LOG4GREEN - Transport Clusters Development and Implementation Measures of a Six-Region Strategic Joint Action Plan for Knowledge-based Regional Innovation

Project: LOG4GREEN

Deliverable Name: Mapping the Existing (regional) Knowledge Landscapes and European Cooperation Context

Deliverable-Nr.: D2.3

Report Version: 1.0.0


Period Covered: 

Classification: restricted

Responsibility: Partner No. 6, UDE
Version Management

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<td>Filename</td>
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<th>Modification</th>
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<td>09.12.12</td>
<td>Thomas Hanke</td>
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<tr>
<td>V0.2</td>
<td>12.12.12</td>
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<td>V0.4</td>
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**EC-Grant Agreement**

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<tr>
<td>Start date of project</td>
<td>01. December 2011</td>
</tr>
<tr>
<td>Duration</td>
<td>36 months</td>
</tr>
<tr>
<td>Organisation name of lead contractor for this deliverable</td>
<td>Entwicklungsagentur Kärnten GmbH</td>
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1. Foreword

Based on the analysis work in WP2 (focusing on developing the information base), this document describes the regionally developed RTDI competencies by providing an overview on regional logistics infrastructure-related best practice models. Scenarios and best for logistics systems solutions regarding the region-specific infrastructures and economic conditions are opened up preparing the way for a focused, implementation-oriented knowledge transfer process. This process will involve stakeholders representing enterprises, research and governance in the participating clusters and additional mentoring regions. To support future implementation measures towards “Greening of Transport”, each region has chosen best practice models and gaps/challenges for logistics innovation with a special impact on sustainable logistics and sustainable urban supply.

This document combines and integrates the previous RTDI insights from the analysis phase. It serves as a comprehensible RTDI Atlas and as a prerequisite for the later work packages, such as the SIRA in WP3.

The existing knowledge landscapes shall reflect the use, the operational mode and the combination of available technologies in the operational planning of new more efficient transportation models as well as research results along with related information and procedures in integrated solutions (logistic services) that match with the overall goal of sustainable transport.

2. Summary of results

In the area of research and innovation, main challenges are named in a similar way. However, the foci in the particular regions remain diverse. Perception and acceptance of “sustainability issues” is different in the regions. But against the background of mega-trends, logistics costs will rise clearly and will make certain processes and value chains unprofitable. Logistics services thus have to face increasing social pressure as well as increasing costs. Accordingly, new (sustainable) services and products have to be developed and offered. These will be the critical factors for long-term competitiveness of logistics companies. Although companies are aware of these developments and have an inherent self-interest of acting as efficient as possible, the behaviour of logistics companies’ is very reserved. There is a high potential for more efficiency and sustainability in logistics but only few take action already.

In North Rhine-Westphalia, topics in sustainability research have changed again and again in recent years as environmental policies changed and standards and tools for products, processes and real estate have been developed. There is a trend towards a holistic view of sustainability in science; interactions of economic, environmental and social impacts are taken much more into account. In this context, the interdisciplinary collaboration in research is crucial. However, sustainability cannot be the single focus of future logistics research; technology developments will always play a major role behind it.

Crucial for sustainable logistics is the resource-efficient organization of processes and supply chains. Sustainable or green logistics is also discussed by public authorities and politics. Not only CO2 emission, but issues like land use, dust, noise and consumption of resources in general are continuing to gain importance. However, when it comes to concrete action on local level, most politicians draw back. Even if they now that most people agree with measures towards more sustainability in general, they do not think that people really would hazard the consequences. Thus, politicians avoid ostensible unpopular measures.
Science & education infrastructure varies in the different regions. Generally, logistics research is considered both basic and application-oriented. However, in some regions, the cooperation between academy institutions and industry sector of economics is more pronounced than in other.

Wallonia has a high (and still growing) level of public R&D expenditures compared to other European regions. Its level of competences and excellence in research in view of the scientific collaborations and performances of Walloon teams in European framework programmes participation is very high. Innovative enterprises develop products or processes, mostly with organisational innovation or marketing competences increasing their capacities. Moreover, Wallonia has developed an education network which, meeting enterprises’ needs, offers a fast access to jobs.

In Istanbul, the science landscape regarding logistics seems to develop in positively. The Istanbul region’s logistics research infrastructure is best described by excellent basic research. Other research types such as interdisciplinary research or cutting-edge research can be also applied. The three key words that define logistics research are ICT, inventory and metropolitan municipality. The logistics sustainability research of the Istanbul region regards mainly to technical solutions, organizational solutions, ICT-based solutions and transformation of socio-economic systems. Istanbul is outstanding in the field of supply chain management research.

Logistics research in Carinthia is assessed to be excellent in basic research as well as moderate in applied research and interdisciplinary research. Logistics topics that are considered to be outstanding are Supply Chain Management, Flexibility research or Interface Research. With regard to the effects and targets of logistics sustainability research, regional logistics performance research is considered a relevant topic, too. However, the RTD-capacities are characterized by the limited availability of human resources in the technical field.

North Rhine-Westphalia is regarded as a high-tech location and is known for having one of the densest research landscapes throughout Europe. Its research institutes conduct interdisciplinary research projects on national and on international level. As an important part of the NRW science landscape, the Ruhr Area strengthened its position as a global centre for innovative design of high-quality and efficient logistics services and logistics research. Its research covers technological, economic, environmental, social and cultural requirements and developments. The complex interactions between the sometimes competing demands require new research approaches in the field of sustainable logistics (currently discussed as “logistics 3.0”). The German Federal State Government as well as the Government of North Rhine-Westphalia put a lot of effort in boosting innovation and technological development. Thus, there are strategies on a rather general level to follow this aim as well as a bunch of policies and programmes on a more specific level to foster and fund promising ideas and developments.

The Odessa region disposes of powerful scientific and technological potential. Most universities and academies located in Odessa region have multi-year experience in the field of fundamental and applied research. The academic research is mostly theoretically oriented; application to real enterprise’s activities is still developing, same as research on sustainable logistics. The logistics research trends concerning economic-mathematical modeling of logistics systems has to be further supplemented with corresponding IT-technologies. The industry considers the regional educational institutions broadly meeting international standards. Unfortunately, in the leading educational institutions in the region the specialization “Logistics” has not been opened yet.

In Normandy, actually logistics and Supply Chain Management are not considered or registered as academics topics. The logistics research infrastructure of the region is best described by excellent interdisciplinary research. Among others, Normandy’s research is outstanding in the fields of intermodality, innovative IT solutions for logistics as well as in tracking and tracing. Cutting-edge research is conducted in the field of sustainable logistics – however, corresponding research often refers to technical and operative solutions. Reverse logistics, city logistics and research on ecosystems are topics to be further developed, too.
3. RTDI Landscape – Regional RTDI Competencies

3.1 Carinthia (Austria)

Regional & economic background

Welfare within Europe is developing diversely. While countries like Germany, France, or Austria merely perceive a slight reduction of their economic dynamic and prosperity, other EU member states undergo a severe economic recession that will probably continue into 2013. Austria’s static domestic export volume since 2011 is just one indicator of global economic stagnation. At least Austria’s domestic demand has regained a positive development since 2012 and thus, stabilized the Austrian economy. Analysis of the economic situation in Carinthia revealed that 70% of all entrepreneurs rate the current economic situation positive and stable. Yet, according to four out of five Carinthian entrepreneurs, one challenge to be tackled is the lack of employees in more specialized fields of action. However, an outlook on 2013 forecasts 0.8% increase in employment in Carinthia (Austria: 1.1%), i.e. approximately 1,700 jobs. (Source: Wirtschaftsmonitor Kärnten, Frühjahrsprognose 2012, Institut für Strategieanalysen, Joanneum Research, KWF)

As can be seen in figure 1 Carinthia is Austria’s southernmost province. From east to west, it is surrounded by the Austrian provinces (Eastern) Tyrol, Salzburg, and Styria in the north, and the Italian province Friuli – Venezia Giulia and the state of Slovenia in the south. Carinthia is one of the smaller Austrian provinces: both in respect to population and area it is No. 5 out of nine Austrian provinces. With a total population of 558,000 inhabitants, there is no city of more than 100,000 inhabitants in Carinthia: Its capital Klagenfurt has some 94,000 inhabitants, Villach some 60,000. Carinthian district towns are Wolfsberg (25,000 inhabitants), St. Veit an der Glan (12,000), and Völkermarkt (11,000) in Lower Carinthia, and Spittal an der Drau (16,000), Feldkirchen (14,000), and Hermagor (7,000) in Upper Carinthia.

Figure 3.1.1: Carinthia is the southernmost province of Austria
A region’s specific strength lies in its strategic position as link within the EU. With its favorable geographical position in the heart of the Alps-Adriatic region, Carinthia is interesting on the one hand as it can open the door to the growth markets in Southern and South-East Europe, and on the other hand it is also situated close enough to the key markets of Central and Western Europe. Carinthia’s economy is characterized by a strong mix of sectors, in which numerous businesses have established themselves as world or European market leaders. The main focus is formed by leading companies in the electronics and microelectronics sector, information and communications technology, renewable energy and environmental technology. The traditionally strong construction sector, supplemented by the timber and wood processing sector, forms a further cornerstone. In addition there is a highly developed tourism sector characterized by a variety of innovative networks. Carinthia’s areas of strength are also reflected in its research institutions and centers of competence. Targeted investments in structure, expansion and further development of Carinthia as a research and development location strengthen its innovation capacity and hence also its competitiveness and value creation capacity.

A main obstacle is that between 2006 and 2010, Carinthia overall has lost around 1,100 inhabitants. Its rural regions Lower and Upper Carinthia, though, have lost 2,700 and 1,800 inhabitants, resp., over that period. What might seem meager numbers is however a foreboding of the demographic changes that Carinthia will face in the future. According to Statistik Austria’s population structure forecast of 2010, Carinthia will be the only Austrian province with a diminishing population through the next decades - by one to two percent until 2050 and by six percent until 2075.

There is also a difference in the sources of income, with Lower Carinthia being dominated by trades and industry while tourism is of special importance in Upper Carinthia. While in Lower Carinthia around 30% of all employees worked in manufacturing, and somewhat less than 5% in tourism, the respective numbers were 17% and 13% in Upper Carinthia. For many years now, Carinthia does not attract as many tourists as is hoped for. In the recent years, the number of guests from Carinthia’s main foreign markets, diminished strongly.

Industry plays a central role in the economic region of Carinthia. Half the workforce is employed in this sector. Although great importance has always been attached to tourism, it actually plays an economically subordinate role and is probably more important in terms of Carinthia’s image. Industry is responsible for about three quarters of the net product (EVA) of the region, whereas tourism contributes only 10% to the gross regional product (GRP). In industry, the regional timber and wood processing companies are a significant sector. Also, very promising is the electronics sector with the electronics cluster me2c, and a series of suppliers in mechanical and plant engineering. However, there is lack of large key industries whose significance would promote new logistical solutions. In 2010, the production sector offered roughly 17% of all employment in Carinthia. While Austria’s industry is characterized mostly by small and medium sized companies, this holds true even more for Carinthia where only 14 of Austria’s 500 largest companies are headquartered. It fits into this picture that Carinthia's largest employer by far is the regional public hospital administration, KABEG, with a workforce of more than 7,500. Anyhow, Carinthia is home to some of Austria’s most prominent corporations, above all Strabag, one of Central Europe’s largest construction companies; Infineon Austria, a producer of semiconductor components and Austria’s second-largest research company; and Treibacher Industrie, who are processing rare earth metals- one of Austria’s oldest research firms, founded by industry pioneer Auer von Welsbach.

Overall, the economic crisis of the last years left its trace in all Carinthian regions, most pronounced, though, in Lower Carinthia that lost 4.3% of its jobs from 2008 to 2009 and - in contrast to the other regions - could not regain any of the losses in 2010. Carinthia was more strongly affected by the crisis than Austria on average and is finding more trouble in getting out of it. The region is also engaged in sustainability issues regarding the timber industry, renewable energy industry and green tourism. Table 1 gives an overview on meaningful economic indicators for regional logistics.
# Academic research

In the region of Carinthia, there are five institutions of higher education with 12,000 students (a share of 2.15% of the Carinthian population) and four other research institutions. Total staff working in the RTD field amounts to 13,500 people in 2010 (a share of 6.76% of all employees in the region). In the course of data collection in companies it emerged that it depends on the sector and size of the company, as to the amount of contact and cooperation with research institutes. Industrial companies in the electronics, chemical and paper sectors cooperate strongly with the university and other research institutions. Smaller companies mostly limit themselves to the incremental development of operational procedures and hardly maintain cooperation with research institutions. Here, companies have reservations towards research, arguing that it is based on academic theory rather than hands-on experience. In this area, companies, particularly small and medium sized, should be made aware of the benefits of cooperation with research institutions.

However, new technical possibilities, new legal or political developments and current environmental aspects create new research opportunities in the logistics sector. In recent years, logistics has matured into a significant, independent research discipline at the Department of Production Management and Business Logistics (PLUM) at the Alpen-Adria-Universität Klagenfurt. The Department of PLUM provides Carinthia with a good basis in the field of logistics management. Its function is seen in illustrating the usefulness and efficiency of logistics in Carinthia through research and theory. Adequate logistics increase the competitive advantage of companies, regardless of whether the logistics service is provided internally or externally. The Department sees itself as translator and facilitator in increasing understanding in the logistics area, for people both in and outside the industrial sector. Therefore, in theory and research the focus is put on themes which are of high practical relevance. Apart from in-house production logistics a central theme is the so-called Supply Chain Management. Companies who are internationally active already know of the necessity of adequately managing all inter-company activities.

The Department of PLUM is currently doing research on operational logistics efficiency in the research project “analysis of conceptual characteristics and implementation requirements for Supply Chain Improvement Systems”. In general, analyses are mostly conducted within the bounds of one company only and not along or even across entire Supply Chains. Realization of enhanced performance measurements and subsequently increased Supply Chain Efficiency, i.e. Supply Chain Improvement, is the current objective. An improvement in the performance of different business activities can be realized not until operational waste is detected and evaluated. Therefore, the Department of PLUM puts special focus on a sophisticated evaluation of production, storage, and transport processes. The idea is to more deeply integrate Key Performance Indicators (KPI) into modern SCM. In doing so, the involved researchers are aware of the fact that operational efficiency is

### Table 3.1.1: Carinthia’s economy in figures

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<th>Austria</th>
<th>Share of Carinthia</th>
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<tr>
<td>Gross Domestic Product (GDP) in bn Euros 2011</td>
<td>15.36</td>
<td>300.71</td>
<td>5.1%</td>
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<tr>
<td>GDP per capita 2011 (PPS)</td>
<td>-</td>
<td>31,755</td>
<td>-</td>
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<tr>
<td>Employment rate 2011</td>
<td>35.77%</td>
<td>39.36%</td>
<td>-</td>
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<tr>
<td>Number of local units</td>
<td>19,886</td>
<td>292,371</td>
<td>6.8%</td>
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<td>Share of local units in logistics</td>
<td>1,253</td>
<td>19,488</td>
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<td>Number of persons employed in logistics</td>
<td>9,793</td>
<td>183,046</td>
<td>5.4%</td>
</tr>
<tr>
<td>Share of persons employed in logistics</td>
<td>7.15%</td>
<td>7.90%</td>
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technology-driven as well as it is human-driven. Both factors have to be considered. Three different stages of Supply Chain Improvement provide companies with distinctive functionalities. This approach allows an individual improvement depending on companies' different requirements from one-time analysis to real-time analysis. Currently, appropriate regional companies are identified to verify conceptual methodologies and evaluation measures that have been developed.

A recently conducted collaborative research project between the Development Agency of Carinthia, the Department of PLUM, and a Logistics Service Provider dealt with the topic of regional material management centers and freight distribution centers. Main goals of the project were to examine the need for a regional Material Management Center or a Freight Distribution Center in the central area of Carinthia. Addressees were industrial and trading enterprises in selected core areas of Carinthia as well as retailers in the city center of Klagenfurt. In the course of the project, expectations of resident companies with regard to services that are offered in a regional material management center were clarified. The responsible Logistics Service Providers focus on modern infrastructure, intelligent cargo handling and delivery, bundling of flows of goods as well as value added services. Specific performance indicators point out if the regional effect is as positive as expected in advance.

Efficient multimodality is a mandatory prerequisite for Freight Villages. An example that aims on the establishment of necessary preconditions for successful multimodal transportation in Carinthia and its surrounding area is ALPLOG Carinthia in Fürnitz. ALPLOG Carinthia is the result of the correspondent collaborative research project between the Development Agency of Carinthia and the Department of PLUM. Main objectives of “ALPLOG Carinthia” are the establishment of a Freight Village and Dry Port for NAPA (North Adriatic Ports Association) in the central area of Carinthia, the identification of opportunities for the Freight Village as well as the effective and efficient management of national and international flows of goods and material. A Freight Village is a cluster of industrial enterprises, trading enterprises, and Logistics Service Providers. At least two major means of transport are tied to the site to combine their respective advantages according to requirements of the customers. Research took account of intermodality and shared services.

Some years ago, the research project “ECOPERIMA” placed emphasis on the development of an integrated performance and risk management concept for sustainable Supply Chain Networks. Main objectives were reduction of the environmental impact of production and logistics processes, recycling of materials, and efficient utilization of resources.

Principally, many representatives of science and education in Carinthia wish for more interdisciplinary cooperation in the handling of research topics. Despite the amount of coordination and time needed, an increased inter-departmental cooperation should be maintained, for example between business administration, mathematics, computer science, and geography departments. The FH Villach will also be a potential research partner in future through the development of its logistics department in the near future. Currently, there is very little inter-departmental communication in research practice.

Financial resources dedicated to logistics research are short. This goes along with a lack of basic research in technology in the region as well as limited availability of human resources in the technical field. With respect to logistics Carinthia’s specific RTDI strengths are Life-Cycle Logistics, Supply Chain Flexibility, Logistics Interface Management, Logistics Controlling, Intermodality, City Logistics, and Freight Villages. The region’s logistics research infrastructure is best described by excellent basic and applied research. However, there is an obvious lack of cutting-edge research in the field of sustainable logistics. Yet, responsible institutions are currently placing more emphasis on this important issue in theory and practice, e.g. analysis of the interrelations between regional planning, policy context, specific logistics environment, logistics performance, and the economic, ecological, or social situation in the region. Moreover, in a global context IT-solutions are improving logistics processes at present. Therefore, increased research in the field of intelligent information technology (IT) for logistics is desirable.
At the end of 2009, a Carinthian strategy for research, technological development, and innovation (RTDI), binding for all public actors in the province, was presented. It was created by a well-thought-out process of interviews and workshops started in spring 2008 and involving nearly fifty stakeholders and experts – the latter mostly from outside Carinthia. Upon completion, the strategy document was signed by the relevant members of the Carinthian government and the leaders of all political parties in the regional parliament. The document depicted a vision for Carinthia in 2020 and defined three areas for action: education (strengthening of Carinthia's universities), research (expand the cooperation of science and industry), and innovation (broaden Carinthia's innovation base). Four „priority axes“ are planned to strengthen the regional innovation system in the long term: human resources (more and better qualified people in research), information- and communication technologies (ICT location Carinthia with international profile), production technologies (increased competitiveness in all branches), and sustainability (prosperity and quality of living also for future generations). Improvements in two areas of the province’s “innovation architecture” to optimize the implementation of innovations were sketched: „Innovation spaces“ to develop locations with international attraction, and “innovation management” to support dynamic of innovation structures by continuous processes of learning and discussion, and integration of all relevant policy areas. Table 2 gives an overview on meaningful indicators for regional logistics.

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<th>Austria</th>
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<tr>
<td>Number of public universities</td>
<td>1</td>
<td>22</td>
<td>4.5%</td>
</tr>
<tr>
<td>Number of private universities</td>
<td>0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Number of polytechnics/universities of applied sciences</td>
<td>4</td>
<td>33</td>
<td>12.12%</td>
</tr>
<tr>
<td>Number of other research institutions</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of science &amp; education institutions related to logistics</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of study courses (degrees) related to logistics</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total RTD personnel (2010)</td>
<td>13,498</td>
<td>200,178</td>
<td></td>
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<tr>
<td>Share of employees in RTD (2010)</td>
<td>6.76%</td>
<td>6.02%</td>
<td>-</td>
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<tr>
<td>Total RTD expenditure in m Euros</td>
<td>388</td>
<td>8,263</td>
<td></td>
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<tr>
<td>Total expenditure as share of GDP</td>
<td>2.53%</td>
<td>2.74%</td>
<td>-</td>
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<tr>
<td>Total number of students</td>
<td>12,000</td>
<td>265,000</td>
<td></td>
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<tr>
<td>Share of students/1,000 inhabitants</td>
<td>21.5</td>
<td>31.4</td>
<td>-</td>
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Table 3.1.2: Research & Education in Carinthia
Research innovation centers beyond academia

Based on the program for competence centers of the federal government, cooperative research centers such as “CTR Carinthia Tech Research AG”, “W3C Wood Carinthian Competence Center” as a part of the “Competence Center Wood GmbH” and “KAI Competence Center for Automotive- and Industrial Electronics GmbH” have been established. Their research programs formulated new offers of cooperation for the companies in Carinthia.

To foster the interchange between Universities and enterprises, the “Lakeside Science & Technology Park” was established and is meanwhile an Austrian best practice model.

Within the “Lakeside Labs”, which were founded in 2007, an ICT targeted research focus has been established, where targeted basic and applied research in the field of self-organizing cross-linked systems is conducted. Carinthia has the ambition to be among the top regions in Europe in the sector of ICT research.

Regional Innovation Environment

In the past years Carinthia has developed its research and development of technologies in an extraordinary dynamic way. The regional research quota reached 2.6 % in 2008, which is third place in the ranking of the Austrian provinces and is among the top 30 regions in the EU.

90% of R&D activities are made by Carinthian companies. Here, experimental research dominates, whilst fundamental research is under 5%. 131 companies are active in R&D. About 280 companies are considered to be technology affine.

The Alps-Adriatic University and the University of Applied Science have approximately 9.500 students. Four research centers and a research network are working in the fields of sensoric/micro systems technique, wood research, automobile and industry electronics and ICT.

Two technology parks – the “Lakeside Science & Technology Park” and the “Technology Park Villach” – form the technology portal of Carinthia.

This strong dynamic is mostly supported by some industrial sectors and companies. To ensure future development, the research quota must be set on a wider entrepreneurial and institutional basis. This is one of the key topics for the future strategy in the fields of research, technology development and innovation in Carinthia (see figure 2).

Essential impulses will mainly be set in the following three areas:

- Education – people and their competences
- Research – knowledge and new correlation
- Innovation – development and implementation on the market

In the transverse section to these areas, four thematic priority axes have been defined to strengthen the innovation system in the long run:

- Human resources
- ICT systems
- Production technologies
- Sustainability
To strengthen the terms for the implementation of innovation in the regional innovation system, improvements in the architecture of innovation must be made in the following sectors:

- Innovation sectors
- Innovation management

**Figure 3.1.2: Innovation architecture, priority areas and fields of operations**

**Table 3.1.3: R&D rates by sectors in Carinthia and Austria from 1993 to 2006**
Quantitatively, research within the company sector is among the top positions in Austria. The aims of the strategy 2020 Carinthia are a substantial enlargement of the number of innovative and R&D affined companies and to win more enterprises for the systematically innovation process.

The following focuses are set:

- **Active knowledge and knowhow transfer**
  There is a permanently increasing number of technology suppliers (competence centers, Alps-Adriatic University, University of Applied Science), which cover different segments in the R&D sector. For the employees of universities, competence centers and further technology suppliers as well as companies, people who are well connected to the science system are needed. These people should actively approach companies and act as a node for technology transfer, further they should offer services like patent research and patent information.

- **Overcome barriers of innovation**
  A graduated offer for promotion of “Innovation Newcomer” should enable companies to be lead step by step to the systematic R&D and innovation processes in the future. To this end, the promotion offer should be extended by a self-contained program for innovation and should further be complemented with measures for innovation management. The program for the promotion of innovation assistants with the aim to strengthen the power of innovation of SME’s, should be extended as a fundamental cornerstone of the offers for innovation newcomers. This should become a role model, which invests primarily in setting up cluster structures.

**Drivers of innovation**

The high dynamic of activities in research show the potential of the Carinthian innovation system, which can be further mobilized by specific promotion. Nevertheless, structural shortfalls in some segments of the innovation system exist, which restrain or prevent the enhanced usage of given potential. The optimization of the system should start with an analysis of the status and the identification of challenges for the future.
Electronics is the strongest industrial branch in Carinthia. The importance for the region is manifold:

Spin-offs and the establishment of research facilities caused by interactions with educational institutions have enhanced the environment for the companies.

