



Synthesis report on the evaluation of the Centres de Recherche Publics (CRPs) in Luxembourg

**Commissioned by the Ministry of Higher Education and Research
of Luxembourg**

Lucerne and Lausanne, 6th March 2023

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I Contracting authority

The Ministry of Higher Education and Research of Luxembourg

I Citation

Rieder, Stefan; Balthasar, Andreas; Haefeli, Ueli; Grosjean, Nicolas; Büchler, Chiara; Essig, Stefan; Thorshaug, Kristin (2023): Synthesis report on the evaluation of the Centres de Recherche Publics (CRP) in Luxembourg, Interface Policy studies Research Consulting, Lucerne and Lausanne.

I Project duration

January 2022 – March 2023

I Project reference

Project number: P21-095

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1. Introduction

The Grand Duchy of Luxembourg operates three non-university public research and technology institutions defined as Centres de Recherche Publics (CRPs): the Luxembourg Institute of Science and Technology (LIST), the Luxembourg Institute of Health (LIH) and the Luxembourg Institute of Socio-Economic Research (LISER). The Ministry of Higher Education and Research (MESR) in Luxembourg mandated Interface Policy Studies Research Consulting, Switzerland to organise and lead an evaluation of the performance of the CRPs in Luxembourg in the period from 2018 to 2021.

The overarching tasks of the CRPs are defined in the law of 3rd December 2014 (CRP law).¹ As stipulated in the law, the CRPs' mission is to carry out targeted fundamental and applied research activities as a necessary support for research, development and innovation activities and to transfer knowledge and technology to the public and private sectors. The detailed activities of the CRPs are defined in four-year performance agreements between the Ministry of Higher Education and Research (MESR) of Luxembourg and the individual CRPs.

This synthesis report presents a general assessment of the entire CRP research sector in Luxembourg and formulates recommendations for the future development of the CRPs. The report is based on the findings in the three institute reports and the 11 department reports.

The report is structured into three parts. This summary details the main findings and recommendations of the evaluation. This chapter presents the evaluation's objectives and methodological approach. Chapter 2 presents the main findings at the system level, considering the CRP's development and positioning, organisation, output and impact. Chapter 3 presents the overall assessment and the recommendations.

1.1 Objective of the evaluation

The MESR mandated Interface Policy studies Research Consulting, Switzerland, to organise and lead the evaluation of the CRPs' performance in the period from 2018 to 2021. The overarching objective of the evaluation is to assess the three CRPs and their research and transfer (innovation) performance. This can be broken down into three sub-areas, namely input, output and outcome/impact:

- The *input* includes the preconditions for the research conducted, such as strategies, financial and human resources, infrastructure, organisation and external collaboration.
- The *output* includes the research performance, exemplified through research and innovation results and their dissemination.
- The *outcome/impact* refers to the medium- and long-term effects as well as the relevance of the output on areas such as science, society, economy and public administration/politics.

The three sub-areas are examined at the level of the departments of the three CRPs. Each department evaluation is summarised in a *department report*. Subsequently, an aggregation of the departmental evaluations is carried out, resulting in individual *institute*

¹ Loi du 3 décembre 2014 ayant pour objet l'organisation des centres de recherche publics: <https://legilux.public.lu/eli/etat/leg/loi/2014/12/03/n2/jo>, last accessed: 24.11.2022.

reports. Based on the department and institute reports, the entire sector of CRP research in Luxembourg is evaluated in a *synthesis report*. Through the identification of the CRPs' strengths and weaknesses as well as the opportunities and challenges, the aim is to contribute to improving the input of the CRPs in order to optimise their research and transfer performance.

1.2 Methodological approach

The evaluation is based on a combination of methodological approaches:

