

Policy guidelines for regions falling under the new regional competitiveness and employment objective for the 2007 - 2013 period in the fields of the knowledge economy and the environment, in line with the Lisbon and Gothenburg objectives

Call for tenders by open procedure N° 2004 CE 16 0 AT 039

**Policy guidelines for regions falling under the
new regional competitiveness and
employment objective
for the 2007 - 2013 period**

Vol. II Country Report. LUXEMBOURG

Prepared for:
European Commission
DG REGIONAL POLICY
Conception and analysis, accession negotiations unit

December 2005

CSIL, *Centre for Industrial Studies*- Milan
EPRC, *European Policies Research Centre and FAI- Fraser of Allander Institute, University of Strathclyde* - Glasgow
DMIO, *Department of Management and Industrial Organisation, Marche Polytechnic University* - Ancona
Mazars & Guérard, *Evaluation & Pilotage des politiques publiques*-Paris

Country Expert: Nicolas Gillio, *Mazars & Guérard* - Paris

DISCLAIMER

This report was produced by a consortium led by CSIL-Centre for Industrial Studies (Milan) for the Regional Policy Directorate General and represents the views of the contractor. These views were produced in order to provide analytical support for the Commission services. They have not been adopted by the Commission and do not necessarily represent the view of the Commission itself or the Directorate General for Regional Policy.

The Team takes full responsibility for the data, information and judgments expressed in the present report.

CSIL - CENTRO STUDI

INDUSTRIA LEGGERA Srl

Corso Monforte 15
20122 Milano - Italy

Tel. +39 02 796630
Fax +39 02 780703
info@csildevelopment.com
www.csildevelopment.com

Cod. Fiscale e Partita Iva
04825320155

CCIAA Iscriz. n. 1042964

Reg. Soc. Trib. Milano
n. 197622

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1 Scope and methodology	9
1.1 Aim of the report	9
1.2 Methodology for context analysis	9
1.3 Structure of the report	10
2. General economic conditions	13
3. Innovation and knowledge economy	15
4. Accessibility	17
4.1. Access to transport infrastructure	17
4.2. Access to telecommunications and information technologies	20
5. Environment and risk prevention	23
5.1 General analysis	23
5.2 Specific Features	24
6. Implementation of Structural Funds	26
6.1. The 2000-2006 Structural Funds Programming period	26
6.2. Implementation of regional policies: lessons learnt	27
7. Policy priorities assessment	29
7.1. Findings from the statistical analysis	29
7.2. Findings from field analysis	30
ANNEX I: Methodology for transport indicators	33
ANNEX II: Telecom indicators levels	37
ANNEX III: Bibliography and sources of information	39

LIST OF ACRONYMS

CIS	Community Innovation Survey
DG Regio	Directorate General of Regional Policy of the European Commission
ERDF	European Regional Development Fund
EKC	Environmental Kuznets Curve
EPO	European Patent Office
ESPON	European Spatial Planning Observation Network
FA	Factor Analysis
GDP	Gross Domestic Product
ICT	Information and Communication Technology
INRA	International Research Associates (Europe)
NUTS	Nomenclature of Territorial Units for Statistics
PC	Personal Computer
PCA	Principal Components Analysis
PPS	Purchasing Power Standards
R&D	Research & Development
SF	Structural Funds
TLC	Telecommunication

EXECUTIVE SUMMARY

This Report offers an assessment of economic conditions and policy priorities for the regions falling under the new Competitiveness and Employment Objective 2007-2013.

It is structured as follows:

- 1) the report presents some statistical data on the general economic conditions of the country.
- 2) a statistical analysis on the three ERDF themes: a) Innovation and the Knowledge economy; b) Accessibility; c) Environment and Risk Prevention.
- 3) a discussion of the current experience with Structural Funds and some implementation issues.
- 4) a set of policy priorities as perceived by the team of independent experts. The methodology, sources of data and description of indicators are explained in detail in Vol. I of the Report, that should be duly considered.

Contributors to the Report include: the statistical team, the core team, thematic experts and the country experts. The final version has been prepared under the responsibility of the core team (Milan).

Eligible Region: the whole country

- *General Economic Conditions*

The country has been specialising in financial services and has undergone a rapid process of urbanisation. Population density is well over the benchmark of the average EU eligible regions to the Competitiveness objective, and probably overestimated because of the high presence of daily commuters. Manufacturing and primary sectors show both an employment share below the benchmark. The nature of international financial centre may lead to overestimation of GDP per capita, which is 70% higher than the benchmark. GDP growth and productivity growth are high and unemployment very low. Thus the general economic performance is high

- *Innovation and knowledge economy*

The country is a low performer in terms of innovation because of its service –oriented economic structure. R&D expenditure over GDP is very close to the benchmark, and EPO applications are relatively high, reflecting the location of some multinational companies in the country, however there is very low employment in hi-tech services and also low share of firms of turnover due to new products. Tertiary education indicator is slightly below that in the EU eligible regions average.

- *Accessibility*

Both multimodal transport accessibility and connectivity to transport terminals by car is high for Luxembourg. Car traffic increased steadily, as road haulage, and motorization is very high. Air transport is forecasted to grow much more than other modes in the 2005-2020 horizon. One TEN –T priority project runs across the country, the high speed train East (Metz-Paris-Mannheim).

ICT/TLC indicators are good on all dimensions, except broadband households connections, however the Benelux area as the benchmark instead of the EU eligible regions average, Luxembourg is well behind the Netherlands and Belgium.