Mechanical engineering is with regard to export orientation, employment, as well as R&D and investments the second strongest sector, where a focus around the topics of ecological and renewable energies can be identified. Also, timber construction and processing, as well as the chemical sector are segments with a high added value in Carinthia. Within the ICT sector a focused increase of competence has contributed to the profiling of domiciled companies and also to the settlement of new enterprises. A considerable number of small and medium sized enterprises, bundled within the software and internet cluster, are very successful in some niche markets (e.g. software for bank institutes, hospitals, E-tourism). Currently there are approximately 280 technology affine companies, which are particularly concentrated in the sectors of ICT and mechanical engineering.

The very good R&D performance of the regional (leading) companies with a high export orientation is reflected by the capacity and power for innovation. The competitive position can generally be explained by the strengths in the fields of production- and process technologies.

![Figure 3.1.5: Innovation and technology-oriented companies in Carinthia](image)

**Logistics specific networking**

In Carinthia, several clusters deal with different topics such as software, micro electronics and social belongings. Concerning logistic specific clusters and networks there are two clusters. **Transport- and Logistics enterprises** are organised on the one hand under the **Verein Netzwerk Logistik (VNL)** umbrella and on the other hand under the **Bundesvereinigung Logistik Österreich (BVL)** umbrella.

**Verein Netzwerk Logistik**

The VNL is an intersectoral platform for producing companies, industry and trade, education and research facilities, service providers in the logistics sector, transport transshipment-storage-logistic service providers, logistics technology suppliers and integrated logistics service providers.
As shown in figure 3.1.6, the VNL classifies companies into the two sectors logistics experts (outer circle of the pentagon) and logistics costumers (inner circle of the pentagon). More than 300 members (companies, research institutes and personal members) are joined within the VNL.

The organization and realization of logistics events, trainings and workshops and the development and implementation of innovative, successful and unique projects such as logistics specific job site, best practice database, network magazine, logistics education catalogue or logistics-requirements 2030 are their core-competencies.

Furthermore, VNL stands for expertise in the publication and dissemination of important results concerning different studies or projects. Summarized the VNL focuses on the following goals:

- strengthening logistic competencies in a sustainable way
- offer a platform for logistic knowledge
- promote a uniform logistic understanding
- create consciousness for innovative logistics and increase logistic competence
- formulate and support common topics
- establish the economic region as a logistics turntable
- accelerate the regional, supra-regional and international cooperation
Figure 3.1.7: Partners of the Verein Netzwerk Logistik (VNL)

With the VNL department “South” (of Austria) the business sector has a platform with a jointly developed agenda and objectives involving business-oriented regular study groups on relevant topics. The VNL network in Carinthia has established contacts to 40 SMEs in the region, of which 13 are active members. Research and higher education institutes, as well as schools, public administration (like city magistrates) are integrated. This well established regional network will serve as a basis for the actual step for a new institutionalised regional cooperation structure.

The cooperation between the regional active drivers – representatives of public institutions, science and the economy – in Carinthia has been long lasting and fruitful for the mutual benefit and for the benefit of the SMEs. The Logistic Cluster acts as a neutral umbrella network to improve and to set up the topics about logistics, transport and traffic in Carinthia. The grown partnership will be further strengthened through the membership in the AlpLOCC Logistik Kompetenzzentrum Kärnten, which has actually been founded as a research-driven logistics competence network by the regional government, the EAK, and the Alpen-Adria-Universität Klagenfurt.

A nameable activity in Carinthia is the Alps.Adriatic.Logistics Congress which took place in November 2012 for the first time and was organised by EAK and VNL amongst others. The congress clearly places South and Southeast Europe (South Germany, Austria, North Italy, Slovenia, Croatia) in the foreground, and is directed across all sectors of industry at management, service providers and those responsible for logistics and production in companies whose products and services have become increasingly active in the Alps Adriatic region. The conference features lectures, discussions and also several interactive workshops and is completed by a panel discussion with policy makers and experts from the business world.
Bundesvereinigung Logistik Österreich

As the second big industry network the BVL makes an active contribution to the development and the practice related implementation of logistics, by supporting interdisciplinary exchange of experiences between practice and science. Thereby the focus lies on the importance of the logistics for the market performance excellence.

For belongings such as

- problems with logistics implementation and logistics development,
- future-oriented logistics questions and information about relevant logistics trends and
- further education

the BVL presents a competent contact.

The regional office which is responsible for Styria and Carinthia is located in Leoben at the Montan University. The issue of the office is to use the long lasting logistics tradition of the location and to reinforce the (already good) exchange of industry and research. Leoben is affected by the closeness to the industry and shelters a logistics center with a large numbers of companies as well as a row of providers and users of logistics solutions.

The BVL platform arranges workshops and state-of-the-art events for well-respected and young companies to present innovative logistics concepts. The highlight of the year is the Logistics Day which took place in 2008 for the first time.

Research Networking

“Logistics Specific Networking” also encompasses the already mentioned cooperation of research and development facilities with high affinity to logistics. The recently created syndicate LRA – Logistics Research Austria – which combines science fields and corresponding disciplines in R&D towards logistics tasks, is one example for specific logistics networking structure.

In view of the future logistics developments in Carinthia, participation within such form of syndicate supports a significance basis for sustainable logistics systems strategies for this specific transport region. Some of the main competences in the following fields of action need to be covered within the mentioned syndicate are:

- Transport modes & multimodality
- Location & network issues
- Sector-Logistics & logistics service providers
- Personal mobility & socio economics development

A variety of competences and action fields is combined without losing the depth on the scientific level. It enables to enrich international visibility and create broad impact in terms of research trends and efforts. Regional research institutions in Carinthia can have a far-reaching access to intensive interdisciplinary research. In times of managing interfaces and topic variety, bundling competencies and disciplines as well as know-how is of significance to further developing the promising region.

RTDI Policies & Strategies

The success of a regional innovation system is based on the interaction of framework conditions, funding strategies, innovative education- and research infrastructures and should ideally be interconnected with the demands of the companies.

To attain this, in the sense of an ideal integration, the installation of an “innovation Think Tank” between the stakeholder of the innovation system Carinthia (politicians) and the consumers of the innovation system Carinthia (enterprises) should be realized. This should be in the form of an
This advisory board would not act as a consulting committee and would consist only of companies from the different regions and branches.

In the current situation the policy does not receive immediate feedback from the companies. With the installation of the new advisory board a direct feedback loop is possible.

Logistics related strategies

Carinthia as a location is characterized by the absence of a large urban center, therefore companies settle in the vicinity of all metropolitan areas. Transport connections influence the logistics management of the companies in a decisive way. The ever-growing percentage of logistics costs on total costs and internationalization, which increases the physical distance between suppliers and customers, make logistics much more important. The time required for the transport of goods between companies affects the storage requirements. The increasing short-term delivery schedules provide suppliers with the option to increase the finished goods warehouse or to deliver faster. Modern logistics concepts such as Just in Time and Supply Chain Management can only be used if transport is fast, reliable and can be implemented cheaply even in small quantities. Thus, logistics becomes an important factor in regional economic development. Carinthia has to obtain an improvement in the accessibility of the regions through involvement in transnational networks. The connection of the regions to the large-scale transport network must have well-developed transport junctions which can be realized in order to change the means of transport quickly and inexpensively.

Objectives:

- Construction of logistics - logistics expertise through training and intensive cooperation with schools, institutions (WIFI, BFI ...), universities, higher technical institutes.
- Upgrade the locations and the entire region through the establishment and expansion of freight transports centers. First priority is the expansion of the marshalling yard Fürnitz to
an intermodal freight transport center as an international logistics hub for the entire Alps-Adria region.

- Networking of SME’s which are active in the field of logistics to a virtual merger of companies.

In 2004, the EAK was entrusted with the preparation and implementation of an operational logistics position paper in context with a governmental decision. The following picture essentially shows the pillars of the "position paper on logistics development in Carinthia" and its defined priorities.

![Diagram showing logistics network for SMEs](image)

Figure 3.1.9: Pillars of the "position paper on logistics development in Carinthia"

With the establishment of NAPA (North Adriatic Ports Association) and the strategic union sealed by the Adriatic ports of Koper, Trieste, Venice, Ravenna and Rijeka a milestone in terms of increasing competitiveness has been set. NAPA has the collective goal of improving the initial situation in the northern Adriatic region. This MOU (memorandum of agreement), which was presented in March 2010 to the European Parliament, can be seen as a basis for further cooperative activities and use of common synergies.
Carinthia has recognized the pioneering reorganization of the European Economic Area and emphasizes the importance of NAPA and its contents. Through the strong partnership between Carinthia and the Adriatic ports a high potential has already been created regarding the establishment of the location Villach-Fürnitz as the transport system of hinterland connections.

**Dry Port concept ALPLOG**

A recently performed analysis revealed that the site Villach-Fürnitz could be used to implement the Premium Dry Port, developing the strategic direction of multi-port dry ports and has a mid-range distance of > 190 km to the ports. The North Adriatic ports can all be seen as potential ports for Villach-Fürnitz. The merger of these ports (Koper, Ravenna, Rijeka, Trieste, and Venice) into the NAPA organization, whose intentions include strengthening the economic attractiveness of the Adriatic region, is an important step to establish the Premium Dry Port Villach-Fürnitz as a common Dry Port of NAPA and implement thereby their technical aspirations. The diagram below illustrates the concept with all target ports. As the Adriatic port of Monfalcone is not yet a member of NAPA, it is shown in color.
Due to the good infrastructural network of Villach-Fürnitz Premium Dry Port there is the possibility to consolidate and guide all container flows to and from the North Adriatic ports. The site will be able to establish itself as a clearing house for the Eastern Alps and represents the gateway to Central and Eastern Europe. To qualify as Premium Dry Port, Villach-Fürnitz has to offer, in addition to a regular train shuttle to and from the ports, close cooperation with the ports and port-specific displaceable offering of all services to the target ports. Additional services (quality control, product processing) will complement the services provided by the Premium Dry Ports-Villach Fürnitz. Due to the expansion efforts of the ports, the Premium Dry Port is entitled to expect more container flows. Since the ports themselves already possess exclusive dry ports, it should be emphasized, that only the Multi-Port Dry Port Strategy on-site Villach Fürnitz will be purposeful and profitable. Through the resulting synergies, the ports will be an incentive for the relocation of container services offered by Villach-Fürnitz.

**Strengths of the Alplog site**

One of the most significant strengths of Villach-Fürnitz is its geographical location, as it is for all import and export goods transported over the Alps economically and strategically important. On the south side of the Austrian Alpine foreland, directly on the intersection of the Tauern and Baltic-Adriatic axes, the existing terminal of Villach-Fürnitz already has good rail and road connections, both to Central and Eastern Europe. In addition to the Brenner Pass, the Tauern Pass is the only effective transportation route across the Alps in the Eastern Alps.

As Austria is a member of the European Union, together with Italy and Slovenia, it has the EU common customs destination. Due to this fact and the fact that Austria is in the Euro-Zone, the import and export of goods can be easily made, both to and from other EU countries.

Due to the expansion efforts of the North Adriatic ports to Germany, German-speaking Austria possesses the strength to be the physical interface between Germany, Italy and Slovenia, because of the language. Austria can be seen as the economic bridge to Germany.

A further strength of the site Villach-Fürnitz is both the area and the infrastructure of the existing intermodal terminals. The extensive technical equipment includes a gantry crane, one full container truck and four UCT sidings. Between Salzburg and Villach-Fürnitz there is also a successful rolling road traffic, which represents an additional service. At the terminal, the option exists to turn over all
types of intermodal loading units. The service also includes the storage of containers, an empty container depot with check-in, container repair option, agency's activities for rail workers, loading and unloading of containers as well as heating/cooling of containers.

Furthermore, the opportunity of storage services for dangerous goods for a maximum of seven days is provided. The existing open spaces around the terminal are potential logistic areas, whose development has already been approved by the authorities. In these areas, Central European logistics service providers can locate in order to offer additional services. Parts of the area could also be used for the expansion of storage capacity. The range of services can be directly targeted and tailored to the requirements of the ports due to the expanding service portfolio. Moreover, the terminal operates successfully as a transshipment center for wagonload traffic, as a container yard and as a terminal for intermodal transport (accompanied and unaccompanied traffic).

With its long experience as an intermodal terminal, Villach-Fürnitz has an in-depth knowledge in the field of intermodal traffic, which has been confirmed by interviews with port representatives. According to the statements of the North Adriatic ports, which already have good experience of cooperation with the terminal Villach-Fürnitz, this fact represents a good basis for future cooperation.

Regarding the infrastructure, it must be emphasized that a rail-road link between the terminal Villach-Fürnitz and the ports already exists. Therefore, the infrastructure for the implementation of a regular train shuttle from Villach-Fürnitz to the ports is already available and no major financial investment need to be made. There is a regular train service to and from Villach to the port of Koper three times a week (on a fixed schedule), and from Villach to the port of Trieste four times a week.

All the above mentioned facts show that the terminal Villach-Fürnitz has ideal conditions to be developed into a dry port.

Future scenarios for sustainable logistics

For several years, the Carinthian Government has increasingly dealt with the topic of efficient energy regarding a very broad spectrum. Since 2008, the transport sector has been added, specifically alternative vehicles. Electric mobility is one of the core issues. The possible applications of electric vehicles in the area of city logistics are a focus of research in the provincial capital Klagenfurt.

With this focus a tender has been won within the program “model regions”, and the project "eLog" will be implemented in mid-2013. The research goes beyond the use of alternative fuels and also considers alternative logistics systems for the urban area.

Another research focus in Carinthia is traffic safety related to electric mobility. Again, some projects are already being implemented, but many questions are still open.

Final research will concentrate on charging technology with a special focus on the charging station. Carinthia is one of the few regions in Europe which already possesses an extensive network of charging stations. User behavior, the behavior of the vehicles and the influence of the seasons on electric mobility, will be important research topics for the future.

At the time, the future outlook of freight traffic volumes in and through Austria will rise and expects the following developments: road freight traffic will increase by a third until 2025, with moving 79 billion tonne-kilometres in 2025, compared to 60 billion back in 2010.

These forecasts will require action towards efficient resourcing, intelligent transport planning, developing logistics processes and continuing efforts to progress in shifting volumes between transport modes. Especially businesses do have essential options to increase resource efficiency with the help of appropriate research and development as well as adapted logistics activities. Aside from future framework conditions, logistics as a discipline and all its corresponding actions are enablers for managing upcoming progress and changes.
In this context, it is necessary to consider different scenario levels – on the level of global/European economy and its future perspectives; as well as intervention aspects on the national/company level.

The thinkable 2-level-scenario-landscape can be identified in the figure and the explanations below:

**Figure 3.1.12: Super scenarios and intervention aspects**

**Superior Scenario – Unrestrained Growth:** This scenario is characterized by unrestrained and accelerated growth with a certain point of natural collapse to be expected. From the logistics-industry point of view, a strong increase in demand for logistics and transport services exists. Collective efforts towards reinforcing sustainable logistics (towards climate change) are less important. Logistics processes and the demanded volumes are operated within shorter, apparently more efficient, but resource-deprived transport processes. Unstable environmental conditions and extreme weather events lead to repeated interruptions along the supply chains. Companies are suffering the effects of higher capital costs.

**Superior Scenario – Globalization Withdrawal:** Taking the catchword “Peak-Oil”; the remaining “free” energy reserves and price levels influence sustainable operations. With every dollar the heavy oil for global transport is more expensive; the labor cost advantage of developing countries loses importance. The trend of globalization is taking steps backwards. Strategic restructuring of companies and processes involve relocating materials and shorten supply chains. Sustainable logistics efforts lead to new designed supply networks and extended regionalization.

**Superior Scenario – States Collapses:** Former endangered European states were in the end not able to avoid bankruptcy (due to heavy debt). The set measures and rescue packages by the EU for saving financial institutions and state budgets create an instable environment for governments, businesses as well for the population and the employment conditions. The euro is suffering from the uncertainty in the financial markets. Cost saving policies, rigid taxation regulations and reformations limit companies’ scopes in each and every respect.

Considering these superordinate scenarios, the following intervention aspects on the subordinate national and company level can be relevant for counteracting scenario related developments.

**Intervention I – Regulations & Taxations:** Moral values, in terms of sustainability and future oriented establishments, turned out to be ineffective. Extended norm standards for reinforced environmental management and energy consumptions and greenhouse gas emissions need to be
implemented. This might happen with an environmental license system, where ecological norms are considered in terms of cost efficiency (“licensed price for pollution” vs “emission-reduction”). Further strict regulations, taxations for excessive consumption but also stronger incentives for innovation-driven concepts in transport and logistics processes are essential approaches.

Intervention II – Consummation Expectations: End consumer-driven outlooks towards “green producers”, sustainable processes and a transparent carbon footprint of products significantly influence the future consumer behavior. Although this aspect is market driven, companies will need to act on this foreseeable development in consumer behavior and are advised to focus on improved logistic practices. Efficient use of material, modified logistics planning and the use of multimodal transport modes do assess the carbon footprint calculation.

Intervention III – Material-applications: This aspect refers not only to the thinkable future sourcing trends (increasing ambition towards regionalization) but also to the attempts to extended reuse of materials in production process cycles. The discipline logistic helps especially in the set-up of cooperating reverse-processes between company partners, reusing end products as raw materials or optimizing interim storages for materials (with usual high transport distances).

In the mentioned intervention options the understanding of logistics as an important discipline enables significant developments in sustainable processing, boosting green business and regional strategies and reducing freight traffic and emissions.

The regional initiative “Carinthia’s Sustainability Days” (Kärntner Tage der Nachhaltigkeit), encompasses perspectives for implementing sustainable processing, mobility or energy demand topics, as well as the platforms

- “Circle Sustainability Network Carinthia” (Nachhaltigkeitsnetzwerk Kärnten) and
- “Energyforum Carinthia” (Energieforum Kärnten),

focus on sustainable awareness and involve logistic specific topics.
3.2 North Rhine-Westphalia / Ruhr Region (Germany)

Regional & economic background

North Rhine-Westphalia (NRW) is located in the heart of Europe and borders on the Netherlands and Belgium. With a population of 18 million inhabitants on 34,100 square km, it is the most populous and the most densely populated (523 inhabitants per square km) of the 16 federal states in Germany. As an agglomeration area, NRW has 29 cities with more than 100,000 inhabitants. The largest cities are Cologne (1,017,000 inhabitants), Düsseldorf (592,000), Dortmund (581,000) as well as Essen and Duisburg. The most important metropolitan area within North Rhine-Westphalia is the Ruhr Area with approximately 5.2 million inhabitants living in 12 cities in the core of the region and four fringe districts each of them comprising some smaller cities.

![Map of Europe and NRW](image)

Figure 3.2.1: The Ruhr Area’s and NRWs Location within Europe

### Table 3.2.1: NRWs Economy in figures (Source: Eurostat)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>NRW</th>
<th>Germany</th>
<th>Share of NRW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Product (GDP) (in bn. Euro) 2011</td>
<td>569</td>
<td>2,570</td>
<td>22.1%</td>
</tr>
<tr>
<td>GDP per capita 2011 (PPS)</td>
<td>31,878</td>
<td>31,446</td>
<td></td>
</tr>
<tr>
<td>Employment Rate 2011</td>
<td>72.50%</td>
<td>69.20%</td>
<td></td>
</tr>
<tr>
<td>Number of Local Units in Logistics</td>
<td>17,686</td>
<td>104,927</td>
<td>16.9%</td>
</tr>
<tr>
<td>Share of Local Units in Logistics in all Local Units</td>
<td>7.4%</td>
<td>8.9%</td>
<td></td>
</tr>
<tr>
<td>Number of Persons Employed in Logistics</td>
<td>547,836</td>
<td>1,846,319</td>
<td>29.7%</td>
</tr>
<tr>
<td>Share of Persons Employed in Logistics In all Persons Employed</td>
<td>10.4%</td>
<td>7.9%</td>
<td></td>
</tr>
</tbody>
</table>

North Rhine-Westphalia's economic structure is characterized by a well-balanced mix of 'classic' and future-oriented sectors. With the Ruhr Area as its core, NRW is the strongest industrial region in Europe. NRW is home to large industrial corporations of world standing as well as dozens of smaller companies.
companies which are leaders in their respective business fields. 18.4 per cent of the employed population of NRW work in the industrial sector. Nowhere else in Germany do industry-related service providers (e.g. consultancies, engineering offices, EDP, R&D) contribute so much to innovation and value added as in North Rhine-Westphalia. Many of them are business partners to industrial companies. The strength of industry in NRW is due in no small measure to the strength of these industry-related service providers.

The Ruhr Area played the most important role in industrial times: It was not only at the centre of North Rhine-Westphalia, but also at the centre of the German economic development of the 1950s and 1960s, as very rapid economic growth created a heavy demand for coal and steel. After coal and steel enterprises became increasingly unprofitable from the 1970s on, the formative coal and steel industry disappeared and the structural transformation began. Today, not only NRW but also the Ruhr Area is a modern scientific, technological and cultural location.

Logistics in the Ruhr Area has a long tradition: it was a huge logistical effort to plan and direct the mining industry. So looking on core industries of the Ruhr Area and North Rhine-Westphalia which led to the strong logistic sector today, the mining industry (steel and coal) was one of them. Other important industries – some of them also arose from the mining industry – are energy, chemicals, engineering of industrial technologies and materials, trade, automotive industry and information & communication technologies. Furthermore, there are a number of services associated with the aging society: for example, pharmacies and healthcare sectors. The economy is increasingly becoming a service economy, as the field of ICT illustrates well.

The growth potentials of these sectors differ a lot. The range of services will continue to grow, even in the energy sector. The trend for tertiarisation unabated continues – at least relatively to the jobs. The Ruhr Area is well advised to keep all production in its region – however, it is difficult enough to defend the status quo instead of gaining growth.

As North Rhine-Westphalia is still an important industrial core in Europe, a lot of products are manufactured every day. All these preconditions lead to a strong & diverse logistics industry and an excellent logistics research in the region: A high number of internationally leading companies operate large distribution centres in the Ruhr Area. Moreover, there are many medium sized logistic service providers, who serve a number of companies. Companies know very well about the advantage of diversification. It is the best way to prevent high pressure by having only a few customers. Producing and trading companies increasingly differentiate by their logistics processes and services. Efficient processes often provide a greater differentiation potential than the offered goods themselves. This also leads indirectly to the high importance of logistics in the research landscape.
Academic research

North Rhine-Westphalia is regarded as a high-tech location and is known for having one of the densest research landscapes throughout Europe. A network of 69 universities, 11 Fraunhofer Institutes, 12 Max-Planck-Institutes, 11 Institutes of the "Leibniz Association", 3 Helmholtz centres (Research Center Jülich, German Aerospace Center DLR, German Centre for Neurodegenerative Diseases), the center of advanced European studies and research (Caesar), 11 research facilities financed from NRW state funds, nearly 50 technology and business incubation centers, and 30 technology transfer units offers an excellent environment for research and development.

The EffizienzCluster LogistikRuhr proves this: By winning the "Leading-Edge Cluster Competition" of the German Federal Government in 2010, the Ruhr Area strengthened its position as a global centre for innovative design of high-quality and efficient logistics services and logistics research. However, today there is no pure logistics faculty at regional universities yet – except one university of applied sciences which is completely dedicated to logistics and economics.

Looking on the education and training side of academia, there is a choice of 36 different study programs in the field of logistics – 18 bachelor and 18 master programs. Nine of these programs are dual or extra-occupational programs, which make them very interesting for logistics companies. The study programs reflect the spectrum of research in the region: there are very technical programs like “Automation and Robotics / Process Automation” as well as logistic-management programs and international supply chain management programs.

<table>
<thead>
<tr>
<th>Research &amp; Education in NRW in figures</th>
<th>NRW</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Universities / Academia</td>
<td>69</td>
<td>392</td>
</tr>
<tr>
<td>Number of Other Research Institutes</td>
<td>76</td>
<td>254</td>
</tr>
<tr>
<td>Number of science &amp; education institutions related to logistics</td>
<td>35</td>
<td>n/a</td>
</tr>
<tr>
<td>Number of study courses (degrees) related to logistics</td>
<td>36</td>
<td>n/a</td>
</tr>
<tr>
<td>Total RTD Personnel (2009)</td>
<td>86,831</td>
<td>534,565</td>
</tr>
<tr>
<td>Share of all Employees (%) (2009)</td>
<td>1.49 %</td>
<td>1.93 %</td>
</tr>
<tr>
<td>Total RTD Expenditure (Mio. €)</td>
<td>10,642</td>
<td>67,014</td>
</tr>
<tr>
<td>Total Expenditure as Share of GDP (%)</td>
<td>2.01 %</td>
<td>2.82 %</td>
</tr>
<tr>
<td>Total Number of Students</td>
<td>535,000</td>
<td>2,217,000</td>
</tr>
<tr>
<td>Share of Students / 1,000 Inhabitants</td>
<td>29.98 %</td>
<td>27.12 %</td>
</tr>
</tbody>
</table>

Table 4.2.5: Research & Education in NRW in figures

Moreover, there are several logistic-related certified training-courses in Germany. Especially for medium-sized companies, cooperative education with strong practical learning phases like it is operated in the so called “dual system” in Germany is of note – also for advanced training. The European Qualifications Framework (EQF) enables a consecutive education system, too, since it acts as a translation device to make national qualifications more readable across Europe, promoting workers' and learners' mobility between countries and facilitating their lifelong learning.