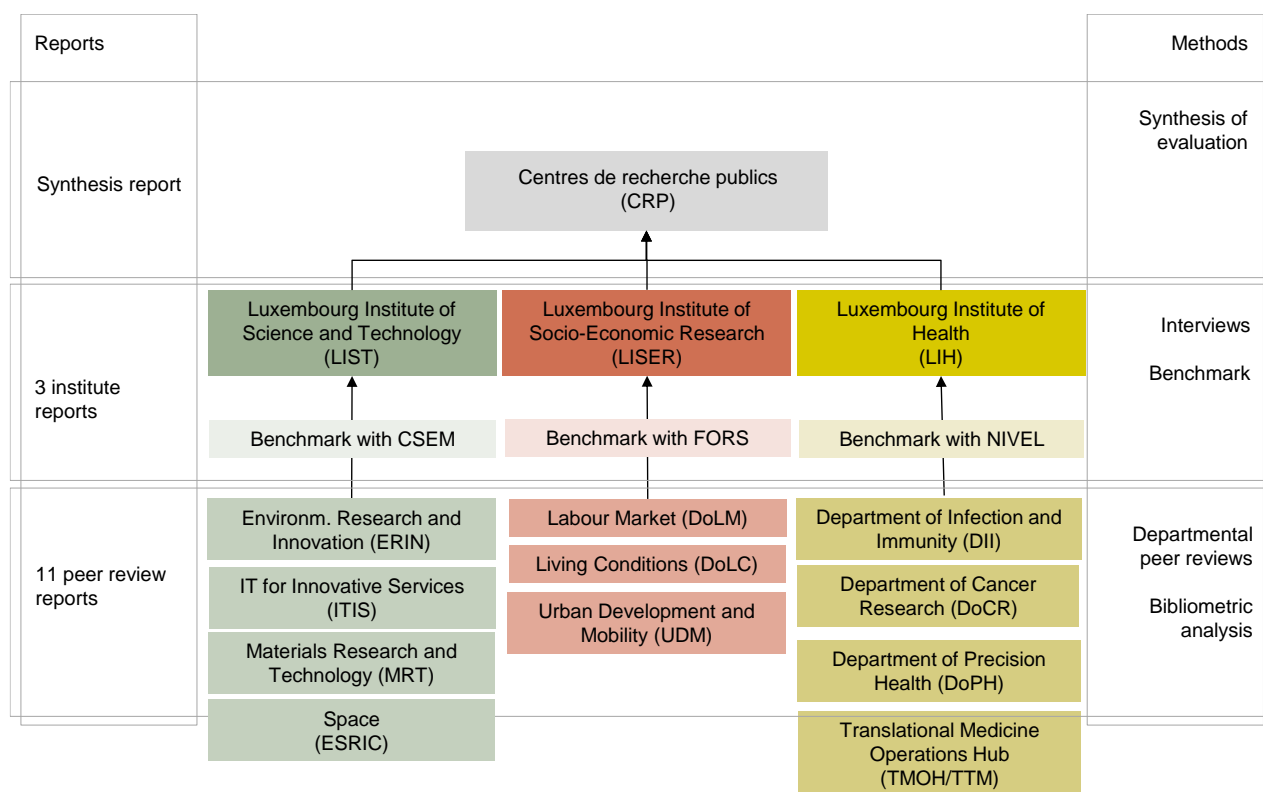
- *Departmental peer reviews*: For each department within the three CRPs, a peer review was conducted (a total of 11 peer reviews). The peer reviews consisted of a self-assessment report written by the CRPs and the departments and a hearing at the departments in August/September 2022. The hearings were organised and moderated by Interface and carried out by group of experts working in the departments' research fields. Each hearing comprised a presentation by the department, a group discussion of the self-assessment report and several individual and group interviews. These included interviews with representatives from the management team and members of the research staff as well as clients.
- *Bibliometric analysis*: A bibliometric analysis was carried out in order to determine the positioning of the three CRPs in comparison to their international academic peer community. The analysis was carried out at the level of the departments and was based on the academic publications of the CRPs between 2018 and 2021 as well as on a collection of publications that served as benchmarks.
- *Governance interviews*: In order to gather information on the internal and external governance of the three CRPs, interviews were carried out with representatives from the CRPs' government commissioners, boards of directors and executive management.
- *Benchmark analysis*: Finally, a benchmark analysis was carried out to assess selected aspects of the CRPs in comparison with international research and technology organisations of comparable size and similar thematic orientation. The analysis focused on the strategy and governance structures as well as the research and transfer performance. To this end, document analyses and interviews with representatives of the organisations were conducted.

Where useful and possible, the results were compared with the evaluation of the period 2014–2017, conducted by the company Technopolis.²

Figure D 1.1 offers an overview of the elements of the evaluation, the methods used and the reporting.

² All evaluation reports since 2017 are available on the following website:
<https://mesr.gouvernement.lu/fr/dossiers/dossiers/rapports-d-evaluations.html>, last accessed: 24.11.2022.

D 1.1: Overview of the evaluation process



Source: Interface.

2. Evaluation results

2.1 Development and positioning of the CRPs

Table D 2.1 gives an indication of the size of the three CRPs based on their expenditures and human resources. LIST is the largest of the CRPs in terms of financial and human resources, accounting for about 50 per cent of the government's CRP budget in 2021. LIH receives about one third of the total CRP funds, while LISER, as the smallest of the three CRPs, receives around 15 per cent of the CRP budget.

D 2.1: Overview of key resource figures for the CRPs (2021)

	<i>LIST</i>	<i>LISER</i>	<i>LIH</i>	<i>Total</i>
Expenditures (thousand €)	78,758	23,501	52,935	155,194
Human resources (FTE*)	632	167	400	1,199

Source: Self-assessment reports of LIST, LISER and LIH 2022. *FTE: Full-time equivalent.

The CRPs in Luxembourg have experienced financial growth in recent years (see table D 2.2). Overall, the revenues of the three CRPs have increased by around 26 per cent since 2014. This is in part due to the Grand Duchy of Luxembourg's declared political will to increase its investments in education and research.³ As a result, government funding for the three CRPs has also increased. Comparing the two evaluation periods of 2014–2017 and 2018–2021, the average increase in government funding in both periods is around 21 per cent. Comparing the absolute amount of total government funding for all CRPs at the beginning and end of the two periods, government funding has increased from 77 million euros in 2014 to 105 million euros in 2021 (an increase of 36 per cent).

