

OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004 COUNTRY RESPONSE TO POLICY QUESTIONNAIRE

LUXEMBOURG

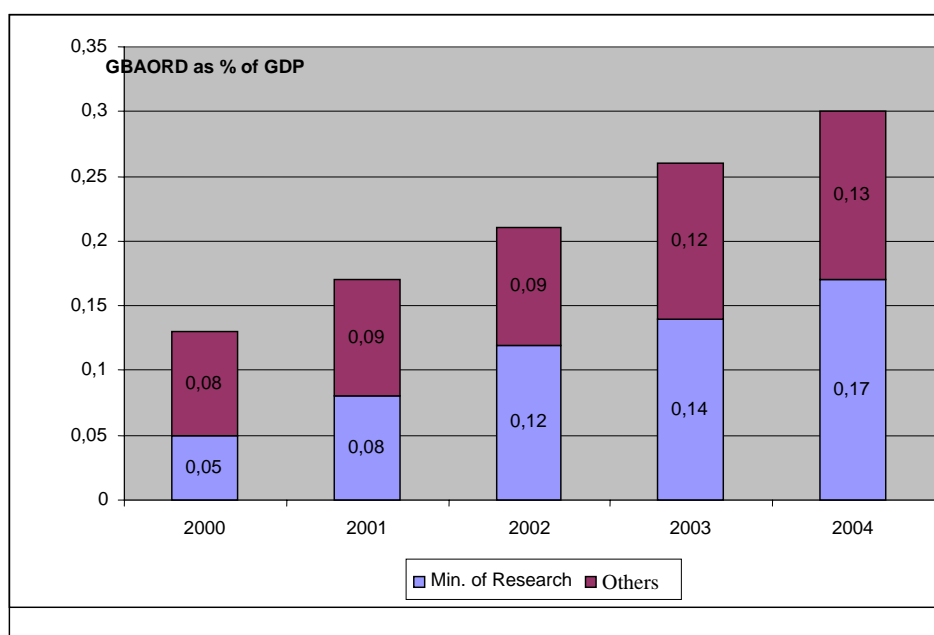
1. General framework and trends in science, technology and innovation policy

The Luxembourg research landscape is characterized by strong private investments and activities as well as by a recent but ambitious public element. In 2000, the GERD reached 1.71% of the GDP, thereof 90% from the private sector.

The main actors for formulating the research and innovation policies of the country are

- The Ministry of Culture, Higher Education and Research, responsible for the public sector and university research policy.
- The Ministry of Economic Affairs, responsible for the private sector research policy.

Although the Government fully endorses the Lisbon strategy and the Barcelona target, there has been no target setting in this context so far. In 1999, the new government set the target to raise the public funds for research to 0.3% within the current legislative period, i.e. by 2004. Although this target meant nearly a triplication of budgetary means dedicated to research and innovation, the target has been met.



The law of 31 May 1999 created the National Research Fund (“Fonds National de la Recherche” – FNR). It has legal, administrative and financial autonomy. Its creation has provided fresh impetus to research, and especially public research, in Luxembourg. The primary task of the FNR is to promote R&D in the public sector at national level.

A further step forward in reinforcing the research tissue in the country was the creation of the first full university in the country through the law of 12 August 2003.

The national research and innovation policy, within the national policy of economic diversification and development of the country, seeks to improve the overall competitiveness of the economic sector by strengthening the science base and raising the overall R&D investment levels.

In 2003, the Government set up an interministerial working group with members of the ministries of Culture, Higher Education and Research, of Economic Affairs, of SMEs, of Work and Employment to elaborate and design a multi-annual action plan in the spirit of the European Commission’s Action Plan “More Research for Europe” in a co-ordinated way. A certain number of new measures in the context of the Barcelona target is hence likely to be introduced during the next years.

2. Public sector research and public research organisations

Public research in Luxembourg is fairly recent. The law of 9th March 1987 set the framework conditions for a substantial research plan to be drawn up at national level in Luxembourg. The main characteristics of the public research in Luxembourg are the close co-operation with the private sector, the importance of technological transfer to companies as well as the restriction to research areas with high potential of socio-economic impact for the country.

Public Research Centres - CRP

Within the framework of this law, three public research centres [*CRP Gabriel Lippmann*, *CRP Henri Tudor*, *CRP Santé*] were created. They directly act under the responsibility of the Ministry of Research. These centres have developed their capacities in a small number of areas considered to be of national economic interest.