- *Environment and risk prevention*

Energy sustainability in the country is good, particularly because of renewable sources. The environmental impact of transport is intermediate, while the degree of protection of natural assets is high. Natural risks are low, but the density of polluting sites, while only marginally above the benchmark for the country, is quite high in specific zones because of the impact of traditional steel and related plants.

- *Implementation of Structural Funds in the current programming period*

Under the current programmes, Luxembourg receives Objective 2 funds in three zones: two rural areas facing economic decline, and an urban area with high environmental problems due to iron and steel industry sites. Planning and rehabilitation expenditures plus environment and energy infrastructure should absorb nearly 50% of funds, while SMEs support, assisting large business, and RTDI around one third of the total, the remaining being assigned to tourism, and other measures.

- *Policy priorities for discussion*

Overall the growth model of Luxembourg has been successful and sustainable, having been able to transform a former agricultural and heavy industrialized country in a rich tertiary economy. The existence of contaminated industrial sites and related environmental problems should be given a high priority. Second, but perhaps more important in terms of potential usage of ERDF funds, Innovation and Knowledge appear to be underdeveloped when compared with other countries in the area, and it may be a risk for Luxembourg to rely too heavily of the financial sector. Thus, a more balanced strategic approach, based on enhancing RTDI capacities and also on some promotion of a new generation of entrepreneurs seem appropriate. Some ICT project and some ESF supported measures may contribute to such a strategy, including the University and related research projects. The Belval West science park project is of particular interest in this context.

1 Scope and methodology

1.1 Aim of the report

The aim of this Country Report is to offer the European Commission an overview of the strengths, weaknesses, opportunities and threats faced by the regions eligible for the new Competitiveness objective 2007-2013. It focuses on the three ERDF themes listed in the draft regulation, and it has been prepared as a background document, with a view to supporting the Commission in its own policy priorities analysis and negotiation with the Member States.

As a part of a comprehensive study on 19 countries including 167 regions, the present Country Report is designed as a summary assessment of some key issues. It is a preliminary assessment that should be completed by a much more detailed structural and policy analysis needed at a later stage for the preparation of the Operative Programmes. Moreover, as explained in detail in Vol. I (Statistical Analysis), and as requested by the Terms of Reference, the present report is based mainly on standardised regional statistics and a common cross-country approach. This has obvious advantages in terms of comparisons and benchmarking, but is not designed to fully capture specific features based on local data, and this fact should be duly considered when using it as a reference.

1.2 Methodology for context analysis

The analysis at regional level presents the following sections: general economic structure, innovation and the knowledge economy, accessibility, environmental and risk prevention. For each section a brief description is given according to a short list of indicators with the following characteristics:

- they are consistent and available at NUT2 level;
- they are relevant for the ERDF thematic approach;
- they are, as far as possible, policy-oriented.

The choice of this set of indicators comes from the need to provide guiding principles for policy priorities, rather than to develop comprehensive regional statistical data. For this reason it should be clear that they give some highlights of the major trends in the regions and do not offer a complete picture of all the needs and weaknesses experienced by the regions.

The rationale of the data processing is the following:

- for each aspect (economic structure plus three themes) a linear composite indicator is created and the region is ranked in comparison with all the other eligible regions;
- for each theme (except Environmental risks) the degree of correlation with the economic performance is investigated, by means of a correlation analysis.

The basic idea is to discuss the main thematic trends in the regions, with respect to the ERDF eligible interventions, in the light of the economic structure and trends and the relative position of the regions as compared to a given benchmark (the EU eligible regions average). This reading of the data helps to discover combinations of, for example, High Innovation and Low Economic Performance, that may suggest the existence of unexploited potential, hence an opportunity to invest more on transfer and adaptation than on R&D or tertiary education per se. This analysis is included in Sections 2 to 5.

This set of information is then discussed from a more qualitative point of view on the basis of inputs coming from an assessment of the current SF programming period and lessons learnt in the field analysis carried out by the national expert.

1.3 Structure of the report

Section 2 briefly summarises the general economic conditions for the eligible regions, using the following average annual data (2000-2002): regional population and its national share, population density, employment share of manufacturing, a 'rural/urban' and a 'presence of manufacturing' classification; and 1995-2002 averages for GDP per capita, rate of unemployment, growth of GDP, labour productivity growth per employee, and economic performance ranking. The latter ranking is crucial in the analysis. It is based on a linear combination of two factors ('levels' and 'growth') arising from a factor analysis (see Vol. I for details). Each data set is presented in comparison with a benchmark given by the average of the EU 168 regions eligible for the objective. Often some additional macroeconomic information is also included.

The following section is on Innovation and Knowledge Economy. It presents regional average annual data (mostly 1995-2002) on R&D expenditure as a share of GDP, EPO applications per million inhabitants, percentage of employment in high-tech services, share of population with tertiary education, share of firms' turnover due to new products (CIS data), and an overall

classification based on a factor analysis. Regions are classified High, Intermediate or Low performing in innovation with a combination of these data.

Section 4 is about Accessibility. It presents data on TLC and ICT (share of firms with Internet access and websites and share of households with a PC and access to the Internet) and data on transport indicators (the ESPON multimodal accessibility potential and connectivity to terminals by car). The analysis is supplemented by recent and forecasted trends in travel demand by mode (DG TREN data and scenario at 2020 (Tremove)). A multi-index analysis is given in the Annex.

Section 5 looks at Environment and Risk prevention. This includes standardised data on energy sustainability (electricity efficiency, self-sufficiency, renewable sources and ranking); the environmental impact of transport (vehicle density, non-fuel transport, anthropic degree, urban/rural typology); natural and technological risk (flood hazard potential, burnt areas and polluting sites). The reader should note that these data cannot cover specific sub-regional environmental risks, but consider regional averages.

