



Interdisciplinary Centre for Environmental Systems

- Ideas Competition -

Documentation for applicants
Strategic research context of Luxembourg

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Strategic research context of Luxembourg

Luxembourg is a dynamic and economically thriving country at the heart of Europe that is currently reinventing itself. After a long agricultural history, the country has moved from being a European pioneer in steel production, to a European global financial leader, and to its ambition now to become of an international academic hub for research, technology and innovation.

Luxembourg is ranked #19 in the Global Innovation Index 2020 and has the highest relative share of knowledge-intensive employment among 132 countries, making talent attraction a strategic priority, as part of its significant investment in research and innovation. The Grand Duchy considers that the research ecosystem will be the main catalyst to generate innovations and will improve the quality of life of tomorrow. Luxembourg initiates collaborations between its research ecosystem and the different societal stakeholders, both nationally and internationally. As a centrepiece of this strategy, Luxembourg has created 19 years ago the University of Luxembourg, the sole university of the country.

National strategies. In 2020, Luxembourg has established its new National Research and Innovation Strategy¹, which puts a strategic emphasis on an interdisciplinary and intersectoral approach. In its past transitions, Luxembourg has grown and developed while making efforts to be sustainable for future generations. Hence, Luxembourg is investing in innovation, supporting start-ups, achieving sustainable growth for all, without neglecting the natural environment. An in-depth strategic study on the '*3rd industrial revolution*'² in Luxembourg has resulted in a roadmap to ensure sustainable development for the future. These efforts are pursued through recent initiatives such as *Luxembourg in Transition*³, and *Luxembourg Stratégie*⁴ as a basis for the Ministry of Economy's strategic planning. Additional national strategies⁵ and plans have been initiated by the Government of Luxembourg, as listed in *Luxembourg Stratégie*. Last but not least, the country is currently revising its national plan for the protection of nature "*Plan national concernant la protection de la nature-Stratégie 2022-2030*"⁶.

Luxembourg is one of the most dynamic and innovative global financial centres, increasingly active in sustainable finance and fintech, and the combination of both. Sitting at the heart of Europe, Luxembourg is home to numerous major European institutions such as the European Investment Bank, the European Investment Fund, the European Court of Justice, the Consumers Health Agriculture and Food Executive Agency and many others. *Digital Lëtzebuerg* is the nation's

¹ <https://gouvernement.lu/dam-assets/documents/actualites/2020/02-fevrier/25-mesr-strategie-recherche-innovation/mesr-strategy-research-innovation.pdf>

² https://www.troisiemerevolutionindustrielle.lu/wp-content/uploads/2016/11/TIR-CG_Luxembourg-Final-Report_Long-Version.pdf

³ https://luxembourginttransition.lu/wp-content/uploads/2021/06/2phase_AREP.pdf

⁴ <https://luxstrategie.gouvernement.lu/fr.html>

⁵ <https://luxstrategie.gouvernement.lu/dam-assets/documents/tableaux-de-suivi-prospectifs/tableau-strategies-nationales-ls-200722.pdf>

⁶ <https://environnement.public.lu/fr/natur/biodiversite/pnpr.html>

clear strategy towards a smart nation which fully embraces the digital world for the benefit of society, including specifically digital health. The country offers multiple reasons to start or extend business activities⁷.

This ecosystem of neighbouring industrial, institutional and political agencies, together with the different actors of public research, makes Luxembourg a vibrant and attractive place to excel in research and innovation. A convincing illustration of Luxembourg's strategy to build a knowledge-based and innovation-based economy, is its sustained efforts to raise the budget dedicated to public research from €1.5 billion for 2018-2021 to €1.7 billion foreseen for the 2022-2025 period.

