knowledge and practice, to scientifically interpret and discuss the obtained results and findings;
- general skills to work independently in the interdisciplinary field of environmental engineering, using theory and appropriate methodology in research activities, reasonably explaining and discussing aspects and current affairs of the scientific field;
- competencies to manage and independently conduct scientific research to evaluate the possibilities of the practical application of research results.

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

As one of the important factors for master's students is to be able to combine their studies with

their professional responsibilities and private interests, students have recommended in surveys to plan contact hours for theoretical studies only on Fridays and Saturdays. However, according to the 2021/2022 study programme plan, 20 contact hours per week were planned. **When starting studies in the 2022/2023 year**, the updated study programme plan provides for 12 contact hours for each credit point, which provides the opportunity to complete studies in two days no longer than from 8:30 a.m. to 5:15 p.m., providing 15-minute breaks every 45 minutes and a 1-hour lunch break.

In the 2021/2022 study programme plan, the content of some study courses included in the compulsory part of the programme was relatively specific and included topics more suitable for individual specialisations. In some courses, the topics to be learned overlapped. Although such courses allow for expanding and strengthening knowledge, they reduce the opportunities to increase the proportion of topics related to the student's chosen specialisation. Likewise, according to the 2021/2022 study plan, a relatively large proportion of the content of individual study courses was professionally oriented, looking at solutions that comply with regulatory enactments. Some of the students had learned the discussed topics at the bachelor's level, while others lacked prior knowledge of the discussed topics. The aforementioned aspects were noted as negative by both teachers and students. Accordingly, such realisation of the content of study courses did not promote student motivation, did not ensure sufficient in-depth acquisition of knowledge and did not promote the development of innovative solutions. With the updated study programme plan for **2022/2023**, the study courses included in the compulsory part and specialisations have been restructured. In addition, their content has been adjusted, promoting the development of creative abilities, research skills and innovations for solving current problems.

According to the 2021/2022 study plan, the student had to choose the master's thesis supervisor and the topic according to the specialisation already in the 1st semester. However, direct contact for master's students in the 1st semester was provided only by part of the teaching staff. Students were often not sure which of the specialisations to study and were not familiar with current scientific issues. The situation had a negative impact on the distribution of supervised master's theses among the lecturers, it made it difficult for the student to choose a relevant topic appropriate to the specialisation and a supervisor suitable for the intended topic. **With the 2022/2023 year**, the updated study programme plan includes a new study course "Scientific Actualities". In this course, the student learns the programme's structure, the specifics of the specialisations, the involved teaching staff, academic and scientific interests and possible research topics. At the end of the course, the student chooses a specialisation, a master's thesis topic and a supervisor. The student conducts studies in the specialisation and scientific activities starting from the 2nd semester.

In the 2021/2022 study plan, the development of the master's thesis in the final phase was hampered by theoretical study courses organised in parallel, the content of which was often not directly related to the topic of the master's thesis chosen by the student. Thus, students' motivation to study the course content was low. **With the 2022/2023 year**, the content of the study courses included in the 3rd semester is oriented towards practical support in acquiring, processing, visualising and interpreting scientific data.

Critically evaluating the developed master's theses, structural deficiencies can be observed in them, and certain aspects of the literature review in the methodology and discussion sections are incompletely developed. Although the content included in the study course "Preparation of Research Reports" successfully explains the principles of the development of research works, students have noted in the surveys that it is recommended to organise the course in later semesters, when the master's thesis is being actively developed. Regular support from the master's thesis supervisor and other teaching staff involved in the programme is also recommended.

However, it should be recognised that individual students who wish to publish the results of their master's degree research in a scientific publication need theoretical knowledge of the basic principles of scientific research development already at the beginning of the master's degree studies. **In the updated 2022/2023 study year plan**, the acquisition of the basic principles of the development of scientific works can be started already in the 2nd semester within the study course "Research Methodology", especially supporting the most active students in the development of a scientific publication. On the other hand, in the 3rd semester, the basic principles of the development of the chapters to be included in the master's thesis will be explained, and support will be provided to students within the study course "Preparation of Research Works". Similar to how it has already been successfully implemented in recent years, the progress of the development of the master's thesis will be demonstrated and discussed within the framework of the 4th semester during three master's thesis pre-defences according to the timetable issued to the master's students (Master`s level Part 3, Appendix 19). The conditions for developing, designing and evaluating the master's thesis are summarised in the methodological instructions (Master`s level Part 3, Appendix 20 (only in Latvian)).

The study process is organised in accordance with the principles of student-centred education. The student's individual interests and abilities are developed in the specialisations included in the master's study programme, as well as in individual works and in the master's thesis. Depending on the specifics of the topic to be studied, the work is organised in optimal student groups of various sizes. Student involvement and discussions both between teacher and students and among students themselves are encouraged. Availability of infrastructure during and outside contact hours is ensured. The teaching staff is available for consultations outside contact hours, both in person and using online tools, e-mails, e-study environment. In order to broaden their experience and develop individual interests and abilities, students are provided with opportunities for international mobility. The review of student complaints is regulated by the LLU Regulation of Studies (<https://www.llu.lv/lv/studijas> (only in Latvian); <https://www.llu.lv/en/study-guide-documents> (only in English)). Students regularly participate in surveys available online, as well as answer unclear questions and find possible solutions in cooperation with the teaching staff and the director of the study programme. The study process and current study courses are regularly discussed with student representatives.

The content of study courses and study materials are available to students in the e-study environment. Master's students' performance and acquired knowledge, skills and competencies in study courses are controlled and evaluated according to the rules and criteria reflected in study course programmes (Master`s level Part 3, Appendix 10). As part of the study courses, seminars are organised, discussions are encouraged, and testing of laboratory, practical and independent works are organised regularly. The acquired knowledge is evaluated on a 10-point scale or with pass/fail according to the criteria approved by the LLU Senate (Master`s level Part 3, Appendix 5).

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

In order to ensure the goals set by the European Union, HELCOM, the UN and the Republic of Latvia, as well as the growth of the national economy and the transition to a sustainable and climate-neutral management model, to realise the sustainable development goals of the UN, we need specialists who are able to assess the current situation, identify existing problems, carry out appropriate scientific research, develop innovative solutions and put them into practice. The study courses included in the study programme and the master's thesis development process prepare highly qualified specialists, providing the necessary knowledge, skills and competencies to develop a sustainable and balanced economy.

The study programme and its parameters are developed in accordance with the national education standard (Part 3, Appendix 5). According to the study program plan (Part 3, Appendix 9), study course descriptions (Part 3, Appendix 10) and the results of the mapping of study courses (Part 3, Appendix 8), the greatest emphasis on the content of the study courses is placed on the acquisition of basic knowledge (code 1.2), the acquisition of in-depth knowledge and the development of understanding (code 1.1), as well as the ability to organise the practical use of existing methodologies and research results in solving complex issues in fields related to the study programme (Master`s level "Other annexes" Annex 3.2.6. Figure 5). According to the scope, an important role is assigned to the ability to identify and critically evaluate problems of practical and scientific orientation (code 3.3), as well as to provide the necessary knowledge to be able to realise the planning of the development of territories, the planning of the implementation of sustainable measures and the planning of the use of resources (code 2.1). Also, to a relatively significant extent, the content of study courses contributes to the development of research abilities (code 2.4) and the ability to organise effective individual and group work (code 3.1). The most important aspects include the development of communication skills (code 2.3), the ability to evaluate the existing management model, and applied methods and solutions (code 3.2). The student acquires in-depth knowledge in the field related to the topic of the master's thesis (code 1.3).

During the implementation period of the study programme from 2016/2017 to the 2021/2022 study year, a total of 46 master's theses were developed and successfully defended (Master`s level "Other annexes" Annex 3.2.6. Figure 6). During the considered period, 14 master's theses were successfully defended in the specialisation "Environmental Engineering" and the same number in "Hydrotechnics and Water Management". 13 works were defended in the specialisation "Geodesy", 5 in the specialisation "Land Management".

During the implementation period of the study programme, the total number of developed and

defended master's theses has tended to increase by an average of 6% per year (Master`s level "Other annexes" Annex 3.2.6. Figure 7). The number of master's theses developed in specialisations has increased by 22% in "Environmental Engineering", 7% in "Hydrotechnics and Water Management" and 12% in "Geodesy". On the other hand, the number of master's theses defended in the "Land Management" specialisation has tended to decrease with an average of one master's thesis defended per year.

In the defended master's theses, by approbating the results of measurements and research obtained on a local and international scale, as well as available digital tools and geospatial data, aspects of the existing management model were evaluated, problems were identified, solutions and their implementation issues were developed and evaluated following modern trends, knowledge gained in international conferences and publications. The results, conclusions and proposals of the master's theses can potentially be used in Latvia, the European Union, the UN and the Baltic Sea region to achieve environmental protection, national economy, sustainable development and climate goals.

The topics of master's theses are devoted to the development of urbanised and rural areas (Part 3 Appendix 21). The issues addressed in the developed master's theses evaluate the current situation and the factors affecting the situation, predict possible future changes, and evaluate the possible methods for the sustainable solution to current and future problems. The topics of defended master's theses include such important questions as:

- the effects of implemented farming practices and other factors on water quality;
- evaluation of the effectiveness of measures improving water quality;
- geospatial planning of water quality improvement measures to achieve and maintain good water quality goals;

- improving the effectiveness of wastewater treatment;
- evaluation of environmentally friendly and sustainable rainwater management systems according to Latvian climatic conditions and existing management methods;
- evaluation of the risk factors of deterioration and clogging of sewage networks and proposed solutions;

- spread of pollution in the urban environment;
- factors influencing greenhouse gas emissions and solutions for their reduction in lands used for agriculture;
- development of methodology for greenhouse gas emission measurements;

- evaluation and possible improvement of the waste management system;
- analysis of waste management and biogas production processes;
- analysis of waste management infrastructure solutions;

- evaluation of alternative solutions ensuring the stability of engineering structures;
- groundwater extraction and resource changes;
- the impact of land management on the hydrological regime;
- flood risk assessment and forecasts;

- ensuring the availability of ecosystem services;
 - development of a circular economy model;
 - invasive species distribution assessment;
-
- the effectiveness of the land survey process using digital tools and open access geospatial data;
 - assessment of aspects of land degradation and improvement of territory development planning methodology;
 - use of freely available digital geospatial data in territory surveying and development planning;
-
- the possibilities of applying remote sensing and photometric methods in the assessment of the condition of engineering structures and communications and their construction;
 - assessment of the accuracy of the geoid models used in the development of territories;
 - improvement of the geodetic support system;
 - evaluation of the use of construction deformation research methods;
 - the interaction between the earth's crust and Baltic Sea level fluctuations and their impact on areas farmed.

Following the developed criteria (Master`s level Part 3, Appendix 20), the quality of the master's theses, knowledge, skills and competencies acquired by the master's student are evaluated by the reviewers of the master's thesis, as well as by the master's thesis examination commission. The main evaluation criteria are the relevance of the topic, novelty, objectives and tasks, as well as their fulfilment; the quality of the conclusions and their relevance to the tasks set; structure of the thesis; the quality and relevance of the sections included in the master's thesis to the objective and tasks of the thesis, the criteria of scientific work, etc. The student demonstrates excellence by participating in scientific conferences and preparing a scientific publication in scientific databases in indexed journals.

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (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 the learning outcomes to be achieved by providing the respective examples.

The characteristics and application of the infrastructure of the Faculty of Environment and Civil Engineering (VBF) involved in the implementation of the study field "Environmental Protection" are included in Chapter 2.3 of Part 2 of this report and in Table 5 of the chapter. Similarly, the chapter explains the attraction of funding, which has resulted in significant improvements to the teaching and scientific infrastructure.

The existing and used measuring devices in the infrastructure, their application and application

possibilities are explained in the study courses. In addition, measurements are performed, and the results are used to develop master's theses. Scientific and educational as well as student attraction functions are performed by the laboratories established in the VBF. The infrastructure of other LLU structural units and the resources of the LLU Fundamental library are also involved in the study process. For research purposes, the infrastructure of other LLU structural units (<https://www.llu.lv/lv/zinatniska-inventara-datubaze>) (Only in Latvian) is available after prior agreement.