Section 6 gives a quick overview of the current 2000-2006 programming period, based on a financial breakdown by re-classified priority and some qualitative comments based on the evaluation results.

The last section is about the policy priorities assessment. The first part of it presents the results of a correlation analysis between Economic Performance and Innovation, Access, and Environment summary indicators. A similar cross-reading is given for Economic Performance, Accessibility and Environment, while the presence of high Natural or Technological Risks is considered as a critical issue per se.

After this combined reading of performance and structural data, the following section is more qualitative, and based on other sources of evidence, including interviews with stakeholders, official documents, evaluation reports, academic research, and the personal assessment by the country expert. This leads to the suggestion of some indicative regional policy priorities, based on the available evidence, to be checked at a later stage when the national frameworks and regional programmes are available.

The report ends with a brief discussion of some implementation issues.

2. General economic conditions

In terms of structural indicators, Luxembourg has a hybrid nature due to its peculiar path of demographic development. Formerly a rural region (still apparent from its not totally negligible share of employment in agriculture), Luxembourg has been specialising in financial services, and has undergone a rapid process of urbanisation; at the same time, this structural transformation has largely occurred without a contemporaneous expansion of the manufacturing sector. As a result, Luxembourg has reached an above-average density of population which is somehow underestimated because of the high presence of daily commuters coming from the neighbouring countries.

Tab. 1 Structural indicators

	Population (thousands)	Population density	Share of primary sectors on total employment	Share of manufacturing on total employment	Rural/urban classification	Presence of manufacturing
Luxembourg	442	171	2.16	10.66	Intermediate	Low
EU eligible regions	313,711	129	3.34	20.18		

Source: Eurostat - see vol. I

The Luxembourg's model of tertiary specialisation has led to an high level of economic performance (see table 2). Although its nature of international financial centre leads to a obvious overestimation of the per capita wealth of the population, due to the presence of international corporations and the local registration of overseas operations, nevertheless the GDP per capita appears to be remarkably higher than the reference average of the 168 eligible regions (see table 3). Moreover, the Luxembourg's model of development, characterised by a high GDP growth, appears to be employment-intensive, as suggested by the very low unemployment rate; this behaviour distinguishes Luxembourg from many other urban-capital regions of the EU (see, among others, the cases of Bruxelles, Wien and London).

Tab. 2 Economic performance indicators

	GDP per capita	Rate of unemployment	Growth of GDP	Growth of GDP per employed person	Economic performance
ranking					
Luxembourg	43,961	2.25	5.44	1.19	High
Average of EU eligible regions	24,162	6.42	2.34	0.99	

Sources: Eurostat and DG Regio - see vol. I

Tab. 3 Economic performance indicators (EU eligible regions=100)

GDP per capita	Rate of unemployment	Growth of GDP	Growth of GDP per employed person
182	35	232	120

Sources: Eurostat and DG Regio - see vol. I

3. Innovation and knowledge economy

Overall, the country does not score satisfactorily concerning the technological and knowledge level, being on the “low” tail of the distribution. However, this is partly due to the above mentioned model of specialisation: in fact, R&D and EPO applications refer typically to secondary activities, in which Luxembourg economy is not focused, while the share of turnover due to new products is certainly biased downward for those tertiary activities in which Luxembourg is specialised. However, two critical points, certainly real and not due to composition effects, emerge in the percentage of employment in high-tech activities, where the Luxembourg’s share is patently inferior to that of the other comparable urban-capital regions, and in the share of population with tertiary education, which is very low, being for example a half of that of Bruxelles.

Tab. 4 Indicators of innovation and knowledge economy

	R&D expenditures on GDP	EPO application per million inhabitants	Percent. of employment in high-tech manufact.	Percent. of employment in high-tech services	Share of population with tertiary education	Share of turnover due to products new to the firms	Overall ranking
Luxembourg	1.71	159	0.35	2.68	22.00	20.00	Low
EU eligible Regions	1.70	136	1.49	3.23	24.81	35.21	

Sources: Eurostat and Community Innovation Survey - see vol. I

4. Accessibility

4.1. Access to transport infrastructure

Concerning the degree of connectivity to transport terminals, Luxembourg scores high relatively to the reference average. This situation can be traced back to the sound infrastructural upgrading which has assisted the Luxembourg's process of urbanization: as a consequence, it emerges that, based on our indicator reflecting the network of secondary roads, the access to transport infrastructure is also high.

Transport context

It is difficult to compare trends¹ in transport demand in Luxembourg with the average EU 15 ones, as this country is very peculiar and its characteristics are more similar to the ones of a metropolitan area. Car and air are the relevant modes for passenger transport and road haulage for freight transport, even though railways and inland waterways maintain significant shares. Motorization is very high, 618 cars every 1000 inhabitants, the highest value in the EU 15 and definitely more than one car every two persons.

Tab. 5 Trends in travel demand - pkm 1990 = 100

Years	Cars	Bus and coaches	Railway	Air
1970	53	89	123	
1980	68	89	118	
1990	100	100	100	100
1995	118	100	138	126
2000	127	100	160	168
2001	130	100	166	182
2001 EU 15	120	112	115	182

Source: EC -DGTREN.

¹ European Commission, Directorate General for Energy and Transport, European Union Energy and Transport Figures, 2003

Tab. 6 Trends in travel demand - tkm 1990 = 100

Years	Road haulage	Railway	Inland waterways
1970	21	124	90
1980	45	108	99
1990	100	100	100
1995	147	86	101
2000	184	103	119
2001	190	95	119
2001 EU 15	143	95	117

Source: EC -DGTREN.