Despite these very good preconditions, there are some obstacles the Ruhr Area will meet with in the next couple of years. The growing shortage of young professionals due to demographic change is one of it and probably one of the most challenging. Since North Rhine-Westphalia and especially the Ruhr Area are shrinking regions, it will be difficult to attract and educate enough students for the upcoming demand of logistics research and services. Regarding logistics research competition between researchers and between research institutes still exists. To press home all the advantages of
the diversified research in the Ruhr Area, parochial thinking has to be overcome. In the same context, reservations against other disciplines have to be mentioned, too. These barriers between single disciplines have to be dismantled, if the Ruhr Area wants seriously to develop sustainable solutions for logistics. In North Rhine-Westphalia the weakness of technology transfer is still a challenge. Thus, a new “format” for the establishment of contacts has to be found to overcome people’s inhibitions.

In recent years, logistics research has evolved from a combination of engineering disciplines (including mechanical engineering) and transportation research as a separate discipline into an own discipline. Information technologies played a major role in this process, too. On the contrary, logistics – as a cross-sector discipline – rather acts as a link between disciplines and researchers are always connected with their “home disciplines” in a stronger way than with logistics as a discipline. However, without further development within the fundamental disciplines, a further development of logistics is not possible. Moreover they agree that there is a trend of coalescence of disciplines which will continue to grow. In the future, research facilities sitting between the faculties – like for example the Centre for Logistics & Traffic (ZLV) at the University of Duisburg-Essen (UDE) – will gain in importance.

With regard to education and training, logistics needs a good balance between specialization and fundamental knowledge. For certain areas, specialists are still essential, but a general understanding of how logistics operate in a broader context becomes increasingly important. The future logistics manager has to be skilled in a broad understanding of logistics processes as well as in one specialised field – this applies both for the internal and external training in logistics. Academic degrees in logistics exist for about 20 years in North Rhine-Westphalia. Over the years, training and education content has changed quite a lot. In the past, people were trained in how to ensure the flow of goods, today it is about the control of supply chains. This is partly a financially demanding but definitely a highly scientific work. However, in a dynamic market like logistics, it is difficult for academia to provide always the “right” education for the “right” people.

The “right” education will consider the demographic change and a decreasing number of students. Additionally, the academic training should be characterized by a more generalist point of view at the beginning of the program. In a later stage, specialization areas should be offered. More attention is necessary to solid IT skills, mathematics, stochastics, but also business management knowledge. Fact is that graduates will be absorbed easily and quickly from the labour market. On contrary, the companies’ demand for especially academically trained logisticians is still limited. Instead they employ engineers, economists or other career changers who improved their skills in the field of logistics by some vocational training. However curricula will be set up, it seems to be important that students learn to think in practical solutions. Scientists and practitioners agree that it would be of benefit to integrate practical training phases into the curriculum. In addition to the business or technical point of view, a more sustainability-oriented view should be part of the education as well. This applies to all but maybe especially to the technical training courses.

**Research innovation centres beyond academia**

Many Universities, Universities of Applied Science, Fraunhofer Institutes as well as other research institutes located in North Rhine-Westphalia have a special focus on logistic aspects. The Fraunhofer Institute for Material Flow and Logistics (IML) in Dortmund covers a wide range of logistic-specific research. With the Fraunhofer IML, the biggest logistics research institute is located in the Ruhr
Region. The institute advises companies of all industries and sizes in all questions about material flow and logistics. In the process, Fraunhofer IML focuses on company-specific, made-to-measure solutions and accompanies its customers from planning to implementation. As one of the major partners in the EffizienzCluster LogistikRuhr, the Fraunhofer IML is not only an important partner for the cluster and the region, but a leading innovation centre in Germany and Europe. Another important innovation centre located in North Rhine-Westphalia is the DHL Innovation Centre. This centre is unique in the field of logistics. In the centre, specialists from the academic, industrial and technological fields exchange their knowledge and talk about advanced new logistics solutions to be used globally. Thus, space for new ideas, for forming innovative networks and developing solutions, from prototype to market launch is offered.

**Regional Innovation Environment**

Looking on the potential for economic development, to say the regional innovation environment, a simple answer cannot be given. In its beginning dynamic years, the Ruhr Area truly had a functioning innovation environment respectively a culture of innovation: Spin-offs of engineers, partly by business partners who established a rival company; organizational changes; technological innovations, especially for developing new markets for steel (automotive, electrical engineering), or the emergence of large-scale plants are indicators for a real qualitative and creative development and not just for a quantitative increase of production volume. But not only in economic respect, also in social and political respect the Ruhr Area experienced an innovative development: Looking at immigration, it was a huge integration effort, the people in the Ruhr Area have accomplished; building up a water economy alliance or the housing settlement association, the Ruhr Area presented political-organizational innovations that have anticipated the essential elements of self-organization and public-private partnership.

The people in the Ruhr Region are rather down to earth, even though there is a high level of innovation in the region. The Ruhr Region is a region that is used to regional and economic change. This might be the reason why people are not in the forefront to try new things; the willingness is generally rather low. However, people are used to change and there are always pioneers who are acting as driving forces. And since North Rhine-Westphalia is one of the German states where the energy turnaround is being promoted heavily, it is in itself a very good basis for further innovation in related areas. However, companies are reserved regarding innovations in logistics. They would rather shun great innovations and carefully watch the political situation as well as competitors’ behaviour. Nevertheless, there are others who can be seen as pioneers taking part in innovation projects and related user groups.

After conflicting years of economic and social changes due to missed or delayed adaptions to changing economy, the Ruhr Area today is a diverse region. There is no uniform culture of the Ruhr Area anymore; the Ruhr culture arises today is contradictory, even if it is empirically difficult to grasp: On the one hand it can be justified that previous attitudes are still in effect as barriers. Start-up activities, the willingness of companies to cooperate, the skill level and the proportion of female employees are still below average. This is also true for the company’s research & development

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**Logistics needs in North Rhine-Westphalia**

- A greater penetration of ICT in day to day logistics: There are a lot of great ideas and systems tested already. But companies have to be convinced that the investments they have to make are worthwhile.
- Companies’ investments in future technologies: even if the return on investment cannot be reached in short time. The public sector is eager to support and promote e.g. clean transport technologies or e-mobility. Such initiatives have to be continued and broadened.
- New intelligent transport systems (ITS): With the “Ruhrpilot”, a first step has already been realized. Ruhrpilot is a transport telematics / traffic management system in the Ruhr Area which aims to support road and traffic authorities in traffic control and management as well as transport companies in their operational tasks.
activities: In 2009, the share of business R&D expenditure of the GDP was 1.23% in NRW in contrast to a share of 1.89% in Germany; 14.2% of the total German business R&D expenditure was displayed for NRW – a relative low share considering the share of 22.1% of GDP. On the other hand there are many success stories in which old and new has been connected or complete new markets has been developed. Outstanding are the environmental industry, the information and communication industry as well as the whole cultural sector in the Ruhr Area. Looking on the importance of ICT services for the logistics in particular, ICT-based solutions have become increasingly important in the last past. There are projects aiming at harmonizing freight traffic and individual traffic through aligning the corresponding systems and processes.

Drivers of innovation

In the Ruhr region, there are the "old" industries like the automotive and the chemical industry which were strong innovation drivers of logistics in the past, but are still today. Moreover, a lot of big trade companies located in NRW ask for innovative solutions for their logistics each day. They are not only clients for logistic service companies, but have to serve the huge NRW market areas with their retail logistics, too. Thus, they are seeking for new technologies to be implemented. Technologies like the RFID technology is being used by single companies already, but as RFID is not sufficiently developed for all the requirements yet and is still too expensive, companies look for alternative technologies. In the future, important impulses are also been expected from the energy sector. Particularly in combination with electric vehicles, it can be assumed that in 150 years all transportation services operate on alternative/renewable energy sources and storage devices. Hence, research and development projects on new technologies such as fuel cells are very important.

Innovation in logistics is often customer-driven. Its impetus primarily comes from the demands of markets; the aim is to overcome bottlenecks. Another innovation driver, of course, is the user-oriented ICT industry & services, mainly located in the Ruhr Area. The ICT sector is strongly connected to the logistics sector in the Ruhr Area and thus influence the development of logistics, too. Lots of innovative ideas regarding intelligent solutions will be realised by these small and medium-sized companies. Thus, ICT is considered a push factor for innovation more than the costumers themselves are seen as pull factors.

Academic science has to be named as driver of innovation. There are a lot of highly recognized research and development departments in the field of logistics in the Ruhr Area. They as well have strong influence on innovation development in logistics. Looking at politics as innovation drivers, politics is considered to act too slowly instead of being an active driver of innovation.

Logistic specific networking

Today, the state government of North Rhine-Westphalia supports the cooperation of companies, research facilities and the public with its powerful cluster policy, set up in 2008. In total, 16 branches and fields of technology are being supported. These 16 clusters possess particularly significant potential for growth and are of great importance for the economic development of the state of North Rhine-Westphalia.
Despite these facts, the interviewed experts were also asked about logistic specific networking in the region as well as about the work and the performance of the clusters. As stated above, the Ruhr Region is a vivid networking region. Thus, networking activities do not only exist on the formal level like of the two clusters. There are different logistics activities running on local or sub-regional level like the round table workshops on logistics and transport infrastructure in Duisburg. Here, the business development of Duisburg offers for 17 years already a platform to exchange ideas, to collect suggestions and to inform the business partners promptly and in detail about planning and development. Another example is the last-mile-logistics network in the northern Ruhr Regions. This network, comprising companies from the cities of Gelsenkirchen, Herne and Herten, focus on urban respectively on last mile logistics. Main activities of the network are: regional marketing as well as brown field logistics; organisation of events and initiation of joint projects; inter-municipal coordination of the development of logistics areas.

Regarding the two logistics cluster in NRW, the first one, Logistik.NRW, is an initiative of the North Rhine-Westphalian state government. Goal of the cluster is to bundle the activities of the logistics industry in North Rhine-Westphalia in order to gain a leading role in Europe’s logistics industry. Main tasks are to establish a logistics community in North Rhine-Westphalia and the marketing of the logistics region and the overall land use policy. Moreover, the cluster will also foster future fields in technology and industry as well as the further development of product strategies for logistics SME’s and improving the image of the logistics sector in the region. Therefore, the cluster delivers support to its members and their networks and institutions.

The second initiative to be named here is the EffizienzCluster LogistikRuhr (ECLR), winner of the 2010 leading-edge cluster competition of the German Federal Ministry of Research and Education (BMBF). ECLR is becoming established as a worldwide center for high quality logistics solutions. In numerous innovative research projects with excellent international reputations the business and scientific communities here are developing technologies, concepts and services for the logistics of the future. In joint projects 100 innovations, products and patents are being developed which the research partners or other interested companies will be bringing onto the market, making logistics

**Best practice: EffizienzCluster LogistikRuhr**

The EffizienzCluster LogistikRuhr (ECLR) is the largest logistics research and development cluster within the logistics branch in Germany. It is a requirement and target for the EffizienzCluster LogistikRuhr to facilitate tomorrow’s individuality – in terms of the individual supply of goods, mobility and production – with just 75 per cent of today’s resources. The efficiency of processes and products is the key focus.

Looking at the specific strength of the cluster, it could be defined as follows “A multiplicity of logistics experts from universities, research institutes and companies – major corporations as well as small and medium-sized companies – coming together for five years to concentrate on the improvement of logistics efficiency: a unique collaboration platform within logistics in Germany.” Focussing on key topics as well as bringing together experts from all disciplines and all kind of entities guarantee a wide perspective on logistics efficiency – technical as well as socio-economic and ecological aspects will be considered.

**Project Examples**

In the project “Green logistics” the ecological effects of logistic processes and systems are being determined for the areas of logistics real estate, intralogistics and transport according to the cost-by-calculate principle. The aim is the development of an internationally acknowledged eco-certification.

Regarding voluntary commitments of the transport and logistics sector, there are no commitments in a narrow sense the region agreed upon. However, within the project “Sustainable Sourcing Excellence”, partners from science develop a sustainable sourcing code in cooperation with major retail companies.

The project CoReLo (Integrated CSR Management in Logistics Networks) is developing innovative strategies in corporate responsibility which go beyond the usual approaches to sustainable supply chain management. Instead the project looks at specific issues relating to the economic, social and environmental responsibility of small and medium-sized logistic service providers and logistics networks.
even more competitive overall. ECLR helps to connect business and science to identify new research fields and to get new research projects off the ground – for even more logistic innovations.

Looking at best practice model for logistics system solutions regarding the region-specific infrastructures and economic conditions, projects from the Effizienzcluster LogistikRuhr are path breaking. Within the key topic “Urban Supply”, five projects concentrate on developing concepts and solutions for bundling logistic and non-logistic services with regard to demographic changes and for bundling various material and goods flows in order to reduce logistics traffic in urban areas. These solutions take navigation systems, access restrictions or requirements for innovative transport systems into consideration. Moreover, concepts will be developed that allow the integration of electro-mobility in urban supply structures as well as innovative goods transfer systems for the last mile to round off the concepts for urban supply. Within the key topic “Environment in Focus”, conditions will be created so that companies are given the opportunity to become aware and to control their influence on the environment. That enables them to act in a more environmentally friendly way in future. The projects of the EffizienzCluster LogistikRuhr work on system solutions for a better and more efficient performance of logistics.

At institutional level the project activities of three EffizienzCluster LogistikRuhr projects (CoReLo among others, see box above) are bundled in a new service point: DIALOGistik Duisburg which is located in the Duisburg docklands. DIALOGistik has been set up to act as an interface between science and practice. This contact point for knowledge transfer, training, qualification and efficiency in logistics in the Duisburg harbour is also aligned to the prospect of setting up a global logistics academy.

![Figure 3.2.2: Partners in the EffizienzCluster LogistikRuhr](image)

*Figure 3.2.2: Partners in the EffizienzCluster LogistikRuhr*
Looking on the interplay of our three stakeholder-groups, science, business and politics, the relationship in the field of logistics is assessed generally positive. However, there are mainly bilateral relationships between the corresponding partners. Science left its ivory tower, and there are very good opportunities to get in touch with the practice. At the micro level, with respect to the projects of the EffizienzCluster LogistikRuhr, cooperation projects are classified as very good. However, technology transfer between science and industry in general is still in need of improvement. Institutes of the Fraunhofer Society like the Fraunhofer Institute for Material Flow and Logistics (IML) or the Fraunhofer Institute for Software and Systems Engineering (ISST) are good examples for good networking between industry and academia is possible. In contrast to universities, the universities of applied sciences in North Rhine-Westphalia are performing very well in cooperating with companies. The technology centres at various sites do a good job, too. However, everything depends on the individual players on both sides. There are many companies participating in research projects, but research is just not a priority for many small businesses in particular.

With regard to the relationships between administration and industry, the business development agencies are doing "lobbying" towards the federal ministries – especially the Wirtschaftsförderungmetropoleneruhr GmbH (wmr), the economic development agency of the Ruhr Area is working on this task in behalf of the local business development agencies and companies. Generally speaking, there is a good and trusting cooperation with the federal departments responsible for logistics. Due to political reasons in recent years and political indecisions in North Rhine-Westphalia, the goal of a constructive networking between industry and administration was yet contradicted. Through this lack of cooperation, concrete action plans are still a challenge.

Not politically driven regulations and obligations, but the companies themselves will have to determine the further development. Yet, policy can support: Initiatives like the Logistik.NRW cluster or the EffizienzCluster LogistikRuhr, both co-financed by the state government of North Rhine-Westphalia, have a positive effect on the future development of the sector. However, there is often no return on investment in less than 6 months so that the economic benefit cannot be displayed in time. Even if joint projects conducted within the EffizienzCluster LogistikRuhr or other funding programmes provide good opportunities for industry partners, especially for SMEs, to cooperate with academia; in daily business it is not easy for industry partners to find a good research partner who provides the solution needed in proper time. Many companies in the region even refuse to innovations from the academic research. They either have just invested in an "old" technology or are “settled” too much within their day-to-day business.

Regarding regional logistics cluster in North Rhine-Westphalia, it has been strongly supported by the government for years. As proof, there are already 200 companies being a member of the Logistik.NRW cluster. The fundamental work of cluster development is done; now the actors can go a step further and foster “cross-clustering” and “cross innovation” like Exzellenz.NRW, the umbrella organisation of the NRW cluster policy, does already.

RTDI Policies & Strategies

Germany is known as a technology-oriented country. A lot of innovation and technological development came from German researchers and developers in the past. To keep up this tradition, the German Federal State Government as well as the Government of North Rhine-Westphalia put a lot of effort in boosting innovation and technological development. Thus, there are strategies on a rather general level to follow this aim as well as a bunch of policies and programmes on a more specific level to foster and fund promising ideas and developments.

With the national high-tech strategy including the leading-edge cluster competition as well as the cluster policy of North Rhine-Westphalia, a good and decisive step has been made for logistics in NRW. In general the support through innovation funding is rated good.
Especially for the logistics industry, a reliable policy regarding regulations and boosting new technologies is very important. Companies and organizations report, that they react very strongly to what is prescribed by politics. For instance due to the debate about noise reduction, emissions and renewable energies. However, this does not always happen especially due to election periods and strong lobby partners. Industry would appreciate a rather long-term oriented policy even if this would mean stronger regulations for them in the long run. Also researchers agree with this claim since research thinks ahead ten to fifteen years but the companies only two to three years. This might change if politics would give a framework more obliged, at least in order to go for some major technological challenges.

Future scenarios for sustainable logistics

For implementing sustainable logistics solutions in practice, possible benefits has to be made clear – among project partners especially if they come from the industry sector. Many companies are eagerly watching what is happening in research & development – but often fail to establish future-oriented solutions on their own. In sustainability issues, most companies (and municipalities) will not be reached by moral values. Thus, there are three scenarios:

a) Sustainable logistics through more regulations
b) Sustainable logistics through re-regionalisation
c) Sustainable logistics through market development

In the first scenario, logistics companies will have to face regulations, financial obligations or at least incentives to act more sustainable. The regulatory framework already existing in North Rhine-Westphalia – the green zones – are controversial, though. However, companies would like to have binding regulations beyond election periods – such as EURO 6 norm as a uniformly regulated European approach. Commitments and norms like the ISO norms seem to be an option, too. Relevant norms are the ISO 14001 environmental management standard, the EN/ DIN 16258 methodology for calculation and declaration on energy consumptions.

High Tech Strategy

The High-Tech Strategy, which was launched in August 2006, is the first broad national concept in which the key stakeholders involved in innovation share a joint vision. It has formulated goals for a wide range of different fields of innovation, defined priorities, and introduced new instruments such as the leading-edge cluster competition and the innovation alliances. The Strategy has linked up topics in various fields of innovation policy across Federal Ministries. Aspects related to funding are addressed in connection with efforts to improve general conditions. Individual fields of technology are seen as contributions to realizing important social policy aims or as innovation drivers for other fields of technology (“key technologies”), while social change is considered to be an important prerequisite for the generation of technological knowledge.

Within the Follow up of the High-Tech Strategy 2020 in 2012 - the Action Plan, forward-looking projects in selected areas will be the focus of future research and innovation policy. These projects pursue specific objectives related to scientific and technological development over a period of ten to fifteen years. Strategies for innovation are being developed and steps towards their realization planned in concrete cases. The High-Tech Strategy has formulated a couple of central examples of forward-looking projects.

The activities and measures of the High Tech Strategy are manifold. There are several programmes alongside the five fields of action climate/energy, health/nutrition, mobility, security, and communication as well as alongside the key technologies information and communication technologies (ICT); Microsystems; optical technologies; production technologies; materials technologies; biotechnology; nanotechnology and innovative services.

RTDI potentials in the field of logistics:

- Mobility and transport technologies, mobility of the future, electric mobility
- Noise reduction in freight transport
- National Maritime Technologies
- Research for Sustainable Development
- Information and Communication technologies including intelligent networks for mobility and cloud computing
- Autonomous devices including service robotics
- Embedded Systems
- Earth observation from space, satellite
and GHG emissions in transport services or the Greenhouse Gas Protocol. Since the implementation of these standards is pretty much customer-driven, this might be rather classified as market development. In terms of incentives, energy policy might lead in the right direction, too.

The idea of re-regionalization seems to be an alternative approach, too. Experts assume that in the future regional products and material cycles will gain importance again. However, this does only apply for a limited amount of products. Re-regionalization – local production and consumption – will be a niche for some products and companies. From a critical point of view, re-regionalisation will even cause emissions directly outside the front door; that will lead to new problems, too. However, also at the World Economic Forum, business leaders suggested to decelerate supply chains.

No matter how more sustainability in logistics will be achieved, logistics will have to move toward this approach in the upcoming years. However, optimization and more efficiency in processes and services is only one part. Some believe that our whole system - processes and structures – needs to be transformed. Renunciation of consumption and prevention of logistics are the keywords. Within the scientific community of the Ruhr Region, this is being discussed currently as “Logistics 3.0”.

Research Focus and Project Examples

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<th>Environment</th>
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<td><strong>Project Example: “Green Logistics - a Seal for Being Green”</strong></td>
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Products and services for “Green Logistics” are subjected to highly different parameters for measuring resource consumption and emissions. There is a lack of standardized ecological evaluation procedures and methods as well as a systematic collection of ecological design alternatives for logistics processes and systems.

Uncertainties about the actual ecological effects combined with the lack of knowledge about possible, more ecological alternatives and their economic impacts make it difficult for small and medium-sized as well as large companies to design their logistics to be eco-efficient.

**Objective of the Project**

Within the scope of this project the ecological effects of logistic processes and systems are being determined for the areas of logistics real estate, intralogistics and transport according to the cost-by-cause principle. In doing so, the entire logistics chain is taken into consideration. The methods and instruments which will be developed (further) for this will result in a certification system for logistics providers.

The aim is the development of an internationally acknowledged eco-certification. This will be formed on the basis of existing data on the one hand, and on a wide platform of practical experience on the other, using a total of eight case studies. At the same time a collection of best practices, guidelines and checklists will be worked out for companies to use.

**Concrete Innovations**

The success of the project will be matched against the increase in efficiency and reduction of emissions in logistics systems and processes. All relevant requirements on the part of future providers and users will be considered in the investigations as well as in the products and services which are to be developed. The innovation here lies in the comparability of ecological effects, in the logistics supply of services and the evidence of the existence of eco-efficient solutions along the entire logistics chain. The industry standard in the field of Green Logistics will be specified by the project results, among others a CO2 neutral air freight hub, an eco-efficient last mile logistics as well as a resource-saving container management system.

**Partners in the Project**

UDE D 2.3 RTDI Atlas 02/04/2013
ARGE Goodman Germany GmbH
Arcadis Deutschland GmbH
DB Mobility Logistics AG
Deutsche Post AG
Fiege Deutschland Stiftung & Co. KG
Fraunhofer Institute for Material Flow and Logistics IML
Lufthansa Cargo AG
Schmidt-Gevelsberg GmbH
TÜV Rheinland AG
United Parcel Services Deutschland & Co. OHG
Vanderlande Industries GmbH
Wuppertal Institut für Klima, Umwelt, Energie GmbH

Facts & Figures
Start of the Project
01/06/2010
Project Duration
58 months
Project Volume
6,2 Mio. Euro

Economic & Policy
Project Example: “Sustainable Sourcing Excellence”
As the real net output ratio for the average company falls, sustainability in international purchasing and procurement logistics is gaining in significance. Scarcity of raw materials, new environmental regulations and industry standards mean that ecological sustainability is becoming as relevant as cost effectiveness.

Due to a lack of measuring systems for sustainability, however, purchasers and logisticians, have until now been ill-equipped to estimate the environmental impact of their decisions. The same applies to mobility.

Objective of the Joint Project
With this joint project the EffizienzCluster Logistik Ruhr is to take on a pioneering role in structured, transparent and comprehensive decision-making as a major component for sustainable action and its value in companies. The entire decision-making process regarding sustainability in purchasing, procurement logistics and mobility is to be covered by a variety of approaches. This will allow assessment/measurement, control and monitoring of sustainability in purchasing and procurement logistics. Key to the project is a commitment to the triple bottom line, in other words the all-round pursuit of ecological, social and economic targets which constitute the achievement of sustainability.

Specific Innovations
The approaches are wide-ranging. Firstly, a procedure to measure the environmental impact of purchasing and procurement logistics is being developed. A comprehensive and quantifiable evaluation method compares resource and energy input, in addition to compliance with social standards, with economic success in purchasing. Secondly, an international sourcing governance
code is being developed which safeguards sustainable purchasing and sustainable procurement logistics. Efforts are also underway to draft a code of practice for sustainability reports in purchasing and procurement logistics. The purpose of this is to make sustainable services accessible to all companies in a standard form. Furthermore, a CO2-efficient sourcing platform is being developed which will provide an insight into the carbon footprint of a range of product groups and logistics services. Finally, a sustainable and IT-supported risk management system is in the pipeline which will help to avoid sustainability risks.