D 2.2: Financial development of the CRPs

	<i>LIST</i>			<i>LISER</i>			<i>LIH</i>		
	<i>2014–2017</i>	<i>2018–2021</i>	<i>Change %</i>	<i>2014–2017</i>	<i>2018–2021</i>	<i>Change %</i>	<i>2014–2017</i>	<i>2018–2021</i>	<i>Change %</i>
Resources (million €)	64.97	75.83	+16	17.99	21.16	+17	39.1	57.77	+47
Block grant (million €)	40.19	46.51	+15	10.47	11.76	+12	28.32	37.45	+32

Source: Self-assessment reports of LIST, LISER and LIH 2022; annual reports; performance agreements.

According to the CRP law, the CRPs have a dual mission; to conduct problem-oriented fundamental research and application-oriented research for the private and public sector. Hence, the CRPs' position in Luxembourg's research landscape sits between fundamental research and training at the University of Luxembourg on the one side and application-

³ The government of Luxembourg has set a target to increase expenditure on research to one per cent of GDP. See «Programme gouvernemental 2018–2023, Enseignement supérieur et Recherche», <https://mesr.gouvernement.lu/de/le-ministere/programme-gouvernemental.html>, last accessed: 24.11.2022.

oriented research conducted by companies and public organisations on the other. However, the position of the CRPs has changed in recent years. In the scientific literature, Ruttan's concept provides a suitable approach to describe this development.⁴ Ruttan's concept is two-dimensional and distinguishes the following four categories:

- *Curiosity-inspired fundamental⁵ research (Bohr's quadrant)*: The work motivation is simply scientific curiosity, even if results may later lead to technological improvement. Supporters might be private foundations, universities and governments. Research questions are formulated by the researchers themselves, based on their own scientific curiosity.
- *Applied research and industry-sponsored technology development (Edison's quadrant)*: Activities need to be economically viable as they are financed by the private sector, using both profits from previous activities and the expectation of future profits. Research questions mainly derive from the industry.
- *Use-inspired fundamental research (Pasteur's quadrant)*: Both private and public organisations may support such activities, as they are expected to solve problems of great economic and social significance. Research questions are formulated by the researchers themselves, but are strongly oriented to the needs of society.
- *Government-sponsored applied research and technology development (Rickover's quadrant)*: For this type of activity, government support is needed, as market institutions are too weak to generate private investment. Research questions are defined by the Ministries or other public administration bodies.

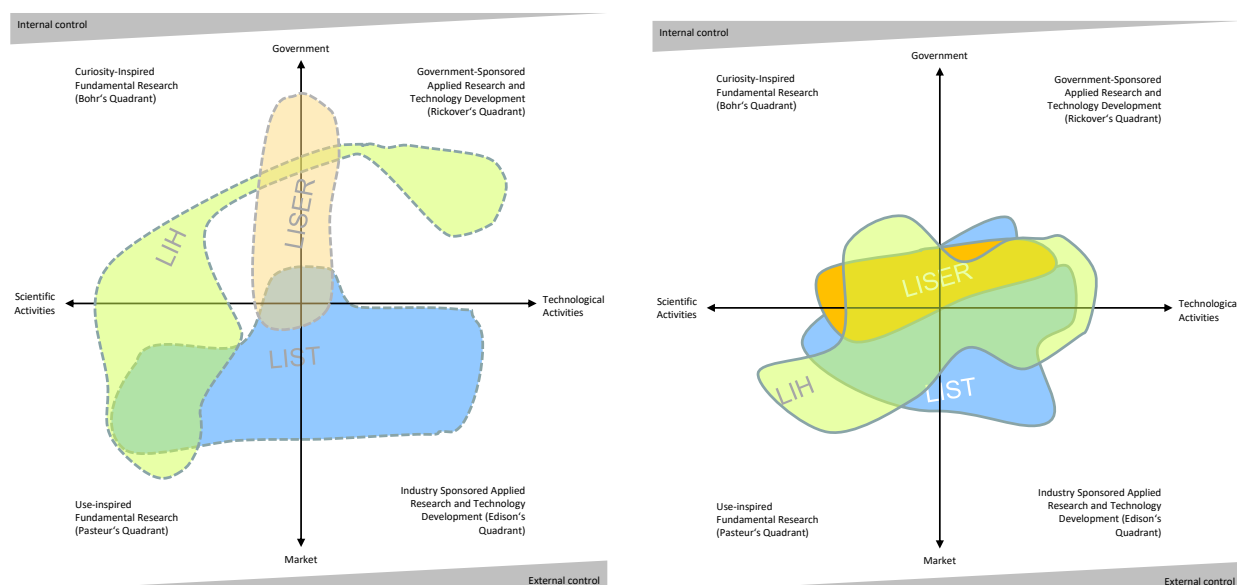
In the 2013 evaluation, the position of the CRPs and their departments in the research landscape was described using Ruttan's concept.⁶ A comparison between the position of the CRPs ten years ago and today can show their development. It should be noted that the position of the CRPs is based on the evaluation results and is not exact in all aspects. Furthermore, the position is likely to be somewhat different depending on the perspective used. The comparison between the situation in 2013 and the situation in 2021 is illustrated in figure D 2.3.

⁴ Ruttan, V. (2001): Technology, growth, and development: An induced innovation perspective. New York: Oxford University Press (534–599); Kölbel, M (2008): Wissensmanagement in der Wissenschaft. Wissenschaftsforschung Jahrbuch 2004: 89–101.