The available equipment is modern and can be used for research related to study specialisations. The equipment opens up vast opportunities for further innovative research in order to develop fundamental science, understand the processes taking place in nature, provide recommendations for the development and implementation of sustainable engineering solutions, planning the development of territories, improving the geodetic support system and measurement methods, researching the possibilities of using the equipment, improving widely used methodologies, as well as predicting possible changes in conditions in the future.

The equipment of the Irrigation and Drainage, as well as the Hydraulic Modelling Laboratory in the VBF enables computerised control, simulation and visually perceptible demonstration of the hydrological and hydraulic processes characteristic of surface watercourses and groundwater flows and the migration of substances affected by them. Laboratory equipment provides experimental work, measurements characterising hydrological, hydraulic and hydrochemical processes, and collection of water samples.

The infrastructure of the Forest and Water Scientific Laboratory (http://www.murzl.llu.lv/?page_id=25) (Only in Latvian) includes modern measuring devices that measure the physical and chemical parameters of water, air and soil. The effects of the physical and biochemical processes taking place in the water are assessed using portable measuring devices equipped with sensors for oxygen dissolved in water, total dissolved substances, pH, conductivity, ammonium chloride, fluoride, nitrate calcium, multi-parameter probes for high-resolution measurements of dynamic changes in the chemical quality of surface and groundwaters, fluorimeters for turbidity measurements in surface and groundwaters, and filtration devices with equipment for measuring the concentration of suspended solids in water. In laboratory conditions, indicators of the chemical quality of water and the chemical composition of the soil-water solution are measured using a spectrophotometer. Hydrological processes are studied by applying pressure sensors to determine dynamic level fluctuations and flow parameters (water levels, flowrates, bed roughness coefficients, soil filtration coefficients) of groundwater and surface water bodies, acoustic bed and flow parameter measuring devices equipped with doppler sensors, a measuring device for flow speed and flowrate dynamic variation equipped with ultrasonic sensors, fluorimeters for water migration measurements in soil and surface water bodies. Soil drills and probes were used to collect mixed and unmixed soil samples.

In cooperation with the Department of Architecture and Building, the available equipment is a laser diffraction and dynamic image analyser for determining the size and shape of solid particles and a hybrid rheometer for measurements of the physical properties of liquids and sedimentation processes.

Long-term measurements are carried out at agricultural runoff and groundwater monitoring stations and sites in order to determine parameters characterising flow and water quality and their influencing factors during changes, to evaluate the effectiveness of water quality improvement measures, to provide initial data for the calibration and validation of mathematical models and to develop recommendations for the implementation of water quality improvement measures. Monitoring stations are equipped with modern equipment, flow parameters, and water chemical

quality measurements, including data loggers-controllers, pressure and conductivity sensors, and equipment for automatic collection of composite samples. The equipment in the Bērze and Mellupīte monitoring stations has been installed that provides high-resolution measurements of real-time dynamic fluctuations in concentrations of nitrogen and phosphorus compounds and data acquisition.

Greenhouse gas (GHG) processes and their influencing factors are studied using optical spectroscopy equipment. Measurements of N₂O, CH₄, NH₄ and CO₂ gas concentrations in the air are carried out in field conditions and in the laboratory to assess the variability of GHG emissions depending on the land management practice and methods and climatic conditions. The device for measuring the isotopes $\delta^{15}\text{N}$, $\delta^{15}\text{N}\alpha$, $\delta^{15}\text{N}\beta$, and $\delta^{18}\text{O}$ is used to study the sources of N₂O gas formation and attraction in nitrification and denitrification processes.

Geographic Information Systems (GIS) Competence Centre, Geospatial Modelling computer classroom is equipped with workstations necessary for study work and research, ArcGIS Pro, Microstation, TRIMBLE business centre, Photomod, Liscad, SPSS and other software. In addition, the GIS competence centre is equipped with modern remote sensing tools and systems. The available infrastructure can be used for the demonstration of measuring instruments, practical training, as well as data collection, processing and interpretation of results for solving practical and scientific tasks.

The geodetic instrument calibration laboratory is equipped with modern equipment for testing geodetic instruments and systems and also provides opportunities to develop new geospatial research solutions and their testing.

In 2021, the LLU Fundamental Library (LLU FL) has been re-accredited as a library of national importance. In the LLU FL, students and teaching staff have free access to educational literature necessary for implementing study courses, with the possibility of receiving it temporarily for personal use. The library's infrastructure includes a reading room, where students and teaching staff have access to workstations and are provided with opportunities to study the necessary printed and online literature and implement other learning process activities. Subscription and trial databases, e-journals and e-books, as well as publications of LLU teaching staff and researchers and master's and doctoral theses defended by students, are available for students and teaching staff in the unified virtual network or after registration in the LLU FL virtual system (<https://llufb.llu.lv/en/catalogues-and-databases>). LLU FL provides access to the electronic catalogues of other Latvian universities, the Latvian National Library, the information centres and information offices located in the faculties of LLU. Access to a free internet connection is provided in all LLU FL and LLU auditoriums and classrooms intended for studies and scientific activity.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between

the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The amount of state-funded study places is agreed upon in a tripartite agreement between the Ministry of Education and Science (IZM), the Ministry of Agriculture (ZM) and the Latvia University of Life Sciences and Technologies (LLU). In the tripartite agreement on financing, the base cost of one study place, study level coefficients, social security of the study place, and study cost coefficients of the thematic field of education are determined (the coefficients for each thematic field of education are different, they are stipulated in the regulations of the Cabinet of Ministers "Procedure in which universities and colleges are financed by the state budget funds").

Every year, the LLU Senate approves the distribution of revenues and expenses of the LLU joint budget structure, prepared following the law "On the state budget" adopted annually by the Saeima and the annual order of the LLU rector "On LLU joint budget planning". The control and audit of the joint budget are carried out by an independent sworn auditor, whose opinion and review report are reviewed and approved by the Senate.

Before the approval of the distribution of revenues and expenses of the LLU general budget in the Senate, it is reviewed, discussed and approved by the Working Group on resource use and development, which consists of the rector, vice-rectors, chancellor, director of LLU, deans of all faculties, head of the resource accounting centre/chief accountant, financial planning head of the centre, chief economists, chief specialists in real estate and legal issues.

The distribution of revenues and expenses approved by the Senate of LLU determines that 80% of the funding allocated by the state consists of compensation costs and 20% of other costs. Of the paid study funding, 60% consists of compensation costs and 40% of other costs, of which 20% is directly at the disposal of the faculty that implements the relevant study programme. The amount of science base funding is annually calculated and allocated from scientific activities. 50% of the science base funding is at the direct disposal of the faculty, and 50% is for covering centralized costs. Science funding is made up of funding for the implementation of projects.

The planned state budget financing for the implementation of the study programme is determined in a tripartite agreement according to the indicators summarized in

Table 1. The cost of implementing the study programme per student is calculated as follows:

$$F = fb \times knoz \times Kn \times k + Sn, \text{ EUR,}$$

kur knoz – study cost coefficient of the thematic field of education, EUR;

Kn – provision coefficient of study field coefficient;

k – coefficient of education level;

fb – base cost per study place;

Sn – social security of the study place, EUR.

Table 1. Cost parameters of the study programme "Environmental, water and land engineering"

| Gads | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|------|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|------|

| | | | | | | | |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Base cost per study place (fb), EUR | 1333.11 | 1393.33 | 1458.51 | 1518.98 | 1518.98 | 1630.11 | 1630.11 |
| Coefficient of education level (k) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Social security of the study place (Sn), EUR | 164.34 | 164.34 | 164.34 | 164.34 | 164.34 | 164.34 | 265.5 |
| Study cost coefficient of the thematic field of education (knoz) | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.94 |
| Provision coefficient of study field coefficient (Kn) | 0.844547 | 0.999924 | 0.999578 | 0.999748 | 0.999828 | 0.999997 | 1.000898 |
| Cost per student (F), EUR | 3373.08 | 4135.03 | 4319.34 | 4492.34 | 4492.69 | 4810.14 | 5013.38 |

1. Indicators that are taken into account for the calculation of the cost of one student year

- **The basic annual cost of one study place determined by the state** - following clause 16 of the Cabinet of Ministers' regulation 994 (2006) "Procedure in which universities and colleges are financed from state budget funds" (hereinafter - Regulation No. 994) and the increase of the academic salary rate due to the reform of teachers' salaries, according to the Cabinet of Ministers' regulation no. 445 (2016) 'Teachers' salary regulations" (hereinafter - Regulations No. 445), the basic cost of one study place per year is 1630.11 EUR;
- **coefficient of study costs** - following appendix 1 of Regulation No. 994, the minimum value of the study cost coefficient is 1.94 in the thematic educational field of Environmental protection;
- **coefficient of study programme level** - following clause 14 of Regulation No. 994, for the master's study programmes is 1.5;
- **state funding for one budget place in the study programme** - state budget funding in 2022 for one budget place financed by the state in the amount of 100% is EUR 5013.38 (including social security costs of the study place EUR 265.50).

2. To ensure the study process:

- The required amount of academic work in hours during the study year for one master's student - in one study year, one student must acquire the amount of 40 credit points (CP). The required amount of academic work in hours per study year for one master's student - in one study year, one student must acquire 40 credit points (CP). The required number of contact lessons (lectures, practical/laboratory work, seminars) for 1 CP is 12 h, for 40 CP it will be 480 h. In addition to the hours of contact hours, 160 hours are planned for teaching staff for other study-related work (correction of study works, exams, tests, etc.). The total amount of academic work per year for one student is planned to be 640 h (480+160=640);
- The required amount of academic work in hours per study year for ten master's students - in one study year, one student must acquire the amount of 40 credit points (CP). The required number of contact hours (lectures, practical/laboratory work, seminars) for 1 CP is 12 h, for

40 CP it will be 480 h. In addition to the hours of contact classes, 1600 h (160 h * 10 (students)) are planned for other study-related work (correction of study papers, exams, tests, etc.). The total amount of academic work per year for ten students is planned to be 2080 h (480+1600=2080);

- The required number of workloads for the implementation of study work in the study year - The following number of academic work hours per year has been set for one workload at LLU by the decision of the Senate:
 - professor - 900 h
 - associate professors - 920 h
 - assistant professor - 940 h
 - lecturer/assistant lektors/asistents - 960 h

The teaching staff of various positions will work in the study programme, but for the calculation of the required number of workloads for one student, the average hours of an assistant professor are taken: 640 h (academic work) / 940 h (determined hours for one workload) = 0.68 workload

The teaching staff of various positions will work in the study programme, but for the calculation of the required workloads, the average hours of an assistant professor for ten students have been taken: 2080 h (academic work) / 940 h (determined hours for one workload) = 2.21 workload;

- The funding for the salary of teaching staff required for the training of **one** student in one study year - **11335.48** EUR (1124 EUR (assistant professor's rate for one load (Regulations No. 445)) * 0.68 load * 12 (months) * 1.2359 EUR (social tax))
- The funding for the salary of teaching staff required for the training of **ten** students in one study year - **36840.30** EUR (1124 EUR (assistant professor's rate for one load (Regulations No. 445)) * 2.21 load * 12 (months) * 1.2359 EUR (social tax))

The required number of students to cover all costs - is 10. Funding for covering study costs in the study year with this number of students will be **50133.80** EUR (10*5013.38=50133.80), which will cover the necessary costs (for teachers' salaries, scholarships and others).

When the number of students is 10, the cost of teaching staff salaries for conducting lectures and practical work will not increase because such a number of students forms one academic and group of laboratory work, and therefore the classes will be able to take place together. Only the salary for additional contact hours, correction of study papers, etc., will increase. The costs for maintaining the common infrastructure will also not increase, as they do not directly depend on the number of students.

The share of costs in percentage is:

- 80% for compensation (for teachers and other staff);
- ~15% infrastructure maintenance and additional fees;
- ~5% for the development of the study programme.

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and

the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

Teaching staff with diverse knowledge, experience and competencies in such fields as, for example, "Environmental Engineering and Energy", "Earth Sciences, Physical Geography and Environmental Sciences", "Biology", "Chemistry", "Construction and Transport Engineering", "Mathematics" and "Philosophy, Ethics and Religion", are involved in the implementation of the programme. The teaching staff involved in the learning process knows and regularly improves their knowledge and passes it on to those studying in the master's degree programme, looking at the problems in the related industries in Latvia, the Baltic Sea region, Europe and the world.

