



Luxembourg National ERA Roadmap – LU targets 2020

1) Priority 1 – Effective national research systems

In recent years, legislation governing public research has been adapted and the establishment of multi-annual performance contracts (PC) with clear definitions of research priorities, goals and performance indicators, as well as regular evaluations and reporting schemes between the government and supporting and performing R&I organisations (e.g. the National Research Fund (FNR), the public research centres (CRP) and the University of Luxembourg and Luxinnovation) was crucial in improving governance. Organisations are now in their third cycle of PC covering the period 2014-2017.

With the latest legislative reform (2014), the FNR as well as the CRP saw their autonomy strengthened and their missions and structures revised.

In 2015, the Luxembourg Institute of Science and Technology (LIST) and the Luxembourg Institute of Health (LIH) were established by merging and integrating different institutions. The new organisations aim at reinforcing research structures, creating human and technological synergies and achieving critical mass.

National public R&D efforts are focussed on a limited number of priority areas which are addressed in the CORE research project funding programme of the FNR. There are specific provisions requiring the CRP and the University of Luxembourg to cooperate very closely to ensure complementarity and coherence in priority areas that relates to: Material and nanotechnologies, Sustainable development, ICT/HPC and Biomedicine.

Luxembourg is the first country to have had two OECD reviews of its research and innovation system, the first one published in 2007 and the second one published in 2016. The purpose of both reviews was an outside neutral expert assessment of the overall performance of the research system in order to receive recommendations on how government policies can contribute to improving the research system.

The ultimate goal of the improvements is to achieve increased effectiveness and efficiency of the research system.

Objectives:

- a) *Develop and implement a national Higher Education, Research and Innovation Strategy.*

This strategy is called to articulate the links between the investments in higher education and research and their likely impacts on the government's economic diversification and social well-being and sustainability goals.

Regular evaluation and impact assessment of the objectives and measures are an integral part of this national strategy, taking into account the evolving context.

Key aspects of a national strategy:

- responding to the needs of a diverse set of stakeholders, exploiting emerging opportunities, and ensuring the long-term sustainability of the research enterprise;
- consolidation of the system after a period of rapid growth and development;
- revisiting the national research priorities in order to consolidate critical mass and excellence and explore innovative ways to best implement them;
- utilising a broad conceptualisation of valorisation.

Indicators:

- *Increase the share of third party financing by 10%, for the public research performing organisations;*
- *Increase the share of H2020 funding by 30%, for the public research performing organisations.*

- b) *Improve the governance of public research*

Appropriate and good governance of public research is key for an effective research system.

In this context, the following actions will be taken:

- horizontal coordination across government: regular exchange between the Ministry of Higher Education and Research in charge of public sector research and the Ministry of the Economy in charge of private sector research;
- establishment of a formal coordination body between the University of Luxembourg, the CRP, the FNR and lead by the Ministry of Higher Education and Research;
- strengthening inter-organisational collaboration between the CRP and the University;
- further development of multi-annual performance contracts between the government and the research performing organisations as well as the agencies.

Indicators:

- *Increase in number of joint FNR funded research projects between the University of Luxembourg and the CRP by 20%.*
- *Increase in number of joint appointments of research staff: by 2020, all newly hired head of department / CEO of the CRP will have a professorship position at the University of Luxembourg.*

2) Priority 2 - Optimal transnational co-operation and competition

Priority 2(a) – Jointly Addressing Grand Challenges

Currently the FNR participates in 7 ERA-Net¹ in support of Joint Programming Initiatives (JPIs) with targeted topics and other multilateral projects such as Ambient Assisted Living (AAL), European and Developing Countries Trials Partnership 2 (EDCTP2), EUROCORES Scheme of the European Science Foundation (ESF), European Collaborative Research Projects ERCP (ESF), Materials World Network (MWN), NSF MATERIALS and EUROSTARS 2. In 2014, Luxembourg has as well announced its financial commitment to PRIMA (Partnership for Research and Innovation in the Mediterranean area) for a period of 10 years.

A number of cross-border initiatives promoting R&I linkages within the Grande Région have been developed recently, including: (i) the Université de la Grande Région, an inter-university consortium comprising six universities in the cross-border area; (ii) cross-border clusters, notably in the field of material sciences; and (iii) business-support activities (e.g. networking events).