⁵ Ruttan (ibid.) uses the term "basic" research.

⁶ Rieder, S.; Dolder, O.; Inauen, M. (2013): Synthesis report on the evaluations of research units in Luxembourg in 2010, 2011 and 2012, Lucerne.

D 2.3: Position of the CRPs in the research landscape (2013 on the left, 2021 on the right)



Comment: The figure is based on Ruttan's concept (Ruttan 2001). The CRPs' position is based on the position of their departments in the grid.

The following two developments emerge from the comparison:

- Firstly, the substantive position of the CRPs at the interface between fundamental and applied research has strengthened. This is reflected in the fact that the areas of the CRPs in the diagram have become smaller and more concentrated. On the one hand, this development is due to structural changes in the CRPs; the creation of LIST, reduced the number of departments from six to three, and the consolidation at LIH also led to a concentration of research areas. On the other hand, it illustrates that the CRPs and their departments have adapted and focused their strategies since 2014.
- Secondly, the CRP's position has shifted more towards fundamental research (especially problem-oriented research). This is a necessary prerequisite for being able to offer applied research for companies and administrative bodies.

Overall, the evaluation team view the development described as positive; the trend towards problem-oriented fundamental research is desired by the MESR, stipulated in the CRP law and promoted by the specifications in the performance agreements (e.g. strategic objectives, performance indicators). In this respect, the CRPs fulfil their dual mission. Additionally, the evaluation results show that the CRPs' research is becoming more thematically focused. This indicates that the CRPs have addressed the recommendations in the 2014–2017 evaluation and implemented corresponding measures. This assessment is supported by the results of the departmental peer reviews, in which the strategies of the departments are viewed as appropriate and consistent.

Despite these positive results, the evaluation shows that the balance between the different types of research need to be regularly re-examined. For example, in some LISER departments and research groups, a strong trend towards fundamental research can be observed. As a result, applied research could suffer. At LIH, some departments are increasingly positioned at the interface between the different types of research, while other departments and research groups are strongly embedded in curiosity-inspired laboratory research. In the case of LIST, some departments and research groups show an opposite

development, with departments moving away from fundamental research. There is also a risk in some departments that their research agendas are too broad.

2.2 Organisation of the CRPs

A clear and efficient organisation is an important prerequisite for good research. In the evaluation, five organisational aspects were regularly addressed at the level of the departments and the CRPs. These aspects are discussed in the following paragraphs.

2.2.1 Organisational structure

All three CRPs have changed their internal structures during the evaluation period, in some cases significantly. At LISER, the classic hierarchical structure has been replaced by a flat hierarchy based on projects and interdepartmental programmes. At LIST, cross-cutting themes have been defined in all departments, linking the various research groups. Additionally, an organisational blueprint has been introduced and implemented in all RDI departments. At LIST, a new department has been founded, thus creating a further thematic focus. At LIH, the Integrated Biobank of Luxembourg (IBBL) has been integrated into the CRP and the departments have been restructured. These organisational changes have been accompanied by turnover in the management positions of the departments. At LISER, for example, all departmental heads were newly appointed shortly before or during the evaluation period. At LIST, there were two changes in one department.

The restructuring measures were explained in a comprehensible way during the evaluation. The objectives range from stronger cooperation between departments to increased knowledge and technology transfer. In the view of the evaluation team, the restructurings have many benefits. However, there is evidence in all three CRPs that the new organisational structures may lead to more complexity. This complexity is heightened by the difficult-to-understand nomenclature of the organisational structures. In addition, most of the structural changes have yet to be fully implemented. From the evaluation team's perspective, it is therefore important to closely monitor the implementation of the new structures, reduce complexity where necessary and simplify the nomenclature. These measures will facilitate both internal and external communication. The benchmark institutions generally have simpler structures, which is an indication that simplification is possible.

2.2.2 Human resources

Overall, the CRPs have highly qualified and motivated staff. According to the evaluation results, the level of staff satisfaction with working conditions is high. There is, however, some dissatisfaction with the available infrastructure and the staff structure (e.g. the ratio between permanent and non-permanent staff). The issue of career management is a critical one in all CRPs, especially for young researchers. The existing staff appraisals should therefore be further developed and systematised with regards to career management. Career management or planning does not only refer to development within the institution, but it is also a matter of supporting people who need to continue their careers outside the CRP and aiding their transition to business, administration or other institutions.

2.2.3 Financial resources

The three CRPs are well-funded. The benchmark institutions either have higher government funding (FORS) or considerably lower government funding (CSEM and NIVEL). The distribution of government funding is a disputed issue in all three CRPs. At two of the three institutes (LIST and LISER), the block grant is used ex-post by the executive management to finance infrastructure, overhead and selected projects. LIH has introduced ex-ante distribution. This ex-post procedure is not fundamentally wrong but

the question arises as to whether additional incentives could be created in the block grant distribution. This question was raised in the 2014-2017 evaluation and still needs to be resolved.