The teaching staff manages and applies modern tools for statistical data processing, scientific research equipment for the study of environmental conditions, geospatial data acquisition, processing, modelling, visualisation and interpretation in the study process and scientific activities (see Chapter 3.1 and Chapter 2.3 of Part 2 of this report for more information). The teaching staff is competent in using geospatial information data in the complex analysis of various interdisciplinary issues and their solution. Open-access geospatial information, laser scanning data obtained with photogrammetric methods, digital surface models data, terrain data, remote sensing information on land use types, geospatial information on agricultural field blocks and crops, soil research data, and other information are increasingly being used. The data are used to analyse territories, development planning, data applicability and improvement research and process modelling. Modern equipment is available for studying environmental quality and process variability, which can be used to assess the existing situation and for forecasting and event planning. The teaching staff is familiar with hydrological and hydraulic process calculations, modelling options and tools useful for understanding processes, predicting future changes and planning effective measures. Hydrological, hydrochemical and hydraulic modelling tools, such as METQ, FyrisNP, HYPE, SWAT, and HEC-RAS, are widely used to implement study courses and scientific activities.

The Faculty of Environment and Civil Engineering and its teaching staff have accumulated historical, scientific and practical experience, which has been passed down through the generations from the specialists working at the former Faculty of Hydromelioration. When Latvia regained the status of a free country, based on the hydrological observations that started in the middle of the last century, the foundations were laid for the currently realised scientific activities. Monitoring of agricultural runoff of national importance has been developed. The collected observations have contributed to the development of scientific activities and regular participation in national and international projects. A significant proportion of scientific activities allows teaching staff to regularly improve their knowledge, develop skills and acquire competencies in accordance with current events in the European Union and the Baltic Sea region. The competencies acquired in the scientific activity have allowed to improve the study programme and to develop the structure of the master's programme and the content of the study courses with 28 new study courses corresponding to modern practical needs and scientific developments. Detailed information about the involvement of teaching staff in the field of study "Environmental Protection" in scientific research and research projects is provided in Chapter 2.4.5 and Appendix 11 of Part 2. In turn, the publications of the teaching staff are summarised in Appendix 12 of Part 2. Additional information on the qualifications of teaching staff is summarised in Sub-chapter 2.3.7 of Part 2 of this report.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff

over the reporting period and their impact on the study quality.

Currently, a total of 32 lecturers from six LLU faculties and centres are involved in the implementation of the study courses included in the implementation of the study programme. Twenty-six, or 82%, of the lecturers that conduct the study courses represent the departments of VBF, mainly the Department of Environmental Engineering and Water Management and the Department of Land Management and Geodesy. In the study programme, of all participating teaching staff (Part 2, Appendix 7), 73% are elected academic staff, and 50% have obtained a doctoral degree.

There have been changes in the composition of the lecturers implementing the study programme, as a result of which the proportion of lecturers with doctoral degrees has slightly decreased. Four lecturers with doctoral degrees and three with master's degrees have stopped participating in implementing the master's study programme study courses. On the other hand, after updating the study programme, two lecturers with doctoral degrees were involved in the further implementation of the study courses in order to implement the studies in the newly created study courses "Statistical Methods", "Statistical Methods and Applications" and "Water Ecosystems". Both specialists have studied in the USA, and one of the specialists has done her scientific activities in France. Lecturers with a master's degree are also involved, most of whom are studying for a PhD and could get their PhD within a year or the next few years. A doctoral student and specialist in hydrological processes with experience in research and modelling of hydrological processes both at the University of Latvia, Latvian Environment, Geology and Meteorology Centre, and in the Netherlands at the company "Expertisecentrum Regelgeving Bouw", and a freelance hydrologist, have been involved in the implementation of the newly created study courses "Modelling of Hydrological Processes", "Management of River Basins I" and "Management of River Basins II". For the implementation of the newly created study courses "Sustainable Resource Management", "Research Methodology" and "Preparation of Research Work", lecturers studying at the doctoral level have been attracted, one of whom plans to defend its doctoral thesis at "Wageningen University & Research" in the Netherlands, and the other at LLU in the next few years.

Four of the lecturers who have been involved in the study process for more than ten years plan to defend their dissertation to obtain a doctoral degree in about one year, and another six lecturers could defend their dissertation in the next few years. Accordingly, it is predicted that the proportion of lecturers with doctoral degrees implementing the study programme could exceed 80% in the next few years.

More than 90% of the lecturers involved in the study programme implementation have more than ten years of experience at LLU, and these lecturers have gained extensive experience in the implementation of the study process. The lecturers who have participated in the implementation of the study process for a relatively shorter time have extensive experience and knowledge in the industry and related scientific fields. Currently, the study programme is characterised by a generational change, when younger colleagues replace retiring lecturers. Approximately 69% of the lecturers involved in the study programme are in age less than 55. Several younger specialists have been successfully attracted already during the bachelor's level study period, implementing scientific activities. During the implementation of the study programme, the attraction of lecturers and the realisation of scientific projects, master's and doctoral theses have promoted the specialisation of lecturers in wider fields of science. The programme attracts more highly qualified teaching staff and is able to solve interdisciplinary issues. The gender structure of the involved teaching staff is similar with a slightly higher proportion of women, where 53% of the total number

of teaching staff are women.

The quality of the studies is positively influenced by the specialization of young teaching staff, which is facilitated by their active involvement in scientific projects and solving practical tasks. Also, the teaching staff regularly attends seminars and conferences of a scientific and practical orientation, which allows the inclusion of the most current scientific research results, tools and methods in study course programmes and lecture materials. Also, the teaching staff can offer students current topics, the results of observations necessary for conducting research, tools and methods for data processing, situation modelling and forecasting in line with contemporary trends. There is an active transfer of knowledge between colleagues of the younger and older generations due to the involvement of several lecturers with different experiences in the implementation of study courses. Likewise, knowledge transfer also takes place at regular meetings of department colleagues.

The change of generations took place gradually. Considering the increasing intensity of scientific activities, a gradual increase and renewal of new teaching, scientific and auxiliary staff are expected in the future. Some of the currently working teaching staff were recruited already at the beginning of this century. Under the guidance of experienced specialists, young teaching staff have been involved in academic and scientific activities. As the intensity of scientific activity continues to increase, the new teaching staff are the ones who have learned the modern use of modern measuring devices, data acquisition and processing methods and technologies, which are also regularly used in practice. Whereas, the experienced, older-generation specialists have contributed by providing their younger colleagues with the fundamental knowledge and skills to use generally recognized scientific methods. Senior colleagues also provide considerable support in understanding and solving administrative issues and organizing work.

Part of the teaching staff is involved in solving not only scientific, but also practical tasks, performing the design and construction of engineering structures, the practical application of diverse materials in reclamation structures, solving land development and territorial planning measures, performing geodetic surveying of various scale structures and territories. Interaction between teaching staff performing practical tasks and scientific tasks promotes mutual transfer and improvement of knowledge, development of the industry and further transfer of knowledge to students.

Part of the teaching staff is involved in solving not only scientific, but also practical tasks, performing the design and construction of engineering structures, the practical application of diverse materials in land reclamation constructions, solving land development and territorial planning measures, and performing geodetic surveying of constructions and territories in different spatial scale. Interaction between teaching staff performing practical tasks and scientific tasks promotes mutual transfer and improvement of knowledge, development of the industry and further transfer of knowledge to students.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff

has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

Academic staff with extensive professional experience in the implementation of practical tasks and scientific research projects in various fields of environmental engineering are involved in the learning process. The created study programme is interdisciplinary and created in cooperation with the Departments of Environmental Engineering and Water Management, Land Management and Geodesy, and Architecture and Building. Cooperation of teaching staff mainly takes place in the process of implementation of the study programme and in research activities at LLU, national and international scientific projects.

The study process is centrally coordinated through the cooperation of the director of the study programme with the academic staff of the Departments of Environmental Engineering and Water Management, as well as Land Management and Geodesy (Fig. 14) (Only in Latvian). Likewise, the director of the study programme resolves issues arising during the study process in direct contact with all participating teaching staff and departments.

Professional experience, scientific activities, seminars and courses for teaching staff to improve qualifications have contributed to acquiring a relatively wide range of specialised knowledge, skills and competencies. The in-depth specialised knowledge of the teaching staff ensured the improvement of the study programme and the development of new study courses and allowed to attract the most competent specialists to teach specific topics. As a result of inter-departmental cooperation, the improved study programme plan and course content and the interdisciplinary composition of teaching staff contribute to the succession of knowledge, skills and competencies and cooperation between lecturers, as well as between teaching staff and students.

The content and sequence of the compulsory study courses contribute to the learning of the content and are the basis for further learning the content of the study courses included in the specialisations and developing the master's thesis. The development of the master's thesis takes place in the mutual interaction between the master's student, the supervisor of the master's thesis

and the teaching staff of several study courses. The content of the compulsory study courses included in the 3rd semester of studies can be realised in tripartite cooperation between the teaching staff conducting the study course, the master's student and the master's thesis supervisor, according to the topic of each master's thesis and the student's scientific interests. Accordingly, the content of the mandatory study courses "Research Methodology", "Preparation of Research Work", "Applications of Geographic Information Systems", and "Statistical Methods and Applications" includes the collection, analysis and visualisation of measurements necessary for individual master's theses and data obtained in other studies, as well as the structuring and improvement of the master's thesis or scientific publication. A group of teaching staff is involved in the regular pre-defence of master's theses, ensuring the improvement of the quality of the master's thesis, the improvement of the student's knowledge and skills, and mutual interaction, and communication and discussions between teaching staff.

Cooperation between teaching staff also takes place in the realisation of other individual courses. By improving the plan of the master's study programme, the proportion of study courses, which implementation is ensured by several teaching staff specialising in specific topics, has been increased. The changes made in the study programme, the conceptual description of the content and the interconnection of study courses are described in detail in Chapters 2.2 and 2.3 of the Part 3 of this report.

In the learning process, in 62% of all study courses covering unique topics (study courses that thematically continue for more than one semester are not indicated separately), individual course training is implemented by one lecturer (Master`s level part 3 "Other annex" Annex 3.4.5. Figure 15). Accordingly, 48% of study courses are taught by several lecturers who specialise in a specific field of science.

The study course "Scientific Actualities" can be realised through the cooperation of a large group of teaching staff from the Departments of Environmental Engineering and Water Management, Land Management and Geodesy, and Architecture and Building. In the study course, the teaching staff prepares students for further study work and for choosing an appropriate specialisation. The study course "Sustainable Resource Management" involves three lecturers who are individually specialised in issues related to waste management, resource use planning, air pollution and greenhouse gas emissions.

Training study courses "Research Methodology" and "Preparation of Research Works" are implemented by two lecturers with experience in the development of high-quality scientific works, the use of scientific databases, the development of rules for the development and design of master's theses and the implementation and management of research projects both in Latvia and abroad.

Two lecturers conduct study courses on geographic information systems from the Department of Environmental Engineering and Water Management and Land Management and Geodesy with extensive experience in geodesy, the application of geographic information systems and geospatial data both in territory development planning and in solving environmental protection and pollution issues. The study course "Water Ecosystems" involves four lecturers with extensive experience conducting and implementing scientific research, monitoring national agricultural runoff, wastewater treatment, biology, hydrology and ecology. The study courses "Modelling of Hydrological Processes", "Management of River Basins I", and "Management of River Basins II" are conducted by two lecturers with extensive professional and scientific experience in Belgium, the Netherlands and other countries concerning the fundamental knowledge of hydrological processes, as well as research and hydrological and hydraulic process modelling. The newly created study course "Sustainable water and land management systems" is implemented through the cooperation

of a group of teaching staff from the Departments of Environmental Engineering and Water Management and Architecture and Building. Special study courses, such as "Theoretical Substantiation and Mathematical Processing of Geodetic Measurements", "Geodetic Works in Civil Engineering", "Development and Maintenance of a Geodetic Support System", and "Precise Levelling and the Effect of Gravity" are realised through the cooperation of industry professionals and academic staff.

In the study programme, the ratio of the average number of students to the full time equivalent of the workload of teaching staff is 10.3: 1.0 from the 2017/2018 to the 2021/2022 study year (Master`s level part 3 "Other annex" Annex 3.4.5. Fig. 16). In the considered period, the ratio has been lower than the average at LLU (13:1). The ratio tends to increase by an average of 5.9% per year, reaching 11.4: 1.0 in the 2021/2022 study year.