In spring 2015 the FNR set up NCER-PD (National Centre for Excellence in Research on Parkinson's Disease). It represents a joint effort between four national partners (LCSB (Luxembourg Centre for Systems Biomedicine), CHL (Centre Hospitalier de Luxembourg), IBBL, LIH) and allows to join existing competencies to address a common research domain that is strategically important for Luxembourg.

Furthermore, Luxembourg is an active member of COST and Eurêka.

Objectives:

- a) Increase national participation in the third pillar (“Societal Challenges”) of Horizon2020.*
- b) Increase the number of bi-lateral partnerships with EU Member States*

Indicators:

- a) Increase the share of funding from participation in the third pillar of Horizon 2020 by 30%.*
- b) Increase the share of FNR financial support of transnational research programmes by 20%.*

Priority 2(b) – Make optimal use of public investments in research infrastructures

Luxembourg is a founding member of the ERIC DARIAH (2014), an infrastructuresupporting the digital research in the arts and humanities. Additionally, Luxembourg is participating in SHARE via the Luxembourg Institute of Socio-Economic Research (LISER) to respond to socio-economic challenges induced by the progressive aging of societies.

¹ M.ERA.Net, ERA-Net NORFACE, ERA-Net NEURON, ERA-SysApp, ERA-Net Transcan, ERA-CoSysMed, JNPD

Luxembourg has also joined in 2016 EATRIS, a medical and translational research infrastructure, and ELIXIR, an infrastructure for biological information data

There is also interest in participating in PRACE that aims at the setup of a pan-European 'supercomputing' infrastructure providing access to resources and service management and large-scale data processing.

Furthermore, the 'Digital Lëtzebuerg' strategy is part of the digital ERA, and aims to strengthen the position of the country in the field of ICT. In recent years, Luxembourg has experienced a significant increase in technology companies, either in the digital content sector, cloud computing, or Big Data. The national HPC project has become a strategic project on the European level with the application for the Important Project of Common European Interest label. The objective is to stimulate new HPC uses for both public and private research entities.

Finally, the geographical clustering of the University (rectorate/administrative services), FNR, LIST, LISER, Luxinnovation and the national business incubator Technoport start-ups in the *Cité des Sciences* at the former industrial site Belval will enable improved procurement and use of existing and new infrastructures.

Objective:

Main focus of new memberships in ESFRI research infrastructures in the domains of IT and Biomedicine.

Indicator:

Membership in 5 ESFRI research infrastructures.

3) Priority 3 – An open labour market for researchers

The University and the CRP have developed human resources policies, including open, transparent and merit-based recruitment measures, following the guidelines of the 'Charter and Code'. The law requires scientific positions at the University of Luxembourg and the CRP to be published and selection panels established.

Luxembourg has an active EURAXESS Job Portal where vacancies from public and private sectors are collected. The EURAXESS Portal offers as well complete and inclusive information that is specifically tailored to researchers interested in working in the country.

Applicants for the ATTRACT (specifically established to 'attract' outstanding young researchers to Luxembourg) and PEARL (for senior level) fellowships from the FNR are considered by selection panels made up of independent international experts. Other high level positions are considered by selection panels made up of both local and independent international experts. Applications for the AFR programme for PhD/post-doc grants are also reviewed by international experts. In Luxembourg, researchers generally receive employment contracts with full social security coverage. Finally, there are no legal, institutional or cultural barriers (at national/local level) to the openness and transparency of the national recruitment system.

Funding schemes are in line with the principles advocated in the 'European Charter for Researchers' and the 'Code of Conduct for the Recruitment of Researchers'. All public research institutions, including the FNR, are signatories of the Charter and the Code. The University and the Luxembourg Institute of Health (LIH) have been awarded the 'HR Excellence in Research' and have implemented HRS4R.

Furthermore, the University of Luxembourg applies the 'European Framework for Research Careers' as a career structuring mechanism to facilitate recognition of career stages and mobility in Europe in H2020.

The Inter Mobility Scheme of the FNR is dedicated to support both inward and outward geographical mobility as well as intersectoral (public/private) mobility.