**Partners in the Project**

Clariant Produkte (Deutschland) GmbH  
Dachser GmbH & Co. KG  
Deutsche Telekom AG  
EBS Business School for Law / Institute for Supply Chain Management - Procurement and Logistics (ISCM)  
Intertek Holding Deutschland GmbH  
neckermann.de  
Rhein-Main-Verkehrs Bund GmbH  
Sandoz International GmbH  
Vattenfall Europe AG

**Facts & Figures**

Start of the Project  
01/07/2010  
Project Duration  
36 months  
Project Volume  
1,8 Mio. Euro

**Society**

**Project Example: “Integrated CSR Management in Logistics Networks (CoReLo) - Economizing Responsibly”**

As a result of the part they play in global value chain processes logistics companies face particular challenges regarding economic, social and ecological responsibility.

Growing public interest in ethical and environmental standards, the increasing significance of ethical and environmental audits and the ultimately inevitable necessity of conserving resources mean that practical strategies for corporate social responsibility must be devised. This presents a special challenge, in particular for smaller and medium-sized enterprises in the logistics sector with their characteristic network structures if they are to play their part in sustainably shaping the future of the region.

**The Objective of the Joint Project**

The CoReLo project is developing innovative strategies in corporate responsibility which go beyond the usual approaches to sustainable supply chain management. Instead the project looks at specific issues relating to the economic, social and environmental responsibility of small and medium-sized logistic service providers and logistics networks. Particular attention will be paid to the companies'
specific corporate culture. A major aspect of the Joint Project is the impact analysis of existing ethics and sustainability programmes, providing an insight into the efficiency of CSR management concepts.

**Specific Innovations**

The result is an ethics and sustainability programme which is tailored to the logistics industry, realistic and easy to implement. An entirely new aspect is the way in which ethics and sustainability analyses are compared with stakeholder information. An additional feature is the development of communication instruments which logistics businesses can use to communicate their CSR activities more effectively both inside and outside the company. The aim is to combine the challenges of sustainable development with the innovative strength of the companies. Codes of practice for sustainability management, put together on the basis of practical experience gained in businesses, will be available to interested companies.

These will take the form of a service point for training and professional development called DIALOGistik Duisburg, to be established in Duisburg's docklands area. The service point is a joint project of the CoReLo research programme, the Universitäre Wissenschaftliche Weiterbildung in der Logistik (WiWeLo) and the Organisational Innovations with Good Governance in Logistics Networks (OrGoLo).

**Partners in the Project**

Institute for Advanced Study in the Humanities
University Witthen/Herdecke
University of Duisburg-Essen
Große-Vehne Speditions GmbH
Horst Weyer Speditions GmbH
relamedia GmbH
Verband Spedition und Logistik NRW e.V.

**Facts & Figures**

Start of the Project
01/10/2010
Project Duration
36 months
Project Volume
2,1 Mio. Euro
3.3 Odessa (Ukraine)

Regional & economic background

The Odessa region is the seaboard and borderline region of Ukraine, located in the extreme South-West of the country. The territory of the region is crossed by two national borders – with Romania and Moldova. In the South the edge of Odessa region reaches the Black Sea. The length of sea and firth coast from the mouth of Danube to Tiligul firth is 300 km. With a population of 2.38 million inhabitants and an area of 33,400 square km the region is one of the most densely populated (71 inhabitants per square km) of the 25 regions in Ukraine. The Odessa region is the foreign trade gate of Ukraine. It fulfills the most important transport-distributive functions on national and international levels. It is the leading region of Ukraine in terms of development of maritime economics, as well as one of the most perspective regions of Ukraine in terms of development of free economic zones and new manufacturing systems. It is the region with one of the most attractive and favorable investment climate. The region’s specific strengths are the favorable geographical situation on the crossing of several international transport corridors (7th and 9th TEN-T, TRASECA, Baltic Sea-Black Sea, and Black Sea Transport Ring). Furthermore, the Odessa region possesses the high market potential for the enterprises of the region. In addition, there is a presence of science-research potential and highly qualified personnel. Last but not least, there are significant opportunities for expansion and development, attraction of investments, upgrade of the region territory, creation of techno- (industrial) parks, logistic centers and clusters in the region. All in all it’s favorable location, the high potential in science, education and for future development, the current infrastructure and the quantity of well-educated personnel offers a lot of opportunities for national and international investments and further development and makes the Odessa region to an attractive and capable location.

The Odessa region’s economic structure is characterized by the transport sector, the agricultural production, the processing industry, fishing, and international sea tourism. Situated directly at the Black Sea and possessing seven sea ports (Odessa, Illichivsk, Izmail, Yuzhny, Bilgorod-Dnistrovskiy, Reni, Ust' Dunaisk) the logistics sector is the most important branch in the region. About 28% of the total employees work in the sector Transportation and storage what highlights the importance of the logistics sector in the Odessa region. Other important sectors are Education with nearly 19% of total employees of the region and the sector Human health activities with nearly 13%.

The logistics and transport infrastructure of the Odessa region is of great strategic importance for the economy of Ukraine. It provides the handling of international cargo and passenger flows, carrying out a maritime gate function for transport and distribution of the inland and transit cargo. The region’s transport network consists of 8.304 km of motorways, 4.014 km of railways, and 130 km of...
inland waterways. With 2 airports (national 36), 7 ports (national 18) and 1 freight traffic center, Odessa is considered a very important transport and logistics region.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Odessa</th>
<th>Ukraine</th>
<th>Share of Odessa</th>
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</thead>
<tbody>
<tr>
<td>Gross Domestic Product (GDP) (in bn. Euro) 2011</td>
<td>5,40</td>
<td>108,3</td>
<td>5%</td>
</tr>
<tr>
<td>GDP per capita 2011 (PPS)</td>
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<td>2,360</td>
<td></td>
</tr>
<tr>
<td>Employment Rate 2011</td>
<td>45%</td>
<td>58.5%</td>
<td></td>
</tr>
<tr>
<td>Number of Local Units in Logistics</td>
<td>1,311</td>
<td>5,017</td>
<td>26.1%</td>
</tr>
<tr>
<td>Share of Local Units in Logistics in all Local Units</td>
<td>8.45%</td>
<td>7.85%</td>
<td></td>
</tr>
<tr>
<td>Number of Persons Employed in Logistics</td>
<td>50,000</td>
<td>1,700,000</td>
<td>3.0%</td>
</tr>
<tr>
<td>Share of Persons Employed in Logistics In all Persons Employed</td>
<td>10.08%</td>
<td>8.4%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3.1: Odessa’s Economy in figures (Source: www.od.ukrstat.gov.ua)

The specific strengths of the logistics sector of the Odessa region are: 1.) a good geographical location on the crossing of several international transport corridors (7th and 9th TEN-T, TRASECA, “Baltic Sea-Black Sea” Corridor, Black Sea transportation ring); 2.) a powerful maritime industry (7 commercial seaports with total cargo flow of 26 m. tons (in 2011), 3 shipping companies, 3 shipyards); 3.) a well developed land transport (railways, automobile, pipeline); 4.) 2 airports; 5.) 295 forwarding companies; 6.) more than 200 crewing companies; 7.) the presence of educational/research institutions in the field of maritime and logistic business (Odessa National Maritime University, Odessa National Marine Academy, 2 R&D Institutions in the field of maritime transport, several marine colleges). The 7 ports of Odessa region provide about 40% transshipment of transit cargoes coming through Ukraine. Maritime logistics in Odessa has a long tradition. Taking into account the transit role of Ukraine in terms of transport logistics, the region has been developed to be the logistics gateway of the country.

Academic research

The Odessa region disposes of a powerful scientific and technological potential. There are 14 state universities and academies in Odessa, as well as several commercial universities, 4 research institutes of the National Academy of Sciences of Ukraine, 2 marine R&D institutes of the Ministry of Infrastructure of Ukraine. Out of 48 Universities and 8 research institutions, 12 are related to logistics within the Odessa region. They count 5,575 academics and a total number of 84,000 students and a total RTD expenditure of 20,575,860 EUR.

With regard to the regions’ specific RTDI strengths, most universities and academies located in the Odessa region have multi-year experience in the field of fundamental and applied research. The leaders among them are: The Odessa National University named after I.I. Mechnikov, the Odessa National Polytechnic University, the Odessa National Academy of food technologies named after M.V. Lomonosov, the Odessa State Economic University, the Odessa State Ecological University, the Odessa National Maritime University, and the Odessa National Maritime Academy.
Table 3.3.2: Research & Education in Odessa in figures

<table>
<thead>
<tr>
<th>Research &amp; Education in Odessa in figures</th>
<th>Odessa</th>
<th>Ukraine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Universities / Academia</td>
<td>48</td>
<td>n/a</td>
</tr>
<tr>
<td>Number of Other Research Institutes</td>
<td>8</td>
<td>n/a</td>
</tr>
<tr>
<td>Number of science &amp; education institutions related to logistics</td>
<td>12</td>
<td>n/a</td>
</tr>
<tr>
<td>Number of study courses (degrees) related to logistics</td>
<td>10</td>
<td>n/a</td>
</tr>
<tr>
<td>Total RTD Personnel (2009)</td>
<td>5,575</td>
<td>99,000</td>
</tr>
<tr>
<td>Share of all Employees (%) (2009)</td>
<td>0.54%</td>
<td>0.49%</td>
</tr>
<tr>
<td>Total RTD Expenditure (Mio. €)</td>
<td>20,58</td>
<td>103,5</td>
</tr>
<tr>
<td>Total Expenditure as Share of GDP (%)</td>
<td>0.4%</td>
<td>0.96%</td>
</tr>
<tr>
<td>Total Number of Students</td>
<td>84,000</td>
<td>2,130,000</td>
</tr>
<tr>
<td>Share of Students / 1,000 Inhabitants</td>
<td>35.17%</td>
<td>46.64%</td>
</tr>
</tbody>
</table>

The scientific research is mostly theoretical orientated, without application to real enterprises’ activities. It concerns mainly the development of analytical paradigms of logistics based on operations research and econometrics. Regarding the interdisciplinary collaboration, for example, the problem of the maritime economy of the Odessa region cannot be viewed only in terms of economics or logistics. It is necessary to take into account regional and social aspects.

The main priority of the current investigations is the development and improvement of the transport system of Ukraine. The research trends concern economic-mathematical modeling of logistics systems and must be supplemented with corresponding IT. The education should be oriented on maritime logistics. Only a relatively small part of the Ukrainian study books reflects innovative solutions in logistics in a sufficient extent (e-business, automatization of logistics processes etc.). The perspective directions of logistics research for Ukraine are supposed to be the following:

- Assessment of logistics costs;
- Development of customer-oriented logistics;
- Logistics marketing and outsourcing;
- Development of ways of adoption of logistics business to external environment;
- Green logistics, etc.

Research innovation centres beyond academia

In Odessa there are two R&D Institutes of Maritime Transport (ChernomorNIIProekt and YuzhNIIMF) with multi-year experience in the field of design and planning of port terminals, water protection, ship design, port mechanization and hydro-technical equipment projecting, economics and operation of maritime transport enterprises). Besides, some Institutes of National Academy of Science of Ukraine are located in Odessa: The Institute of Economic-Ecological Investigations, the Institute of Biology of South Seas, the Physico-Chemical Institute named after Academician Bogatskii, the Institute of Ecology of South Seas, the Filatov Institute of Eye Diseases & Tissue Therapy.
Regional Innovation Environment

In 2010 the network of 13 regional centers of innovative development (CID) was created in Ukraine. The “Project of a regional program of innovative development of the Odessa region for 2010-2020” was developed by the Odessa regional CID. According to this program, the medium-term priority directions of innovative activities in the region are:

- new and renewable sources of energy;
- new recourse-preserving technologies in industry;
- nanotechnologies;
- microelectronics;
- IT and telecommunications;
- transportation systems and logistics;
- protection of environment and human health;
- high-technologies in agriculture and processing industry;
- building and reconstruction.

There are some others innovation support centers in Odessa.

a) Innovative-information Centre (private company) with the following main activities:

- assistance in integration science, education, production and organization-methodical support of innovative structures forming in Odessa region;
- information-support of state policy in Odessa region;
- forming the data bases;
- assistance in transfer of innovative technologies;
- preparation and organization seminars, exhibitions of new technologies and scientific results, presentations and other scientific-technological meetings;
- Information-organizational provision of small and medium size business, marketing of innovations in the region, etc.

b) Centre of innovative business and small enterprise development (public organization). This center exists since 1999 and it supports the development of small business on the basis of IT implementation in the region. The concrete results of the center’s activities are:

- increasing the qualification of managers from business-centers, business-incubators, public organizations from Izmail, Bilgorod-Dnistrovskiy, Reni, etc.;
- informing the business of Odessa region about advantages of IT and stimulating of their use;
- simplification of access of business to the Internet-recourses and electronic libraries on the business/economic thematic.

Since many years the South Scientific Centre of the National Academy of Sciences of Ukraine and Ministry of Education and Science, Youth and Sport of Ukraine works in the Odessa region. It is a public organization and the aim of its activity is the coordination of various scientific institutions involved in developing scientific problems of high importance for economic-social and cultural development of the South part of Ukraine (Odessa, Nikolayev, Kherson regions).
Drivers of innovation

Academic science has to be named as a primer driver of innovation. Industries like the food production and the chemical industry are strong innovation drivers of logistics, but first it is the maritime industry that demands modernisation programs, new technologies and innovative ideas. An example of collaboration between business and science is illustrated by the project “Dry Port”, whereby the local and international scientists cooperated with the private development company and the Odessa Port Administration. From the side of the industry, there is an interest in closer and more fruitful collaboration. The short-term orientation of the regional business and the limit of the state financing are strong obstacles to innovation development and adopting. A tighter collaboration between science and industry is needed.

Logistic specific networking

Concerning networking, the ports are active in several international organizations like BASPA, MedCruise, as well as in the National Association of the ports of Ukraine; the Odessa port hosts the international conference BlackSeaCruise. One of the most important linkages is the co-operation with the Baltic region via the intermodal train “Viking” between the Ukrainian and Lithuanian ports. The ports cooperate, first of all, with the related organizations like stevedores, shipping companies, expeditors, railway and terminal operators. The universities cooperate in a form of joint conferences and workshops. The Odessa National Maritime University as well as the National Institute for Strategic Studies organize annual round tables and conferences on logistics and transport infrastructure development in the region.

Cluster Performance

Currently there are no active logistics clusters in the Odessa region. “Cluster” is a rather new notion; there is no exact understanding of the meaning and the purpose of its creation. The public stakeholders recommend scientists to promote the potential efficiency of clusters among the business community in the region. On the level of regional administration and city authorities, special organizational units have been established to promote the cluster systems.

Currently the so-called “transport cluster” has been created in the port of Odessa. Its initiators are the port administration and the Odessa Regional State administration. In 2011 the Charter of Transport Cluster on the base of the state enterprise “Odessa Commercial Sea Port” was adopted. The core of this cluster will be unfortunately only the Odessa port and the linked companies. The aim of the cluster is to promote the competitive advantages of the Odessa port on the Black Sea.

RTDI Policies & Strategies

There are some on-going programs in the Odessa region to improve the interaction between science, industry, and politics. First of all, the universities ONMU and ONMA educate highly qualified staff for the maritime industry. Furthermore, some universities of Odessa cooperate with the different companies in short-term qualification training courses, for example, in logistics.

The government has established several policy and funding programs:

- National Environmental Policy of Ukraine – Assessment and Development Strategy
- Strategy of economic and social development of the Odessa region up to 2020
- Conception of industrial parks creation in the Odessa region
- Support to the integration of Ukraine in the Trans-European Transport Network TEN-T
- Transport Strategy of Ukraine for the Period up to 2020
- Regional programs of socio-economic and cultural development of Odessa region for 2012
One of these programs is illustrated in detail in the following box:

**Support to the integration of Ukraine in the Trans-European Transport Network TEN-T Abstract:**

- **Duration of Program:** 2010-2011
- **Type of Program:** RTDI
- **Scope of Measure:** national
- **Key Policy Actors:** Ministry of Infrastructure of Ukraine
- **Total Budget of Program:** 65m EUR
- **Sources of Funding (share):** EU (100%)
- **Key Target Groups:** Business entities, research entities, public authorities
- **Sectors addressed:** Transport & logistics, energy

**Abstract:** This is a partnership project between the EU and the Government of Ukraine. The TEN-T project team works in close cooperation with the Ministry of Infrastructure of Ukraine. On specific themes, such as road traffic, the project also collaborates with the Ministry of Internal Affairs. The overall purpose of the program is the introduction of strategic priorities for the transport sector development and strengthening of cooperation outlined in the relevant parts of the Ukraine – EU Association Agenda and other bilateral agreements. The specific objectives of the program are aimed to support the sectors’ institutional reform and improvement of transport infrastructure. They contribute to the approximation of Ukrainian laws to EU and International regulations and standards.

**Key Activities:** The Cooperation includes the coordination and legal support for road, rail, air, maritime and river transport and development of multimodal services. In accordance with the draft Association Agreement between Ukraine and the European Union, TEN-T experts will contribute to the Transport Strategy of Ukraine up to 2020. The Strategy has been developed by the Ministry of Infrastructure and approved by the Government in October 2010. Main objective of the project is the development of the transport sector of Ukraine on the basis of support to Ukrainian specialists in the implementation of the program “Budget support of transport sector of Ukraine”.

**Main (expected) outcomes:** The Transport Strategy of Ukraine has established key goals, principles and priorities for the country's transport system that would contribute to an efficient and sustainable operation of the sector. The strategy acknowledged that a well-organized transport system is essential for social and economic development of the county and for increasing the competitiveness of its national economy. The main outcomes are: Organization, on regular basis, monitoring of transportation processes; planning of transport infrastructure development and modernization; implementation of European system of accounts; improvement of transport flows forecasting. A program for the development of all modes of Transport and Road Infrastructure up to 2015 is currently being developed by the Ministry of Infrastructure, with the support of TEN-T experts. The major strategy implementation trends are the enhancement of governance efficiency, improvement of transport service quality and its energy performance.

**Future scenarios for sustainable logistics**

Currently, the logistics network in the Odessa region is represented by single activities like warehousing, clearance of goods, and transport and composed of separated elements, which are warehouses and freight forwarders. It is necessary to create a concept of logistics and transport development of the region that outlines the directions and priorities for the logistics business support. The industry advocates for more logistics land development in the region; there is a demand of 130 hectare for terminals, transshipment facilities, and warehouses. Additional logistics centers could improve the situation with empty containers and increase the containerization of the export goods.
Sustainable logistics has become an important new field in the logistics branch in Ukraine. While it hasn’t played a significant role in the past years, the companies, the government and the universities have realized its importance, especially in the context of globalization and the improving competitiveness in international trade and of Ukraine itself. Therefore, the activities are mostly in the planning process and only a few approaches have just been started.

Currently Green logistics is not a point of activity in Ukraine. Taking into account the general step of development of sustainability, which is very basic and is just about to develop, all the work concentrates on this area. That is why Green logistics is of minor importance.

There are several starting approaches for the improvement of sustainable logistics. Several universities and academies offer courses for logistics and have started to integrate the aspects of sustainable logistics into it. This will improve the competence and the awareness of logistics personnel in the future. However, there is criticism about the quality of the education and the quantity of the personnel from the side of the industry.

The public sector has developed the idea to shift transportation from road to river in the future to implement environmentally friendly transportation modes. These processes are in the beginning and it will take some time to develop and introduce this new approach.

There is a certain interest and involvement of logistics companies in the field of sustainability. Many companies and especially the port authorities have understood the importance and the benefits that sustainability offers. Many shipping companies see sustainability as a possibility of strategic planning and forecasting (and also as a way to reduce their costs for environmental facilities and payment of fines for environmental pollution). However, urban and regional environmental services need to control the processes of pollutant emissions into the atmosphere and aquatic environment of the transport and industrial enterprises, assigning specific penalties for exceeding pollution standards. By implementation of sustainable measures, ports can prevent the pollution of the ocean (coast and offshore) and take care of water and air pollution in transshipment operations.

There have been several programs implemented in the Odessa region in the past years. These are in particular:

- Formation of a national ecological network in the Odessa region for 2005-2015
- Regional protection programs and update the water resources in the basin of the estuary Kuyal'niksogo for 2012-2016 years
- Regional program of environmental protection, rational use of natural resources and environmental security in the Odessa region for 2009-2013
- Regional Program "Forests of Odessa region in 2011-2015"

**Research Focus and Project Examples**

<table>
<thead>
<tr>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current situation</strong></td>
</tr>
</tbody>
</table>

Sustainable logistics can not be developed in the region successfully without the implementation of international standards in the sphere of transport and logistics in Ukraine. The ports as important links of logistics chains must also pay attention to sea protection from shore and ships pollutions. The ports authorities must take care not only for water and air environment protection in the process of cargo loading/unloading but fulfill the requirements of IMO, as well. The existing system of penalty for environment pollution has more a punitive than an encouraging character.

In the organizational structure of the Odessa Region State Administration there are some departments with the function of solving problems related to development of regional logistical strategies as for example, the “Central Administrative Board of Infrastructure and Energy Supply”
and the “Maritime Complex, Transport and Communications Board”. In October 2011, the “Strategy of Economic and Social Development of the Odessa Region for the Period up to 2020” was approved where problems related to regional infrastructure development were reflected. But direct logistical aspects are not touched in this strategy.

In the Odessa region, which is traditionally a recreation zone, a lot of ecological problems have been occurred during the last decades. Therefore, under the auspice of the Odessa Region State Administration the following documents were developed and adopted:

“Program of National Ecological Network Forming in the Odessa region for the period 2005-2015”;
“Regional Program of Protection and Renewal of Water Resources in the Kuyal’nikylinman basin for 2012-2016”;
“Regional Program of Environment Protection, Rational Use of Nature Resources and Ensuring the Ecological Safety in the Odessa region for 2009-2013”;
“Regional Program “Forests of Odessa the region for 2011-2015”;
“Regional Program of Handling Toxic Waste Products in the Odessa region for 2008-2015”.

Possible outcomes (Improving the efficiency of multimodality)

Development of logistics is directly connected with transport technologies development (intermodal, multimodal, combined systems of cargo delivery). As far as transport influences on environment negatively, it is necessary to take into account these aspects and develop more “clear”, from the ecological point of view, kinds of transport. For example, it would be much better to use instead of the road the river-going transport either on national or international routes. The alternative to the above said is the implementation of the EC FP7 Program “Motor Ways of the Sea” (Marco Polo II).

Since regional sea ports are the points of different modes of transport interface, the improvement of multimodal transportation is immediately connected with environment protection, first of all water and air. That is why, while developing the ecological strategies, it is necessary to take into account measures on preventing the pollution of environment through transportation and transshipment of cargo by different modes of transport.

Technology

Current situation

The Odessa Region is one of the most perspective regions of the south of Ukraine and has a great development potential in the majority of branches.

The transport system of the Odessa Region is represented by all kinds of transport and includes the large sea commercial ports, shipping companies, shipyards, railways roads, auto roads, the network auto transport enterprises, forwarding companies, airports and air transportation companies.

The most developed industry in the region is the maritime transport. Odessa logistics & transport infrastructure is of great strategic importance for the economy of Ukraine. It possesses over 70% of total cargo turnover of the Ukrainian ports and 20% of the Ukrainian railway capacity.

But the logistics infrastructure performance is weak and requires significant investments. The port capacity of the region is not used in full extent. There is no good cooperation between the companies during the goods delivery process. The companies can provide logistics service only on 1-2 PL level.

Therefore the implication of modern information systems is expected to improve the logistic process and infrastructures.
Logistics is the heart of the operation of modern transport systems and implies a degree of organization and control over freight movements that only modern technology could activate. It has become one of the most important developments in the transportation industry.

Possible outcomes (Improving the efficiency of information systems)

It is well known that logistics conception proclaims an optimal combination of standardization and universality in respect of equipment and technology used in logistic systems. The resilience and flexibility of logistical systems are the most important competitive advantages.

The system analysis must be applied more constructively to study, modeling, and optimization of logistics systems (operations research, optimal control of dynamic systems, stochastic processes theory, fuzzy sets theory, transportation networks theory, etc).

It is very important to make use of international experience regarding the creation and exploitation of logistics centers and clusters.

Economy

Current situation

During the last decades, in economically developed countries the logistics clusters have demonstrated a significant development thanks to governmental and private initiatives in the field of transport and logistics. These clusters represent a geographical agglomeration of logistics-intensive operations and include a number of big and small enterprises from different fields of economics side by side with the universities and R&D institutes under support from the regional administration. They are located suitably to enable efficient transportation and delivery services to large populations.

The analysis of socio-economical, politic and scientific activity in the Odessa region has shown that the region has a powerful industry and scientific potential, mainly in the sector of transport and logistics activity, with a high potential of value-added and job positions creation.