Tab. 7 Modal shares by mode of land transport - Passengers - 2001

	Cars	Bus and coaches	Railway	Urban rail	Powered two wheels
Luxemburg	79.9	13.9	5.3	na	0.9
EU 15	80.4	8.8	6.5	1.0	3.2

Source: EC -DGTREN.

Tab. 8 Modal shares by mode of land transport - Freight - 2001

	Road	Rail	Inland waterways	Pipelines
Luxemburg	71.1	17.2	11.7	na
EU 15	75.5	13.1	6.8	4.7

Source: EC -DGTREN.

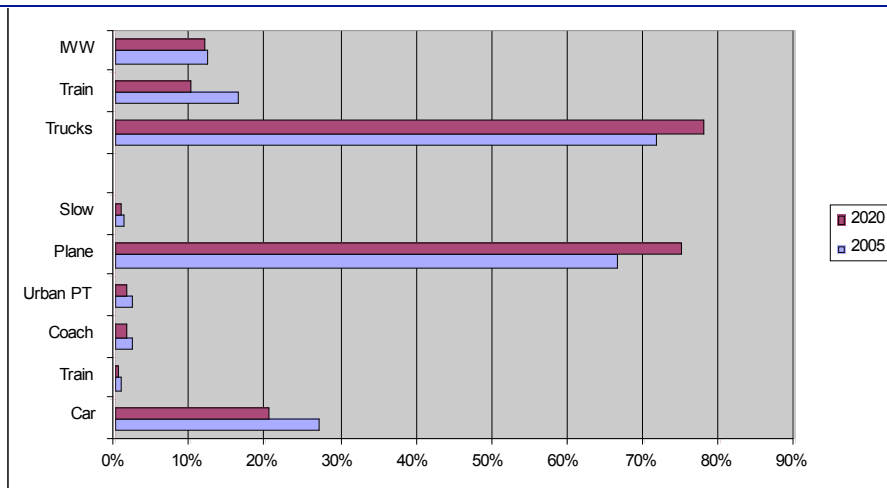
Tab. 9 Motorization - cars per 1000 inhabitants

	1970	1980	1990	1995	1996	1997	1998	1999	2000	2001
Luxemburg	212.28	353.15	480.3	558.95	558.3	562.47	594.22	608.97	624.03	617.93
EU 15	183.64	292.5	392.92	432.97	438.22	446.13	456.88	468.81	478.81	487.75

Trends projections²

Baseline trends in transport demand, emissions and vehicle stock are derived from the Tremove study³ for the period 2005-2020 and are used as background scenario for the regional analysis. Air will continue to be the dominating mode for the region, as it is expected to grow much more than all the passengers competing modes of transport. In spite of the already very high motorization rate, the car fleet will increase. The share of freight travelling by road will also increase, at the detriment of the railway mode, while inland waterways will remain stable in terms of modal shares. The expected overall impact of these trends is an increase in CO₂ emissions.

Fig. 1 Modal shares. Percentage change 2005-2020.

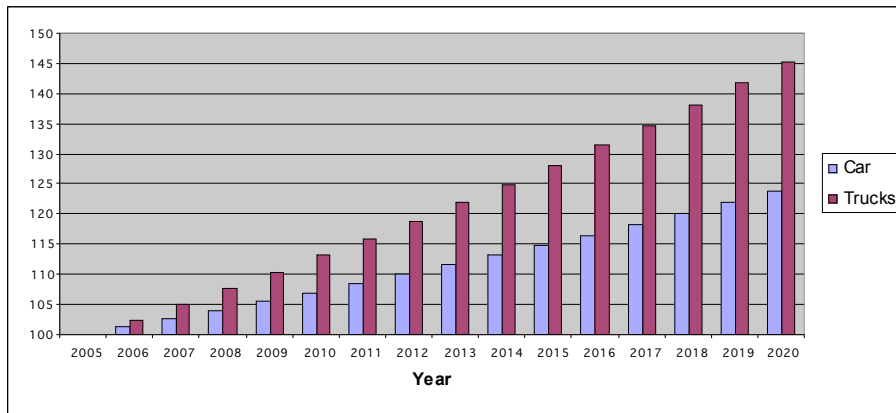


Source Tremove.

² Trends have been derived from the Tremove database, data cannot be compared with the past trends presented in the previous section as the transport modes as well as the type of flows considered are different. Nevertheless they represent a likely trend in the absence of specific transport policies.

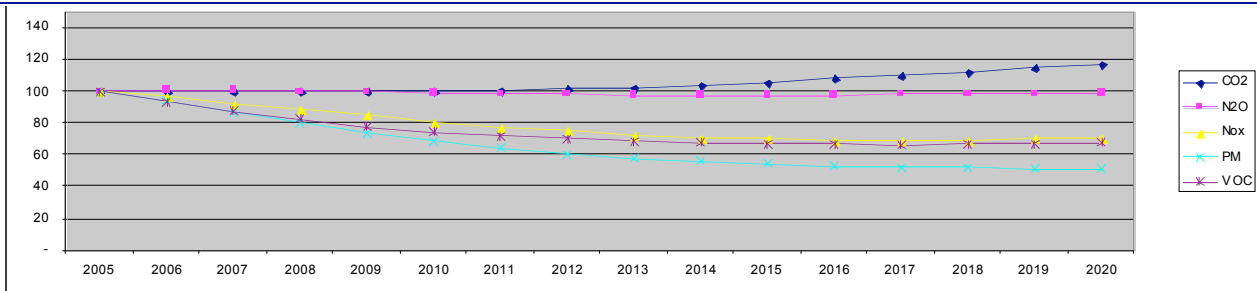
³ Tremove 2 Model has been developed by K.U Leuven and Transport & Mobility Leuven together with WSP, TRT, TRL, INFRAS and COWI, on behalf of DG ENV (2005)

Fig. 2 Road vehicles stock



Source: Tremove.