Annexes

| III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme | | |
|---|--|---|
| Sample of the diploma and its supplement to be issued for completing the study programme | Diploms_pielikums_mag_programma_EN.pdf | Diploms_pielikums_mag_programma.pdf |
| For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable) | mag_stud_prog_Vides_udens un zemes inzenierzinatne_AIP atzinums_EN.pdf | mag_stud_prog_Vides_udens un zemes inzenierzinatne_AIP atzinums.pdf |
| Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable) | | |
| Statistics on the students in the reporting period | 4_ENG_studejoso_skaita_raksturlielumi (45529).docx | 4_LV_studejoso_skaita_raksturlielumi (45529).docx |
| III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof | | |
| Compliance with the study programme with the State Education Standard | 5_ENG_progr_atbilstiba_valsts_izgl_standartam.docx | 5_LV_progr_atbilstiba_valsts_izgl_standartam.docx |
| Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable) | | |
| Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable) | | |
| Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme | 8_studiju_kursu_kartejums_ENG.xlsx | 8_studiju_kursu_kartejums.xlsx |
| The curriculum of the study programme (for each type and form of the implementation of the study programme) | 9_VUZI_programmas_plans_2022_2023_LV_EN.xlsx | 9_VUZI_programmas_plans_2022_2023_LV_EN.xlsx |
| Descriptions of the study courses/ modules | Magistra_studiju_kursu_programmas_ENG.rar | Magistra_studiju_kursu_programmas_LV.rar |
| Description of the organisation of the internship of the students (if applicable) | | |
| III - Description of the Study Programme - 3.4. Teaching Staff | | |
| Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable) | | |
| Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable) | LLU_apliecinajumi_Vides_aizsardziba_EN.docx | LLU_apliecinajums_studiju_virzienam_Vides_aizsardziba.edoc |

Environmental Engineering (51529)

| | |
|---|--|
| Study field | <i>Environmental Protection</i> |
| ProcedureStudyProgram.Name | <i>Environmental Engineering</i> |
| Education classification code | <i>51529</i> |
| Type of the study programme | <i>Doctoral study programme</i> |
| Name of the study programme director | <i>Ainis</i> |
| Surname of the study programme director | <i>Lagzdinš</i> |
| E-mail of the study programme director | <i>ainis.lagzdins@llu.lv</i> |
| Title of the study programme director | <i>Dr.sc.ing, profesors</i> |
| Phone of the study programme director | <i>29336304</i> |
| Goal of the study programme | <i>The aim of the doctoral study programme "Environmental Engineering" is to prepare highly qualified specialists of an international level for scientific research, organizational and academic work, at the same time providing the necessary conditions for such a level of research work that would allow successful development of the doctoral thesis and obtaining of an internationally recognized doctoral degree in the sub-branches of Environmental Engineering and Energy including Environmental Engineering or Water Management.</i> |
| Tasks of the study programme | <i>The tasks of the study programme are content wise targeted to ensure that young scientists:</i> <ul style="list-style-type: none"> - are able to raise, formulate, and independently solve problems in accordance with the principles of scientific research; - be creative and competent in the selection and application of scientific research methods; - acquire in-depth and comprehensive knowledge in the chosen sub-branch of research; - achieve a level of scientific research work that would allow one to be involved in implementation of national and international research projects; - acquire pedagogical work skills necessary for pedagogical staff; - develop and defend a doctoral thesis for obtaining a doctoral degree. |

| | |
|--|--|
| Results of the study programme | <p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - Knows and understands the most current scientific theories and findings, orients himself in the terminology used in foreign languages in the sub-branches of environmental engineering, manages the latest research methodology and modern research methods in one of the directions of environmental engineering or water management implemented in the study programme and in the interface of various areas related to the environment. <p><i>Skills:</i></p> <ul style="list-style-type: none"> - Able to independently evaluate and choose appropriate methods for research in the directions of environmental engineering or water management. Is able to conduct theoretical and empirical research, collect, analyze, critically evaluate and systematize the information obtained, knows the methods of data processing and analysis obtained from research. - Able to communicate about the field of research activity and issues of the environment as an interdisciplinary branch of science with the scientific community and society at scientific conferences and seminars. Able to independently improve their scientific qualifications, implement research projects, manage research or development tasks in companies, organizations. - Has contributed to the expansion of knowledge in the chosen directions of environmental engineering or water management, or has given new understanding to existing knowledge and its applications in practice by carrying out original research, some of which is at the level of internationally cited publication. <p><i>Competencies:</i></p> <ul style="list-style-type: none"> - Able to provide creative research in solving complex issues related to environmental engineering or water management through critical analysis and evaluation of results. - Able to independently propose research ideas, plan, structure and manage research projects, participate in the implementation of international projects. |
| Final examination upon the completion of the study programme | PhD Thesis |

Study programme forms

Full time studies - 3 years - latvian

| | |
|------------------------|-------------------|
| Study type and form | Full time studies |
| Duration in full years | 3 |
| Duration in month | 0 |
| Language | latvian |
| Amount (CP) | 120 |

| | |
|---|---|
| Admission requirements (in English) | <i>Master's degree or equivalent higher education in environmental science or hydro engineering. If the master's degree has been obtained in another field of science, an entrance examination in Environmental Engineering may be determined</i> |
| Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english) | <i>Doctoral degree Doctor of Science (Ph.D.) in Engineering Science and Technology</i> |
| Qualification to be obtained (in english) | - |

Places of implementation

| Place name | City | Address |
|---|---------|--------------------------------|
| Latvia University of Life Sciences and Technologies | JELGAVA | LIELĀ IELA 2, JELGAVA, LV-3001 |

Full time studies - 3 years - english

| | |
|---|--|
| Study type and form | <i>Full time studies</i> |
| Duration in full years | <i>3</i> |
| Duration in month | <i>0</i> |
| Language | <i>english</i> |
| Amount (CP) | <i>120</i> |
| Admission requirements (in English) | <i>Master's degree or equivalent higher education in environmental science or hydro engineering. If the master's degree has been obtained in another field of science, an entrance examination in Environmental Engineering may be determined. At least B2 level of English language skills.</i> |
| Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english) | <i>Doctoral degree Doctor of Science (Ph.D.) in Engineering Science and Technology</i> |
| Qualification to be obtained (in english) | - |

Places of implementation

| Place name | City | Address |
|---|---------|--------------------------------|
| Latvia University of Life Sciences and Technologies | JELGAVA | LIELĀ IELA 2, JELGAVA, LV-3001 |

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

According to the amendments to the Law on Higher Education Institutions of April 24, 2020, the study direction of "Environmental Protection" is accredited until December 31, 2024. This study direction currently consists of the study programmes implemented in three subsequent levels including the professional bachelor's study programme "Environment and Water Management", the academic master's study programme "Environmental, Water and Land Engineering", and the doctoral study programme "Environmental Engineering".

In the study year of 2019/2020, the reorganization of the doctoral study programme "Environmental Engineering Science" was completed, during which it was combined with the doctoral study programme "Hydroengineering Science", and in accordance with the classification of the fields of science in Latvia, a new study programme "Environmental Engineering" was created. The new study programme was licensed on February 25, 2020 by the decision of the Study Quality Committee. The doctoral study programmes "Environmental Engineering Science" and "Hydroengineering Science" were closed in October 2020.

The doctoral study programme "Environmental Engineering" was created on the basis of the accredited and existing study programmes "Environmental Engineering Science" and "Hydroengineering Science". The experience accumulated during the implementation period of the previous doctoral study programmes was taken over and critically evaluated as new doctoral study programme was established. The initiated research directions were continued, developed and expanded, which means that the newly created study programme fully complied with the accredited study direction of "Environmental Protection". The doctoral study programme "Environmental Engineering" was included in the study direction "Environmental Protection" on March 30, 2022 by the decision of the Study Quality Committee.

The main reason for the development of a new study programme is consolidation of study programmes with the aim to reduce fragmentation of the existing study programmes at university and

Taking into consideration the proposal of the representatives of the The Quality Agency for Higher Education to evaluate possibilities to change the code of the doctoral study programme determined according to the Cabinet Regulation No. 322 "Regulations on the classification of the Latvian education" from June 13, 2017, during the preparation of the self-assessment report the decision was made to change the code of the study programme from 51853 (the group of educational programme - Environment and Water Management) to code 51529 (the group of educational programme - Environmental Engineering). The need for this change has been brought up by the content of the Cabinet Regulation No. 595 "Regulations on the Groups, Fields and Sub-Fields of Science in Latvia" from September 30, 2022, which stipulates that the field of science "Environmental Engineering and Energy" includes the sub-fields of science such as "Environmental Engineering" and "Water Management", which content-wise correspond to the research directions

implemented in the study programme.

The degree to be awarded has changed during the reporting period. After a successful defense of the doctoral thesis in the time period until 2019 the applicant was awarded with the Doctoral Degree in Engineering Sciences (Dr.sc.ing.) in the field of Environmental Science, the sub-field of Environmental Engineering. Starting from September 30, 2022, the degree awarded is the Doctoral degree Doctor of Science (Ph.D.) in Engineering Science and Technology. The above-mentioned changes were made based on the changes in the legislation during the reporting period: 1) the changes have been made in the classification of the groups, fields and sub-fields of science as determined by the Cabinet Regulation No. 595 "Regulations on the Groups, Fields and Sub-Fields of Science in Latvia" from September 30, 2022; 2) the changes have been made in the information to be included in diplomas including the official abbreviation of the doctoral degree awarded, the relevant group of science and the title of the doctoral thesis as determined by the amendments made in the "Law on Scientific Activity" from September 1, 2022.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The implementation of the doctoral study programme in several aspects are unique to the specific conditions in Latvia. The assessment of impacts of agricultural activities and its connection with environmental protection including the research on water quantity and quality, implementation of environmentally friendly drainage systems for water quality improvements, emission of greenhouse gases and measures to reduce emissions, the importance of drainage and hydrotechnical structures in mitigating flood risks is addressed only at Latvia University of Life Sciences and Technologies (LLU) and in the context of preparation of doctoral thesis in the doctoral study programme "Environmental Engineering".

It is important that the Ministry of Agriculture, the Ministry of Environmental Protection and Regional Development, State Limited Liability Company "Real Estates on Ministry of Agriculture", State Limited Liability Company "Latvian Environment, Geology and Meteorology Centre", the union "Farmers Parliament" and other governmental and non-governmental organizations are interested in implementation of research activities and applications of results obtained within the study programme. The research results and scientific potential are used in the planning of agricultural policy in Latvia and in the preparation of national reports for successful fulfillment of international obligations including preparation of the reports on implementation of the EU Nitrates Directive, the EU Water Framework Directive in Latvia, and the preparation of the inventory report on emissions of greenhouse gases in the agricultural sector.

The aim of the doctoral study programme "Environmental Engineering" is to prepare highly qualified specialists of an international level for scientific research, organizational and academic work, at the same time providing the necessary conditions for such a level of research work that would allow successful development of the doctoral thesis and obtaining of an internationally recognized doctoral degree in the sub-fields of Environmental Engineering and Energy including

Environmental Engineering or Water Management.

The tasks of the study programme are content wise targeted to ensure that young scientists:

- are able to raise, formulate, and independently solve problems in accordance with the principles of scientific research;
- be creative and competent in the selection and application of scientific research methods;
- acquire in-depth and comprehensive knowledge in the chosen sub-field of research;
- achieve a level of scientific research work that would allow one to be involved in implementation of national and international research projects;
- acquire pedagogical work skills necessary for pedagogical staff;
- develop and defend a doctoral thesis for obtaining a doctoral degree.

The learning outcomes to be achieved consist of a set of knowledge, skills and competences, which are related to solutions of topical issues in the chosen field of research in environmental engineering or water management.

Knowledge:

- after successful completion of the study programme the doctoral student knows and understands the most current scientific theories and findings;
- is familiar with the terminology used in a foreign language;
- manages the latest research methods and software for processing and analysis of research results;
- knows the content and implementation procedure of research projects.

Skills:

- is able to independently evaluate, choose, and apply appropriate research methods in the chosen field of research in environmental engineering or water management;
- is able to perform theoretical and empirical research, summarize, systematize, analyze, and critically evaluate research results;
- has contributed to the expansion of knowledge in the chosen field of research in environmental engineering or water management, or has provided a new understanding of the existing knowledge and its application in practice by implementing an original research, some of which is at the level of internationally cited publications;
- can communicate about his/her research activities and results obtained with scientific community and society in scientific conferences and seminars;
- can independently increase his/her scientific qualification, apply for and implement research projects, manage research or development tasks in research institutions, companies and organizations.