In the universities and R&D institutes of the Odessa region, serious studies have been conducted recently which are oriented on the practical problems of the industry and logistics. A part of these investigations has been used for developing the strategies of socio-economic development of the regions’ transportation systems. At the same time an insufficient attention was paid to logistical strategies development (in particular, low cost strategy) as an important part of the above mentioned socio-economic regional strategies. Besides, in the Odessa region the co-operation between industrial enterprises and science is episodic and doesn’t exist on regular bases. As a result, the innovative activity isn’t sufficiently high.

There are serious obstacles to demonstrating efficiency of logistics clustering in the Odessa region. The evaluation of economic efficiency of clusters creation is an actual scientific and practical problem.

The efficiency of any logistics cluster on the bases of value-added principles has been determined by the following main sources:

- possibility of additional cargo flow attraction due to the improvement of marketing activity of enterprises, increasing of transport companies services quality, flexible tariff policy;
- possibility of enterprises and companies to increase their profit due to extension of their services specter, more co-ordination between participants of logistics service, decreasing total logistical cost along supply chains entering the cluster;
- the innovative decisions implementation in the field of transport/transshipment technologies, energy preserving and environment protection technologies.
Possible outcomes (Demonstrating the added value of clustering)

The practical realization of logistics clusters’ advantages are hampered because of the absence of special co-ordination centers in the region – Cluster Councils – which could be fulfilling the following functions:

1.) Analysis, generalization and implementation of international experience of logistics clusters management;
2.) Analysis of logistics costs of enterprises entering a cluster and evaluation of the economic results of the clusters’ activity as a whole and for each of its participants;
3.) Working out recommendations on decreasing logistics costs, joint action (coordinating) plans of all enterprises (companies) entering a logistics cluster taking into account their innovative activity;
4.) Working out the logistics strategies of a cluster and their coordination with general socio-economic strategies of a regions’ development;
5.) Keeping in touch with the national and international logistics associations.

The Clusters’ Council should be a nonprofit organization; based upon a voluntary association of representatives from the main transport and industry enterprises, universities and R&D institutes entering the regional logistics cluster. Its activity embraces close contacts with the corresponding departments of local administrations which are responsible for development and realization of regions’ development strategies.

Society

Current situation

The Odessa Region is strongly keeping the reputation of a powerful scientific and educational centre of Ukraine that is represented by 19 higher educational state establishments, 43 branches and 17 academic establishments. More than 80 research institutes, centers and laboratories are engaged in research and development in different branches of science.

Since the governmental policy in the education sphere is saved from substantial changes in the near future, it can be assumed that the demand for competent authorities will rise.

The increasing number of people of retirement and preretirement age and the decreasing quantity of population may induce the state to intensify the tax pressure on the wages.

The birth-rate falling at the beginning of the nineties last century has already caused a reduction of people that start their education in the educational institutions. This will objectively lead to an increase of competition between specialized educational institutions, changes in their quantity in the region, and the need to change their specialization according to the demands of the regional labor market.

Structural disturbances in economy always result in discrepancies between demand for labor force and its requirement, i.e. in decreased employment rate and increased unemployment. The ponderosity of the problem is determined by both the economic consequences of the unemployment for society and mankind and by purely social ones. That is why the raising of the employment rate in the region is one of the priority tasks of the social and economic development strategy providing for growth of the gross product.

On the other hand, the Odessa region has a developed transport and logistics infrastructure, which needs high qualified personal. In this respect the logistic education is very important.
Its necessary to say, that in the main state universities in the Odessa region, which are preparing the staff for the transport enterprises, such as ports, shipping, freight, forwarding, and other companies, there is no such professional specialty as “Logistics”, only some courses are included in the study plans in the education of managers and some other specialists.

**Possible outcomes (Ensuring sufficient educated people for logistics business)**

The main goals are the optimization of the educational establishment network in the region and improving the mechanism of employment of graduates and stimulating education in professions, which are demanded in the region.

It’s necessary to provide new courses of modern logistics, special courses on “Green” logistics and sustainable development for high schools and colleges and to organize exchanges by them among universities. The organization of training centers for business representatives in the universities regarding the above mentioned topics is needed.

Consequently, some integrated courses may be worked out on the basis of corresponding interdisciplinary research. However, theoretical research must be enhanced by permanent contacts with logistics practitioners. Therefore, it is expediently to organize regular trainings, seminars, and conferences with their participation.

### Policy

#### Current situation

The realization of Ukrainian’s strategic course for the integration into the EU is only possible through the active participation of the regions in this process.

Special attention is paid to the development of cross-border cooperation in the Odessa Region. One of the most effective instruments of cooperation with regions of EU countries is euro-regions.

The Odessa Region is the only Ukrainian region which is an actual member of 6 European regional organizations:

- Assembly of European Regions;
- Association of European Border Regions;
- Working Community of the Danube Countries;
- Conference of Peripheral Maritime Regions of Europe;
- Assembly of European Wine-Producing Regions;
- Euro-region “Lower Danube”.

Cooperation between regions should improve the quality of administrative services that are provided by executive authorities and local self-government in different spheres.

The development of trans-border cooperation in the Odessa region is important for foreign exchange of the region with neighborhood countries. Trans-border cooperation is an important factor for the realization of European integration of Ukraine and a tool of regional development.

It’s necessary to say, that the existing infrastructure in the Odessa region was created during the USSR period and now needs a modernization and further development in context of using flexibility and modern infrastructure creation.

In recent years the legislative basis has been significantly improved which has engendered new conditions for economic activity. Even now, it may be affirmed that substantial changes are not expected in the near future; just the corrective elements for the legislative basis will be implemented.
Possible outcomes (Improving the coordination of laws and plans with reality)

Local authorities and business representatives should pay more attention to the poor state of the regions’ infrastructure while working out the strategies for the socio-economic development of the regions.

The government and local administration must consider the logistical potential of the region while developing the regional socio-economic and ecologic strategies of the region. Moreover, it is necessary to develop the logistic strategy of the region, as well.

Special education courses for governmental managers and businessmen must be worked out to cultivate among them a new, integrated vision and a deeper understanding of logistics in modern society with special emphases of its social-economic and green impact.
3.4 Wallonia (Belgium)

Regional & economic background

Wallonia is located in the heart of Europe and borders Flanders and the Netherlands in the North, France to the South and West, and Germany and Luxemburg to the East. With a population of 3.5 million inhabitants on 16,844 square km, it represents 55% of the Belgium’s population (209 inhabitants per square km). Belgium is divided into 11 provinces, including 5 in Flanders, 5 in Wallonia and Brussels, the capital. The capital of Wallonia is Namur (106,954), and its largest metropolitan area is Liège (194,715), while its most populous municipality proper is Charleroi (203,454 inhabitants). These 3 count more than 100,000 inhabitants.

![Figure 3.4.1: The Walloon Region and the location of Belgium within Europe](image)

Most of Wallonia’s major cities and two-thirds of its population lie along the Sambre and Meuse valley, the former industrial backbone of Belgium. To the north lies the Central Belgian Plateau which, like Flanders, is relatively flat and agriculturally fertile. In the southeast lie the Ardennes; the area is sparsely populated and hillier.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Wallonia</th>
<th>Belgium</th>
<th>Share of Wallonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Product (GDP) (in bn. Euro) 2011</td>
<td>87</td>
<td>362.5</td>
<td>24%</td>
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<tr>
<td>GDP per capita 2011 (PPS)</td>
<td>20,300</td>
<td>27,700</td>
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</tr>
<tr>
<td>Employment Rate 2011</td>
<td>57%</td>
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<td>3,887</td>
<td>17,658</td>
<td>22.1%</td>
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<td>Share of Local Units in Logistics in all Local Units</td>
<td>3.3%</td>
<td>3.5%</td>
<td></td>
</tr>
<tr>
<td>Number of Persons Employed in Logistics</td>
<td>54,700</td>
<td>198,051</td>
<td>27.6%</td>
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<tr>
<td>Share of Persons Employed in Logistics In all Persons Employed</td>
<td>11.8%</td>
<td>7.9%</td>
<td></td>
</tr>
</tbody>
</table>

*Table 3.4.1: Wallonia’s economy in figures (sources: Eurostat and IWEPS)*
During the industrial revolution, Wallonia was second only compared to the United Kingdom in industrialization, capitalizing on its extensive deposits of coal and iron. This brought wealth to the region, and, from the beginning of the 19th to the middle of the 20th centuries, Wallonia was the more prosperous half of Belgium. Since World War II the importance of heavy industry has greatly declined, and the Flemish Region surpassed Wallonia in wealth as Wallonia economically declined. In the last decades Wallonia’s industries turned towards future-oriented sectors.

From this industrial past Wallonia has learned a lot about logistics. That is probably why, in the beginning of the years 2000, a small group of stakeholders, led by the rector of the University of Liège, created a non-institutional cluster based on a common wish to develop transport & logistics activities in the Region. It was thus a real bottom-up action that led to the application at the Walloon Government to a general call for projects in the framework of the Plan Marshall, an integrated policy plan designed to revitalize the regional economy. In 2004, this big policy program established 6 poles of competitiveness destined to boost the economic dynamism and the competitiveness in 5 key sectors of the regional activity, including logistics.

The regional wish regarding logistics was based on the specific strengths of the region with, as first, its ideal location. The region offers an excellent accessibility to the major consumer markets. For example, it is possible to reach more than 60 million consumers in three hours by road from Liège, against just 31 million from Paris. This notion of accessibility goes hand in hand with an integration into the existing transport networks. Indeed, what should be the point of being near to the markets if the existing transport networks do not enable you to reach them quickly? At this level, the density of the road and rail networks, along with the presence of a good network of navigable waterways, constitute the major advantages of Wallonia.

The range of services developed in Wallonia, among which bio-technologies, information and communication technologies, metallurgy, chemistry, healthcare, agriculture and foods, allows the region to become a real pole of interaction between persons as well as goods and to grow further, also in service economy.

Notably due to its history, the Walloon industry is now characterised by a need in innovation. That is why the economic policy must today promote networking, internationalisation, professional qualification and workforce mobility as well as adaptation to societal and environmental demands in order to enable a sustainable economic development.

**Power distribution and research policy**

In Belgium, scientific research is an area shared by the Federal State, the 3 regions (Wallonia, Flanders and Brussels-Capital) and the 3 communities (French-, Flemish- and Dutch-speaking). Teaching - including university education - is the core competency of the communities. The legislator entrusted thus to them the jurisdiction of basic scientific research, which is mainly conducted in universities.

The regions are competent for research linked to Economy, Energy, Agriculture, Environment, Transport and other regional competences. Activities funded by the Regions are a matter of applied research and experimental development.

The Wallonia-Brussels Federation has also in charge the training of research teachers which reports fully of universities and university academies. Applied research, as mentioned above, is the responsibility of the regions but the Federation Wallonia-Brussels have jurisdiction to that conducted in the High Schools. However, there is currently no Community budget dedicated to this type of research.

For research, responsibilities distribution is thus based on intervention areas and not on operators. That means that universities and high schools can receive funding from the Federal State as well as from the community or from the region, depending on the concerned research.
Table 3.4.2: Overview of available financial resources for regional R&D activities the frame of R&D activities.

For the regional research activities, competent services in Research and Technologies are integrated in the Directorate General for Economy, Employment and Research. Its Department of Research programs, firstly, funds research activities in universities, institutions with university level and research centres and, then, ensures the participation of the Region in federal and international research programs. Its Department of Technologic Development manages support mechanisms that enable the funding of industrial and experimental development research projects or specific help for SMEs, as well as awareness activities for sciences and innovation promotion.

The region can be qualified as excellent regarding the obtaining of public support by innovative companies, the R&D expenditures funded by companies and those made in high technology sectors. Another good indicator is the regional valuation capacity for the organisational or marketing innovation rate and for the part of total employment in high technology services and in terms of knowledge development.

Regional research network

There is a plethora of trainings that touch transport and logistics areas in Wallonia: A lot of science and education institutions related to logistics as well as an important number, still increasing, of study courses (degrees) related to logistics that demonstrate the field needs and the importance given to the education of qualified workforce taking into consideration the high regional labour supply. Indeed, in front of the transversal character of logistics, very different approaches are developed in a broad range of qualifications, from Mechanics to Engineering through Sociology or Management.

For the regional economy, logistics represents the advantage to be a labour intensive activity, not very delocalisation-sensitive. Beside the workers needed for handling and goods treatment, it also employs a lot of qualified workforce for the supply chain management.
a) Academia

Belgium has a very dense research network and counts 11 universities of which 6 French-speaking ones (joined since 2004 and bundled into 3 academies) and 3 Walloon ones. Wallonia also gathers 21 high schools and 22 agreed research centres. Since 199, the Region created 62 Spin-offs born from these universities with the help of 14 entrepreneurship support organisations (with the aim of stimulating the business implementation and the settling as a self-employed worker).

Wallonia belongs to a very dense network of connections with border regions and takes that situation as an opportunity to develop partnerships, including education and training. That is the case, for example, within the Grande Region (Saar - Lor - Lux - Rheinland – Palatinat – Wallonia - French and German Communities of Belgium): Considering the transregional character of logistics, it is important to work as part of a global network. That is why the University of Liege proposes a continuing training in logistics and transport oriented to sustainable logistics and quality management - thanks to the success of this partnership under the framework of the InterregIVa project (Network for university continuing training in the Grande Region).

b) Training

To control the new challenges the logistics businesses are facing, more and more competences have to be developed: To highlight the contribution of purchase, logistics and supply chain management to the company's added-value; to propose a structured and process-oriented approach for the different training offers; to be as close as possible to the field needs; to develop knowledge in terms of knowledge-, know-how- and behavioural-skills. For example, the ABCAL (Association belge pour les Cadres d’Achat et de Logistique) has developed a very rich training offer gathering operational level (professional purchaser and negotiation practice in e-learning) and strategic level trainings (strategic management of purchase and international supply chain management) as well as trainings in partnership, requested and elaborated by companies themselves.

c) Competences Centres

It is the development of Liege Airport in the cargo segment from the beginning of the years '90 that urges the FOREM to develop strongly its activities in the logistics field. Indeed, the Airport has brought in its wake a certain number of companies which are specialised in logistics services. By taking place right by the runway, they were rapidly facing urgent needs in qualified workforce in different jobs.

The FOREM provides logistics trainings in Liege and La Louviere - and not only training of truck drivers. These knowledge spaces are not only training centres but real poles of economic development because they address all types of audiences (students, managers, job seekers...) and aim at promoting innovation by adapting their content to specific and current market needs. They also train handlers, supply chain managers, warehouse managers, forklift truck operators, human resources managers, technicians, security advisors...etc. Blue and White collars, thus. Each training course is made of practical and theoretical courses and a work experience placement is part of the program which often leads into a job. The insertion rate reaches 75%, what indicates the good health of the sector.

d) Accredited Research Centres

The 22 regional accredited research centres play a key role in the economic recovery, including logistics developments. Indeed, the identification of the sector as a high potential for the economy requires a permanent concern for innovation throughout the whole process. The main criterion of this official accreditation is the ability to self-financing the activity, key indicator of their benefits to industry.

For a few years, researchers have been looking at transport and logistics as an important source of R&D possibilities because of a double interest: Pure research on the one hand and concrete application on the other. Research is carried out in the domains of transport, production, planning...
and stock management... either in theoretical terms or with a connection within a company. That is why research centres like the Centre de Recherches Routières, Multitel or the CETIC, for example, have been working for a long time on logistics issues and in cooperation with Logistics in Wallonia and with companies that are part of the regional network. Today, the most complex logistics flows may be the subject of studies within Walloon research centres.

<table>
<thead>
<tr>
<th>Research &amp; Education in Wallonia in figures</th>
<th>Wallonia</th>
<th>Belgium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Universities / Academia</td>
<td>24</td>
<td>50</td>
</tr>
<tr>
<td>Number of Other Research Institutes</td>
<td>22</td>
<td>n/d</td>
</tr>
<tr>
<td>Number of science &amp; education institutions related to logistics</td>
<td>11</td>
<td>n/d</td>
</tr>
<tr>
<td>Number of study courses (degrees) related to logistics</td>
<td>35</td>
<td>n/d</td>
</tr>
<tr>
<td>Total RTD Personnel (2009)</td>
<td>13,848</td>
<td>59,851</td>
</tr>
<tr>
<td>Share of all Employees (%) (2009)</td>
<td>1.06%</td>
<td>1.33%</td>
</tr>
<tr>
<td>Total RTD Expenditure (Mio. €)</td>
<td>1,785.25</td>
<td>7,047.48</td>
</tr>
<tr>
<td>Total Expenditure as Share of GDP (%)</td>
<td>2.22%</td>
<td>1.99%</td>
</tr>
<tr>
<td>Total Number of Students</td>
<td>131,241</td>
<td>445,309</td>
</tr>
<tr>
<td>Share of Students / 1,000 inhabitants</td>
<td>37.23%</td>
<td>40.66%</td>
</tr>
</tbody>
</table>

Table 3.4.3: Research & Education in Wallonia in figures (Sources: Eurostat, EWI and UWE)

- **Centre belge de recherches routières (Belgian Road Research Center)**

  The Belgian Road Research Centre (BRRC) is a privately operated public utility research institute created in 1952 by application of a decree-law of 1947 aimed at promoting research in industry.

  In its over fifty years of existence, it has built a solid reputation at both the national and international levels as an impartial trend-setting centre for research in the areas of road design, construction and maintenance. Moreover, it has recently extended its expertise to the fields of road safety, mobility, and environment-friendly road construction.

  On this foundation, BRRC has developed an extensive package of services to assist road contracting firms, the competent national, regional and local authorities, manufacturers of materials and equipment, inspection, certification and standardization bodies, circles of education in all forms and at all levels, consultancy firms and designers, and control and testing laboratories.

- **CETIC**

  Based in Charleroi, CETIC was created in 2001 through the initiative of three Belgian universities (Namur, Louvain and Mons). Through its on-going relationships with university teams, CETIC remains permanently updated on current and emerging scientific progress in Belgium, Europe and the World.

  CETIC provides expertise in software engineering, innovative service based on service oriented technologies, cloud and embedded systems.
Software and System Engineering provides methodological support to help companies develop high-quality IT products and services, ensuring reliability, safety, security, and compliance with international standards.

Software and Services Technologies provides businesses with strong technological expertise to help them implement distributed, service-oriented and dynamic computing architectures. Through the use of semantic technologies and by exploiting the real business opportunities of open source software, this department helps accelerate the transformation of information into knowledge.

Embedded and Communication Systems helps companies prototype innovative embedded systems. This department focuses primarily on embedded software for intelligent wireless systems for a wide range of applications, ranging from road transport to eHealth, consumer electronics, home automation, etc.

For a long time ago, CETIC has taken part to Plan Marshall projects and, on that way, brings its expertise to innovation activities promoted by the Pole.

- **Multitel**

  Multitel doesn’t need to be presented any more as a confident partner for collaborative projects and its experience testifies that fact! It is a research centre in scientific technology supported by a multidisciplinary team including engineers and technicians, as well as a sales structure. Its aim consists in developing and implementing innovative projects in collaboration with local and international companies. Multitel's scientific skills include voice technologies, data fusion, optic fibre applications, image processing, and computer network management. Besides its Research & Development activities, Multitel offers services in optics and telecommunication, and in company computer networks.

  The centre disposes of a certification department which is an independent laboratory for the ERTMS certification, specialized in testing solutions, as a support for the certification and validation of industrial solutions and components, in particular for the railway signalling sector (ERTMS). It provides R&D in the design of new tools (hardware and software) as reference for the whole railway sector.

- **Materia Nova**

  The Materia Nova research centre develops materials of the future in the field of polymers and surface coatings. The major goal of Materia Nova is to extend the research activities of its academic affiliates towards industrial applications. This implies very active collaborations with local and international companies in the fields of chemistry, materials, and energy. About 70 researchers are currently employed at Materia Nova. Logistics applications in collaboration with the Poles have not been implemented yet but Materia Nova is, without any doubt, a choice partner for the future.
A regional challenge towards innovation: to highlight the links between competencies and ideas.

BRRC, Multitel, CETIC and MATERIA NOVA are the 4 regional accredited research centers which develop research activities directly in link with logistics application.

In complementarity with the university departments stemming from the 3 regional universities, the high schools and the training institutions, they bring in the logistics area a large range of knowledge.

The challenge is to parallel them with project ideas born in innovative and creative enterprises, what’s notably particularly difficult in the case of SMEs.

**Best practice 1:**
That’s why Logistics in Wallonia has implemented an annual “**stock market for competencies and project ideas**” during which both industrials and researchers can meet and cross their interests in order to, maybe, build a consortium and submit a project.

**Best practice 2:**
Through the **organization of Loginn groups**, which gather suppliers and science representatives, the Pole tries to stimulate productive and concrete discussions on needs and realities in order to bring out common consideration and collaboration willingness.

Innovation as a key-word

Logistics in Wallonia is one of the six Poles of Competitiveness established by the Walloon Government within the framework of the Marshall Plan for economic recovery in Wallonia. The objective of the authorities, through the implementation of this hub, is to support all types of innovation in the logistics sector, within the technological as well as the non-technological domain.

The role of the Pole is to bring parties from the logistics field closer together, to provide them with a long term vision through the surveillance over technological evolution involving everything to do with transport and logistics which Logistics in Wallonia carries out.

The Pole consists of suppliers, transporters and scientific and technological service providers who need encouragement and support to innovation, including finance, through regional aids. The Pole helps them to establish and to bring into being projects, especially within the 4 domains of multimodality, security of the logistics chains, sustainable logistics and company logistics. It is also about developing international activities because market development goes through international collaboration. In that way the cluster acts as a catalyser of innovative ideas.

Once a year the Cluster launches a call for innovative projects on the basis of a “stock exchange” where stakeholders come and present to the audience their innovative ideas or their competences. In that way, they can build consortia, followed individually by the team and aiming at developing a new product or service, destined to come into the market and, so, increase regional companies’ competitiveness.
It is important for Wallonia to capitalise on high added-value sectors in which the region has developed excellence. This is the case in pharmacy, bio-technologies, food-processing industry or also in aeronautics.

**Biolog Europe** is an initiative powered by Logistics in Wallonia, aiming to further develop Logistics activity in Wallonia in the life sciences sector (Pharmaceuticals, Biotech and Medical Devices). In addition to the fact that, over the years, Belgium and, in particular the region of Wallonia, has become a key location for the Life Sciences sphere, the presence of global actors such as GSK, UCB, Baxter, Pfizer, Johnson & Johnson, but also BD, Terumo and many others, not only for their R&D, manufacturing but also for their distribution in Europe provides some of the best evidence to the potential advantages of the Wallonia-Belgium region.

**Strengths and weaknesses of the Walloon RD&I system**

**a) R&D expenditures**

According to the data gathered in the annual report of Walloon Council for Scientific Policy which aims at evaluating the scientific policy of Wallonia and the Wallonia-Brussels Federation, the region is characterised by a good position from the point of view of R&D investments.

Total expenditures in this domain reach 2.2% as share of the GDP (data 2009), what places the region above the Belgian and European averages.

It is certainly due to the relative weakness of the Walloon GDP but, nevertheless, R&D expenditures per inhabitants have been increasing faster in Wallonia than elsewhere in the country from 2005 and they are superior to the amount observed for the E.U.

In particular, a sustained effort can be noticed from the private sector in favour of research. In contrast, the public investment intensity in that domain is particularly weak, in comparison with other countries or regions of Europe and stands below the European average.

![Figure 3.4.2: Evolution of the total intra-muros R&D expenditures in Wallonia, Belgium and EU, from 1995 to 2009 (in % of GDP). Source: Eurostat, Science &Technologies, Statistics on R&D](image)

A preoccupying point is the double concentration of industrial R&D expenditures, which represent 78% of the total R&D expenditures. They are principally realised in High Tech sectors – mainly in pharmacy – on the one hand and in very big enterprises on the other hand. This situation weakens...
the Walloon RDI system which could be really affected by the strategies of some companies. It also reveals an insufficiency of the R&D in more traditional sectors and in SMEs, which constitute the essential part of the regional economic fabric. That is why, in transport and logistics, considerable effort must be done to support SMEs, encouraging them to take part to collaborative projects.

Of course, in comparison with other European countries, the share of SMEs in R&D expenditures is relatively high in Wallonia but it is not up to the importance of such enterprises for the regional economy.

It is important to qualify this analysis by the fact that a certain number of Walloon enterprises develop product and process innovation activities by using existing technologies. Software and equipment purchases absorb 45% of the industrial innovation expenditures. The share of innovation expenditures that are not consecrated to R&D in Wallonia is one of the highest in Europe.