According to the evaluation team, the CRPs could consider dividing the government funds ex-ante into three parts. The largest part could remain at institute level to cover infrastructure costs, overhead and strategic projects. A smaller part could go to the departments as a global budget. These funds could be used for strategic projects in line with the strategies of the departments. The smallest part could be incentive-based, with researchers applying for these funds with project ideas. Whether this or another concept is applied is not decisive. What is important is to increase the use the block grant for strategic projects, as recommended in the 2014-2017 evaluation, and to increase the incentive effect.

2.2.4 Relationship with the University of Luxembourg and between the CRPs

In the Luxembourg research landscape, the activities of the CRPs are closely linked to those of the University of Luxembourg. From a strategic point of view, the CRPs should complement the University's activities and at the same time ensure close collaboration. The latter is necessary, given the small size of the country and to ensure efficient use of government research investments. Overall, the evaluation shows an appropriate division of labour between the University of Luxembourg and the CRPs, and a well-functioning cooperation. This is particularly true for LISER. All CRPs are linked to the University of Luxembourg through joint projects, co-professorships or teaching. All three benchmark institutions also maintain close cooperation with the universities around them and see cooperation as important for their activities. The cooperation of the benchmark institutions with universities is often closer than that of the CRPs, especially with regard to the establishment of joint professorships (e.g. Nivel has no less than 13 joint professorships with universities across the country).

The evaluation identifies room for improvement at LIST and LIH. At LIST, some departments work well with the University's institutes, while in other areas, cooperation could be improved (especially in engineering and computer science). Some of the difficulties are related to overlapping research areas, others to the presence of both institutions in commissioned research. The recommendations from the evaluations of the LIST departments regarding its relationship with the University are of great importance and should be implemented as soon as possible. For LIH, it is recommended to intensify cooperation in the teaching and career development of staff.

The CRPs have a common history and a shared focus. Therefore, cooperation between the CRPs will continue to be very important in the future. Cooperation already exists in various areas and can be strengthened both thematically (e.g. health, environment) and in the area of knowledge transfer. For knowledge transfer, the establishment of a joint TTO office of the CRPs is already being planned. From the evaluation's point of view, this effort is to be assessed very positively and should be pursued further in the next evaluation period.

2.2.5 Governance

During the evaluation of the CRPs, special attention was paid to the issue of governance. Both external governance (relationship between the CRPs and the MESR) and internal governance (relationship between the Board of Directors, Executive Management and staff) were examined. The results for all CRPs can be summarised as follows:

With regard to external governance, the CRPs are more strongly steered by the state funder than is the case for the benchmark institutions. This is illustrated by the performance agreements, where the agreement between the MESR and the CRPs is more detailed than the agreements of the benchmark institutions. For example, the agreements of the benchmark institutions do not include quantitative performance indicators. In addition, the MESR has an observer role on the Boards of Directors of the CRPs, which is not the case with the benchmark institutions. Finally, the legislator can directly influence the CRPs by amending the CRP law. This is not possible with the benchmark institutions, which are organised as independent foundations or not-for-profit companies. This comparatively strong control has proven successful, however. The MESR and the CRPs' Boards of Directors and Executive Management report that the exchange between the partners is well established and has proven to be useful. The imbalance between the three parties observed in the 2014–2017 evaluation is no longer in evidence. The internal governance of the CRPs has also proven successful. A primary weakness here is the distribution of the block grant. This aspect has already been discussed in section 2.2.3.

Overall, there is room for improvement in two areas of governance as follows:

- The first issue concerns the lack of external advisory boards in the CRPs. The establishment of such advisory boards was recommended in the 2014–2017 evaluation. Efforts to remedy this are underway and should be continued.
- A second issue concerns the key performance indicators in the performance agreements. The indicators have mostly been achieved or surpassed in the past. In the view of the evaluation team, the indicators serve as reporting and monitoring tools rather than as incentive instruments in the sense of targets. It is therefore recommended that more ambitious indicators are introduced. This was already noted in the 2014–2017 evaluation. In addition, the indicators in the performance agreements do not sufficiently reflect the societal impacts of the CRPs. The CRPs have responded to this by including additional indicators in the performance agreements (partly as of 2018, partly as of 2022). These efforts should be pursued further.

2.2.6 Infrastructure

Overall, the CRPs have access to good infrastructure. This applies to the general office facilities, the laboratories and the technical equipment. However, all three CRPs have specific issues concerning the infrastructure. At LIH, some of the buildings are (temporarily) unavailable, which severely hinders the work of one department. At LIST, the move into and equipping of a new building has been delayed, and the institute representatives perceive the implementation of a long-term infrastructure strategy as uncertain. At LISER, there is a partial lack of office space. These infrastructural constraints hinder the development of the CRPs and cannot be solved by the CRPs alone.

2.3 Output and impact of the CRPs

2.3.1 Output

Overall, the CRPs demonstrate good to very good scientific performance, both in qualitative and quantitative terms (e.g. number of scientific publications, volume of reviewed publications and publications per researcher). The bibliometric analysis shows that the field weighted citation impact (FWCI) for all CRPs is above the value of one. This means that citations of the CRPs' publications are above the average value of comparable research institutions in the same research field. An above-average FWCI can be considered an indicator of successful publication activity. As shown in table D 2.4, LIH has the strongest performance in the period from 2018 to 2021. LISER also performs very well, with its increased focus on academic research in recent years reflected in its output

(a trend also visible in the case of LISER, see section 2.1). At LIST, the quality and quantity of academic outputs have remained stable over time and are at a good level.