Competences:

- can provide creative research in solving complex issues related to environmental engineering or water management by performing critical analysis and evaluation of the research results;
- is able to independently generate ideas for research projects, plan, structure and manage

research projects, participate in implementation of national and international projects.

The duration of doctoral studies is 3 years, during this time doctoral students must fulfill the criteria set to obtain 120 CP including theoretical studies of 24 CP and research work of 96 CP. The experience so far shows that in 3 years no one has defended the doctoral thesis, which is related to the high degree of complexity and time-consuming research characteristic of engineering sciences, as well as the limited funding allocated for the implementation of research activities, which often results in combining doctoral studies with paid work.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

Highly qualified specialists in environmental protection and water management are in a great demand in the labour market, because the well-thought-out and justified management of natural resources is essential for ensuring sustainable and balanced development of Latvia, which is also the main task of specialists in this field. Given that research opportunities in environmental protection and water management is developing very rapidly, and the number of offers to participate in international projects is growing, we already feel that there is a catastrophic shortage of young researchers with doctoral degrees and it is expected that the demand will only increase in the future. New doctors are also needed to ensure the development and stability of academic staff.

Shortly before the opening of the new doctoral study programme “Environmental Engineering”, the doctoral thesis was defended by the candidate of the doctoral degree of the study programme “Environmental Engineering Science”. The title of the doctoral thesis - The simulation of hydrochemical parameters for poorly gauged river catchments, the degree awarded - Doctor of Science (Ph.D.) in Environmental Engineering and Energy, the date of defense - August 28, 2020, the scientific supervisors - Viesturs Jansons, Emeritus professor Dr.sc.ing., Ainis Lagzdiņš, professor, Dr.sc.ing. Currently this graduate works as an assistant professor at the Department of Environmental Engineering and Water Management of Latvia University of Life Sciences and Technologies thus ensuring renewal of academic staff at the university.

It has to be mentioned that three earlier graduates from the study programme “Environmental Engineering Science” are also working at the higher education institutions in Latvia - Latvia University of Life Sciences and Technologies (2 persons) and Liepaja University (1 person), one graduate currently works at Institute of Physical Energetics and Latvian Association of Waste Management Companies.

If the work places of the existing students of the doctoral study programme “Environmental Engineering” are evaluated, it is possible to conclude that three persons currently work at Latvia University of Life Sciences and Technologies, two persons work at the State Environmental Service, while one person works at the Institute of Food safety, Animal Health and Environment “BIOR”.

It is expected that the existing students will continue to work in the mentioned institutions of higher education, research and public administration after graduating from the study programme thus promoting involvement of highly qualified specialists in various fields of environmental engineering. The information on the employment of study programme graduates was obtained through personal communication as statistical information in this matter is not publicly available.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The type of implementation of the doctoral study programme is full-time studies, and the form of studies is intramural. The studies are planned to be implemented both in Latvian and English, while currently the studies has been carried out in Latvian. All doctoral students study with the state funding.

In the study year of 2020/2021 four doctoral students from the study programmes “Environmental Engineering Science” and “Hydroengineering Science”, which were implemented until September 1, 2020, were matriculated in the new doctoral study programme “Environmental Engineering”, as the study programme “Environmental Engineering” was developed on the basis of the study programmes implemented previously. In addition, in the study year of 2020/2021 two doctoral students were enrolled in the 1st year of studies in the study programme “Environmental Engineering”. The information about changes in the number of students within the study years and among 1st, 2nd, and 3rd year students is summarized in Table 1 of Appendix 4 “Statistical data on the students of the doctoral study programme “Environmental Engineering””.

The pandemic situation of COVID-19 in the country played a negative role during the opening period of the study programme, which significantly affected the planned number of doctoral students to be enrolled. In the study year of 2021/2022 doctoral students were not enrolled in the 1st year of studies. In the unstable situation, potential doctoral students did not choose to start their studies, because it is difficult to start and continue research remotely.

The information about the number of dropouts and reasons within the study years is summarized in Table 2 of Appendix 4 “Statistical data on the students of the doctoral study programme “Environmental Engineering””. During the short time of implementation of the study programme, one student was unrolled due to the end of the study period. Overall it has to be recognized that the prescribed duration of doctoral studies (3 years) is too short a period of time for doctoral students to be able to conduct research specific for engineering disciplines, which in most cases includes experimental studies in field conditions.

In addition to financial support for full-fledged research, doctoral students and candidates of the doctoral degree work in university and elsewhere in parallel with their studies to provide a livelihood. In such a situation, there is a lack of time and money for qualitative research, which does not allow to fully develop research within the doctoral studies and defend the doctoral thesis within two years after graduation. Aware of the above situation and in order to motivate doctoral students and candidates of the doctoral degree to get more involved in studies and research work, which would allow to develop research qualitatively and defend doctoral theses during the studies, LLU has been working on support programs for doctoral students and candidates of the doctoral degree for the last years. They give the opportunity to devote more time to their research and development of the doctoral thesis. For example, LLU programmes “Strengthening Scientific Capacity of LLU” and “Carrying out Fundamental Research at LLU” provide the opportunity to apply for funding for research, as well as to ensure publicity in international conferences. These support tools have also been used by two candidates of the doctoral degree in the doctoral study programme “Environmental Engineering”.

During the time period from 2020 to 2026, the university aims to create a new model for the

development of doctoral study programmes in the fields of strategic specialization of LLU, therefore in 2020 the LLU Doctoral School was established. The new approach will offer a different funding model for doctoral students and a greater connection with the already more strongly developed research directions at LLU, where active work is also taking place within the framework of various research projects. Thus, these directions will be strengthened by reducing the fragmentation of research, creating succession and visibility. The new model will also focus on the involvement of doctoral students and doctoral degree holders in the academic and research work of LLU, promoting the development and succession of academic staff. On January 28, 2021, the "Development plan of doctoral study programmes of Latvia University of Life Sciences and Technologies for implementation of new doctoral model for 2020-2026" was agreed with the Ministry of Education and Science (the appendix - 51529_Vides_inzenierija_3_1_4_LLU_DSP_attistibas_plans_2020_2026_LV - available in Latvian language). Already starting from 2021, a new support program has been launched, which allows doctoral students to apply for a grant for research within the project "LLU transition to the new doctoral funding model" (No. 8.2.2.0/20/I/001). More detailed information about the project is available on the university's website - <https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2021/llu-pareja-uz-jauno-doktoranturas-finansesanas-modeli-es32> (available in Latvian language).

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The doctoral studies are organized in accordance with the Regulations of Doctoral Studies of LLU, which has been updated on November 13, 2019 (<https://www.llu.lv/index.php/en/study-guide-documents>). The programme is implemented in accordance with the LLU doctoral study programme implementation guidelines approved on November 29, 2017. The doctoral studies are supervised and managed by the Vice-Rector for Science of LLU, the study process is organized by the Studies Centre and the programme director in cooperation with the management of the Faculty of Environment and Civil Engineering.

The planned duration of the study programme is 3 years. The studies consist of theoretical study courses (approximately 25% of the total study volume) and scientific work (Appendix 9 “Study plan of the study programme “Environmental Engineering””). This distribution is comparable to study programmes implemented in other European Union countries. Most theoretical courses are planned at the beginning of studies (1st year) to provide knowledge of research methodology, to introduce data processing methods, to write scientific articles and to supplement foreign language knowledge with scientific terminology. The student chooses the special course in one of the sub-branches, hereby Environmental Engineering or Water Management, of the Environmental Engineering and Energy according to the chosen sub-field of science at the beginning of the studies, while the special course in the scientific direction is selected by the student from the courses offered in the study programme according to the sub-field chosen earlier. The special courses may change depending on the content of the research carried out by the student and possibilities of their implementation. Each doctoral student of the programme acquires the respective study courses and passes three doctoral exams: 1) special course of a foreign language; 2) theoretical studies in the sub-field of science; 3) special course of the scientific direction. The doctoral examination is open, it is accepted by the examination commission approved by the Rector of the LLU and consisting of three doctors of sciences. The evaluation is given in a 10-point system in accordance with the LLU Study Regulations (<https://www.llu.lv/index.php/en/study-guide-documents>).

In order to assess the intensity and quality of scientific work, the blocks of study courses “Research (I-VI)” has been developed, where in each part (semester) the tasks and procedure for evaluating the achieved results are defined. The block is designed so that the successful completion of the last part (formal test) indicates that the research has been successful and a draft version of doctoral thesis has been prepared. The block of study courses “Presentation of Research Results (I-V)” and “Publication of Research Results (I-V)” regulate the scope and conditions of public approbation and evaluation of research results. The study courses are interconnected, they are arranged in a logical sequence so that students first acquire theory, gain knowledge, start and develop research skills, can analyze research results, draw conclusions, present results of their studies to a scientific community and finally defend the doctoral thesis. Study courses fully ensure the acquisition of knowledge, skills and competencies defined in the study programme. The connection of the results to be achieved in the study courses with the results of the programme is analyzed in the mapping of the study courses (Appendix 8 “Mapping of the study courses”).

The study courses “Presentation of Research Results (I-V)” and “Publication of Research Results (I-V)” have requirements for determining the adequacy of the scope of work, which are coordinated with the LLU doctoral study programme implementation guidelines.

Presentation of research results:

- presentation (oral presentation) at international scientific conferences, seminars, congresses, symposiums (abroad) - 3 CP
- presentation (poster presentation) at international scientific conferences, seminars, congresses, symposiums (abroad) - 2 CP
- presentation (oral presentation) at international scientific conferences, seminars, congresses, symposiums (in Latvia) - 2 CP
- presentation (poster presentation) at international scientific conferences, seminars, congresses, symposiums (in Latvia) - 1 CP
- presentation at scientifically practical conferences - 1 CP

Publication of research results:

- in scientific journals indexed in the Web of Science and/or Scopus - 5 CP
- in proceedings of international conference indexed in the Web of Science and/or Scopus -

3 CP

- in scientific journals - 2 CP
- in the collections of international conferences - 1 CP
- approved patent application (abroad) - 3 CP
- approved patent application (in Latvia) - 2 CP

Identification of literature sources (10 sources) - 1 CP

Development of doctoral thesis (1 chapter) - 5 CP

In order to the evaluation of the study process would be successful each semester doctoral students must receive the amount of credit points indicated in the study plan. The process of implementation and supervision of the study programme is designed to be understandable to doctoral students, its implementation should be reviewed and evaluated on a regular basis, which promotes achievement of the study results.

The uniqueness of the doctoral study programme and research activities carried out in the study direction of "Environmental Protection" is defined in the LLU "Development Strategy 2015-2022" (available <https://www.llu.lv/en/mission-and-vision>). The environmental engineering is mentioned among the specialization fields and sub-fields of LLU, while "Research on climate change mitigation and environmental technologies, hydrology and agricultural runoff" is recognized among the priority research directions with the main research tasks: to develop new and approbate the existing technologies to reduce climate change specific for the conditions in Latvia; to carry out research in the field of development of environmental technologies, paying special attention to technologies that reduce water pollution caused by agricultural activities; to carry out fundamental research in the field of hydrology and hydrochemistry; to carry out research on the composition and variability of agricultural runoff at different intensities of agricultural activity from point and diffuse sources of pollution, as well as to provide recommendations to reduce such pollution. The main research tasks listed above are addressed by implementation of research activities within all study programmes included in the study direction "Environmental Protection".

3.2.2. In the case of master's and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

The content of the doctoral studies is focused on solving current environmental challenges in Latvia, the countries of the Baltic Sea region, and the European Union. The quality of water in the Baltic Sea and multiple Latvian watercourses does not correspond to a good ecological status, which creates a series of socio-economic challenges. The international agreements and the EU directives have been introduced to reduce or prevent water quality problems, the most important of which are the Helsinki Convention, the Water Framework Directive and the Nitrates Directive. The relevance of the content of the study programme has been recently strengthened by the content of the European Union strategy "Farm to Fork" presented in May 2020, which is a part of the European Green Deal. One of the most important goals set in the strategy is to reduce nutrients losses by 50%, while ensuring that soil fertility is sustained, as well as to reduce the use of fertilizers by at least 20% by 2030. In addition, the European Green Deal addresses the necessity to reduce emissions of greenhouse gases in order to achieve climate neutrality by 2050.