Another source of concern also lies in the fall of performance of our research teams in terms of participation to European research and development framework programs. Between the sixth and the seventh programme, we can note a reduction of the number of accepted projects and of the success rate. On the contrary, the number of enterprises implied in ERA-Nets or EUROSTARS projects is strongly increasing but these projects are funded by regional resources and, thus, don’t bring any additional funds to regional research.

b) **Human resources**

Human resources available for R&D and for results valuation represent another concern. Both, the total R&D staff and the number of researchers have been facing a positive evolution these last years, even if their share in the employment is inferior to the Belgian and European averages. But the renewing of the competence stock is not ensured in all domains. Indeed, if Wallonia has very satisfying scores for the share of population from 25 to 64 years and from 30 to 34 years with high level degree, it stands at the bottom of the ranking if we consider the number of degree holders in Sciences and Applied Sciences. Moreover the share of population that takes part to continued training (5%) is largely inferior to the European average.

c) **Research results valuation**

Walloon enterprises engage more and more in innovation cooperation agreements, what reveals an accentuation of the “open innovation” process. That trend is especially marked within big service industries but mainly with customers and suppliers: universities and institutions seem to be less implied. Moreover, innovative companies don’t avail themselves a lot of scientific sources to get information. It seems that technology transfer between science and industry needs to be strengthened.

In terms of organization and marketing (what we name “non-technological innovation”), Wallonia has a good position but could improve: Once more, figures are interesting for big enterprises but could be better for SMEs.

**RD&I system assessment**

As a solution to specific regional reality and needs, the region has adopted and/or implemented particular measures.
In terms of **knowledge development**, main regional strengths are:

- R&D intensity
- Industrial R&D expenditures
- Use of existing technologies

But efforts need to be made in terms of:

- Public R&D expenditures
- Industrial R&D concentration in HT sectors and big enterprises – insufficiency in traditional sectors and SMEs
- Performance in participation to EU Framework Program

In terms of **R&D results valuation** and **innovation process**, Wallonia’s main strengths are:

- Accent on open innovation
- Innovation rate in big enterprises
- Share of high-tech service in regional employment
- Net companies creation in HT sectors

But efforts need to be made in terms of:

- Innovation rate in SMEs
- Share of HT services in added value
- Technology transfer between science and industry
- Collaboration between innovative SMEs
- Marketing and organisation innovation in SMEs

**a)  For knowledge development**

To maintain the regional assets described above, some conditions must be met:

- **Having a sufficient number of available researchers and technicians**
  - Wallonia devotes 8M€/year to activities destined to promote science among young people with the aim of increasing its poor rate of scientific degrees. These measures are a huge success but they are not sufficient to fill the gap. They must be thus reoriented in comparison with the needs. A solution could be to prove to young students that possible outcomes can be reached by engaging in scientific areas.
  - Wallonia and the Wallonia-Brussels Federation adopted in Mai 2011 the “Partenariat Wallonie-Bruxelles pour les chercheurs et les chercheuses” which shows the public willingness to improve the researchers’ carrier through the implementation of the “European Charter for Researchers”. Principles gathered in this text must still be translated in concrete actions.
  - Moreover, continued training must be improved in order to really compensate knowledge deficits and to update workers’ skills with regards to scientific and technical evolutions.

- **Provisioning adequate financial resources and allocating them efficiently**
  - Regional research credits were drastically decreased in 2010 and 2011 but, for competitiveness, it’s essential that public authorities devote sufficient action means to R&D. Moreover, it is important to multiply opportunities to take profit from additional funding sources, what implied to better articulate the regional R&D programmes on the European programmes. This solution works through a better integration in international networks.

**b) To preserve the regional research and innovation potential**
The regional rooting of big enterprises in the productive fabric is a crucial challenge and the availability of university departments and performing research centers play an important role in the implementation choice of multinational units. The “Poles of Competitiveness policy” is fully inscribed in this view and, until now, the budget dedicated to R&D projects followed by the operational staff has been held. The Poles also contribute to a better implication of SMEs in R&D processes. Their participation must be encouraged and developed to be the reflection of their importance for the economy. This is notably the case of young innovative companies.

But this measure, alone, can’t be the solution to significantly increase the number of innovative SMEs in Wallonia; that’s why the Government focused its effort on a huge number of initiatives in that sense: “First Enterprise”, “Programme CWALITY”, “Programme EUROSTARS”, “Primes HORIZON”, different aids to the support of research activities...etc. All other aid mechanisms destined to enterprises and, thus, to SMEs, can be added to specific SMEs measures. To this end, the action of the “Agence de Stimulation technologique” comes and strengthens the support by accompanying SMEs in the funding process.

**c) To transpose research results in high tech activities**

The transposition of R&D results in profit-making industrial and commercial activities that offer growth perspectives is a major point of concern. Focusing public means on buoyant sectors in which Wallonia disposes of technological, scientific potential and organizing partnerships around them is an efficient means of promoting R&D results that the poles of competitiveness try to develop. That’s also the action of the TTO’s (technology transfer offices) implemented in the regional universities and high schools which offers support for management, extraction funds...etc.

One of the negative aspects of all these mechanisms is their dispersion and the lack in clarity (numbers of actors and multiplicity of decision centers) which makes difficult the identification of gaps. Another one is the distribution of the R&D and innovation competences between the Minister for Research and the Minister for New Technologies.

To make the process efficient, it’s important that, firstly, all phases could be covered from the industrialization to the commercialization and, secondly, that non-technological aspects of innovation should be taken into account.

Among other opportunities to develop, the following ones could be underlined:

- Need in supporting and creating spin-off that are inscribed in a growth process.
- Need in valuating “orphan” results coming from the projects submitted under the innovation calls of the poles of competitiveness.
- Need in completing public funding with private ones, coming from starting to development phases.

**d) Strategic policy orientations**

In 2011, the Government adopted a framework note called “Towards an integrated vision of research” that defines an orientation strategy for a research programme during 5 years. It includes the 6 axes of the poles of competitiveness as well as 5 other transversal themes linked to the main...
current challenges (sustainable development, renewable energies, new technologies, health, ageing and quality and duration of life).

In parallel, a specific plan for innovation – Creative Wallonia – was adopted to promote creativity and innovation development in whatever form.

These initiatives show the public authorities’ willingness for implementing middle term policies, ensuring the continuity of actions. They also take into account the technological as well as non-technological aspects of innovation.

One thing that could be improved is the absence of clear links between the research and the innovation policies as well as the broad range of themes covered by these strategies. If the concentration of public resources on a limited number of buoyant domains in terms of scientific, technological and industrial capacities is a way to favour the transformation of R&D results to innovative activities that create added-value and jobs, an associative process, linking all stakeholders, would be the best way to work. It is important to avoid the dispersion of means.

Generally speaking, it’s probably the lack of integration which is the main fault in regional policies, like it’s the case for the transport & logistics field in particular. Both industry and science would appreciate a rather long term oriented policy that would consider all stakeholders, considering the needs in infrastructure, education, training, investments, economic competitiveness... in parallel with Wallonia’s skills and assets as well as its weaknesses.

**Future scenarios for sustainable logistics**

Since the logistics sector is rather unpopular, it is not easy to communicate its economic importance to an uninformed public. Therefore, when we talk about sustainable logistics, even in a favorable context for actions following the green trend, the concept remains unclear. It is therefore necessary to determine the trajectories to investigate to sensitize various stakeholders of the supply chain and their technology providers to the need to integrate the various aspects of “sustainability” (planet, profit, people) to their strategic thinking.

**Sustainable logistics through European, national and regional legal frames**

As it is the case in most of the long term changes to be established in a society, companies need a boost to make the fold policy of sustainable development and accept its implications and constraints. A framework exists in Wallonia, influenced by European standards, but negotiations on certain subjects are difficult. This is the case of the eco-combis (super-trucks) that are the object of a disagreement between the political authorities in Wallonia, considering on one hand, the economy of fuel they allow and the reduction of the transport costs and, on the other hand, their lack in flexibility in urban zones and the doubt around the effective reduction of air pollution. They are currently prohibited on Walloon roads which has implications on Walloon’s companies competitiveness. They must also adapt to European emission standards (Euro) whose objective is to reduce air pollution from road transport. Moreover, among other challenges, the region must advance its road pricing projects as recommended by Europe. It is worth remembering, however, that future efforts will undoubtedly be accompanied by new incentives to avoid jeopardizing the regional industrial competitiveness.

**Sustainable logistics through innovation**

The long road to sustainable logistics inevitably includes an ever greater innovation, technological or not, to emerge the solutions required to implement new environmentally friendly practices, the economic health of industrial and welfare of human resources that compose it.

Innovation includes a large number of actors and this is one of the missions of the Pôle to gather them in collaborative actions in which a big current challenge is to include, more systematically, sustainable development. It is also necessary to make sustainable development a reflex acquired from these actors so that they take themselves the lead in initiatives geared in this direction.
In addition to mobilizing within the region, it is necessary to consider Wallonia as a part in the heart of an international network. We should be aware of assets available to the network in terms of knowledge sharing, potential collaboration and promotion of regional assets and innovation results.

**Sustainable logistics through going back to local practices**

In a world where trade has intensified significantly, periods of crises remind us that our region has a large number of excellent resources, often underused. Calculating the cost-benefit ratio needs to be done by companies to determine the market potential carrier which is located directly beneath their feet. The exploitation of regional resources also passes through regional public encouragement and promotion practices.

**Research Focus and Project Examples**

<table>
<thead>
<tr>
<th>Environment</th>
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<tbody>
<tr>
<td>TOPIC I: Energy efficiency / Environmental impact of logistics management and operations</td>
</tr>
<tr>
<td><strong>Project / Program title 1:</strong> LEAN &amp; GREEN</td>
</tr>
</tbody>
</table>

**Subject and objectives**

Lean and Green is a programme aimed at encouraging businesses and government bodies to move to a higher level of sustainability by taking measures that not only yield cost savings, but at the same time reduce the burden on the environment. Lean and Green makes a distinction between the mobility of goods and mobility of people. If an organisation can demonstrate through a plan of action that it will be able to reduce its CO2 emissions by 20% in five years’ time, it becomes eligible for the Lean and Green Award. If the objective in the plan of action is actually achieved, the organisation is awarded its first Lean and Green Star.

With the Lean and Green Award, organisations can show that they are actively engaged in making their logistics and mobility process more sustainable. That is something to be proud of. Winning the Award makes your organisation part of the Lean and Green Community, which now consists of more than 250 Lean and Green Award winners.

The Lean and Green Stars help the programme to ensure that the process of increasing the degree of sustainability in organisations continues to move forward. Organisations that actually achieve their objective to reduce CO2 by 20% receive the Lean and Green Star as a symbol for fulfilling their Lean and Green aim. The next stars are being developed in cooperation with the participating organisations.

Logistics in Wallonia entered a process of agreement with the institution holder of the Lean & Green license and the Flanders Institute for Logistics which has already launched the project on the Flemish region. Our goal is to generalize the practice on the Belgian territory and to extend the project to Walloon enterprises.

For operators that take part to the project, the advantage is to be able to improve energy efficiency and reduce the environmental impact of logistics activities and reconcile sustainable development with economic performance by

a) measuring “green” performance (operations and management)

b) identifying improvement levers

c) positioning themselves within a panel of companies

**Challenges-related possible outcomes**

Possible links with the following Environment-related LOG4GREEN challenge(s):

“Coping with the growth in a sustainable way”
Prospective/possible outcomes | Relevance/Feasibility
---|---
Knowledge exchange | □
Experience sharing | □
Further collaboration in R&D development | 
Demonstration | 
Networking with project holders/participants | 
Other: extension of the practice in partner regions | □

**Project / Program title 2:** Liege CAREX / Euro CAREX

**Subject and objectives**

The concept Carex is the use of the European rail network for high-speed transport pallets and containers air at distances between 300 and 800 km with:

- a "modal" trucks and planes short / medium haul to high speed trains where relevant;
- air-rail terminals connected to high-speed rail and airport facilities continuity;
- a service adapted to the supply chain and transportation plan integrators with priority given to freight Express in order to ensure delivery D+1 and less urgent air freight cargo in addition.

The Liege CAREX project was launched on the basis of the following background:

- Activity Freight and Cargo Express has been rising sharply in recent years the major European airport hubs. The observed decline in traffic over the past few months due to the global economic downturn should be temporary.
- The scarcity of slots night air in order to control noise pollution suffered by people flown limit the development of the activity of freight operators.
- The speed limit for trucks from 1 January 2007 and the saturation of major European highways, making transportation of goods by truck less attractive.
- The price of a barrel of oil known significant fluctuation: April 2006 = $ 75 = $ 150 in August 2008, January 2009 = $ 50 = $ 70 in June 2009, November 2009 = $ 80 ...
- The development of the network of high-speed rail lines provides an opportunity to explore complementarities between the plane, truck and rail through modal.
- The opening to competition of the market rail freight since 1 April 2006 in Europe is an added advantage.
- The local authorities concerned and airfreight operators are motivated by such a sustainable development project.

Awareness that there will be no service without network partners RoissyCarex have links with correspondents already involved locally on the subject, in France and in Europe. Thus were born Lyon Carex, Carex Liège, London Carex, Carex HST Cargo Schiphol today all under the banner Euro Carex.

**Challenges-related possible outcomes**

Possible links with the following Environment-related LOG4GREEN challenge(s):

"Coping with the growth in a sustainable way"

"Improving the efficiency of multimodality"
Prospective/possible outcomes | Relevance/Feasibility
---|---
Knowledge exchange | X
Experience sharing | X
Further collaboration in R&D development | 
Demonstration | 
Networking with project holders/participants | X
Other: the project needs a gateway to Germany | X

**Technology**

**TOPIC I: Urban Supply**

**Project / Program title:** URBANZEN

**Subject and objectives**

UrbanZen proposes a collaborative solution to participate in urban traffic congestion. It is based on the centralization of information from co-drivers themselves and the municipal authorities.

This solution aims to achieve indication from carriers about the existence of black dots, via the transmission of information by a simple and minimally invasive tool, and to compare it to the municipal plans of mobility computerized and updated in real time by the municipal administration. The feedback to the driver is directly available via GPS to the majority of trucks, allowing the automatic rerouting of them by calculating a route "bis" specific and compatible with the constraints expressed by municipal managers. Its originality lies especially in the fact of using existing vehicle telematics (without additional housing), or a simple communicating smartphone using generics operating systems.

**Challenges-related possible outcomes**

Possible links with the following Technology-related LOG4GREEN challenge(s):

- “Improving the efficiency of information systems”
- “Facilitating the use of technological solutions for combining passengers and goods transportation”
- “Improving flexibility of logistics processes & infrastructures”
TOPIC II: Risk management for logistics operations / Security and safety of the supply chain

Project / Program title: GIR

Subject and objectives

The objective of this project is to offer companies, and more particularly safety advisers in the transport of dangerous goods, a tool to verify compliance with the requirements governing the carriage of dangerous goods, whatever the mode or combination of modes transport.

The particular application would be able to automatically generate shipping documents, safety protocols, labeling and packaging as well as the annual report (mandatory and on which counselors spend a lot of time that can’t be spent on safety and security on the ground).

Developing an integrated system for the provision of requirements and procedures in relation to the regulations of the different modes would allow players (logistics managers, safety advisers) to ensure the implementation of the Europe Agreements and management of risk and safety / security best throughout the chain (indispensable part of the European certification OAS).

It is a system of intelligent type insofar as it responds to complex logistics and multimodal scenarios for the provision of protocols, procedures and best practices tailored to the realities on the ground (in terms of level of risk and costs).

The system will be suited both for use in offices and in the field, through the use of graphics tablets. Another component of this system is the implementation of an early warning in case of an accident during transport, which will allow players to have as much information on the nature of the disaster, and as soon as possible .

Challenges-related possible outcomes

Possible links with the following Technology-related LOG4GREEN challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”

<table>
<thead>
<tr>
<th>Prospective/possible outcomes</th>
<th>Relevance/Feasibility</th>
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<tbody>
<tr>
<td>Knowledge exchange</td>
<td>☒</td>
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<tr>
<td>Experience sharing</td>
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<tr>
<td>Further collaboration in R&amp;D development</td>
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<tr>
<td>Demonstration</td>
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<tr>
<td>Networking with project holders/participants</td>
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<tr>
<td>Other:/</td>
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</table>

Project / Program title: Secure WMS

Subject and objectives

The project combines video surveillance and positioning technique to create an innovative logistics management secure. Secure WMS project responds to the need for securing goods / products in the supply chain, both internal (storage / management) and external (routing). This security is necessary for reasons of cost (to prevent loss and theft) and to meet emerging regulations.
Specifically, it is about the design of intelligent tools, based on a combination of video surveillance technology and positioning (WMS and ERP), able to secure transactions in indoor / outdoor, and, where appropriate, to detect anomalies or behavior 'suspects', such as intrusion or unauthorized charges.

**Challenges-related possible outcomes**

Possible links with the following Technology-related LOG4GREEN challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”

<table>
<thead>
<tr>
<th>Prospective/possible outcomes</th>
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<tbody>
<tr>
<td>Knowledge exchange</td>
<td>✓</td>
</tr>
<tr>
<td>Experience sharing</td>
<td>✓</td>
</tr>
<tr>
<td>Further collaboration in R&amp;D development</td>
<td>✓</td>
</tr>
<tr>
<td>Demonstration</td>
<td>✓</td>
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<tr>
<td>Networking with project holders/participants</td>
<td>✓</td>
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</table>

**Project / Program title: BEM**

**Subject and objectives**

This project uses an advanced artificial intelligence engine in order to minimize the negative consequences of unexpected events that can be very expensive while simplifying the design flow of management solutions.

The project objective is to develop a new approach to IT management of unforeseen incidents that may affect the supply chain and to restabilize management system on a known case.

Currently, the research center is moving towards the development of a methodology based on field requirements, enabling formalization in a meta-language easily accessible. The GUI interface that supports the meta-language should not pose much of a problem, if is built in an existing work. Between the time of definition of the project and present, priorities moved from "truck" logistics to "store" logistics.

**Challenges-related possible outcomes**

Possible links with the following Technology-related LOG4GREEN challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”
Prospective/possible outcomes | Relevance/Feasibility
---|---
Knowledge exchange | ☒
Experience sharing | ☒
Further collaboration in R&D development | ☒
Demonstration | ☒
Networking with project holders/participants | ☒
Other:/ | 

Project / Program title: **Trasilux**

Subject and objectives

Trasilux project aims to develop an integrated fight against counterfeiting.

This solution relies on RFID technology and its embedded cryptographic capabilities. The primary target of this solution is the luxury sector in the broad sense, but counterfeiting affects all areas of technology (electronic, mechanical, pharmaceutical ...) at, for example, spare parts or parallel markets.

The project studied the definition of architecture completely secure for two scenarios:

the closed loop (known and mastered all stakeholders and all stages of the logistics process);

and the open loop (where external factors are involved in the process). It may be anyone who would validate the authenticity of a luxury product purchased second hand, for example.

This definition work is fundamental since it will ensure the robustness of the overall solution.

The main achievements are the following ones:

The developed cryptographic tools have been integrated at the level of the database access.

Based on specifications defined for targeted industries, kitdemonstration was finalized. It remains to evaluate its capabilities in the field.

The test bench prototype developed in the project helped to start a business approach towards industrials of the target market.

Challenges-related possible outcomes

Possible links with the following Technology-related Log4Green challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”
Prospective/possible outcomes | Relevance/Feasibility
--- | ---
Knowledge exchange | ✓
Experience sharing | ✓
Further collaboration in R&D development | ✓
Demonstration | ✓
Networking with project holders/participants | ✓
Other:/ | 

TOPIC III: Fluidity / Safety rail traffic

**Project / Program title:** GreenRail

**Subject and objectives**

Rail transport, as a major consumer of energy, is particularly affected by the problem of improving energy efficiency and reconciling economic growth and reduction of greenhouse gas. This improvement, however, can’t be done at the expense of efficient use of existing infrastructure and improving the quality of service.

In a context of increasing demand for rail transport in Europe, it is clear that the networks will reach an unmanageable level of occupation as is the case in Belgium. This saturation is not without causing problems of punctuality, traffic fluidity and decrease in quality of service to users. The social climate in railway companies is also degraded.

Improving traffic fluidity and punctuality in a constant energy efficiency appears to be important for operators. And covering this need through the standard ERTMS appears as logical and most profitable in the short term.

It is in this context that GreenRail participates in the development of integrated management of rail traffic, innovative concept for multiple criteria such as the fluidity of traffic, improving the capacity and conflict management in the interests of efficiency energy and interoperability.

**Challenges-related possible outcomes**

Possible links with the following Technology-related Log4Green challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”

“Facilitating the use of technological solutions for combining passengers and goods transportation”
Prospective/possible outcomes | Relevance/Feasibility
--- | ---
Knowledge exchange | ✔
Experience sharing | ✔
Further collaboration in R&D development | ✔
Demonstration | ✔
Networking with project holders/participants | ✔
Other:/ | 

Project / Program title: **Locotrac**

**Subject and objectives**

This project aims to define “system” concepts taking advantage of new innovative technologies to integrate these technologies and to develop new products responding positively to the needs of local and regional lines, applications "tram-train" as well as low cost markets ATP (Automatic Train Protection).

The specific objectives are:

A better understanding of market needs and regional and local lines (European but also global view of the export standard ERTMS);

The search for new concepts system to meet these needs at lower Life Cycle Cost (LCC);

The integration of new technologies in the development of new products;

Researching the optimal level of compatibility with ERTMS standard to ensure level of interoperability between these lines and main lines;

The development of new standards for this market actually open (harmonization specifications and solutions developed by European manufacturers);

The demonstration of new concepts through a mockup of the new systems, sub-systems and products and a full-scale experiment on rail site;

The validation of these new concepts in performance at the RAMS level (reliability, availability, maintainability, safety) and according to the interoperability perspective of ERTMS.

**Challenges-related possible outcomes**

Possible links with the following Technology-related LOG4GREEN challenge(s):

“Improving the efficiency of information systems”

“Improving resilience of logistics systems”

“Improving flexibility of logistics processes & infrastructures”

“Facilitating the use of technological solutions for combining passengers and goods transportation”
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<tr>
<td>Demonstration</td>
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<td>Networking with project holders/participants</td>
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**TOPIC IV: Traceability**

**Project / Program title:** Temptrack

**Subject and objectives**

The project focuses on the development of a RFID solution for the traceability of temperatures. The system combines the temperature sensor and the RFID tag, the latter having the ability to transmit real-time information.

This project aims to develop a comprehensive solution for the automatic traceability of the temperature of a product uniquely identified throughout its life cycle.

The first part concerns the efficient, automatic, reliable and constant collection of data, throughout, or at some key moments in the life of the product, and then their rise in a centralized information system able to filter, store and return. The solution will be based on the combination of RFID technology and the technology of electronic sensor for temperature.

The second part consists of visual information on exceeding a temperature threshold and the duration of the delay. This second part is necessary for several reasons:

- It provides confirmation information necessary in the pharmaceutical and biotech sector;
- The operator will not need any media in order to interpret the information, its information will be colorful, immediately visible and interpretable.

This solution is primarily intended for the pharmaceutical and biotechnology industries.

**Challenges-related possible outcomes**

Possible links with the following Technology-related LOG4GREEN challenge(s):

- “Improving the efficiency of information systems”
- “Improving resilience of logistics systems”
- “Improving flexibility of logistics processes & infrastructures”
TOPIC V: Technological guidance

Project / Program title: Connect to all (C2A)

Subject and objectives
The INTERREG project "C2A" joins the Champagne-Ardenne region, Nord-Pas de Calais and Picardy in France and Wallonia and Flanders in Belgium.

Launched in 2008, "C2A" aims at the design, development and implementation of an intelligent interconnection system for transportation and logistics. The objective is to ensure a better flow of information inside and outside the vehicle.


Challenges-related possible outcomes
Possible links with the following Technology-related LOG4GREEN challenge(s):
“Improving the efficiency of information systems”
“Improving resilience of logistics systems”
“Improving flexibility of logistics processes & infrastructures”
“Facilitating the use of technological solutions for combining passengers and goods transportation”

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<td>Demonstration</td>
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</table>
TOPIC I: Competitiveness

Project / Program title: Eco-Combis

Subject and objectives

The Eco-combi is deemed allow transportation cost savings and a reduction of 20,000 liters of fuel per year in operating long distance – for 10 000 kilometers per month - compared to a conventional road vehicle that would carry out the same mileage, thanks to the volume and the additional load that it is able to carry.

In view of Logistics in Wallonia, these Eco-Combis are therefore a real need for the economic competitiveness of our country.

According to the Minister for Economy, in terms of competitiveness, this type of transportation with a single driver for more quantity transported is important, but he doesn’t want to overlook security aspects or the maintenance and rehabilitation of the network.

This balance between pros and cons that is happening between the Minister for Economy and the Minister for Environment slows down the process of regulation allowing the circulation of Eco-Combis.

Challenges-related possible outcomes

Possible links with the following Economy-related LOG4GREEN challenge(s):

“Demonstrating the added value of clustering”

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TOPIC II: Logistics development in life science sector

Project / Program title: Biolog Europe

Subject and objectives

Over the years, Belgium and, in particular the region of Wallonia, has become a key location for the Life Sciences sphere.

The presence of global actors such as GSK, UCB, Baxter, Pfizer, Johnson & Johnson, but also BD, Terumo and many others, not only for their R&D, manufacturing but also for their distribution in Europe provides some of the best evidence to the potential advantages of the Wallonia-Belgium region.