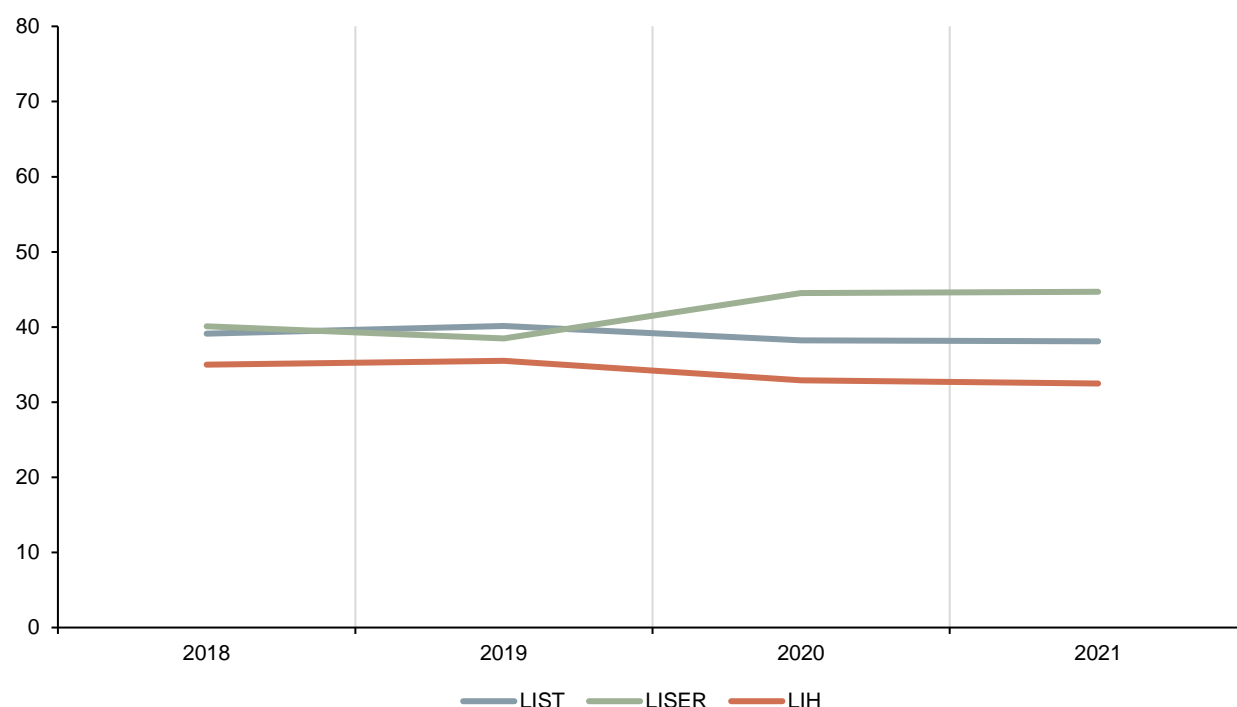
D 2.4: Comparison of main indicators from the bibliometric analysis (2018–2021)

	<i>LIST</i>	<i>LISER</i>	<i>LIH</i>
FWCI*	1.27	1.42	3.87
Outputs in top (10%) citation percentiles	13.4%	16.9%	31.6%
Publications in top (10%) journal percentiles	43.3%	41.3%	48.4%
Number of publications	1,456	372	991

Source: Bibliometric analysis. *Field weighted citation impact: Number of citations received by publications, divided by average within the same Scopus Subject field. Values >1 indicate above average within field citations, values <1 indicate below average.

Another indicator often used to assess output is the amount of third-party funding raised by research institutes. The third-party funding of the CRPs differs considerably; the share of third-party funding at LISER in 2021 was 44 per cent, at LIST it was 38 per cent and at LIH 32 per cent. Figure D 2.5 shows the development during the evaluation period. The figures for LISER show a slight upward trend, while the values for LIST and LIH have remained roughly the same over the period.

D 2.5: Share of third-party funding for each CRP (2018–2021)



Source: Self-assessment reports of LIST, LISER and LIH 2022. The LIH data excludes the extraordinary contribution to the 2020 block grant for Covid-19 projects.

In the 2014–2017 evaluation, it was pointed out that the CRPs did not reach the overall third-party funding target of 40 per cent of total resources. In 2021, this target was achieved by LISER (44%), narrowly missed by LIST (38%) and clearly missed by LIH (32%). Increasing third-party funding thus remains a challenge that the CRPs have to face, especially LIH. The MESR has introduced a “*bonus institutionnel*” in the performance agreements; a financial institutional bonus linked to the CRPs’ performance and success in the EU Framework Programmes for Research and Innovation. The bonus has been created to encourage the CRPs to apply for more third-party funding from the EU. The evaluation team assesses the incentive provided by the bonus as positive.