The study programme is also important in the context of the draft plan “Latvian National Plan for Adaptation to Climate Change until 2030” developed by the Ministry of Environmental Protection and Regional Development. This document analyses climate change, its potential risks and the analysis of the effects of the risks. This document lists a number of international agreements and documents that are also relevant for Latvia, such as the Law on the United Nations Framework Convention on Climate Change, Law on the Paris Agreement of the United Nations Framework Convention on Climate Change, UN General Assembly Resolution 2015 “Transforming Our World: The 2030 Agenda for Sustainable Development”.

This concerns in particular the assessment of possible climate change, water protection, agricultural runoff, the impact of changes in water quality on aquatic ecosystems, emissions of greenhouse gases. These issues are being addressed not only in the European Union but throughout the world. Of course, there are marked differences between the various regions, because the world's climatic conditions are very diverse and each region has its own differences and priorities. It is important to evaluate and analyze the directions of various economic activities as influencing these changes, and adaptation to these changes. It is important to not only identify these problems, but to adjust the economic activity. Considering the fact that these potential changes in environmental factors are very different in different regions, it is especially important to conduct research in specific (Latvian) climatic conditions. It is therefore very important to prepare young scientists who will be ready to carry out research to solve these problems. The doctoral programme will also be relevant for foreign students, as it will allow the comparison and evaluation of research results in different environmental (climatic) conditions and gaining of a broader view of current environmental problems and evaluation of their possible solutions.

When assessing the content of the study programme “Environmental Engineering” it should be taken into consideration that environmental engineering is a field of science that studies the means to reduce adverse effects on the environment, paying particular attention to the development of environmentally friendly technologies, the reduction and prevention of water, soil and air pollution, as well as the development of engineering methods for environmental remediation, waste collection, storage, recycling and disposal. These research directions and activities are also in line with the understanding of the content of environmental engineering in the world: hydrology, water processing, water quality, wastewater treatment, waste management etc. In addition, attention is paid not only to chemical and biological processes, but also to various engineering studies and solutions to address these challenges, for example, in relation to soil and water – a set of measures to regulate the water regime (land reclamation).

The need for the doctoral study programme is determined also by the content of the Latvian Rural Development Programme (2014-2020), which emphasizes the special hydrological conditions of Latvia and the risk of water pollution. The weaknesses include the problems associated with malfunctioning of drainage systems and importance of soil moisture regulation as an important factor affecting productivity of agricultural land. One of the necessary measures is the need to reconstruct and maintain the existing drainage systems in agricultural lands and forests. Without the regulation of soil moisture and protection of areas from flooding, the development of agricultural production and forestry activities is not economically feasible in Latvia, as the productivity of both agricultural crops and forest stands decreases significantly. All study programmes of the study direction “Environmental Protection” including the doctoral study programme are the only ones in Latvia with an in-depth focus on water management, hydrology, hydrotechnical reclamation.

1. The most important directions of research in the sub-branch of “Environmental Engineering”

a) Agrohydrology

- Water balance and modeling of hydrological processes;
- Quantity and qualitative composition of agricultural runoff, measures for pollution control and reduction;
- Environmentally friendly drainage systems and green infrastructure.

b) Air pollution in agriculture

- Emissions of greenhouse gases and air pollutants;
- Modeling of emissions of greenhouse gases.

2. The most important directions of research in the sub-branch of “Water Management”

a) Integrated water management

- Wastewater treatment;
- Storm water management.

b) Water resources engineering

- Flood protection of cities and settlements;
- Hydrotechnical structures.

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The most important part of doctoral studies is research activities, which aim to achieve a specific result of elaboration of doctoral thesis. LLU scientific laboratories, computer software, sources of scientific information of the Fundamental Library, as well as research resources of other Latvian scientific institutions are used for this purpose, if necessary. Every year the doctoral students give presentations at seminars and conferences and present the research results obtained, followed by elaboration of scientific publications, the content of which gradually is incorporated in a doctoral thesis.

General principles and approaches in the implementation of study process:

- As part of organization of the study courses the lecture materials presented by the academic staff are available for students. In order to implement the study courses, academic staff and students are using the LLU E-studies environment, which was especially relevant during the Covid-19 pandemic. The LLU E-studies environment allows to publish materials for students, record video lectures, conduct online lectures and seminars, students are able to submit their work, academic staff can perform evaluation of the study process and results achieved. Also, in this environment it is possible to provide feedback and comments on the work submitted, to communicate, as well as create a transparent and easy-to-understand environment for each study course, where the student can find all the necessary information about the

course.

- In order to facilitate communication, an e-mail has been created for each student and academic staff at LLU, but communication with all parties involved in the study course is possible through the LLU E-studies environment.
- The study environment is organized in the building of the Faculty of Environment and Civil Engineering, where students have access to work premises, the Information Centre where up-to-date scientific and periodic literature, and other materials are available, the access to the databases subscribed to by the LLU Fundamental Library. There is also access to computer classroom with all the necessary computer programs, scanning and printing.

The following principles of student-centered education are implemented:

- The accessible study environment is ensured to each student by respecting their individual needs, the accessibility of the environment in the premises is also ensured. Students have the opportunity to attend classes and use study and scientific equipment, to use the study and research infrastructure also outside of classes.
- Academic staff is available for students for communication not only during classes, but also during consultation hours, as well as for communication in the E-studies environment and by e-mails. Students are provided with support from the academic staff through both mandatory and additional consultations.
- Students going abroad on a mobility are provided with the opportunity to take the missed courses one term after their return, as well as it is possible to acquire study courses remotely while being abroad. Before going on a mobility, an individual work plan is prepared for each student, which ensures the procedure of reconciliation of study courses when returning from the mobility.
- The review process of student complaints is regulated by the Regulation of Studies (<https://www.llu.lv/en/study-guide-documents>), the complaints are reviewed by the commission created for this purpose. In addition, students are invited to seek assistance starting from the director of the study programme, the head of the department, vice-dean, dean and ending up with the Vice-Rector for Studies.
- In order to ensure mutual respect and collaboration between students and academic staff, the Code of Ethics of the LLU has been developed (https://www.llu.lv/sites/default/files/2016-06/CODE%20OF%20ETHICS_2005_English.pdf).
- The learning and evaluation criteria of study courses are defined in the description of each study course, which is available to students in an electronic form. In addition, each academic staff introduces students with learning and evaluation criteria at the start of the specific study course.
- The study results and evaluations are explained to students by academic staff by giving the feedback to students on the works submitted.

LLU has developed the Regulation of Studies, which describes the evaluation of students' works by using qualitative and quantitative methods:

- For the qualitative assessment 10-point scale is used (from 1 to 10 points, where successful evaluation starts from 4 points) or the pass/fail assessment (<https://www.llu.lv/en/study-guide-documents>).
- The quantitative indicator is the volume of the study course in credit points (1 CP = 1.5 ECTS).

Several potential students from abroad including from India, Pakistan, Iran, Turkey, Sri Lanka have shown interest to study in the doctoral study programme “Environmental Engineering”, but as soon as communication between potential students and the director of the doctoral study programme reaches the point of gathering and processing documents needed, no real action on the part of potential students has followed. In addition to the principles and approaches applied in general and student-centered education mentioned earlier in this chapter, it is planned to apply the following additional aspects to foreign students as studies will be conducted in English:

- providing living conditions in the dormitory intended for students from abroad or finding a rental apartment and arrangements of necessary documents;
- detailed explanation of the study process and study plan, planning of activities in order to fulfill the theoretical and research activities included in the study plan;
- translation and explanation of the information available only in Latvian language about the promotion process;
- communication with academic staff involved in the implementation of the study programme about arrangement of classes in English;
- identification and planning of available funding sources for successful fulfillment of the aims and tasks of doctoral studies.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

In order to make information about the promotion procedure easily accessible to doctoral students and candidate of the scientific degree, a corresponding section “Doctoral study programmes” has been created on the website of LLU (<https://www.llu.lv/en/doctoral-study-programmes>). This section of the website contains the most important information about implementation of the promotion process at LLU.

The candidate of the scientific degree submits the completed doctoral thesis to the Administrative Center of LLU for registration. After registration, the Administrative Center sends the doctoral thesis to the Promotion Council of the LLU in the field of “Environmental Engineering and Energy”. The Promotion Council under the leadership of the Chairman carries out the promotion procedure in

accordance with the Cabinet Regulations of the Republic of Latvia of December 27, 2005 No. 1001 “Procedures and Criteria for Awarding a Doctoral Degree (Promotion)”, furthermore clarified in the Regulations on the Promotion Councils and the Promotion at LLU with the last amendments made on May 13, 2020 (https://www.llu.lv/sites/default/files/2022-05/Promocijas_nolikums_2020_en_gb.pdf). After a successful defense of the doctoral thesis in the time period until 2019 the applicant was awarded with the Doctoral Degree in Engineering Sciences (Dr.sc.ing.) in the field of Environmental Science, the sub-field of Environmental Engineering. Starting from January 1, 2020, the degree

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

The doctoral study programme “Environmental Engineering” is designed for a long-term implementation, which is determined by the initiated research directions at Latvia University of Life Sciences and Technologies and current trends in research development in environmental protection in Europe and worldwide. Currently, in the European Union, increased attention is being paid to solve the current problems in environmental protection, which is expressed by development of various strategies and action plans content wise related to processes of environmental impact assessment, waste management, reduction of emissions of greenhouse gases, limiting climate change and mitigating its negative impacts, sustainable water management, more environmentally friendly production, etc. In order to find solutions to reduce or eliminate the above-mentioned problems, the recommendations from researchers are needed, which are based on the results of research carried out in the conditions of Latvia.

The topics of doctoral theses developed by the students of the doctoral study programme cover the aspects of current problems in environmental protection:

- The identification of nitrous oxide sources in the soil using isotope measurements. The scientific supervisor: Dr.sc.ing. Laima Bērziņa.
- The development of water body morphometry and hydrological regime research methodology. The scientific supervisor: Dr.sc.ing. Ainis Lagzdīņš.
- Integrated flood and precipitation collection and discharge in Latvian cities. The scientific supervisors: Dr.sc.ing. Reinis Ziemeļnieks, Dr.oec. Sandra Gusta.
- The analysis of selection and implementation of environmentally friendly drainage systems. The scientific supervisor: Dr.sc.ing. Ainis Lagzdīņš.
- The risk assessment of air pollution with heavy metals using spatial modeling. The scientific supervisor: Dr.sc.ing. Laima Bērziņa.
- The evaluation of measures to reduce ammonia emissions in the crop production sector. The scientific supervisor: Dr.sc.ing. Laima Bērziņa.

It is planned that in the near future three candidates of the scientific degree will defend their doctoral theses on the following topics of environmental engineering:

- The efficiency and solutions for water quality improvement in constructed wetlands in Latvia. The scientific supervisor: Dr.sc.ing. Ainis Lagzdīņš.
- The improvement of conceptual hydrological model METQ with urban hydrological response

unit and GHG emission modelling. The scientific supervisor: Dr.sc.ing. Laima Bērziņa.

- The impact assessment of agrohydrological factors on the quality of agricultural runoff. The scientific supervisor: Dr.sc.ing. Ainis Lagzdīņš.

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (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 the learning outcomes to be achieved by providing the respective examples.

The material and technical provision has been purposefully developed according to financial possibilities on the basis of the main research directions of the Faculty of Environment and Civil Engineering (VBF) since the 1990s and it can be divided into several blocks:

1. Extensively expanded and developed network of agricultural runoff monitoring in Latvia, which is one of a kind and consists of buildings, hydrotechnical structures, equipment that allows to carry out long-term field observations, the results of which can be further used in research, modelling of hydrological and hydrochemical processes.
2. Equipment and facilities for conducting research in hydrology, which includes computers with appropriate software for modelling of hydrological processes.
3. Equipment for water quality research.
4. Equipment for measurements of greenhouse gases (GHG) emission. This equipment is unique as it is the only one not only in Latvia, but also in the Baltic states.