BioLog Europe is aiming to further develop Logistics activity in Wallonia in the Life Sciences and life sciences sector (Pharmaceuticals, Biotech and Medical Devices).

With BioLog Europe, the Pole positions itself as a facilitator for:
Short survey (or validation) of markets’ potential (for smaller companies mainly);
Helping companies to define their supply chain strategy (for smaller companies mainly);
Connecting companies to a vast network of economic partners;
Helping companies to get in touch with local authorities and AWEX (for Financial Incentives and support (grants, subsidies);
Providing companies quick and easy access to available infrastructure and Logistics Service Providers (LSP’s).

Challenges-related possible outcomes
Possible links with the following economy-related LOG4GREEN challenge(s):
“Demonstrating the added value of clustering”

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<td>Experience sharing</td>
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<td>Demonstration</td>
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<td>Networking with project holders/participants</td>
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Society

TOPIC I: Education & Training
Project / Program title: LogTracAlim

Subject and objectives
LogTracAlim develops training courses on management and traceability and new technologies in the field of identification. The project revolves around the use of ERP (Enterprise Resource Planning) and integrates the traceability of several types of elements (the article, a carton, pallet or container). It consists of manufacturing, packaging and preparing chocolate at the Formalim center in Verviers and sending it to the other Forem logistics centers at La Louvière and Bierset. There the chocolate is stored and re-prepared before being distributed. This chain enables students to learn about traceability and the new technologies involved in the jobs of production and logistics.

Challenges-related possible outcomes
Possible links with the following Society-related LOG4GREEN challenge(s):
“Ensuring sufficient educated people for logistics business”
“Improving awareness on green/ sustainable aspects of logistics”
TOPIC I: Integrated regional vision for logistics

Project / Program title: “Plan intégré transport & logistique”

Subject and objectives

It is desirable for all players that Wallonia adopts an integrated strategic plan for transportation and logistics. However, the record prepared by Logistics in Wallonia now suffers from a political deadlock.

Challenges-related possible outcomes

Possible links with the following Policy-related LOG4GREEN challenge(s):

“Improving the coordination of laws & plans”
“Giving politicians an integrated vision of logistics”
“Ensuring stable infrastructure”
“Defining standards for CO2 emissions (reliability)”

Prospective/possible outcomes

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<tr>
<th>Prospective/possible outcomes</th>
<th>Relevance/Feasibility</th>
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<tbody>
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<td>Further collaboration in R&amp;D development</td>
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<tr>
<td>Networking with project holders/participants</td>
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<tr>
<td>Other: we need models and good practices as well as success stories in that field</td>
<td>☑</td>
</tr>
</tbody>
</table>
3.5 Istanbul (Turkey)

Regional & Economic Background

Figure 3.5.1: Istanbul's Location within Europe

The Istanbul logistics region has comparative and competitive location advantages that led to a substantial development of the logistics sector in the last few years. However, to support this growth in a sustainable way, the relating actors from administration and research have to be interlinked.

With officially more than 12.5 million inhabitants living in 5,343 square kilometres, the city of Istanbul is defined by the OECD as 'big population magnet and emerging metropolitan economy'. (OECD Territorial Reviews: Istanbul, Turkey; March 2008). By the year 2005, the city and provincial borders have been fixed and become NUTS1, NUTS2 and NUTS3 regions with Turkey's adaptation to EUROSTAT. Istanbul is surpassing 127 countries with a USD 133 billion yearly income according to PwC's ‘The Largest City Economies in the World in 2005 and 2020’.

Turkey’s 45 percent of national production, 36 per cent of exports and 40 per cent of imports pass through Istanbul. Together with its geographical region Marmara, Istanbul is also the logistics hub for all industrial and commercial activities mainly for construction, electronics, textile, iron-steel, chemicals, and automobile. The region itself is both major origin and destination for goods from the hinterland of all Turkey, and the transitional economies of the Black Sea region, SEE, former Soviet territories, Middle East, and Eastern Mediterranean regions as well as overseas.

The logistic nodes in Istanbul include: organized industrial zones (8 of them located in Dudullu, İkitelli, Tuzla Deri, Tuzla Mermerciler, Tuzla Boya Vernik, Tuzla Kimya and Beylikduzu), small industrial sites (113 of them include 35,000 businesses employees 150,000 people), cargo terminals (Topkapı Cargo Terminal includes 140 businesses employees around 1250 people and has a daily economic turnover of approximately USD 1.4 M), food terminals (Bayrampasa and Erenkoy are fruit and vegetable terminals, Rami and Mega Centre are dry food terminals, Yenikapi is a seafood terminal, and the average traffic is about 17,000 vehicles per diem), customs warehouses (424 customs
warehouses under 16 customs offices), storage of chemical products. (Istanbul Metropolitan Municipality, 1/100.000 Scaled Provincial Master Plan, 2009)

Currently Turkey’s foreign trade volume is around USD 300 billion, and estimated two times higher in 15 years when half of it will come from the region of Istanbul. The proportion of logistics within that volume is nearly 10 per cent. One of the visionary components of Istanbul’s new master plan for the year 2023 envision new logistic zones, a third airport and the enlargement of existing ports. Through ongoing major transportation projects like Marmaray and Kars-Tiblisi-Baku railroad constructions and new highway projects, the capacity of logistics activities will strengthen the regional competitiveness and increase economic growth. OECD’s Territorial Review and TINA reports indicate a regional economic growth centred at Istanbul. If the sustainable development principles are adopted with the economic growth policies, then the sustainability of the overall economy will also contribute to the competitiveness with integrated and inter-sectoral dimensions.

The industry and trade in the region represents the bulk of Turkish trade and industry. In 2010, Istanbul became the first city with the highest commercial activity on the basis of all companies in all regions and has a 70 % share in all Turkish industrial production. Istanbul has a share of 44 in Turkish exports (in value terms: It accommodates 52% of all exporter companies) and 52 % in imports (in value terms: It accommodates 58% of all importer companies). The region is characterised by its high population level, high level of consumption and consequently, a high level of transport demand.

The Istanbul region connects the European and the Asian continent with shortest road and sea connections, while has a dominant position on the maritime routes connecting the Black Sea to Mediterranean countries. The Pan-European Corridor 4 starting from Dresden ends in Istanbul. She has efficient road and rail connections with the Turkey’s European border gates Kapıkule, Ipsala and Hamzabeyli. Istanbul is the most competitive city (region) among 81 cities in Turkey in terms of "human capital, life quality, trademark development and innovation, trading skills and production potential, accessibility"(according to the 2008-2009 Competitiveness Index prepared by the International Competitiveness Studies Organization).

One regions’ main obstacle is the high traffic density; the high level of motorization and of immigration from other cities of Turkey create serious problems as a barrier to the city’s development. The highly populated city is face to face with serious traffic congestion problems in almost all parts of the city, while the current distorted urbanization tendency seems to lack necessary attention by government authorities. Plus, the imminent threat of a serious earthquake near the city puts all economy at risk.
As one region’s major needs, first of all, the risk of a serious earthquake should be taken more seriously by all actors including the public and private sector since any such incident would damage not only the regions’ but the whole Turkish economy. So, each and every organization/entity should address and take precautions against this threat. Secondly, the high level of immigration should be reduced down through economic actions to be taken in other regions of Turkey to motivate people to stay in their hometowns instead of seeking their welfare in Istanbul. The revised “system of incentives” seems to support such tendency but it needs to be implemented more determinedly.

In the stage of project generation, it is inevitable not to cause conflict within the decision-making process in accordance with the interest of each institution. However, these conflicts are solved with the aim of collective benefit. Istanbul is a city enabling people from different culture and character to live together. In terms of city development, although communication in general has a positive impact, hierarchy has sometimes positive and sometimes negative impacts.

Istanbul is one of the cities with the strongest economy in Turkey. According to the statistical data regarding the region and Turkey by the year 2011, the Gross Domestic Product regarding the region is 190 billion Euros and 882 billion Euros for the country.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Istanbul</th>
<th>Turkey</th>
<th>Share of Istanbul</th>
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<tbody>
<tr>
<td>Gross Domestic Product (GDP) (in bn. Euro) 2011</td>
<td>190</td>
<td>882</td>
<td>21,6 %</td>
</tr>
<tr>
<td>GDP per capita 2011 (PPS)</td>
<td>14.300</td>
<td>11.958</td>
<td></td>
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<tr>
<td>Employment Rate 2011</td>
<td>43.10 %</td>
<td>69.20 %</td>
<td></td>
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<tr>
<td>Number of Local Units in Logistics</td>
<td>27.700</td>
<td>270.517</td>
<td>10,2 %</td>
</tr>
<tr>
<td>Share of Local Units in Logistics in all Local Units</td>
<td>7,97 %</td>
<td>14,56 %</td>
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</tr>
<tr>
<td>Number of Persons Employed in Logistics</td>
<td>126.503</td>
<td>612.814</td>
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</tr>
<tr>
<td>Share of Persons Employed in Logistics In all Persons Employed</td>
<td>3,00 %</td>
<td>2,54 %</td>
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</table>

*Table 3.5.1: Istanbul’s Economy in figures (Source: TUIK, Turkish Statistical Institute)*

In addition to the people employed in the logistics sector, a certain share of personnel working in industry, manufacture, commerce, environmental/waste management sectors indirectly contributes to the logistics sector by their services. That means staff counted within industry, such as in storage, delivery, or purchase functions within a factory, are actually contributing to the logistics area. Similar to that, people who work in storage of waste disposal can also be assessed in logistics.

**Academic Research**

In general, as the regional research infrastructure is analyzed, it is foreseen that departments regarding logistics newly commence education programmes and for the coming future a positive development has been enabled. The three key words that define logistics research are ICT, inventory and metropolitan municipality.

There are 44 universities in Istanbul, as well as 2707 high schools and primary schools. In recent years, Istanbul’s educational system has expanded substantially; from 2000 to 2007, the number of classrooms and teachers nearly doubled and the number of students increased by more than 60 percent. From 2007 to now, the government increased the student quota. Universities take much more students if we compare to the past.

Engineering departments experience a sustainable development, with supply chain and logistics courses as course topics. The supply chain management subject tends to become a popular course.
Universities carry out scientific researches and build science laboratories to work on related subjects. Many graduate students work on these lab centres in order to carry out research. Also, some companies invested in those lab centres.

There are 44 science and research institutions in Istanbul. 15 of the are related to logistics, as well as 26 study courses. There are nearly 48 universities, and nearly 50 vocational training schools that give lectures in logistics in Turkey. However, they do not represent a sufficient capacity to train qualified staff according to the needs of the sector.

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<thead>
<tr>
<th>Research &amp; Education in Istanbul in figures</th>
<th>Istanbul</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Universities / Academia</td>
<td>44</td>
<td>171</td>
</tr>
<tr>
<td>Number of Other Research Institutes</td>
<td>N/A</td>
<td>154</td>
</tr>
<tr>
<td>Number of science &amp; education institutions related to logistics</td>
<td>15</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of study courses (degrees) related to logistics</td>
<td>26</td>
<td>N/A</td>
</tr>
<tr>
<td>Total RTD Personnel (2009)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Share of all Employees (%) (2009)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total RTD Expenditure (Mio. €)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Expenditure as Share of GDP (%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Number of Students</td>
<td>355,000</td>
<td>2,087,890</td>
</tr>
<tr>
<td>Share of Students / 1,000 Inhabitants</td>
<td>26,06 %</td>
<td>27,94 %</td>
</tr>
</tbody>
</table>

Table 3.5.2: Research & Education in Istanbul in figures

In addition, courses which are related to the study of the environment, the relationship between consumption and environment, or sustainable energy etc., are given in universities. In high schools and primary schools that kind of lectures does not exist but in universities these courses are available to many students in different departments.

We can say that Istanbul region’s logistics research infrastructure is best described by excellent basic research. Other research types such as interdisciplinary research or cutting-edge research can be also applied.

The logistic research of the Istanbul region is outstanding in the field of supply chain management. The region has a strategic position regarding the rail networks to Europe and the Middle East, and the only sea route between the Black Sea and the Mediterranean. It is an important point in a supply chain for lots of companies.

The logistics sustainability research of the Istanbul Region regards mainly technical solutions, organizational solutions, ICT-based solutions and the transformation of socio-economic systems.

Research Innovation Centres beyond Academia

EMIT (THE EURASIAN AND EASTERN MEDITERRANEAN INSTITUTE OF TRANSPORTATION AND LOGISTICS ASSOCIATION) INITIATIVE

This is an initiative to be traced back to the international symposium, “Approaches to Regional Transport Problems: Middle East Requirements”, May 23-26, 1988, which has gathered some of the members of the present working group who have launched an effort to set a regional / international research organization with strong ties with the rest of the world for prospering studies in transport.
However, this start has been blocked by the war in Iraq and it was not possible to recover the momentum it had been set forth for a long time.

Then, in the aftermath of 10th WCTR in Istanbul, the initiative has been revived by September 2005 when a group of transport professionals have come together at a workshop held in Istanbul on 22-23 September 2005 – “Prospects and Possibilities of International Cooperation in Transport Research and Education in the Eurasian and the Middle Eastern Basin”. After an intensive work of 1.5 days, the group agreed on following the guidelines of a Final Action Plan naming the initiative as PETRAT which was initially planned to be a platform to be started as a joint organization between ITU Foundation and the UND (International Transporters’ Association of Turkey). However, this plan has failed.

Later, with the persistent efforts of the members of the group the initiative has been revived at another workshop held in 2007 (1-2 Nov.2007) in Istanbul again – “Organising an International Transport and Logistics Research Centre for Eastern Eurasia and Eastern Mediterranean”. This time the group has been enlarged with new participants. This Working Group, following the main theme of the Final Action Plan of 2005 WS, advised to organize an international conference where an international association accommodating selected and prominent transport professionals from around the world should be initiated.

The conference was held in Istanbul on 12 – 14 February 2009 under the title “Prospects for Research in Transport and Logistics on a Regional–Global Perspective”. As the draft of the constitution of an international association, the Eurasian and Eastern Mediterranean Institute of Transportation and Logistics Association was undersigned by the founder members among the participants of the conference as some new prominent partners have joined the Group.

However, certain legal barriers were in force in Turkey that didn’t allow the quick establishment of such an association, therefore a Platform was accepted to be set up on a temporary basis, to pave the way for some kind of a Center of Excellence on Transport & Logistics, which is an urgent requirement for the Turkish transport & logistics sector. At this Center, it is planned to educate and train future academics that have necessary knowledge and know-how on the transport and logistics business.

On 21 November 2011, a protocol founding the EMIT Research Platform undersigned by the Chairman of ITU Foundation and the Rector of ITU (then), Professor Muhammed Şahin and the President of UND Ruhi Engin Ozmen and was legally put into action. UND, one of the partners of this project (Log4Green) is closely involved.

In the short term, the EMIT Platform plans to create an optimum “transport and logistics higher education curriculum” and to offer special training courses for professionals in the industry. In the long term, an international master programme on transport and logistics is to be implemented and the necessary number of academics will be ensured to open an international institute (a center of excellence) with a strong support from an esteemed global network of universities and senior academics including prominent figures from MIT, Rutgers University, Karlsruhe University, Cairo University, University of Lisboa, etc.

Regional Innovation Environment

Istanbul has many universities and institutions which work on logistics. Projects and investments are made by those universities and institutions. The geographical position of Istanbul is very important. The city is at the centre of the second-largest metropolitan area in Europe and among the world’s largest cities by population within city limits. It enables this region to be open to investment, and new technological investment are continued all around the city.

Strengths can be also listed as follows:

- Geographical position: The city connects Asia and Europe.
The city is at the centre of the second-largest metropolitan area in Europe and is thus attractive for investments.

- Sea and road transportation between Asia and Europe runs through Istanbul.
- Many freight transport and logistics companies
- Many universities which have departments related to logistics

Collaboration between universities and industry

There are deficiencies in the number of qualified personnel. There is a lack of coordination with industrial sectors and a lack of funds to initiate university/industry joint projects. Personnel are not enough to train qualified staff according to the needs of the sector. Academic education and training should be carried out in conjunction with the private sector. Besides the knowledge of the general elements of the logistics, there should be specializations in the specific areas of the sector and experts should be educated in every subject. Experts on this area should arrange training programmes. Logistics curricula should be reconsidered and orientated to real life problems and useful projects. There are not enough reference books in the sector.

Istanbul is at the centre of the second-largest metropolitan area in Europe and among the world's largest cities by population within city limits. It is expected that population will be much higher in the future. Therefore, needs will increase. It is expected that information technology will develop in the coming future. It is required that logistics training is performed by qualified institutions, course training with application is more common and information technology is applied more efficiently. Logistics training is mostly focused on supply chain management. This is really the popular issue of the day and seems to sustain its importance in the coming future.

In order to improve the logistics and transportation sector,

- Logistics training should be extended, increasing diversification and quality, and course plans should be organized according to the needs of the region and of the educational institution;
- Logistics professional standards (job descriptions, staff qualifications etc.) should be established;
- Logistics vocational training and education should be encouraged;
- Training of trainers should be provided;
- Institutionalization and professionalization of the sector should be encouraged to provide an environment of trust, the accreditation of logistics companies, and the certification of logistical employees should be supported;
- Activities like logistics research, theses, conferences, and publications should be supported.

On the other hand the statistical data that could be the basis of plans for healthy planning are needed.

As there are deficiencies in the number of qualified personnel to support fast and accelerated growing of the logistics sector, the opening of new departments at universities aims to address this gap.

Drivers of Innovation

As the combination of science, economics and politics in Istanbul is considered, they cannot be separated from each other and these factors have impact on both the foundation structure of the city and its current status. In the combination of these structural factors integrated and nested with each other, the most crucial actors are politicians and investors and in some aspects investors come
to the forefront. Therefore, investor-local administration and investor-politician relationships also become important. By increase in use of mass communication tools (internet, etc.), politics, economics and science have become more coordinated compared to the previous years. As decisions are made in Istanbul in terms of urbanization, science and economics are complemented by efficient politics. Because Istanbul is a continuously developing city, a great potential for development is common. The sectors with a high potential for growth are finance, construction, food, retail market, health and tourism. It is estimated that the city with its historical and cultural wealth will develop in terms of tourism and it has everlasting values that will be discovered.

There are areas within the scope of “World Cultural Heritage” by UNESCO, and in addition the Bosphorus connecting both continents has a separate importance for the history of humanity. The metropolis is foreseen to become one of the most important finance centers for banking and insurance sectors. Cluster building and development has positive aspects for all of the sectors and is desirable; thus healthy, reconciliatory and collaborative decisions can be made. Cluster building formed by the sectors will foster development in each business and because it will provide integration, it will have a positive impact on the development of the city logistics due to the fact that it refers to policy. Politics play a key role in local logistics decisions. Innovation and visionary politicians make difference.

Logistics has a political importance not only in regional dimensions, but also in both national and international areas and it is fed and grows by this aspect. Logistics is a tool for development and has an effective place within science and economics. There are many scientific institutions in Istanbul compared to other parts of the country and these institutions that are in accordance with the world standards and grab a slice in history. Among more than 20 universities located in Istanbul, academic institutions work with other organizations and municipalities. They work on different projects with regional and European partners. In the issue of social acceptance of the logistics procedures, site selection is required to be performed as rail systems and highway connections have to be developed considering natural thresholds.

Logistics companies can only benefit from limited incentives granted by the Ministry of Technology, Industry and Science for the establishment of research –development centers by private sector companies on condition of employing at least 50 researchers and this incentive allows for the following advantages:

- payment of social security employer tax
- exemption from revenue tax
- exemption from stamp tax
- reduction in corporate tax

Logistic Specific Networking

Turkey, as a country is a member of 4th Pan-European Corridor, 8th Pan-European Corridor, 10th Pan-European corridor, Economic Cooperation Organization (ECO), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP).

The (EU-planned) Pan-European Transport Corridors that Turkey is included are: the 4th Pan-European Corridor connecting the rest of Europe with South-eastern Europe as well as the 8th Pan-European Corridor (covering cities Durres-Tirana, Skopje-Bitola, Sofia - Plovdi-Dimitrovgrad- Burgas-Varna) and the 10th Pan-European Corridor (covering cities, Salzburg ,Villach, Ljubljana, Zagreb, Belgrade, Nis, Skopje and Thessaloniki).

The organization for Economic Co-operation (EIT) was established in 1964 to improve the regional economic cooperation between Turkey, Pakistan and Iran. Today, the Organization for Economic Co-operation became an organization that has 10 members that are over 350 million people, covering an area of 7 million square kilometers.
Turkey also has memberships in regional/national and international networks and organizations in this sector. Some of these networks are IATA, IRU, FIATA, BSEC, BSEC-URTA, TRACECA, Conqueror Freight Network, HTFN Global Logistics Partner, TecDis (The European Technical Distribution Network), ECO, Heavy Group, WCA, UND, UTIKAD, DEIK, TIM and TOBB.

There is no established “regional transport cluster” in Istanbul, yet.

There are logistics-oriented strategies in Istanbul and also a data infrastructure is started to be prepared including inventory work for the master plan. Information and technological infrastructure required for logistics-oriented strategies are constructed both today and in the coming future. As being public institutions, the associations and directorates of the municipality are subject to Municipality Law. With regard to rail transportation, Turkish State Railways is a monopoly and it is the sole decision-making authority in that kind of transportation. Additionally, regarding logistics, they are subject to public politics and rules enforced by international agreements. Being in cooperation with public institutions, the processes of the application of logistics procedures, performing activities in mission areas, preparation of future plans and projects are realized.

There is a consensus among sector stakeholders on the necessity of the preparation of a master plan and the execution of efforts to accelerate country and regional logistics. These plans collect a range of topics such as increasing quality standards of logistics providers, government incentives, the construction of new commercial ports, and logistics processes in connection with urban planning.

UND is an industry partner for a similar EU-funded Regions of Knowledge project that aims to improve “intermodality”, thus environmental performance of transport & logistics”. The InTraRegio project is a coordination action funded under the “Regions of knowledge” programme from the 7th Framework Programme.

The project brings together five clusters from different European regions: Canary Islands (ES), Bremen (DE), Marmara (TR), Calabria (IT) and Ruse (BG) with the aim to enhance intermodality in their regional transport systems, foster the economic developments of the regions and improve clusters’ capacities and performance.

Through mutual learning processes and collaborative relationships among the regional research-driven clusters, represented by 18 partners coming from governmental, research and industrial side, a transnational strategy will be established, directed at developing the take up of innovative measures that spin towards new collaboration among regional players and address as a joint force transport-related issue.

The project will be implemented during a 36 months period in three main consecutive and complementary phases while project management and dissemination will be horizontal activities:

- Establishment of the institutional cluster framework through an in-depth Analysis of the regions’ state of play and a Cross-regional Analysis of regional Research Agendas
- Joint RTD Strategy & Policy Formulation Event and building of a Joint Action Plan with integrated Business Plan;
- Mutual learning and mentoring through personnel exchanges/ trainings and transnational workshops, supporting the goals set in the Joint Action Plan.

**RTDI Policies & Strategies**

The Scientific and Technological Research Council of Turkey (TÜBİTAK) is the leading agency for management, funding and conduct of research in Turkey. It was established in 1963 with a mission to advance science and technology, conduct research and support Turkish researchers. The Council is an autonomous institution and is governed by a Scientific Board whose members are selected from prominent scholars from universities, industry and research institutions. More than 1,500
researchers work in 15 different research institutes of TÜBİTAK where contract research as well as targeted and nation-wide research is conducted.

Public institutions are aware of the activities/projects that are applied in the region and ready to give support when required.

There is no private finance program for logistics companies. However, government subsidies, private financing by the World Bank or IMF, private financing within the companies would be beneficial for development of the sector. The growth and development potential of logistics is due to the increase as a transit region.

On the priority arteries which have high traffic density, such studies are done within the framework of public-private partnership using alternative sources of finance, in order to realize the new state road and highway projects; Istanbul - Izmir (including Bay Area Crossing), Edirne - Izmir (including The Dardanelles Crossing), Ankara - Izmir highways and the 3rd Istanbul Transit, a bridge and its connecting roads, Izmir Tube Crossing / Bridge.

Organized Industrial Zones established and manufacturers, exporters and industry-focused experts should be supported to locate around here by incentives, with the settlement of these regions will be established near the parks, logistics services, logistics bases and supported by grant on a consolidated basis. To speed up the exit process on border crossings capacities should be increased, beside simplification of exports customs procedures will be useful with technological facilities. If they are made, by the very great importance in the geopolitical position of the country, its chance to be a world-class business centre and accordingly logistics base will increase.

**Future Scenarios for Sustainable Logistics**

With globalization, the commerce of a product produced in one country to another country becomes common, and this makes logistics a desirable industry. However, with the help of more efficient use of logistics and its parallel development to technology, international trade is enabled.

“Active” or “pro-active” logistics that will support or enable transformations required by the region against the problems seems possible to occur. Logistics should be performed in a sustainable way without giving harm to the environment.

When logistics become better, it means less cost and better environment. With globalization, logistics become open to investment. If we consider the geographic position of Istanbul, it can be said that it will be developed by investment.