Fig. 3 Trends in transport emissions



Source: Tremove.

The TEN-T priority project running through Luxembourg is the high speed train East, which will connect Luxembourg with Metz–Paris–Mannheim and will be completed after the year 2010.

4.2. Access to telecommunications and information technologies

Luxembourg’s expenditure on ICT is well above the EU25 average (6.90%), and as a country Luxembourg enjoys a leading position in all the ICT industry, with a slightly lower performance only in mobile telephony: it belongs to the 1st category for fixed telephony⁴, but also for PC and Internet availability; it is in the 3rd category only for mobile telephony.

⁴ See ANNEX II

Table 10 shows the level of TLC and ICT accessibility, where Luxembourg stands at an intermediate position with respect to the reference average. Taking the Benelux area as a benchmark, Luxembourg's delay seems more pronounced on the firms side, with shares of Internet access and Web sites inferior to those of Belgium and Holland. Instead, on the households' side, the distance is lower. Finally, a big gap emerges in the households broadband diffusion.

Tab. 10 Access to TLC/ICT

	Share of firms with Internet access	Share of firms with a Web site	Share of households with PCs	Share of households with Internet access	Share of households with broadband Internet access	Overall ranking
Luxembourg	85.0	58.0	63.4	45.7	1.8	Intermediate
EU eligible Regions	86.01	56.33	49.29	35.19	5.05	

Sources: ESPON and INRA - see vol. I

Tab. 11 Ranking by variable

	Share of firms with Internet access	Share of firms with a Web site	Share of households with PCs	Share of households with Internet access	Share of households with broadband Internet access
Ranking	15	12	5	6	14

Sources: ESPON and INRA - see vol. I

Tab. 12 Indicators of ICT access

	Share of firms with Internet access	Share of firms with a Web site	Share of households with PCs	Share of households with Internet access	Share of households with broadband Internet access	Overall ranking
Luxembourg	85.0	58.0	63.4	45.7	1.8	Intermediate

Sources: ESPON and INRA - see vol. I

5. Environment and risk prevention

5.1 General analysis

The analysis of environment and risk prevention indicators shows that Luxembourg does not present clear areas of criticality (cf. tables 13-16). First, the degree of energy sustainability is high, and the transportation impact falls within the intermediate range of the distribution. Second, despite being a centre undergoing a process of intensive urbanization, Luxembourg has succeeded in maintaining an intermediate level of natural assets, a low level of natural risk and an intermediate level of technological risk.

Tab. 13 Indicators of energy sustainability

	Electricity efficiency	Electricity self-sufficiency	Renewable sources of electric energy	Overall ranking
Luxembourg	3.492	0.200	0.889	High
EU eligible Regions	3.646	0.254	0.202	

Source: EUROSTAT - NEW CRONOS (Regio) - see vol. I

Tab. 14 Indicators of transportation impact

	TR1 Vehicles density	TR2 Non-fuel transportation	TR3 Traffic intensity	Overall ranking
Luxembourg	0.114	0.019	-0.832	Intermediate
EU eligible Regions	0.218	0.031	0.400	

Source: EUROSTAT - NEW CRONOS (Regio) - see vol. I

1) Every transport indicator - TR1, TR2 and TR3 - should be interpreted according its own dimension (and colour in column chart). Indicators cannot be compared with each other because of the difference in scales used. See Annex.

The value of the traffic intensity indicator (TR3) could be some time negative because of the method of normalization used to calculate it. Such a normalization method allows us to summarize the two heterogeneous variables which make up the indicator ("total number of driven intra-regional trips/Total Area" and "Total number of kilometres made by journeys produced-generated by the region/Total Area). Values produced by normalization are relative and not absolute values.

Tab. 15 Indicators of natural/rural assets

	Degree of protection	Wilderness degree	Anthropic degree	Urban/Rural typology	Overall ranking
Luxembourg	0.148	0.372	0.067	1.000	Intermediate
EU eligible Regions	0.088	0.310	0.103	2.819	

Source: IRENA Database and ESPON-CORINE Landcover Database - see vol. I

Tab. 16 Indicators of natural and technological risk

	Natural risk			Technological risk	
	Flood hazard potential	Share of burnt areas	Overall ranking	Polluting sites density	Overall ranking
Luxembourg	0.000	0.000	Low	0.464	Intermediate
EU eligible Regions	0.763	1.622		0.447	

Source: ESPON Database and EPER-EEA - see vol. I

5.2 Specific Features

Electricity efficiency and renewable energy

Electricity efficiency in Luxembourg has a value equal to the Union average (3.5 million euros GDP produced per gigawatt hour consumed), the same happens as for the degree of *self-sufficiency* (0.20). The share of *renewable sources* (88.9%) is among the highest registered in the EU. So, according to the composite indicator of energy sustainability, a high performance is attributed to Luxembourg.

Transport and environment

Vehicles density (0,114) does not reach the EU average levels, and the correlated *traffic intensity* (with -0,832) is among the lowest EU levels. The share of non fuel transportation has the same EU average value.

Generally speaking, the impact of transport on environment is considered to be intermediate.

Natural resources assets and management

As regards the *degree of protection* (14.8%) and the *wilderness degree* (37%), the levels reached by Luxembourg are in line with the EU average ones. The share of areas with higher human intervention (*anthropic degree*) is quite low (6.7%), compared to the EU average.