- CRP Gabriel Lippmann. The CRP Gabriel Lippmann focuses on 3 major research areas: 1) innovative material technology (and in particular nanotechnologies and instrument development); 2) sustainable management of natural resources; and 3) information society technologies
- CRP Henri Tudor. Its main effort consists in promoting technological innovation in the private and public sector. The centre offers a whole range of services and activities: R&D projects, technology transfer, technical assistance, advanced training. The activity areas are ICT, material science and environmental technologies.
- CRP Santé. The centre is co-ordinating the national health-based research and is performing advanced biomedical research, notably in virology, immunology, cancer research and cardiology. Beside these research activities, it fosters the technology and knowledge transfer to both the public and the private sector.

The research centres are also host laboratories for PhD theses in co-supervision with the University of Luxembourg and foreign universities.

Beside these 3 public research centres, there is also the CEPS/INSTEAD (*Centre d'études de population, de pauvreté et de politiques socio-économiques*), a public research institution acting directly under the responsibility of the Ministry of State. It carries out studies on population, poverty and socio-economic policies by creating and using databases. Furthermore, it develops analyses, modelling and simulation instruments for socio-economic policies.

The public research centres can rely on the following resources for financing their activities:

- An annual financial contribution from the State budget, awarded according to the R&D priorities laid down by the Government and the activities programme proposed by each CRP;
- Annual financial contributions from the State budget, reserved for carrying out missions determined by prior agreement between the Government and the CRP(s) concerned;
- Contributions disbursed for R&D projects carried out on a contractual basis with other research centres, companies and bodies or institutions, both national and international;
- Donations and legacies, in specie or in kind;
- Revenue from management of their assets;
- Revenue from the transfer of rights of ownership or the granting of a licence.

From 2004, the financing of the CRP has slightly changed from an essentially project-based financing to a broader approach including institutional financing.

National Research Fund - FNR

Since its creation in 1999, the national research fund FNR promotes R&D in the public sector at national level. The activities of the FNR should foster

- The creation of new competences and knowledge
- The strengthening of existing competences and knowledge
- The development of national and international synergies

These objectives are designed to increase the attractiveness of Luxembourg as an environment for scientific and economic excellence.

Since 2000, this is achieved by defining of a number of multi-annual research programmes restricted to certain specific areas. Besides scientific excellence of the programme, monitored through continuous assessments, the programmes are characterised by the national environment they are dealing with as well as by well-defined opportunities of socio-economic outcomes at national level. Parts of the programmes are elaborated in close co-operation with the private sector and require an active participation of industry.

The following seven national multi-annual priority programmes are currently underway:

- SE-COM: security and efficiency of new practises in e-commerce for socio-economic partners
- NANO: new materials and nanotechnology
- EAU: sustainable management of water resources
- BIOSAN: health and biotechnology

- VIVRE: living tomorrow in Luxembourg
- PROVIE: medical aspects of ageing
- TRASU: surface treatment
- SECAL: food safety

University of Luxembourg

The founding principles of the first full university in Luxembourg, created in October 2003, are, inter alia, interdisciplinary co-operation, symbiosis between teaching and research and international co-operation.

The university is organised in three faculties:

- Faculty of Science, Technology and Communication, covering inter alia natural sciences and industrial engineering
- Faculty of Law, Economics and Finance
- Faculty of Humanities, Arts and Educational Science

Research will constitute the cornerstone of the University of Luxembourg and will guarantee the state-of-the-art of education. Existing research teams have fostered axes and research fields which form the backcloth for developing the Faculty's major scientific directions thereby underlining the interdisciplinary character of research.

A special emphasis will be put on the mobility of students and researchers. The university will develop and exploit basic, applied and technological research. These research activities will be implemented through research projects on contractual basis with other research institutions and with industry. The University may also benefit from support from the FNR.

Representatives from industry are members of the administration boards of the public research centres, the university and the FNR.

The "Cité des Sciences, de la Recherche et de l'Innovation" is currently one of the beacon projects of the Government. It will re-use industrial wasteland in the south of the country and the Cité is based on the concept of interaction of various activities on one single site:

- Higher education and research: the Cité des Sciences will witness the gathering of existing higher education and research institutes to this site as well as the creation of new institutions and infrastructures. The existence – and presence – of a critical mass of researchers and students on a single site is necessary to organise the exchange and cooperation between the different functions.
- Start-up companies and companies of the New Economy: the ministry of economic affairs will set up on-site an industry initiative for innovative start-ups and technology companies. It will profit from synergies with the higher education and research institutes.

3. Government support for private-sector R&D and innovation

While the public research policy is under the responsibility of the Ministry of Research, private-sector research policy is part of the competence domain of the Ministry of Economic Affairs.