2.3.2 Outcome and impact

In the evaluation team’s opinion, the CRPs’ activities have a clear impact on Luxembourg’s economy and society. The CRPs have long-standing links with stakeholders in the economy and administration and provide services that are in demand and highly appreciated. The following outputs of the CRPs illustrate their contributions: LIST carries out research projects with companies from Luxembourg and provides high-quality implementation services for the administration, especially in the fields of environment and climate. LIH cooperates closely with stakeholders in the health sector, especially with hospitals. LISER supports the work of public administrations in various areas such as education, the labour market and spatial development with research results and data from specific surveys. During the Covid-19 pandemic, all three CRPs were able to provide short-term services and support that contributed to the management of the pandemic. LIH, in particular, provided extensive services to the public sector.

With regard to outcome and impact, two points are considered important for all CRPs:

- Firstly, a balance must be found between fundamental and applied research. In some CRP departments, there is a strong trend towards fundamental research. In other departments, the trend is in the other direction. Balancing the positioning between fundamental and applied research is thus an ongoing task for the CRP, as it influences their impact potential.
- Secondly, further efforts are needed to optimise the transfer of knowledge into practice. This includes strengthening the visibility of the CRPs’ research output, promoting the establishment of transfer offices and creating formats for reaching the population. In addition, ongoing efforts to create indicators for monitoring the CRPs’ impact on economy, administration and society should be further pursued (see section 0). The external evaluation that LISER has carried out on societal impact is, in our view, the right way forward.

3. Overall assessment and recommendations

3.1 Overall assessment

The development of the CRPs over the last ten years has been positive in terms of growth and performance. This development has also continued during the evaluation period (2018–2021). Interface's evaluation team would like to draw particular attention to the following four aspects:

- Over time, the *profile* of the CRPs in the research landscape has been focused and sharpened. Today, the CRPs hold a sensible bridging position between fundamental and applied research. This development has been accompanied by an increased focus on core research areas. The profile building process is still ongoing and has not progressed to the same extent in all CRPs and in all departments.
- Overall, the CRPs demonstrate *output* of good quality and quantity. Their academic achievements in the form of publications, in particular, are respectable and are above those of comparable institutes abroad, as measured by selected bibliometric indicators.
- Through their research activities, the CRPs are able to have a substantial *impact*. They provide useful products and services to businesses and administrative bodies in Luxembourg and abroad. The CRPs benefit from the fact that they are the only institutions in various sectors that can provide certain services in Luxembourg. They are thus able to make an important contribution to economy and society in Luxembourg. This impact could be further enhanced by improving the visibility of the CRPs' research activities and results, and by increasing transfer efforts.
- The *governance structures* in the triangle between MESR, the Board of Directors and the Chief Executive Officers (CEOs) are firmly established and have proven their worth. The steering instruments used, mainly the performance agreement, play an important positive role in the exchange between the MESR and the CRPs.

In addition to aspects concerning profile, output, impact and governance, the evaluation assessed various *organisational aspects*. During the evaluation period, there were several organisational restructurings as well as turnover in management positions within the CRPs. Although the reasons for these changes are understandable, it should be noted that the restructurings have required considerable efforts on the part of the CRPs. In addition, the complexity of the structures seems to have increased. In terms of human resources, the evaluation has clearly identified that the CRPs' staff members are highly motivated and committed to the mission of the institutions. One weakness, however, is found in the career development support for younger researchers. In terms of financial resources, the CRPs have benefited from the public sector's willingness to invest and have been able to increase their third-party funding. The distribution of the governmental block grant across the CRPs is an issue that should be given more attention.

3.2 Recommendations

Based on the evaluation, the evaluation team formulates the following recommendations (the first recommendation concerns the strategic positioning of the CRPs, while recommendations two to seven concern organisational aspects):

I Recommendation 1: Regular reviews of the positioning between fundamental and applied research

In the evaluation team's opinion, the dual mission of the CRPs (fundamental and applied research) pushes the institutions to regularly review and adapt their position and activities. Their development over the last ten years confirms this, as the foci and activities of the CRPs have changed, in some cases considerably. The positioning of the departments within the CRPs has also changed to some extent, and while some departments tend more towards fundamental research, others gravitate towards contract research.

- The first part of this recommendation is addressed to the CEOs and the Board of Directors of the CRPs. It is recommended that the CRPs review the positioning of their departments and the CRP as a whole at regular intervals as part of their strategy development process. A prerequisite for this is a clear positioning of the CRP between fundamental and applied research, as also addressed in the 2014–2017 evaluation. Linear concepts based on a continuum between fundamental research and innovation in the market are often used to determine the positioning of an institute (e.g. the "technology readiness level" concept). In the evaluation team's opinion, non-linear concepts better take account of the social sciences and are therefore more suitable for assessing the positioning of CRPs (see section 2.1).
- The second part of the recommendation is addressed to the MESR. It is recommended that the positioning required by the government for each CRP be more explicitly stipulated in the performance agreement negotiations.

I Recommendation 2: Further development of the distribution of the block grant

The distribution of the block grant was a recurring topic in both the 2014–2017 and the 2018–2021 evaluations. The evaluation team recommends that the block grant be distributed ex-ante for all CRPs, as this would improve the strategic and incentive-based use of the funding. A distribution of the block grant across three areas could be used as a starting point for discussions on a new allocation principle:

- One part of the block grant (the largest part) could remain at institute level to finance central infrastructures and services as well as strategic projects.
- One part of the block grant could be allocated to the departments as a global budget for free use on project funding.
- One part (the smallest part) could be allocated on an incentive basis through an internal competition on project ideas.