The Luxembourg territory is in prevalence a *urban typology* one, as the rural settings almost reach the minimum EU registered share.

As a consequence, an intermediate level is attributed to the Country, according to the composite indicator "Natural/rural assets endowment".

Risk Prevention

The natural risks of *flood* and of *burnt areas* are negligible in Luxembourg, while the risk of *polluting sites* is higher than the EU average (0.464 towards 0.300).

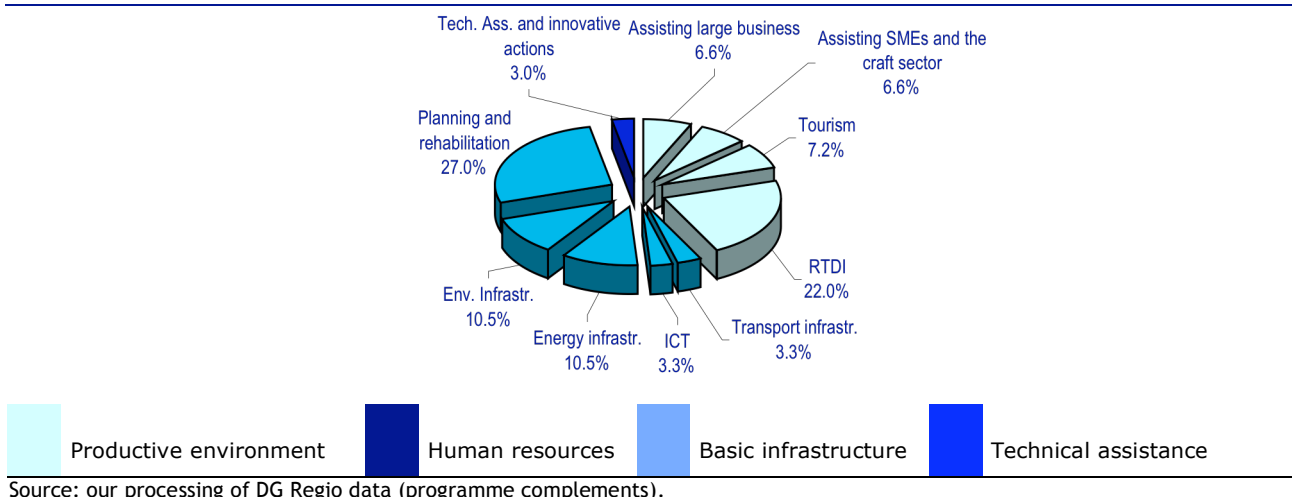
The indicator of natural risk shows therefore a very low value, whereas the technological risk is intermediate because of polluting industrial sites.

6. Implementation of Structural Funds

6.1. The 2000-2006 Structural Funds Programming period

In the 2000-2006 programming period Luxembourg receives Structural Funds under a single Objective 2 regional programme covering three zones: two rural areas facing a decrease in agricultural employment and an urban area with environmental risks caused by industrial wasteland in the iron and steel basin. Another urban zone benefits from transitional support until the end of 2005.

Fig. 4 EU Contribution by priority area, Objective 2 (2000-2006)



The Luxembourg regional programme focuses on four priority areas. First of all, development of the local potential is pursued by infrastructures and services as support to economic activity, by diversifying activities around skill centres and exploiting regional heritage and tourism (assisting large and small businesses together with tourism account for 21% of total contributions). Secondly, sustainable economic and territorial development is promoted through the improvement and renovation of industrial wasteland, the rehabilitation of rundown urban areas, the creation of infrastructures, especially social ones, and job creating activities (planning and rehabilitation is the most financed area of intervention and accounts for 26% of total contributions). Furthermore, a particular relevance is given to RTDI measures (22%) and environmental protection – environment - friendly productions, awareness and advisory actions, improvement of waste and energy management (environmental and energy infrastructure account for 22%).

In the current programming period Luxembourg receives 47 million € under the Objective 2; in addition, it benefits from 45.71 million € under Objective 3, 7.73 from INTERREG, 4.42 from EQUAL and 2.21 from LEADER+. The total amount of Structural Funds is 107.71 million €⁵.

6.2. Implementation of regional policies: lessons learnt

The Luxembourg single programming document is a three zones programme (North, East and South), and takes both from former Objective 2 and Objective 5b 1994 – 1999 its eligible areas but also from a new area located in the eastern part of the Grand – Duché.

- South area is mainly urbanized with: Bascharage, Bettembourg, Differdange, Esch/Alzette, Mondercange, Pétange, Sanem and Schiffflange.
- Northern territories are more rural and gather: Eschweiler, Heinerscheid, Hosingen, Munshausen, Wiltz et Wilwerwiltz
- In the East, rural territories were introduced in the new programme for 2000-2006 period: Echternacht, Grevenmacher, Merttert, Mompach et Rosport.

⁵ 2004 prices, performance reserve included.

7. Policy priorities assessment

7.1. Findings from the statistical analysis

In order to perform a synthetic analysis between the indicators of economic performance and those concerned with the other thematic areas, we separate the exam of environment and risk prevention variables from that related to other issues of innovation & knowledge economy and access to ICT and transport infrastructure.

Table 17 summarises the second group of thematic areas for the Luxembourg economy. Face to its high economic performance, a relation of strong un-correlation emerge with its innovative and knowledge economy base, partly explained by a composition effect from its tertiary model of specialisation and partly attributable to a real gap, being due to a below-average share of population and employment having high skills and education. As a consequence, although currently a wealthy economy, Luxembourg displays a few critical points in its national system of innovation which could undermine the long-run sustainability of its current model of fast and employment-intensive growth focused on tertiary sectors.