Luxembourg as a research location only took shape at the turn of the millennium. The first public research centres were established 35 years ago in 1987 and its sole public university was founded in 2003. The country's research sector is thus young. Yet, today's research ecosystem in Luxembourg encompasses five major public research institutions, the University of Luxembourg, the Luxembourg Institute of Science and Technology (LIST, www.list.lu), the Luxembourg Institute of Health (LIH, www.lih.lu), the Luxembourg Institute for Socio-Economic Research (LISER, www.liser.lu), and the Max Planck Institute (MPI, www.mpi.lu) Luxembourg for Procedural Law. Other public research organisations are conducting research activities and contribute actively to the Luxembourg's research landscape. These include the National Health Laboratory (LNS, www.lns.lu), the hospitals⁸, the Luxembourg Space Agency (LSA, www.space-agency.public.lu), the Musée National d'Histoire Naturelle (MHN, www.mnhn.lu), the *Institut fir biologesch Landwirtschaft an Agrarkultur Luxemburg* (IBLA, www.ibla.lu), STATEC Research (www.statistiques.public.lu), and others. The continued presence of several large companies, which maintain important R&D and innovation activities in the country and several companies accredited as private research institutions by the Government⁹ contribute to a population of about 3000 R&D staff in the private sector, which is concentrated, among others, at companies such as ArcelorMittal, Delphi, Dupont de Nemours, Goodyear, IEE, SES, Ceratizit, Husky Injection Molding Systems.

The booming "Cité des Sciences", Belval campus, in the south of the country (figure 1) combines, on an emblematic site, past industry glory and the modern knowledge society. It has become a landmark in the country, and is internationally acclaimed. As an example, the brand-new Luxembourg Learning Center (LLC) is much more than a library. Combining modern digital tools with traditional learning methods, it symbolizes the ambition of the University of Luxembourg. Figure 2 summarizes key factors and attractors of public research in Luxembourg¹⁰.

⁷ <https://www.tradeandinvest.lu/10-good-reasons-to-choose-luxembourg/>

⁸ <https://fhlux.lu/web/>

⁹ <https://guichet.public.lu/en/entreprises/sectoriel/organismes-recherche-privee/organisme-recherche-privee.html>

¹⁰ https://www.researchluxembourg.org/wp-content/uploads/2022/06/Research_Luxembourg_10-reasons-why.pdf

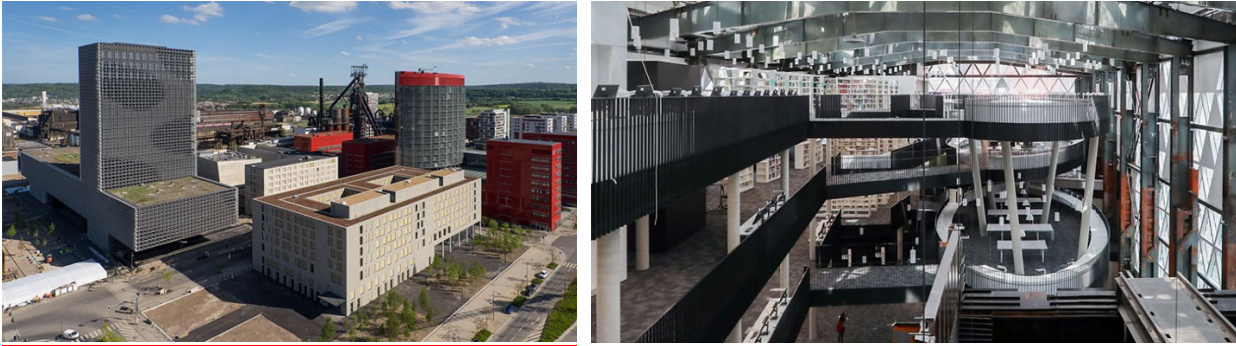


Figure 1. Belval Campus. Left : “Cité des Sciences”, Right : The Luxembourg Learning Centre

The “Cité des Sciences” campus in Belval gathers the main public research institutions which between them host more than 2700 researchers in the public sector. More than 80% of researchers are non-Luxembourg nationals showing the strong international mindset and attractiveness of Luxembourg’s research ecosystem. The National Research Fund (FNR) finances a large proportion of the national research projects and operates with a block grant of 294 Mio€ for the 2022-2025 period. The FNR also provides a good overview of the history and progress of the research landscape in Luxembourg¹¹. Additional support to the R&D sector is provided by Luxinnovation¹², the national innovation agency, that empowers companies to innovate, and by Research Luxembourg¹³, a joint initiative of the main actors in Luxembourg public research. R&D expenditure represented 1.07% of GDP in 2020, below the European average of 2.31% (Eurostat¹⁴). Yet, Luxembourg devoted the highest allocations for R&D in the EU, with €648 per person in 2020, and has an ambitious target of 2.3-2.6% of GDP expenditure on R&D.