Direct financial measures:

- Grants. The main instrument for co-financing industrial research is the framework law on economic development and diversification, which provides a clearly defined R&D incentive scheme. It aims at co-financing investments in R&D that are of general economic interest and are performed by private-sector industries and research centres in order to stimulate the development of R&D activities within these organisations. Beneficiaries might be industrial companies, service providers if they have a key impact on economic development as well as private-sector research centres.
- Loans. The SNCI¹ (Société nationale de crédit et d'investissement) grants inter alia so-called innovation loans. These loans are dedicated to financing expenditures related directly to R&D programmes or projects which aim at introducing new products/services or to the development of new production /marketing processes. These loans have a fixed interest rate which is lower than the current market rate.
- Collaborative research. One of the cornerstones of the law of 1987 on public research is the strong cooperation between public research centres and industry as well as the technology transfer to the private sector. The objectives of the public research centres are to create new technological expertise and to transfer this know-how to the companies. The co-operation takes mainly shape through collaborative R&D projects of public research centres with private companies.

In addition some of the programmes of the FNR have been defined and set up in close collaboration with the private sector in order to better meet their needs.

Indirect financial measures:

Innovative firms may benefit, under certain conditions, from three types of tax incentive measures but none of them is specific to R&D and innovation investments. The government decided to decrease significantly the tax rates of companies in order to guarantee an increase in their competitiveness. This measure came into effect on 1st January 2002: the tax level for companies decreased from 27.27% to 22%.

Other direct measures:

Information, brokerage and awareness schemes

Beside the financing aspects of research projects, the FNR also supports accompanying measures for public players in order to reinforce the general framework of research in Luxembourg, such as the promotion of scientific awareness, national R&D co-ordination, international scientific co-operation and organisation of scientific conferences in Luxembourg.

- The Luxembourg portal for innovation and research has been launched in July 2003. It is dedicated to all aspects of R&D and innovation in Luxembourg and aims at all players in the field of R&D, from research centres over individual researchers to private labs and innovative companies.

¹ The SNCI is a banking institution governed by public law and specialised in providing medium- and long-term financing to Luxembourg businesses.

- With the help of Luxinnovation, the national agency for the promotion of innovation and research, the Government wants to enhance the development of a policy for disseminating information, increasing awareness and providing support for R&D and innovation.
- The aim of the Luxembourg-Trier-Sarrebruck Innovation Relay Centre is to assist companies (active in these neighbouring regions) in the innovation process as well as in European RTD programmes.
- The Technology Watch Centre aims at developing technology watch services for the benefit of companies, in particular SMEs.

Science parks

The “Technoport Schlassgoart” is an incubator for technological companies. This start-up centre is dedicated to existing and future start-up SMEs and offers its facilities in an efficient business environment enhanced by value-added backup services such as secretarial services and internet connections.

Public Research:

As stated above in “R&D and innovation policy types” on collaborative R&D, research in the public sector is closely linked to the needs of the industry.

The law of 1987 on the organisation of research and technological development within the public sector and the transfer of technology and scientific and technological co-operation between the public sector and companies, foresees the financing of R&D projects carried out by public bodies.

The start-up park “Technoport Schlassgoart” has been created in 1995, initiated by a public research centre with the support of the Ministry of Research and the Ministry of Economic Affairs. The Technoport is for the time being Luxembourg’s sole high-tech incubator.

Intellectual property rights:

Intellectual property in Luxembourg is determined by the following regulations:

- Patents law of 20 July 2000, with several subsequent amendments in order to better take into account the user’s needs and to rectify provisions which have proved not to agree with International or EU law.
- The Luxembourg patent, which has a maximum life of 20 years from the date of submission, is a patent for registration only with no patentability check of the invention. This characteristic constitutes a guarantee of rapidity and simplicity.
- The law of 18 April 2001 regulates copyright, related rights and databases.
- Trade marks are regulated by the Uniform Benelux Law, which took effect on 1st January 1971.
- Concerning biotechnological inventions, the EPO conditions apply.

To stimulate and encourage companies (especially SMEs) to register patents, the Ministry of Economic Affairs (department of Intellectual Property Rights) created two new measures:

- The short-term patent: The main difference between the classic patent and this “short-term” patent is the duration of the protection and its cost. This 6-year protection patent does not require

the submission of a research report, whereas the 20-year “classic” patent does. The classic patent is justified by a higher level of legal security which accompanies the research report.

- The online registration of patents and copyrights: this project aims at facilitating and speeding-up the patent and copyright registration process.

Systemic solutions

In the 1999 coalition agreement, the Government has emphasised the need to promote centres of technological expertise using existing resources. The “cluster” programme of the Ministry of Economic Affairs was launched in November 2001. Its aim is to form industrial partnerships involving the sharing of complementary technological expertise potentially leading to co-operative projects in the field of R&D and the development of new economic activities. The main advantages of this co-operation are an easy access to shared competences together with the easy dissemination of technologies and the share of technological risks and joint action costs.