The situation concerning the access to TLC and ICT is less critical: with an intermediate level of access, the performance is slightly inferior to that of comparable countries. Conversely, Luxembourg level of road connectivity appears adequate.

Tab. 17 Economic performance versus innovation & knowledge economy, access to ICT and access to transport

Economic performance	Innovation and knowledge economy	Access to TLC and ICT	Access to transport (connectivity)
Ranking	Ranking	Ranking	Ranking
High	Low	Intermediate	High

Source: our processing.

Moving to the issues of environment and risk prevention, the overall situation appears fairly good, with no apparent areas of criticality. Despite the high level of human activity and economic performance, Luxembourg's model of economic specialisation and environment prevention appear sustainable, as the high level of energy self-sufficiency shows, the intermediate natural asset endowment and the intermediate level of technological risk.

Tab. 18 Economic performance versus environment and risk prevention

Economic performance	Energy sustainability	Transport impact	Natural/rural assets	Natural risk	Technological risk
High	High	Intermediate	Intermediate	Low	Intermediate

Source: our processing.

7.2. Findings from field analysis

The Grand Duché has prepared to the coming policy priorities by an assessment based on the weaknesses and strengths identified in the report⁶ recently released by The "Observatoire de la compétitivité" which is a public organization from the Ministry of Economic of Luxemburg. This report is the pendent of the working group led by Wim Kok but is a national based report on Luxemburg competitive position in the late 1990s. Even if the approach does not directly relate to Structural Funds and its contribution to Lisbon and Gothenburg strategy for 2007-2013, it gives good insight of the situation the Grand Duché will have to cope with in the next programming period.

Many reasons for wondering about competitiveness appear as new countries could threaten Luxemburg position in financial services, as tax environment evolved towards a more integrated system and as new opened areas emerged with European enlargement.

To get to a knowledge society, Luxemburg needs to reconsider its competitive advantages of its financial cluster as it can not only be based upon tax competition with other countries. Therefore turning to a more diversified economy, to a higher education level for people working in the Grand Duché and to the development of research have become priorities along with environmental risks and renewal of old steel industry sites.

There is a dual phenomenon taking place in Luxemburg which is represented by the high percentage of people working in the country but living in France for example. French employees represent 30,000 people that commute daily to Luxemburg.

Projects such as the one of Esch – Belval represents a good opportunity to develop innovation and research in relation with economic activity. In the context of the overall revitalisation of a region deeply marked by the steel industry, Belval-Ouest is particularly important since the new urban development, with a maximum floor area of almost 1.3 million m² on 69ha of

⁶ Rapport Fontagné, 2004.

improved land is supported by the State and European structural funds through a large-scale programme to decentralise its administrative functions and the implementation of an ambitious third-level education policy in the context of the creation of the University of Luxembourg. It is inserted into the urban fabric of the districts of Esch sur Alzette (second largest city in Luxembourg with 27,000 inhabitants. Main realizations should take into account housing, leisures, commercial area and firm headquarters.

As a matter of fact, deprived lands of former steel industry in this part of the country should keep on concentrating a significant amount of financial resources in the next period of 2007-2013.

ANNEX I: Methodology for transport indicators

The multi-index approach

Finding a unique measure of the transport conditions in a given region, even if the analysis is focused on one main aspect like accessibility, is a very difficult task. Both demand and supply conditions play a role and both can be seen from different perspectives so that each indicator is hardly more than just a limited point of view. For that reason, we decided to use different indicators, namely three indexes:

- Infrastructure Usage Index - IUI_j
- Accessibility Index - AI_j
- Connectivity Index - CI_j

The Infrastructure Usage Index measures the level of road and rail demand entering the region and leaving the region (i.e. generated and attracted traffic excluding trips starting and ending in the same region) in comparison to the supply of major roads and rails. The index is computed separately for road and rail and for passenger and freight⁷ by taking the ratio between the demand and the length of the main infrastructures (e.g. motorways, dual carriageway roads, etc.). Thus four separate ratios are computed. Then the logarithm of each ratio is computed and a weighted average of the four logs is computed where the weights are the modal shares of road and rail on passenger and freight demand. The weighted average is the Infrastructure Usage Index. The index is greater for zone where the ratio between demand and supply is higher, that is where infrastructure are more exploited.

The Accessibility Index is a synthetic measure of multimodal potential accessibility. It is based on the assumption that the attraction of a destination increases with its size (in terms of population or GDP) and declines with distance, travel time and costs. The accessibility model used in the ESPON study assumes the centroids of NUTS3 regions as origins and destinations and, then, calculates the minimum travel time (with respect to different modes of transport, that is by road, rail and air) between the various centroids. This indicator of potential accessibility contains parameters that need to be calibrated so that it cannot be expressed in

⁷ Generated and attracted traffic is estimated from the results of the European transport model SCENES.

familiar units. The higher is the index the higher is the accessibility. As a consequence, NUTS3 data are standardised to the average accessibility of the EU25 countries. NUTS2 indicators have been computed by the Statistical Team by averaging NUTS3 data provided by the ESPON database.

The Connectivity Index is expressed as the reciprocal of the hours needed to reach by car different transport nodes (rail stations, motorways accesses, seaports and airports) starting from the centroid of each NUTS3 region. Thus, regional centroids are taken as origins while transport terminal as destinations. The higher is the index the higher is the connectivity. Again such an indicator is available for NUTS3 European regions from ESPON and it has been averaged by the Statistical Team to obtain NUTS2 indexes.