¹¹ <https://www.fnr.lu/research-in-luxembourg/#1461325462687-4024382d-5f20>

¹² <https://www.luxinnovation.lu/>

¹³ <https://www.researchluxembourg.org/en/>

¹⁴ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure#Gross_domestic_expenditure_on_R.26D

10 REASONS TO CONSIDER RESEARCH LUXEMBOURG

2ND MOST ATTRACTIVE RESEARCH SYSTEM

Luxembourg ranks 2nd most attractive research system and scores particularly high on foreign doctorate students, employment in knowledge-intensive activities, population with tertiary education, trademark applications, lifelong learning, and international scientific co-publications.



(source: European Innovation Scoreboard 2021)

STATE OF THE ART RESEARCH FACILITIES

Luxembourg is developing highly sophisticated digital infrastructure such as high-performance computing, big data storage and processing, as well as world-class skills in cybersecurity.



HIGH ALLOCATIONS FOR R&D

Luxembourg devoted the highest allocations for R&D in the EU, with €648 per person in 2020.



(source: Eurostat)

ATTRACTIVE FOR TALENTS

Luxembourg is No. 1 worldwide when it comes to talent attraction and No. 5 worldwide when it comes to brain retention.



(source: INSEAD Global Talent Competitiveness Index 2021)

RESEARCH IS A NATIONAL PRIORITY

Luxembourg has one of the fastest-growing public research budgets in Europe. Research budget increased fourteen-fold since 2000.



A HIGHLY DIGITAL ENVIRONMENT

Luxembourg's workforce proportion of ICT specialists is No. 3 in the EU. The country has the 4th best connectivity in Europe.



(sources: Eurostat, 2021 Digital Economy and Society Index)

A YOUNG RESEARCH-ORIENTED UNIVERSITY

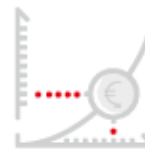
Created in 2003, the University of Luxembourg already ranks among the top 18% of universities evaluated by Times Higher Education. The University is No. 3 worldwide for its international outlook.



(source: THE World University Ranking 2022)

A COMPETITIVE AND RESILIENT ECONOMY

Luxembourg ranks No.1 worldwide in the political and macroeconomic section. Considering all factors, the country ranks 3rd most resilient in the world.



(source: 2021 FM Global Resilience Index)

EXCELLENCE IN KEY DOMAINS

Luxembourg has set up a comprehensive research system in under two decades, focusing on a handful of key areas such as materials, health, ICT and data science. 20 ERC grants were awarded between 2014 and 2021.



A STABLE AND QUALITY ENVIRONMENT

Luxembourg ranks among the top countries for its living conditions and quality of life. The country ranks No. 8 in the 2021 World Happiness Report.



(sources: 2021 World Happiness Report, 2020 Raise A Family Index, AIRINC's Global 150 Cities Index)

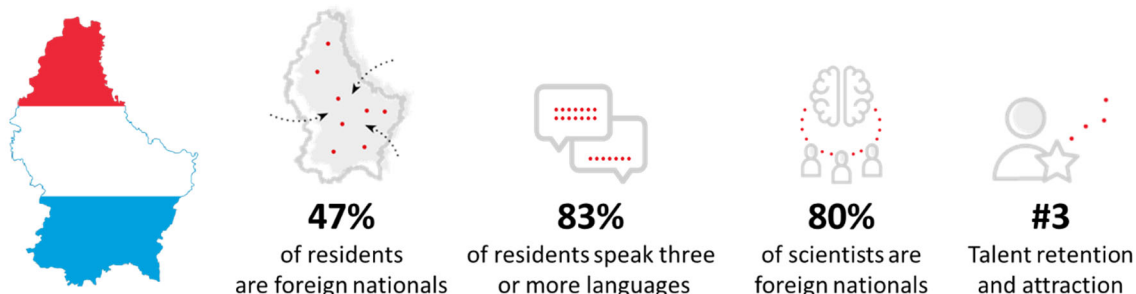
Figure 2. Some key factors and attractors of public research in Luxembourg