Currently, three clusters are running:

- InfoCom cluster: ICT
- SurfMat technology cluster: new materials – surface finishing and coating
- AeroSpace cluster: aeronautics and aerospace technologies

4. Enhancing collaboration and networking among innovation organisations

Most of the activities in this section are described elsewhere [points 2, 3 and 5]

The major instrument to foster collaboration between private firms in R&D is the cluster programme of the Ministry of Economic Affairs – with currently three running clusters in key domains [see above].

Linkages between industry and public research organisations have been strong since the beginning of the public research in 1987. Indeed, the closeness of public research to the needs of industry is one of the characteristics of the national public research. It is hence not astonishing that a large part of the research projects of the public research centres are collaborative projects with one or more partners from industry. In addition some of the programmes of the FNR have been defined and set up in close collaboration with the private sector in order to better meet their needs. [see above]

The innovative grant project LIASIT [see below] can also be considered as a measure to increase the mobility between the public and the private sector. In this scheme, the doctoral students perform part of their doctoral research in industry.

5. Human resources for S&T

In the absence of a full university, Luxembourg students were forced to get their university education and diploma abroad. For this reason and since the registration of a higher education diploma is not compulsory in Luxembourg, there are no national statistics on science and engineering graduates. On the other hand, the Luxembourg graduates are already included of the statistics in the country they receive their diploma.

Distribution of research personnel per sector in 2000:

Sector	Research personnel FTE	Research personnel %
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BES	3337	91.3
GOV	295	8.1
HES	23	0.6
<i>Total</i>	<i>3655</i>	<i>100</i>

Table 1. Distribution of researchers per sector in 2000:

Sector	Researchers FTE	Researchers %
BES	1399	86.1
GOV	203.5	12.5
HES	22	1.4
<i>Total</i>	<i>1624.5</i>	<i>100</i>

Improve the supply

The national grant system (bourses de formation-recherche) allocates funds to doctoral and postdoctoral students, independently of their citizenship, for scientifically excellent research projects under the condition that the project is linked in some way to Luxembourg (the research is (partly) performed in Luxembourg and/or the results of the research are expected to have an impact at national level). This aims at attracting highly trained scientists to the country.

In 2002, an innovative pilot project of grants called LIASIT (*Luxembourg International Advanced Studies in Information Technologies*) has been set up in the field of IT research. Its aim is to build a strong partnership between academic research and the private sector and to strengthen the international co-operation in IT R&D. The doctoral projects are co-organised, supervised and financed both by public and private partners. After the end of the pilot phase, the LIASIT model is likely to be extended to other sectors.

In the context of improving the supply of highly qualified personnel, the creation of the university has also to be mentioned.

Stimulate demand

The expansion phase in which the public research centres are since 2000 requires additional researchers. Additional funds from the government side as well as from the national research fund tend to be of a certain attractiveness.

The setting up of the national university, in order to be successful, demands in the coming years a certain amount of excellent research personnel.

Grants and mobility

Until 2003, the absence of a complete university in Luxembourg forced Luxembourg students to continue their studies abroad and to gain experience abroad. Within the new university, the concept of mobility has its own place: one of the fundamental principles of the university is the mobility of students, teachers and researchers.

The FNR has special accompanying measures to foster mobility of researchers both coming to Luxembourg and leaving Luxembourg. Furthermore, exchanges of researchers between co-operating Luxembourg and foreign organisations are strongly encouraged.

The existence of a full university is considered to be a further measure for meeting the needs of highly and well educated scientists.

Public awareness of science

One of the missions of the FNR is to promote the scientific culture and to cultivate and raise the public awareness of science in the country. In fall 2003, the science festival organised in this context was a huge success: within one week, over 20000 people visited different exhibitions, workshops, conferences and events. Science festivals will be organised on a regular basis in the future.

The Young Scientist Association, besides its yearly organised contest, organises in collaboration with the Ministry of Education the “Mini-Researcher” contest in order to introduce and enthuse pupils to science and technology. Within the “Science Club” scientific workshops dedicated to teenagers are organised with different partners.

6. Policies to boost innovation in the service sector

There are currently no measures dedicated especially to the service sector.

7. Policy evaluation

In order to fulfil its mission, the FNR has to guarantee a regular and systematic evaluation of the programmes and results obtained within the financed projects. This would lead, if necessary, to any readjustment of the priorities.

Since 2003, the public research centres have to provide annually a set of commonly agreed performance indicators. The aim of these indicators is to measure the productivity and socio-economic contribution of the public research centres. These quantitative and qualitative indicators are taking into account the different missions of the centres.