All three indexes provide a piece of the story and there is not a hierarchy among them. As the analysis in section 2 will show, the Infrastructure Usage Index is somewhat correlated to the Accessibility Index, in the sense that zones where the former is greater than the median (showing a lower performance in terms of availability of infrastructures with respect to the generated and attracted demand), also the latter is greater than the median (showing a better performance in terms of accessibility). In other words, not surprisingly, the most accessible zones tend to be attract and generate more demand, in relative terms, than less accessible zones.

Furthermore, more than the numeric values, the most useful information is how the regions within a country are ranked according to each index and especially which performs better and which worse. When a region underperforms according to all the indexes, this is a hint that some problems exist concerning accessibility, and vice-versa if a region overperforms.

Therefore, the analysis consisted in the following steps:

- a) For each index the median across the NUTS2 regions of a given country has been computed: MED(IUI), MED(AI), MED(CI). The median has been preferred to the mean because in most of the countries the distribution of the indexes is strongly asymmetrical and so the mean can be influenced by one or two very high (or low) values.
- b) Each region in the country has been classified as underperforming or overperforming in terms of each of the three indexes: underperforming have been considered those regions where the index is lower than the median (for the accessibility and the connectivity index) or, vice-versa, higher than the median (for the infrastructure usage index). This classification allows to compare regions in terms of a specific index.

- c) For each region has been computed the ratio between the value of the index for that zone and the median value computed above across all the zones of the country: $AI_j/MED(AI)$ and $CI_j/MED(CI)$ for the accessibility and the connectivity index or, vice-versa, the ratio between the median value and the value of the index for the zone: $MED(IUI)/IUI_j$ for the infrastructure usage index. These ratios are greater than one for zone overperforming and lower than one for the regions underperforming.
- d) For each region the three ratios computed above have been summed. The higher is the sum and the better the region performs. However, as the aim of the analysis is not computing a super-index, the value of the sum is not really relevant in itself. Instead, the average and the standard deviation of the sums have been computed. The zones where the sum of the ratios is lower than the average minus one standard deviation ($SUM_j < Average - DevSt$) can be considered as highly problematic with respect to the average conditions in the country. The zones where the sum of the ratios is lower than the average minus 75% of standard deviation ($SUM_j < Average - 0.75*DevSt$) can be considered as problematic even if at a less extent. On the opposite side, zone where the sum is higher than the average plus one standard deviation ($SUM_j > Average + DevSt$) can be considered as those with less problems concerning their accessibility.

This analysis mixes quantitative and qualitative indications to provide a comparative picture of region's performances. It should be stressed that the results make sense in relative terms (e.g. comparing the regions each other) rather than in absolute terms. In other words, a region can perform worse than other regions of the country but this does not mean that the accessibility is absolutely poor; if the overall situation is good in the whole country, even regions classified as underperforming can enjoy a good level of accessibility.

Multi index analysis

The multi index analysis is based on three different indicators:

- Infrastructure Usage Index - IUI_j
- Accessibility Index - AI_j
- Connectivity Index - CI_j

Luxemburg consists in one region only at the NUTS2 level, therefore the analysis has been carried out by comparing the Luxemburg values with the average values for Belgium and the Nederland. As can be seen from the table, the values of the three indexes in the three countries are very close to each other: taken into account that population density in

Luxemburg is lower than in the other two countries (160 inhabitants against 326 in Belgium and 458 in the Nederland), the performance of the region can be valued positively for two out of three indexes. The Infrastructure Usage Index is lower then on the other two cases and the Accessibility Index is higher, the only one below the values of the other two countries is the Connectivity Index.

Tab. 19 Indexes

	IUI	AI	CI
Luxembourg	41.5	139	3.6
Belgium Median/Mean	42.1	132.4	4.4
Nederland Median/Mean	43.8	123.7	4.3

ANNEX II: Telecom indicators levels

Sources and definitions

The source is: ESPON project 1.2.2 Telecommunication Services and Networks: Territorial Trends and Basic Supply of Infrastructure for Territorial Cohesion.

Main telephone lines per 100 inhabitants:

Level 1 = >70

Level 2 = 60-69

Level 3 = 50-59

Level 4 = 40-49

Level 5 = 30-39

Level 6 = <30

Cellular mobile subscribers per 100 inhabitants:

Level 1 = >90

Level 2 = 80-89

Level 3 = 70-79

Level 4 = 60-69

Level 5 = 50-59

Level 6 = <50

Estimated PC per 100 inhabitants:

Level 1 = >50

Level 2 = 40-49

Level 3 = 30-39

Level 4 = 20-29

Level 5 = 10-19

Level 6 = <10

Internet (users per 10000 inhabitants):

Level 1 = >5000

Level 2 = 4000-4999

Level 3 = 3000-3999

Level 4 = 2000-2999

Level 5 = 1000-1999

Level 6 = <1000

ANNEX III: Bibliography and sources of information

Mid term evaluation of Objective 2 in Luxemburg. ADE - ECAU, 2003. Ministry of economy.

Compétitivité du Luxembourg: une paille dans l'acier. Rapport pour le Ministère de l'Economie et du Commerce extérieur du Grand-Duché de Luxembourg. Lionel Fontagné, novembre 2004.

Les activités d'innovation et de recherche au Grand – Duché de Luxembourg, Etat des lieux et pistes de réflexion, Rapport au Ministre de l'Economie et du Commerce Extérieur du Grand-Duché de Luxembourg, Septembre 2005. LUXINNOVATION GIE Agence nationale pour la promotion de l'innovation et de la recherche.

www.luxembourg.lu

www.gouvernement.lu

www.innovation.public.lu

www.portrait.public.lu

www.portmerter.lu

www.statec.lu

www.luxinnovation.lu