The **University of Luxembourg** (UL) is an international research university with a distinctly multilingual character and the ambition to further develop its interdisciplinary research. UL has three main missions: 1) to conduct cutting-edge research, 2) to educate the next generation, and 3) to enable socio-economic and cultural impact. UL counts about 7000 students, 2300 employees including 300 professors, encompassing about 100 nationalities. UL benefits from a government block grant of 902 Mio€ for the 2022-2025 period. The University's faculties and interdisciplinary centres focus jointly on three key research areas: 1) Digital Transformation, 2) Medicine and Health, and 3) Sustainable and Societal development.

Rooted in strong disciplines, the University's success for all three key areas also relies on interdisciplinary and intersectoral collaborations, drawing on combined contributions from Social Sciences and Humanities (SSH), Science, Technology, Engineering and Mathematics (STEM), and Medicine. The University's research community leads key initiatives in high-performance computing and data science while addressing ethical, cultural, and legal questions around digitalisation. In the areas of health, medicine, and life sciences, the activities focus on system biomedicine, neurosciences, oncology, digital health, and socio-economic aspects of health and wellbeing. The research community plays an active role in sustainable and societal development with key initiatives in sustainable energy systems supported by digital/data-based transformation, legal, regulatory, socio-economic, and behavioural approaches.

Various University assets such as the High-Performance Computing (HPC¹⁵) platform, the University's Institute for Advanced Studies (IAS¹⁶), and the pioneering Luxembourg Learning Centre (LLC¹⁷), are instrumental in promoting cutting-edge, collaborative, and interdisciplinary research. Finally, UL offers 17 Bachelor's, 46 Master's Degrees and custom-made training programs for about 1000 PhD candidates in 4 doctoral schools. Times Higher Education ranks UL #3 worldwide for its "international outlook," #25 in the Young University Ranking, and among the top 250 universities worldwide (2022 ranking).

The figure below presents some key figures characterizing the Luxembourg context and illustrate the vibrant international working environment offered at UL, which arguably is unparalleled in the EU. In addition to the country's highly cosmopolitan nature, UL itself has a large international collaborative network including both academic (about 100 partner universities) and about 250 public/private partners. At UL, being international is not a buzzword, it is our daily life.