The material and technical provision used for the implementation of the study programme “Environmental Engineering”

| No. | Department | Faculty | Place | Description |
|-----|------------|---------|--------------|---|
| 1 | VUS | VBF | Room No. 118 | Sediment flow measuring equipment Computerized hydrological process study equipment with software (ESHK 210001/11) Computerised drainage and filtration visualization study equipment [PDFDC 0002/11] |

| No. | Department | Faculty | Place | Description |
|------------|-------------------|----------------|-------------------------------------|--|
| 2 | VUS | VBF | Rooms No. 401 and 401a | Optical leveller Leica Loger 24 (3 pcs) Oximeter DO-5510 Measuring instruments for the study process (soil m.AE35746; wind m.1108776; solar rad.m.S / N100600509) Sonar 718 set GPS Receiver Mobile Mapper CE Multi-parameter water quality meter Model:AL15 Digital flow speed meter Laser leveller (model:LL100 SN157383) |
| 3 | VUS | VBF | Laboratory building 2nd floor | Drying cabinet SNDL 24/200 Analytical scales HR-150A Spectrophotometer for analysis of water impurities |
| 4 | VUS | VBF | Auce monitoring station | Automatic sensor for water level and temperature measurements Automatic barometric sensor for water level measurements Groundwater level meter (Model:DI 501) |
| 5 | VUS | VBF | Mellupītes monitoring station | Barometric pressure meter (Model:DI 500) APC BACK-UPS 800VA 230V Data loggers for monitoring at the research scales of river, drainage field and experimental plots Groundwater level meter (Model:DI 501) |
| 6 | VUS | VBF | Bērzes monitoring station | Groundwater level meter (Model:DI 501) Data reading device on the field Diver-Mate III Experimental riverbed areas RP-2 Multi-parameter probe YSI 6920 V2 Multi-parameter YSI 6920-SV Barometric pressure meter DI 500 Automatic meteorological observation station equipped with data logger, air temperature and relative humidity sensor, wind sensor, pyrometer, rain meter and soil humidity and temperature sensor. Multi-level groundwater monitoring well, water level meter and groundwater sample pump for groundwater quality monitoring in different water horizons. |

| No. | Department | Faculty | Place | Description |
|-----|------------|---------|--|---|
| 7 | VUS | VBF | Monitoring stations: Miltiņi, Stalģene, Vienziemīte, Oglaine | Monitoring wells with sensors, data loggers |
| 8 | VUS | VBF | Mežacīruļi artificial wetland monitoring station | <p>Multi-parameter probe for water level measurements up to 10 m in depth, with 6 sensors including conductivity and water temperature sensor, pH/ORP (oxidation-reduction potential) sensor, optical dissolved oxygen sensor, turbidity sensor, ammonium sensor, nitrate sensor.</p> <p>Monitoring well with built-in 90° V-notch weir. Data logger, unified water pressure/level and water temperature sensor.</p> <p>Digital conductivity sensor.</p> <p>Fluorometer for determining the source and velocity of groundwater and surface water flow.</p> <p>Electromagnetic water flow meter equipped with throughput flow module and area speed sensor for research in subsurface flow constructed wetland</p> |
| 9 | MURZL | VBF | 401 A The equipment is designed for field work | <p>Electronic robotic tachometer Topcon PS-103A with data controller Topson FC-3336, telescopic 2.5 m, Topcon stem</p> <p>GNSS receiver Topcon Hiper SR with 2 m fixed composite material stem, GNSS post-processing software Magnet Office</p> <p>A set of equipment for field measurements of N₂O, NH₄ and CO₂ emissions Picarro G2508</p> <p>Hydroacoustic flow meter for rivers, lakes RiverRay ADCP, RD Instruments</p> <p>Hydroacoustic flow measurement system for canals, narrow rivers and streams Vertical ADCP, RD Instruments</p> <p>Field multimeter for water quality parameters</p> <p>Probe AP-7000 measuring device Aquameter AM-200, Aquaread</p> <p>Moisture meter for primers PR2 DL6 HH2 PR-ASK 1-L, Delta-T Devices</p> <p>Probe for measuring water parameters CTD-Diver DI 271, Eijkelkamp</p> |

| No. | Department | Faculty | Place | Description |
|-----|--|---------|---|---|
| 10 | MURZL | VBF | 401 A The equipment is designed for field work | Nitrogen oxide isotope and concentration measurement equipment G5131-i, Picarro 3D printer MakerBot Replikator 2X |
| 11 | Department of Environmental Engineering and Water Management | VBF | Auditoriums No. 402, 403 | Auditoriums are equipped for lectures (60 and 30 seats): computer, projector, whiteboard, wireless internet connection) |
| 12 | Department of Architecture and Construction | VBF | Model Laboratory | Four different models of hydraulic structures and possibilities to operate them in different modes |
| 13 | Department of Management Systems | ITF | Auditorium No. 37 | Auditorium with 30 workplaces, equipped for lectures: computer, projector, whiteboard. |
| 14 | Department of Management Systems | ITF | Computer classroom No. 31. | 26 desktop computers HP ProDesk 600 G1 SFF Data processing software Free software R, Rstudio, SPSS |
| 15 | Department of Management Systems | ITF | Computer classroom No. Auditorium No. 221 | 20 desktop computers HP Compaq 8100 Elite SFF Data processing software Free software R, Rstudio, SPSS |

VUS - Department of Environmental Engineering and Water Management

MURZL - Forest and Water Resources Research Laboratory

VBF - Faculty of Environment and Civil Engineering

ITF - Faculty of Information Technologies

The material and technical provision is directly related to the research directions to be performed, which are defined in the doctoral study programme and also show the differences from other doctoral study programmes in the field of environmental engineering implemented in Latvia.

The work on improving the material and technical provision of studies is carried out continuously:

- computer programmes are maintained and subscribed every year (Microstation, SketchUp, ArcGIS), which are necessary for work in the study directions implemented at the Faculty of Environment and Civil Engineering. AutoCAD program offered in the Academic Network is also available at the Faculty;
- the LLU Forest and Water Resources Research Laboratory has rebuilt premises to improve working conditions for master and doctoral students, as well as purchased 8 sets of

computers for the needs of research work.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

The cooperation with other research institutions and institutions of higher education is mainly implemented in the context of joint research projects, within the framework of which doctoral students and candidates of scientific degree have the opportunity to improve their knowledge, gain experience and improve their research work skills in various research directions of environmental engineering. This type of cooperation is implemented within both national and international projects. Below is a list of the most important research projects and cooperation partners from other scientific institutions and higher education institutions, which are involved in the creation and development of cooperation and in the implementation of which doctoral students and candidates of scientific degree are involved:

- The Interreg Baltic Sea Region Programme 2014-2020 project “Water driven rural development in the Baltic Sea Region” (WATERDRIVE). The cooperation institution: Swedish University of Agricultural Sciences (Sweden).
- The LIFE programme project “Demonstration of climate change mitigation potential of nutrients rich organic soils in Baltic States and Finland” (LIFE OrgBalt). The cooperation institution: Latvian State Forest Research Institute “Silava”, University of Tartu (Estonia), Natural Resources Institute Finland “LUKE” (Finland), Lithuanian Research Centre for Agriculture and Forestry “LAMMC” (Lithuania).
- The LIFE programme integrated project “Implementation of River Basin Management Plans of Latvia towards good surface water status” (LIFE GOODWATER IP). The cooperation institution: State Limited Liability Company “Latvian Environment, Geology and Meteorology Centre”, University of Latvia, Latvian State Forest Research Institute “Silava”, Institute of Food safety, Animal Health and Environment “BIOR”.
- The Central Baltic Programme 2014-2020 project “Practical actions for holistic drainage management for reduced nutrient inflow to Baltic Sea” (NUTRINFLOW). The cooperation institution: Swedish Institute of Agricultural and Environmental Engineering “JTI” (Sweden).
- Improvement of accounting system and methodologies for estimation of greenhouse gas emissions and CO₂ removals from croplands and grasslands. The cooperation institution: Latvian State Forest Research Institute “Silava”.
- Surface water and groundwater monitoring in Nitrate Vulnerable Zones and agricultural land as a part of Agricultural Runoff Monitoring Programme. The cooperation institution: Latvian Institute of Aquatic Ecology, Agency of Daugavpils University.
- Assessing the impact of agricultural drainage on climate change (flood risk) mitigation. The cooperation institution: Latvian State Forest Research Institute “Silava”.

Follows additional information to the 3.3.1. section on the resources available in the Fundamental Library.

The Fundamental Library of LLU provides wide opportunities to obtain scientific literature. One of the main tasks of the library is to the maximum extent obtain all editions published in Latvia in the library collection, and, as far as it is possible, also published abroad, related to crop production,

gardening, agricultural economics, natural sciences, engineering, agricultural machinery, animal husbandry, veterinary medicine, food industry and nutrition, wood processing, forestry, etc. The library collection includes a large number of publications in natural sciences, engineering, technology and social sciences. In addition, it is possible to use services of interlibrary subscription.

Sectoral publications for studies and research are available in the Subscription, Study Literature Subscription, Reading Room, Deposit Library of United Nations Food and Agriculture Organisation. Factographic and bibliographic inquiries on various issues related to agriculture and other sectors are available at the Bibliographic Information Department.

The subscribed databases in the LLU network or outside the LLU network can be used to search for information sources that are not available in the library collection by using LLU IS, information can be obtained at the Reference and Information Centre of the LLU Fundamental Library, as well as services of interlibrary subscription can be used. The search engine LLU Primo Discovery, online databases BIS Aleph500, online databases created in the LLU Fundamental Library (8 databases of different meanings) are available to search for scientific literature. When using the LLU IS user account, a number of subscribed databases are available: CAB Abstracts; CRC Press e-books; EBSCO databases; EBSCO eBook Academic Collection; ScienceDirect journals; Scopus; Web of Science and other databases.

Academic staff and doctoral students are informed about the databases to which access is granted on a temporary basis. The databases of publications of academic staff and doctoral theses have also been created. The staff of the library provides consultations on current events, as well as advises students on searching for scientific information.

The informative and methodological base of Latvia University of Life Sciences and Technologies is detailed, transparent, and structured so that students could quickly obtain all information related to studies, get acquainted with the study course materials and requirements of study courses in the e-learning environment of LLU, and the Fundamental Library provides students with a very wide range of learning and scientific literature and access to a variety of databases.

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The doctoral study programme “Environmental Engineering” were developed on the basis of two study programmes implemented until 2020 including “Environmental Engineering Science” and “Hydroengineering Science”. During the implementation of the previous study programmes the material, technical and financial provision have been created as LLU receives state funding for 11 study places, which have been further directed to the new study programme “Environmental Engineering”. This number of study places is optimal to ensure study process of a high quality.

The funding base of the study programme is planned as follows:

- state funding for 11 study places;
- tuition fee income by implementing doctoral studies in English for doctoral students from

abroad. The tuition fee for doctoral students from abroad is 4200 EUR.

A larger number of students is economically more feasible as it reduces the actual expenses per student at the same time the common infrastructure is used, as well as the salary of academic staff is associated to each student. This is very important given that the funding for higher education and science is insufficient.

The planned state budget funding for the implementation of the study programme:

1. The planned state budget funding for the implementation of the study programme in 2021:

$$F = n \times [(fb \times knoz \times Kn \times k) + Sn] = 11 \times [(1630.11 \times 2.06473 \times 0.9999965 \times 3) + 1009.53] = 11 \times 11106.71 = 122173.76 \text{ EUR};$$

where, $n = 11$ - number of students financed from the state budget,

$knz = 2.06473$ - coefficient relevant for the field of study programme,

$Kn = 0.9999965$ - provision coefficient of the study field,

$k = 3$ - coefficient of the study level,

$fb = 1630.11$ - base costs of the study place,

$Sn = 1009.53$ - social security costs of the study place

2. The sources of funding:

| | |
|-----------------|---|
| National budget | EUR 122173.76 |
| Paid studies | EUR 12600 (3 foreign students x EUR 4200 of the tuition fee per year) |
| Other sources | _____ |
| Total | EUR 134773.76 |

3. The distribution of costs:

3.1. State budget funding:

- Salaries for academic staff, support staff, etc. (80%);
- Expenses for maintenance and provision of the study process (20%).

3.2. Revenue from paid studies:

- Salaries for academic staff, support staff, etc. (60%);

Expenses for maintenance and provision of the study process (40%).