I Recommendation 3: Further improvement of career development

In the evaluation team's opinion, career development is crucial for recruiting, retaining and developing excellent staff. Successful activities have been developed in all three CRPs in this regard. However, PhD students, and postdoctoral researchers in particular, express a need for clarification of their career prospects and opportunities both within and outside the CRPs. It is therefore recommended that more attention be paid to this aspect of personnel management. In particular, career planning for junior staff should be more actively pursued.

I Recommendation 4: Consider simplification of organisational structures

The organisational structures of almost all CRPs and departments have been altered during the evaluation period. The reasons for these changes were plausibly explained in the interviews with the CRPs' management and in the departmental peer reviews. In the evaluation of the departments, some of the experts expressed concerns about the complexity and difficult-to-understand nature of the new organisational forms (including the nomenclature of the departments). It is therefore recommended that the CRPs consider

ways of simplifying the structures wherever possible to ensure that they are clear and comprehensible.

I Recommendation 5: Establish external scientific advisory boards

The benchmark comparison has shown that external scientific advisory boards are an integral part of the governance of scientific institutions. The 2014–2017 evaluation recommended that the CRPs establish such boards, and efforts are already underway at some CRPs. The evaluation team recommends that these efforts continue. The following suggestions on how to structure the advisory boards may be helpful:

- The advisory boards should be composed of external experts from the subject areas of the CRPs’ departments. For each subject area, two or three external experts could be appointed. Thus a CRP advisory board would consist of six to twelve members.
- The tasks of the advisory boards could include advising on the strategic development of the departments and the CRP as a whole. The advisory board could also be responsible for reporting to the Board of Directors on the strategic development of the departments and the CRP and, if necessary, for developing proposals.

I Recommendation 6: Joint planning of infrastructure availability

Overall, the CRPs have access to good infrastructure. However, some issues are identified with regards to the availability of the necessary space for offices, research infrastructures (e.g. laboratories) and equipment. These issues cannot be solved by the CRPs alone. It is therefore recommended that the MESR, together with the CRPs and the property developers, develop an infrastructure plan that gives the CRPs certainty as to when additional infrastructure will be available.

I Recommendation 7: Develop more ambitious key performance indicators

In the past, the CRPs have generally been able to achieve or even surpass the key performance indicators set out in the performance agreements. In the view of the evaluation team, the indicators serve mainly as reporting and monitoring tools and only to a lesser extent as incentives. Thus, the negotiation of more ambitious indicators for all CRPs is recommended.

Appendix

A 1 List of evaluation reports

I LIST

Rieder, Stefan; Grosjean, Nicolas; Büchler Chiara (2023): Report on the evaluation of the Luxembourg Institute of Science and Technology (LIST), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Rieder, Stefan; Büchler, Chiara (2023): Report on the evaluation of the IT for Innovative Services department at the Luxembourg Institute of Science and Technology (LIST), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Grosjean, Nicolas; Büchler, Chiara (2023): Report on the evaluation of the Department for Environmental Research and Innovation (ERIN) at the Luxembourg Institute of Science and Technology (LIST), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Rieder, Stefan; Büchler, Chiara (2023): Report on the evaluation of the European Space Resources Innovation Centre (ESRIC) at the Luxembourg Institute of Science and Technology (LIST), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Rieder, Stefan; Büchler, Chiara (2023): Report on the evaluation of the Materials Research and Technology department at the Luxembourg Institute of Science and Technology (LIST), Interface Policy studies Research Consulting, Lucerne and Lausanne.

I LISER

Rieder, Stefan; Haefeli, Ueli; Thorshaug, Kristin (2023): Report on the evaluation the Luxembourg Institute of Socio-Economic Research (LISER), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Rieder, Stefan; Thorshaug, Kristin (2023): Report on the evaluation of the Department of Living Conditions (DoLC) at the Luxembourg Institute of Socio-Economic Research (LISER), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Haefeli, Ueli; Thorshaug, Kristin (2023): Report on the evaluation of the Department of Urban Development and Mobility (UDM) at the Luxembourg Institute of Socio-Economic Research (LISER), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Haefeli, Ueli; Thorshaug, Kristin (2023): Report on the evaluation of the Department of Labour Market (DoLM) at the Luxembourg Institute of Socio-Economic Research (LISER), Interface Policy studies Research Consulting, Lucerne and Lausanne.

I LIH

Grosjean, Nicolas; Balthasar, Andreas; Essig, Stefan (2023): Report on the evaluation the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Balthasar, Andreas; Essig, Stefan (2023): Report on the evaluation of the Department of Infection and Immunity (DII) at the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Balthasar, Andreas; Essig, Stefan (2023): Report on the evaluation of the Department of Cancer Research (DoCR) at the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Grosjean, Nicolas; Essig, Stefan (2023): Report on the evaluation of the Department of Precision Health (DoPH) at the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.

Grosjean, Nicolas; Essig, Stefan (2023): Report on the evaluation of the Translational Medicine Operation Hub (TMOH) and Transversal Translational Medicine Unit (TTM) at the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.