¹⁵ <https://hpc.uni.lu/>

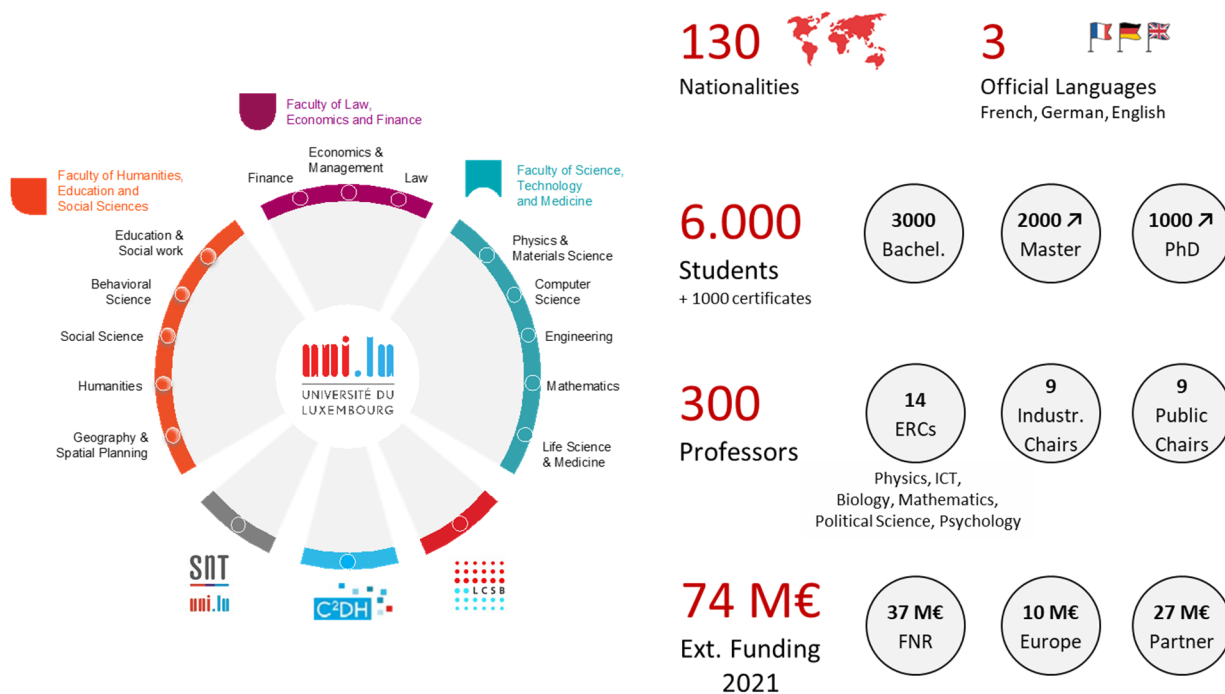
¹⁶ <https://wwwfr.uni.lu/ias>

¹⁷ https://wwwen.uni.lu/luxembourg_learning_centre

Alongside its three faculties, the Faculty of Science, Technology and Medicine (FSTM); the Faculty of Law, Economics and Finance (FDEF); and the Faculty of Humanities, Education and Social Sciences (FHSE), the University of Luxembourg has already established three Interdisciplinary Centres (IC): the Luxembourg Centre for Systems Biomedicine (LCSB) in the field of 'Medicine & Health', the Interdisciplinary Centre for Security, Reliability and Trust (SnT) in the field of 'Digital Transformation' and the Luxembourg Centre for Contemporary and Digital History (C2DH), dedicated to the contemporary history of Luxembourg and Europe (<https://www.uni.lu/>).

Interdisciplinary Centres within the University are large interdisciplinary research structures with their own academic staff, headed by a director, which deliver excellent research and societal relevance. With their competitive facilities, research infrastructures and long-term mission, they are attractive places to academics from around the world. ICs pursue a mandated mission and develop long-term strategies for research and innovation, by addressing both academic and societal challenges.

University of Luxembourg – in a nutshell (rounded numbers)



Living in Luxembourg

The Grand Duchy of Luxembourg, and in particular its capital, offers a truly cosmopolitan environment. Luxembourg is one of the wealthiest countries in the world and provides a stimulating mixture of modern culture and tradition. Out of a population of nearly 645,000, 47% are foreign residents coming from 170 different countries. Foreigners account for 70.6% of Luxembourg city's population.

In addition to excellent health, education (public, private and high-level international schools) and recreational services, the community affords a rich variety of cultural activities typical of a major university environment, including museums, music, art, and theatre. Multilingualism is an important aspect of life in Luxembourg. The country is about to become a five-language nation. Besides the official languages, French, German and Luxemburgish, English, Italian and Portuguese are frequently spoken. The working languages at the University are English and/or French and German.

The cost of living in Luxembourg is relatively high, but all residents in Luxembourg benefit from a comprehensive social security system. It covers family benefits (including a state subsidised day-care system and flexible models of full and part-time parental leave), unemployment insurance, work accident insurance, health care, old age and disability pensions as well as long-term care insurance. Employees and the self-employed are automatically enrolled in their respective state social security system and, in the majority of cases, benefits extend to family members, such as the spouse, children and other dependent family members in the household.

The local educational system is based on the three official languages which are French, German and Luxembourgish (Lëtzebuergesch), as well as English. This enables anyone who has been schooled in Luxembourg to do business with the surrounding countries (Belgium, France, and Germany) as well as with the international business community. Luxembourg airport, 15 minutes from Luxembourg City, provides easy access to more than 50 European cities, with several flights a day to London, Frankfurt, and Paris. High-speed trains are convenient options to access to Paris, Strasbourg, Lyon, Montpellier, and to high-speed lines to the west of France and the rest of Europe.

This allows quick and easy access to Europe's major economic centres. Luxembourg also offers excellent road and train transport. The national railway network is highly efficient and provides trouble-free connections to the major European railway routes. It is easy to travel to Paris, Frankfurt, and Brussels.