The funding available is used for the development of the study programme in the following aspects:

- to cover costs of subscription of research databases, purchase books, E-journals and E-books

necessary for research activities;

- to create and maintain individual workplaces, as well as computer classes;
- to purchase and maintain laboratory equipment, reagents and consumables;
- to purchase and maintain measuring devices, tools and materials necessary in field measurements;
- in the scope of each semester students have the opportunity to apply for one-time financial support of no more than 280 EUR to cover the costs related to attendance of scientific conferences and publishing of scientific articles.

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

10 persons as academic staff are involved in the implementation of the doctoral study programme: 5 professors; 2 associate professors; 3 assistant professors. All academic staff is elected in academic positions in LLU. All elected faculty members have a doctoral degree. The elected academic staff ensures the most important part of study programme implementation including the provision of the theoretical study process (except for the professional foreign language - German if such a language as a foreign language would be necessary for a doctoral student) and scientific work. The information on the academic staff involved in the study programme implementation is shown in the appendix to 3.4.1. section "List of academic staff involved in the implementation of the study programme Environmental Engineering".

Article 55 of the Law on Higher Education Institutions determines the requirements to be met by academic study programmes. These requirements are fully fulfilled by the doctoral study programme "Environmental Engineering". The number of professors and associate professors (5) specified in the law is exceeded (7). All professors and associate professors are elected in LLU, which ensures compliance of pedagogical and scientific qualification (Regulation of the Cabinet of Ministers No. 391 "Procedure for Assessing the Scientific and Pedagogical Qualification of a Candidate for the Position of Professor and Associate Professor").

The field of environmental engineering is thematically very diverse and in essence is related to many other fields of science often even overlapping with certain issues (agriculture, forestry, etc.). Therefore, the study programme involves academic staff, who know the widest possible range of issues addressed by environmental engineering. It expands the field of knowledge and competencies acquired in the study programme in the fields of communication with other fields of science. Thus it is positive that the study programme involves not only 5 experts approved by The Latvian Council of Science in the field of "Environmental Engineering and Energy", but additionally 1 more expert in the science direction "Engineering and Technologies", as well as 1 expert in the science direction "Agriculture, Forestry and Veterinary Sciences".

As the study program develops and expands, if necessary it is possible to involve additional academic staff from LLU in the implementation of the study programme, who have been elected as academic staff at LLU and qualifies as experts of the Latvian Council of Science in the field of science “Environmental Engineering and Energy”.

The academic staff has improved their English language skills with support of the SAM 8.2.2 project “Improvement of LLU academic staff”, No. 8.2.2.0/18/A/014, as well as developed study materials in English with support of the SAM 8.2.1 project “Consolidation of LLU study programmes and development of new programmes” No. 8.2.1.0/18/A/007.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

Since the establishment of the new doctoral study programme “Environmental Engineering” in the study year of 2020/2021, there have been two changes in the composition and qualifications of the academic staff:

1) the implementation of the study course “Preparation of scientific papers” led previously by professor, Dr.agr. Zinta Gaile, who reduced her working load due to partial retirement, has been taken over by associate professor, Dr.sc.ing. Ruslans Šmigins. Considering that one expert of the Latvian Council of Science has been replaced by another expert, the quality of studies can be considered are well maintained.

2) after earning a degree of Doctor of Science (Ph.D.) in Environmental Engineering and Energy, assistant professor Artūrs Veinbergs has become the academic staff of the doctoral study programme in 2021, he ensures the implementation of research activities in the thematic direction of “Water management”.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

The total number of publications prepared by academic staff involved in the doctoral study programme and the number of publications indexed in the Scopus or Web of Science databases are summarized in the table. A detailed list of publications prepared by the academic staff is available in Appendix 12 of Chapter 2 of the self-evaluation report.

The number of scientific publications of the academic staff involved in the implementation of the study programme Environmental Engineering during the reporting period

| Nr. | Last name, Name | Total number of publications | Number of publications indexed in the Scopus or Web of Science |
|-----|------------------|------------------------------|--|
| 1 | Arhipova Irina | 15 | 12 |
| 2 | Bērziņa Laima | 26 | 19 |
| 3 | Šmigins Ruslans | 15 | 9 |
| 4 | Gusta Sandra | 5 | 4 |
| 5 | Lagzdiņš Ainis | 21 | 13 |
| 6 | Paura Līga | 16 | 14 |
| 7 | Sudārs Ritvars | 5 | 3 |
| 8 | Šinkus Tatjana | 5 | 3 |
| 9 | Veinbergs Artūrs | 4 | 3 |
| 10 | Dukulis Ilmārs | 21 | 19 |

During the reporting period, academic staff involved in the implementation of the study programme have written 133 scientific publications, 99 of which are indexed in the Scopus or Web of Science databases. The topics and content of the publications in the most cases are related to the research interests of the academic staff and doctoral students in the relevant field of science. At the same time, it should be mentioned that the publications are elaborated in accordance with the content of the research projects implemented, which are not always directly related to the research interests of academic staff and doctoral students in the relevant field of science.

Six persons involved in the implementation of the study programme as academic staff are experts of the Latvian Council of Science. The academic staff have acquired the rights of expertise not only in the thematically directly related field of science such as Environmental Engineering and Energy (4 persons), but also in the field of science Animal and Dairy Science (1 person) and Electrical Engineering, Electronics, Information and Communication Technologies, which contributes to the interdisciplinarity of the study process implemented. The information about the academic staff involved in the implementation of the study programme Environmental Engineering with respect to the expertise of the Latvian Council of Science is summarized in the table below.

The academic staff involved in the implementation of the study programme Environmental Engineering - the experts of the Latvian Council of Science

| Nr. | Last name, Name | Doctoral degree | The field of science | The term of expertise |
|-----|-----------------|-----------------|---|-----------------------|
| 1 | Arhipova Irina | Dr.sc.ing. | Electrical Engineering, Electronics, Information and Communication Technologies | 03.02.2024 |
| 2 | Bērziņa Laima | Dr.sc.ing. | Environmental Engineering and Energy | 02.06.2024 |
| 3 | Dukulis Ilmārs | Dr.sc.ing. | Environmental Engineering and Energy | 01.06.2025 |
| 4 | Lagzdiņš Ainis | Dr.sc.ing. | Environmental Engineering and Energy | 24.03.2023 |
| 5 | Paura Līga | Dr.agr. | Animal and Dairy Science | 06.10.2024 |
| 6 | Šmigins Ruslans | Dr.sc.ing. | Environmental Engineering and Energy | 02.12.2023 |

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

The doctoral study programme “Environmental Engineering” is designed for a long-term implementation, which is determined by the already started research directions and research development trends in the field of environmental engineering in Latvia, Europe and the world.

The academic staff of the study programme have accumulated a long-term experience in implementation of research projects as evidenced by their involvement in a large number of research projects. In recent years, there have been increasing opportunities to involve master, doctoral students and candidates of the doctoral degree in research projects offering the necessary conditions for research activities. This process is evolving and has become more stable in recent years - in the academic year of 2015/2016 students were involved in 2 projects, in 2016/2017 - 20 projects, in 2017/2018 - 12 projects, in 2018/2019 - 20 projects, in 2019/2020 - 20 projects, in 2020/2021 - 20 projects.

In 2016, the academic staff of the Department of Environmental Engineering and Water Management, which is the structural unit of LLU profiling the doctoral study programme participated in the implementation of 19 research projects of different levels and 10 contract projects with entrepreneurs, in 2017 - 16 research projects and 4 contract projects, in 2018 - 15 research projects and 16 contract projects, in 2019 - 16 research projects and 12 contract projects, in 2020 - 13 research projects and 8 contract projects, 2021 - 15 research projects and 1 contract project. This information indicates the capacity to provide potential doctoral students with the topics for research activities. In addition, by participating in the implementation of international

projects (2016 - 5, 2017 - 3, 2018 - 12, 2019 - 10, 2020 - 5, 2021 - 4) the scientific qualification of academic staff increases, as well as international cooperation and opportunities for doctoral students to do internships abroad is extended.

When doctoral students participate in the research projects with high importance both nationally and internationally, it is ensured that the doctoral degree is awarded for the research of high relevance, the results of which are highly appreciated by the Ministry of Agriculture, the Ministry of Environmental Protection and Regional Development, State Limited Liability Company "Real Estates on Ministry of Agriculture" and other stakeholders involved in environmental protection. Participation in international projects also ensures that research provides experience and information on ongoing activities in this field of research outside of Latvia.

The academic staff of the doctoral study programme "Environmental Engineering" (51529) has participated in the implementation of 9 international projects, 5 other EU-funded projects, 37 projects funded by the state, state institutions (ministries), 3 contract studies and 1 internal grant of LLU. A detailed list of projects implemented by the academic staff of the doctoral study programme is available as the appendix - 51529_Environmental_Engineering_3_4_4_List_of_projects_implemented_ENG.

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

The cooperation of the academic staff takes place by working on the improvements of the study programme, as well as by cooperating in research and in supervising and consulting doctoral students about the topics of doctoral thesis. The improvements of the programme and concrete topics of doctoral thesis are discussed in the department's meetings and/or by communicating in the e-environment on a regular basis. Cooperation between the academic staff within the study programme is mainly subordinated to the research topic of the doctoral student. The academic staff of the theoretical courses of the programme communicate with the supervisors of the doctoral thesis in order to specify the individual tasks in accordance with the topic of the doctoral thesis.

The cooperation between the academic staff and exchange of views is best marked by the format of the doctoral exams. The exam is accepted by a commission with a minimum composition of 3 members of the academic staff. The doctoral exam in the special course in the sub-field, hereby Environmental Engineering or Water Management, of the Environmental Engineering and Energy is organized in the 4th semester so that the doctoral student has already acquired prior knowledge in the research process in the sub-field. The doctoral exam in the special course in the scientific direction is organized in the 6th semester, which provides an opportunity for the doctoral student to demonstrate already compiled research and competence acquired in discussions with the academic staff. At the time of the exam, not only the current issue is presented, but also the exchange of scientific opinions between the commission/academic staff and doctoral student. The format of doctoral examinations in the 4th and 6th semester, clearly describes not only the abilities of the doctoral student, but also the contribution of the academic staff that has/has not ensured the necessary level of interdependence for promotion of the research work. Cooperation between the academic staff of the programme also takes place within the framework of various study courses

involving more than one member of academic staff.

All academic staff involved in the implementation of the study program are elected, which ensures academic staff stability and eliminates regular changes. The ratio between the number of students and academic staff is currently 6 (2 in study process and 4 in academic leave) to 10, which is related to the specifics in the study programme implementation with a small number of students, which provides the opportunity to apply an individual approach to each student.

Annexes

| III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme | | |
|---|---|---|
| Sample of the diploma and its supplement to be issued for completing the study programme | Doktora_diploms_Vide_EN.pdf | Doktora_diploms_Vide_LV.pdf |
| For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable) | dokt_stu_prog_Vides_inzenierija_AIP_atzinums_EN.pdf | dokt_stu_prog_Vides_inzenierija_AIP_atzinums.pdf |
| Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable) | | |
| Statistics on the students in the reporting period | 4_appendix_Statistical_data_on_the_students_doctoral_programme_Environme...docx | 4_pielikums_Statistikas_dati_par_studejosajiem_doktora_programma_Vides_i...docx |
| III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof | | |
| Compliance with the study programme with the State Education Standard | | |
| Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable) | | |
| Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable) | | |
| Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme | 8_appendix_Mapping_of_the_study_courses_EN.XLSX | 8_pielikums_Studiju_kursu_kartejums_LV.XLSX |
| The curriculum of the study programme (for each type and form of the implementation of the study programme) | 9_appendix_Study_plan_doctoral_programme_Environmental_Engineering_51529...docx | 9_pielikums_Studiju_plans_doktora_programma_Vides_inzenierija_51529_LV.DOCX |
| Descriptions of the study courses/ modules | 10_appendix_Doktora_studiju_kursu_programmas_ENG.rar | 10_pielikums_Doktora_studiju_kursu_programmas_LV.rar |
| Description of the organisation of the internship of the students (if applicable) | | |
| III - Description of the Study Programme - 3.4. Teaching Staff | | |
| Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable) | LLU_aplicinajumi_Vides_aizsardziba_EN.docx | LLU_aplicinajums_studiju_virzienam_Vides_aizsardziba.edoc |
| Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable) | LLU_aplicinajumi_Vides_aizsardziba_EN.docx | LLU_aplicinajums_studiju_virzienam_Vides_aizsardziba.edoc |