Recently, the FNR introduced an innovative high quality PhD training scheme via the PRIDE programme awarding a block of non-nominative PhD grants to a consortium of supervisors regrouped around a coherent and competitive research programme. This allows the institutions to be more competitive, flexible and faster when recruiting the best talent.

Objective:

Improve intersectoral mobility (between private and public sectors).

Indicator:

Increase the number of doctorate holders moving from the public sector towards the private sector or vice-versa by 20%.

4) Priority 4 – Gender equality and gender mainstreaming in research

One of the priorities of the Luxembourg Presidency of the Council of the EU in 2015 was about advancing gender equality within the ERA. The SHE Figures 2015 show that the situation on gender equality within Europe is still suboptimal. Although Luxembourg is the country in Europe with the fewest women researchers within its researcher population (24%), it is experiencing a high annual growth rate of the female researcher community in the public sector with, however, a decrease in the business enterprise sector. It has to be noted that Luxembourg had only 16,5% female full professors in 2013 compared to a 21% EU average.

Several measures have been taken to improve the situation. By law, the administrative boards of the public research institutions and the FNR (for which the rule applies also to its scientific board) are required to have a minimum of 40% of board members to be of the underrepresented sex.

The performance contracts of the research institutions ask to strive for gender equality at all stages of the researchers' careers and especially for nominations to internal boards (governing/scientific). The performance contract of the national funding agency FNR sets an average target of underrepresented gender nominations of 40% (ATTRACT programme: attracting outstanding young researchers with high potential to Luxembourg) and 30% (PEARL

programme: attracting established and internationally recognised researchers from abroad) on a 4-year reference period, and the setting up of medium-term targets to improve the proportion of the underrepresented sex in its evaluation committees. The performance contract of the University of Luxembourg explicitly foresees to set up and implement a Gender Action Plan.

These initiatives will be further strengthened by focussing on two strategic objectives.

Objectives:

a) *Increase the percentage of the underrepresented sex in leadership and decision-making positions*

This objective aims at improving the current low share of women full professors and heads of departments/faculties.

The following measures will be taken:

- Monitoring sex representation at applicant and candidate level for key decision making positions such as full professors and heads of departments/faculties;
- All public research organisations to develop Gender Actions Plans, validated by the ministry of Higher Education and Research;
- Encouraging structural change within the research institutions including awareness raising initiatives and implementing gender sensitive recruitment and evaluation procedures;
- Monitoring potential impact of an improved gender balance in decision making on the research output indicators in the performance contracts;

Indicator:

Increase by 30% the share of female full professors at the University of Luxembourg.

b) *Apply gender mainstreaming in public research programmes*

The aim of this objective is to foster scientific excellence and research relevance by means of gender mainstreaming.

The following measures will be taken:

- Raising awareness among the research institutions on the impact on diversity, excellence and quality of research when taking into account the gender aspect;
- Considering the H2020 gender guidelines when applying a gender dimension to the composition of research teams, evaluation bodies and research content;
- Providing annual sex disaggregated statistics in research;

Indicator:

Implementation of the H2020 gender dimension criteria in at least one FNR programme.

5) ERA Priority 5 – Open Science and Open Innovation

Priority 5(a) – Scientific Knowledge Transfer (KT)

Luxembourg reinforced the link between higher education, research and innovation at the *Cité des Sciences* in Belval which host the University, the public research centers LIST and LISER, the national research fund FNR, the national innovation agency Luxinnovation and the national incubator Technoport. In recent years a *Luxembourg Cluster Initiative* has been set up around five thematic clusters which seek to accelerate the KT and good practices and to increase competitiveness and diversification of the Luxembourg economy. The FNR has developed the programme 'Knowledge & Innovation Transfer Support' (KITS) which assigns competitive funding to research institutions to attract specialists in the field of KT. The programme will contribute to the reinforcement of institutional units that endeavour to engage in the strategic integration and operational implementation of KT activities with the ultimate goal of generating economic and societal value through their research programmes. The University of Luxembourg offers a Master of Science in Entrepreneurship & Innovation which has the vocation of promoting entrepreneurial spirit in companies and creating innovative companies through a university training programme. The National Composite Centre-Luxembourg (NCC-L), operated by LIST together with 12 partner companies and launched beginning of 2016, has a particular focus on industry-oriented research and innovation projects.

Objectives:

a) Establishment of Technology Transfer Offices for all Luxembourg public research institutions

As Technology transfer activities are currently partly established across the various CRP and the Uni LU, the government is currently considering reinforcing TT activities within the TT structures of the various Luxembourg research organisations. It should be based on a multidisciplinary team of experts connected to a well-known European TT office.

b) Increase the public-private partnerships in doctoral and post-doctoral programmes with the AFR-PPP and CORE-PPP grant schemes

A particular emphasis will be placed on public-private partnerships in both research programmes (CORE-PPP) and doctoral and post-doctoral (AFR-PPP) programmes. Geographic and inter-sector mobility are taken into consideration.

The following measures will be taken:

- Implementation of a new law relating to the promotion of private RDI: A law providing significant incentives for companies of all sizes to cooperate with public and private entities, to innovate with products and services and to participate in the production process is currently in preparation.
- *Joint Research Programme*: The FNR will develop a partnership with the Ministry of the Economy with the objective of providing financial support for major, strategically

important public-private projects that seek to generate new knowledge to face the technological challenges of the future for partners and countries and to establish Luxembourg as an innovation hub.

- The preparation of a smart specialization strategy in which the emphasis is placed on diversification of the economy, while concentrating on a limited number of specific sectors such as industrial technologies, eco-technologies, logistics, biomedicine and ICT.
- The establishment of the Luxembourg Intellectual Property Institute (IPIL) which will coordinate the implementation of public policy and federate all involved entities, develop and provide support and assistance services to companies and public research institutions and develop and provide training programmes and promotional or awareness activities.
- Support of start-ups has continued via the establishment of the *ICT seed* fund, which is dedicated to innovative companies of the ICT sector.

Indicator:

Double the number of the public-private partnerships in the CORE-PPP and AFR-PPP programmes.

Priority 5(b) – Open access (OA)

As a member of ScienceEurope, the FNR endorsed a statement of principles that ‘advocate that research publications (resulting from projects funded via FNR schemes) should either be published in an OA journal or made available or be deposited as soon as possible in a repository’. In 2016 the share of scientific publications in OA journals is 61%.

The University promotes the ‘green’ way by its ORBiLu (OpenAIRE compliant) data repository. ORBiLu has various connections to networks which have been established to help increase the visibility of the publications it showcases. The University also plays the role of ‘facilitator’ (key node) of OA policy development for Luxembourg in PASTEUROA project. The Luxembourg Consortium (National Library (BnL), University, LIST, LIH) offers periodicals, books and access to numerous specialized databases. In the context of long-term preservation, the BnL offers public access via the internet to digital copies of previously inaccessible works.

The FNR has developed in 2016 a common national OA strategy in consultation with the different national research stakeholders.

Objective:

Implement the common national open access strategy for publications

Indicator:

Increase the share of publicly funded scientific publications in OA journals to reach 80%

6) ERA Priority 6 – International co-operation

The FNR programmes cover multiple aspects related to the internationalisation of public research, including mobility programmes to recruit foreign senior / junior researchers (PEARL, ATTRACT) and to give Luxembourg based researchers the opportunity to spend part of their career abroad or foreign researchers to come to Luxembourg (INTER mobility programme). With the INTER programme, the FNR offers a number of bilateral grants that strengthen research between Luxembourg and selected partner organisations (e.g. Japan (RIKEN), Singapore (University)) and issues regular calls for bilateral projects with the US National Science Foundation (NSF).

Luxembourg is also a member of the PRIMA consortium (cf. priority 2(b)).

Objectives:

- a) Focus on bilateral partnerships with US, Singapore, Japan, China and Israel (target countries)*
- b) Promote further research collaborations of the University and the CRP with third countries, e.g. by increasing the percentage of doctoral students from third countries as percentage of the total number of doctoral students Share of doctoral students from outside EU*

Indicator:

- a) Increase the number of co-publications with US, Singapore, Japan, China and Israel by 30%*
- b) Increase the share of doctoral students from third countries to reach 25%*