Supply chain strategies are also important in the logistics area. With globalization, supply chain organization may include companies from other countries. Better supply chain management means better logistics. Cost and emissions can increase by deficient supply chain management.

Communication is the driving force of both globalization as well as logistics. A greater share of the market is taken due to communication. The effect of globalization on Istanbul causes more needs of communication and transport. If you get caught unprepared for these needs, you will lag behind the day.

Due to Turkey’s geographical location, it has an important place strategically. Turkey is an east-west trade route bridge between the countries which begin to be authorities in the world trade and change the course of the world trade as Russia, China and India. Thereby this situation makes the logistics sector a critical sector for the economic development of the geography.

Turkey’s position has a great importance for the closeness of the developing markets of Asia and Africa. Also the factors like being in the entrance of the Black Sea, closeness to the ports of the Eastern Mediterranean, being members of 4th Pan-European corridor, 8th Pan-European corridor, 10th Pan-European corridor, Economic Cooperation Organization (ECO), UN/ESCAP (United Nations
Economic and Social Commission for Asia and the Pacific) increases the importance of Turkey’s strategic perspective. This is also an important fact that shows the future potential of logistics sector in Turkey. Logistics is the most important tool for the increasing global competition and the main element of competition policies. So far, significant investments are made and significant improvements are provided about “minimizing environmental damage” for logistics.

The importance of sustainable logistics is that in a city like Istanbul where natural resources are consumed rapidly due to high population density, the functioning of this concept of sustainability gains a special value.

Regarding “Sustainable Development”, “Green Logistics” means minimum emission values; and this requires considering rail system and seaway and minimizing highway transportation. In order to reach this goal of sustainability, a structure rather concentrating on the use of resources in logistics than economic interests is vital. In addition to this, the lacking potential in sustainability is information and awareness. When compared to other industries, there is a potential for the growth of logistics companies. This is foreseen to increase in the coming days in Istanbul, as the planning procedures for logistics, the activities for searching land are performed. So, for sustainable logistics, selling land for cheaper prizes and providing transportation infrastructure will be a good support.

Sustainable logistics is important in many ways. Sustainable transportation systems have positive impact on environmental, social and economic sustainability of the communities and sustainability plays a role in the scientific work. Research focuses on transportation that has low impact on the environment. Green logistics and sustainable development have a common aim. They are both considering the environment. Type of fuels should be changed to become “sustainable”. Tax reduction can be a good support for sustainable logistics because sustainability requires investment.

On the other hand institutional sustainability is a work model which assesses the risk of development of economics, environmental and social rightly besides creating long period benefit for institutes and investor by evaluating the opportunities of these risks. Sustainable logistic can be described as a logistics and supply chain management providing the continuity of education, systems and tools on the investment which are important for proactive work. Logistics and supply chain managements appear to play a critical role in sustainable strategic management activities.

The green-environmental approach and the importance of sustainable development have become an important factor for the success of the supply chain over the years. Companies are responsible for recycling their products according to the concept of e-waste (which contains unused or scrap electric / electronic materials or utilities) and the acquis related to the subject. E-waste implementation will be use in near future in Turkey.
3.6 Normandy (France)

Regional & economic background

Figure 3.6.1: The Atlantic Arc (Source: prof.hg.free.fr)

Normandy faces many challenges. Firstly, Paris is near. Secondly, its industry has been based on cars – Lower Normandy has been the forth employer with OEM and sub-contracting, Sandouville a plant assembly in Higher Normandy counted 14 000 employees when created in 1964 (to day 2000 people inside the plant). Thirdly, Normandy remains a rural region. And there are many other challenges.

Open to a large sea front of more than 600 km which stretches along the Channel Lane, one of the busiest maritime roads in the world, Normandy has to restore its harbours competitiveness against the big northern ports. Le Havre port represents one of the main opportunities for growth in Normandy. Its infrastructure modernization will allow an offer of 12 berths on 4 km to make the Seine estuary one of Europe's leading containerized traffic hubs competing with northern ports. This investment would have to match with road, rail and water infrastructures modernization. The Seine Axis has become a regional and national priority. Upstream is Paris with its huge RTDI infrastructures
and Rouen, the region largest municipality communities, on the other side of La Seine, Caen and the gateway to Western regions of France. The Seine Axis project has national and international ambitions. It is the main link between the Atlantic Arc (see map on the left) and North Eastern Europe.

Normandy is supporting sustainable development. The Region encourages energy saving and alternative regional energy sources as well as green process. When comparing onshore wind energy with offshore, the advantages of the second make it easy to understand that Normandy supports wind farms development due to its large front line. The number of farms would increase from 13 (170 MW) to 30 (1250 MW) i.e. 20 % of French production. The national challenge is to be met by wind farms providing up to 20% of the national need.

![Figure 3.6.2: The offshore wind farms in Normandy (Source: Vigie Business)](image)

![Figure 3.6.3: Normandy (Source: frenchwayoflife.net)](image)
One of the main interests of LOG4GREEN is to address these cultural disparities which initiate administrative divisions that have written the territories history. These boundaries have a real impact on our capability to compare our regions from the point of view of statistical data. There is an obvious lack of standardization, even when the provider is the same. Normandy is an historical entity which has been split into two political regions by the central government in 1956, both including 5 departments (another historical space dimension due to French Revolution).

And then again, they are divided into smaller parts according to different criteria, with their own governance, rules and nature. France counts many local, regional and national assemblies and is a complex administrative system. A national commission is studying the problem. So, we tried to be as much synthetic as possible, being dependent of data pattern. But where aggregation was not significant the two entities – Lower Normandy and Higher Normandy have been kept apart.

Normandy is bordered Along the west-northern coasts by the English Channel. It has been divided in two parts in 1956 by a highly centralized decision. High Normandy was focused on industry and Harbor activities, Low Normandy dedicated to agriculture. The reunification is highly topical to make the new entity visible. It would rank it in 7th place instead of the 13th and 18th place. The overall population was 3.315 700 inhabitants at the beginning of 2010 for 29.906 square km. But, with 21% of the area, Seine Maritime has 38% of the population and the two largest conglomerations: Rouen (486 200) and Le Havre (243 348). The third one is Caen (214 528). Otherwise, none of the cities stand for more than 90 000 inhabitants. But the triangle Caen – Le Havre – Rouen has an area which the 6th of the total Normandy area but concentrates roughly a third of the total population. The region remains a rural area.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Low Normandy</th>
<th>High Normandy</th>
<th>Normandy</th>
<th>France</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Product (GDP) (in bn. Euro) 2011</td>
<td>33,52</td>
<td>44,7</td>
<td>79,60</td>
<td>2190</td>
<td>4,2</td>
</tr>
<tr>
<td>GDP per capita 2011 (PPS) SPA</td>
<td>23,309</td>
<td>23,400</td>
<td>24,577</td>
<td>30,600</td>
<td></td>
</tr>
<tr>
<td>Employment Rate 2009</td>
<td>63,70</td>
<td>62,80%</td>
<td>63,80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Local Units in Logistics</td>
<td>1,600</td>
<td>5,000</td>
<td>6,600</td>
<td>104,927</td>
<td>16.9</td>
</tr>
<tr>
<td>Share of Local Units in Logistics in all Local Units</td>
<td>1.22%</td>
<td>5.32%</td>
<td>2.60%</td>
<td>8.9%</td>
<td></td>
</tr>
<tr>
<td>Number of Persons Employed in Logistics 2009</td>
<td>28000</td>
<td>65,000</td>
<td>93,000</td>
<td>1,516,000</td>
<td>29.7</td>
</tr>
<tr>
<td>Share of Persons Employed in Logistics In all Persons Employed</td>
<td>8.00%</td>
<td>10.4%</td>
<td>5.81%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 6.3.1: Normandy in figures*
Figure 3.6.4: Normandy location in Europe and France (Source: frenchwayoflife.net; la Normandie en chiffres et en cartes CCIR; passion-focus.com; CROSS/MRCC, Direction des affaires Maritimes; europe.eu)
Today’s crisis and strong decrease in car industry must not hide the fact that Normandy is strongly present in the transport equipment manufacturing. Nuclear industry and energy industry are present, too. It has a very strong touristic image (The Mont Saint Michel is visited each year by more than 3 million people and Low Normandy employs 24 000 people in tourism industry). Le Havre and Rouen harbours had a strong effect on logistic development, reinforced by the vicinity to Paris. But no headquarters are located there.

In the last decade, the economy of Normandy has known a general increase. Some notable figures about its economy: 60% of the production of lubricants, 50% of plastics, 30% of cars, 4th region on the foreign exchange market, 1st region for the production of flax, 6th region for the research. But, considering the growth of the other regions on the same period, it should be ranked 16 out of 22 if both regions are consolidated. And it has suffered the effect of the 2008 economic crisis and the economic prospects are not improving. It obviously suffers from the competitiveness of Paris, Brittany and Pays de Loire.
Figure 3.6.6: Distribution of agribusiness plants with over 200 employees.

Figure 3.6.7: Distribution of plants with over 500 employees
Figure 3.6.8: Mains activities along the axe Seine – Paris
The map above is a sum-up of main activities in Normandy. It is supposed to show the impact of the vicinity of Paris on the scope of activity in Normandy. The regions’ focus on transport and logistics shows the real importance of Normandy without the Paris region. Higher Normandy has good ranks in terms of employment and economic activity.

Figure 3.6.9: Distribution of location of the 200 main enterprises (Source: Usine Nouvelle)

In addition the map above shows where are located our main industries in France. We can view the importance of the Seine axis for Normandy. If this proximity may set problems, the general location has advantages. Normandy is at the gates of the English Channel, one of the world’s busiest shipping lanes, linked to North-Western Europe, within easy reach of major business centers including Paris, London and Brussels.

Academic research

As the main fields are medicine and nuclear research by far, sustainable development and energy as well as ICT are real centres of interest for research and are well funded.

Normandy holds three universities. The oldest, Caen University, has been established in 1432, nearly 200 years before the first college (medicine) of Rouen University 1607. But Rouen University really started at the twentieth century after splitting with Caen University. So it has roughly the same age as Le Havre whose first department was created in 1967. Within the three universities, half of the research potential is dedicated to science (including medicine). At the end of 2011, the three universities created a PRES (Centre for Higher Education and Research) counting 70,000 students, 4,000 teachers-searchers
Institutes, departments and schools are disseminated all over Normandy, Caen, Rouen and Le Havre being the biggest campus. As the figures below show, Normandy is not really endowed regarding to national figures. The national ratios of number of RTD employees par 1000 inhabitants and expenses as well are three times and two more than for Normandy.

**ISEL** (Institut Supérieur Etudes Logistiques) created in 1994 is the only Engineering school in logistics in France. It is located in Le Havre and is integrated to the Normandy PRES.

Due to a misunderstanding, logistics are considered as a technical area. This is why its development is only now taking off. Many research efforts concern the technical and the modelling aspect, others information systems. Moreover, industrial logistics and quality found more favour among universities, schools and therefore, students without developing real research topics. At last, in France there is a focus on technology and innovation. It took long before the field of innovation started to include organization. Today, new programs based on the concept of global logistic are developed and collaborative research projects encouraged by central and regional institutions. The Ministry for Transport is very involved in this step. The result is a trend towards multi regional programs. Nov@log and the Normandy PRES are participating in some projects.

**Figure 3.6.10: Dissemination of training and research in Normandy (Source : Strater_BH-Normandie)**

Due to a misunderstanding, logistics are considered as a technical area. This is why its development is only now taking off. Many research efforts concern the technical and the modelling aspect, others information systems. Moreover, industrial logistics and quality found more favour among universities, schools and therefore, students without developing real research topics. At last, in France there is a focus on technology and innovation. It took long before the field of innovation started to include organization. Today, new programs based on the concept of global logistic are developed and collaborative research projects encouraged by central and regional institutions. The Ministry for Transport is very involved in this step. The result is a trend towards multi regional programs. Nov@log and the Normandy PRES are participating in some projects.
Table 6.3.2: Research and education in Normandy

Research innovation centres beyond academia

Beyond academia are the two other blades of the triple helix – enterprises and institutions and the interactions between the three blades. The typical case of interaction between the three is “Carnot Institutes” which promotes upstream (fundamental) and back stream researches (partnership with technical-economic system) control and funded by the ANR (National Agency for Research). There are two Carnot Institutes in Normandy. CALYM is dedicated to medical research on lymphoma cancer; ESP works upstream logistics (Energy systems and propelling systems). ESP combines recognized high level skills and knows how and important experimental means in a set of fields such as energy, study of emissions and impacts on environment, fluid mechanics, vibration acoustics and embedded electronic systems. Its main objective is to contribute to the implementation to new transformations process, energy saving and environmental kind
As one can notice, Normandy is high specialized in medical research and nuclear research with two other big research infrastructures: Ganil (National Large Heavy-Ion Accelerator) and Cyceron (Neuron Sciences Imaging). Normandy holds four clusters PharmaValley, GlassValley; Dieppe mécaénergie and eGov. Although logistics is not directly present, it is naturally linked to all human activities.

Regional Innovation Environment

The innovation environment is discussed through the triple helix concept because of the economic fabric of this region.

- **First blade : enterprises**
Normandy is characterized by a weak entrepreneurship dynamics. It is due to the economic structure of Normandy. It counts mainly SMEs which are not innovation orientated. Big companies can be found, especially in Higher Normandy but their headquarters are outside Normandy.

- **Second blade : institutions**
Due to the economic fabric, institutions have a major importance in the innovation field. First of all, Normandy counts seven competitiveness hubs which are shortly described in the following table. Two Carnot institutes specialized in cancer research for one and in energy and propulsion system for the other have already been mentioned.

To help the implementation and take off, two enterprises incubators in each part of Normandy have helped the creation of 55 enterprises. This help is completed by 8 technologies consultancy centres for SME, 3 regional technology dissemination agencies and, at last 2 innovation agencies Miriade and Seinari.
<table>
<thead>
<tr>
<th>Hubs</th>
<th>Moveo</th>
<th>Cosmetic valley</th>
<th>TES</th>
<th>Filière équine</th>
<th>No@log</th>
<th>Valorial</th>
<th>Mer et Bretagne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Normandy Ile de France</td>
<td>Centre, Ile de France, Higher Normandy</td>
<td>Lower Normandy</td>
<td>Lower Normandy</td>
<td>Higher Normandy</td>
<td>Brittany, Lower Normandy Pays de Loire</td>
<td>Brittany Lower Normandy Pays de Loire</td>
</tr>
<tr>
<td>Area</td>
<td>Worldwide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Worldwide</td>
</tr>
<tr>
<td>Number of enterprises</td>
<td>176</td>
<td>162</td>
<td>88</td>
<td>50</td>
<td>63</td>
<td>173</td>
<td>219</td>
</tr>
<tr>
<td>Employees</td>
<td>26 361</td>
<td>12 938</td>
<td>35 888</td>
<td>4 119</td>
<td>7 319</td>
<td>18 451</td>
<td>15 469</td>
</tr>
<tr>
<td>RTD projects validated</td>
<td>67</td>
<td>8</td>
<td>25</td>
<td>10</td>
<td>17</td>
<td>31</td>
<td>24</td>
</tr>
<tr>
<td>Public researchers attached to labeled projects</td>
<td>461</td>
<td>11</td>
<td>40</td>
<td>52</td>
<td>78</td>
<td>67</td>
<td>206</td>
</tr>
<tr>
<td>Private researchers attached to labeled projects</td>
<td>861</td>
<td>8</td>
<td>157</td>
<td>24</td>
<td>134</td>
<td>45</td>
<td>130</td>
</tr>
<tr>
<td>Patents linked to labeled projects (2009)</td>
<td>28</td>
<td>n/a</td>
<td>n/a</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>n/a</td>
</tr>
</tbody>
</table>

*Table 3.6.3: Normandy competitiveness hubs 2009 (Source: DGCIS – Recensement auprès des Pôles – INSEE)*

Moveo: cars industry, road engineering, public transportation – should integrates electric car engineering
Cosmetic Valley: cosmetic and perfume RTD
Transactions Electroniques Sécurisées (TES): electronic data safe interchange, numeric identity and financial transactions
Filière équine: production of high standard horses
Nov@log: international logistics and pegging
Valorial: agribusiness
Mer Bretagne: sea products industry
Drivers of innovation

As Europe is living a transition period, building its own identity, discovering and coping with new consumption and production models, innovation is driven as more by new concerns than by more traditional activities.

- **Medium term drivers**

  The transport sector is one driver concerning energy saving in aeronautics and car industry and searching for tomorrow vehicle. If aeronautics is doing quite well, on the other hand, it is essential to French car manufacturers to quickly innovate through energy saving, new materials, new combustible substances, and embedded systems. A first technology cluster has been created around Moveo.

  A second cluster driven by Cosmetic Valley is concerned by health and welfare going from pharmaceutical industry to food care and public health. Agroindustry is involved and is influenced by two sources of pressures – sufficiency for tomorrow and quality for today (organic demand increasing).

  A third cluster is dedicated to traceability and authentication. It is under Nov@log control to help all kind of industries for flow control, consumer safety. Innovation would come from ICT and IS.

- **Long term drivers**

  Normandy is very involved in local and renewable energy sources. Although eco-design is not a new concept since the principle has the same base as design to cost developed by Japanese controllers at the end of the sixties, it appears like an awareness of our consumption modes. It concerns logistics deeply through supply chain management. Firstly, supply chain management rests on three systems. The physical and the information ones are known through Toyota Production System and MRP IS. But the social one is as important and much more difficult to control. Secondly, successful supply chain management necessarily includes reverse logistic and more.

  Real supply chain management and sustainable development are tightly linked through location (closeness of upstream and back stream markets), waste definition and management, energy saving and complete costs assessments.

**Logistic specific networking**

  Normandy is an economic centre of exchanges between Europe and the rest of the world. It benefits from the international logistic radiance of its ports, relying on an efficient multimodal network. Normandy owns the first French port complex with Rouen, the 1st cereal harbor and the port of Le Havre for foreign trade and containerized lining shipping. As said earlier, Le Havre port is one of the main opportunities for growth in Normandy.

  The Seine Axis is a major project planning spanning three regions: Upper Normandy, Lower Normandy and the Ile-de-France. This project was born in 2007 following the architectural competition "Grand Paris", initiated by the president of the Republic, which aimed to imagine Paris in the future.

  As the domination of Paris (Ile de France) can be seen on the map below, it hides the Atlantic Arc going from UK and North West of Europe to South of Spain as well as the network linking Paris to North Eastern Europe. The presentation of Normandy main activity is reinforced by Paris nearness. Two projects to reinforce the Seine Axis must be mentioned:
- HAROPA ("HAvre-ROuen-PARis" or the international "HARbour of PARis"): Economic Interest Grouping (EIG) between the ports of Le Havre, Rouen and Paris has been created 19 January 2012 in order to position the Seine as a gateway to Northern Europe.
- Port Seine-metropolis: project development of port infrastructure multimodal (river, rail, road) around the port of Achères in the Yvelines who will become the gateway to the Greater Paris for river transport and the link between Seine Axis (the Seine Axis) and northern Europe via the future Canal Seine-Nord.

*Figure 6.3.12: Seine Gateway (Source: AURH)*

Especially after drastic cuts on logistic infrastructure projects by French government due to the economic crisis, these projects are important. For instance, the new line Paris-Normandy (LNPN): Line rapid rail project substantially is supposed to reduce journey times between Paris and major cities in Normandy while unblocking the classic lines for the benefit of freight has been postponed.

Nevertheless the logistic industry is represented by two networks. Historically “Logistic Seine Normandie” was the first one preparing Nov@log creation. In Lower Normandy, the logistic industry was asked by the regional government to federate itself to be able to discuss as a whole entity : “la Fédération des Clubs Logistiques de Basse Normandie”. A web site was created with a services offer to link together all industrials concerned with logistics. One can hope that these two institutions will manage an integration to expand the network toward Paris and Pays de la Loire.
RTDI Policies & Strategies

One can find the innovation drivers as a result of RTDI policies and strategies, even if today economic crisis has changed time scale and priorities. Innovation remains a priority and sustainable development has become one, too.

Thanks to Nov@log, the triple helix is a stronger reality. Two projects can help to understand. OSCIA (Optimization of the Supply Chain by Articulated Intelligences) is a logistic project driven par Robert Bosch SA Plant in Mondeville. The project was funded by the Transportation and Sustainable Development Ministry and by the General Council of Lower Normandy. The project integrated Caen University. The plant near Caen was threatened by a delocalization in low costs countries. Its activity is to produce automotive electronics.

By showing the excellence of its logistics, through the implementation of a smart milkrun, the plant turned to be a plant pilot in logistics for the electronic world division of Robert Bosch and started to specialize in upstream jobs like industrialization of the electric engine for e-bikes manufactured in Romania.

This project has been followed by a second one named “Camion Gaz” using the cleaner technology of dual fuel for delivering and purchasing goods between France and Germany. The second project is a second milestone on a greener path to road transportation. After this, investigating naturally renewable and smart energy sources and processes will be the next issue.

So, Caen City promotes Social Solidarity Economy as an alternative model to the market economy. Food waste collection of restaurant and catering services (especially from schools) will not only allow energy production (bio methane) but equally provide local jobs to help social reintegration.

Future scenarios for sustainable logistics

In 2007, the Seine Axis project was launched on the hypothesis that at a higher level, aggregation of Ile de France (Paris), Higher Normandy and Lower Normandy was significant as a competitive region. It is based upon a large coast line of over 600 km, a triangle Caen – Rouen – Le Havre and the line Paris – Rouen – Le Havre.

Five major axis for economic development were

- Port activity in the Great Sea Ports and harbours secondary: Intensifying and coordinating the activity of the ports of Paris, Rouen and Le Havre based on a dense network of port cities averages (Caen, Cherbourg, Dieppe ... ) for the development of a wider hinterland;
- Industry: Revitalization and expansion of existing tissue by moving towards a green growth, thanks to renewable energy;
- Logistics: Structuring and creation of interactions between chains port, rail and industry in order to make support for the organization of economic space of the Axis Seine Axis;
- Logistics: Creating a structured network between port, rail road and industries;
- Education and higher education: Exploiting synergies between the systems;
- Tourism and culture: Giving them a strong identity.

In 2012, part of many projects have been postponed due to economic crisis and political agenda which do not match always sustainable development.

But, on the other hand green energy and transport challenge seem to be more understood by citizens.
4. **RTDI from A to Z**

### 4.1 Carinthia

<table>
<thead>
<tr>
<th>Name of Institution, Location</th>
<th>Type of Organisation</th>
<th>Name of Entity (faculty, department, chair)</th>
<th>Professional Classification e.g. economics, mechanical / industrial engineering or logistics itself</th>
<th>Exploratory Focus / Main Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpen-Adria-Universität Klagenfurt</td>
<td>University</td>
<td>Department production management &amp; business logistics</td>
<td>Business Administration</td>
<td>Production Management, Mass Customisation, Industrial Flexibility, Business Logistics, City Logistics, Freight Villages, Supply Chain Management, Supply Chain Improvement, Sustainability</td>
</tr>
</tbody>
</table>
## 4.2 North Rhine-Westphalia

<table>
<thead>
<tr>
<th>Name of Institution, Location</th>
<th>Type of Organisation</th>
<th>Name of Entity (faculty, department, chair)</th>
<th>Professional Classification e.g. economics, mechanical / industrial engineering or logistics itself</th>
<th>Exploratory Focus / Main Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWTH Aachen University</td>
<td>University / Academia</td>
<td>Chair of Operations Research and Supply Chain Management Chair of Corporate Theories Chair of Optimization of Distribution Networks Institute for Rail Vehicles and Materials Handling Laboratory for Machine Tools and Production Engineering (WZL) Campus-Cluster Logistic Institute for Industrial Management (FIR)</td>
<td>Engineering</td>
<td>Logistic Management, Operations Research, Supply Chain Management, Mathematical Modeling of Complex Optimization Problems, Controlling in Industrial Management with Focus on Production and Logistics, Distribution Logistics, Optimization of Distribution Networks, Transshipment Technologies, Simulation in Production, Configuration and Optimization of Production Planning and Control, Value-Oriented Production Control Campus Cluster Logistic with three Innovation Labs with key research focus on: - Enterprise Resource Planning (interoperability, standardization, system integration), - Smart Objects (technology scouting and testing, information logistics, standardization of intelligent objects), and - Services (modularization of customer-oriented service programs, cooperation effects in the provision of services).</td>
</tr>
<tr>
<td>Ruhr University Bochum</td>
<td>University / Academia</td>
<td>Faculty of Mechanical Engineering Faculty of Economics RISP</td>
<td>Mechanical Engineering, Economics</td>
<td>Energy-Efficient Production and Logistics, Product &amp; Service Engineering, Production Management, Production Logistics</td>
</tr>
<tr>
<td>University of Cologne</td>
<td>University / Academia</td>
<td>Faculty of Management, Economics and Social Sciences: Department of Business Policy and Logistics Department for Supply Chain Management and Production</td>
<td>Economics</td>
<td>Value adding networks, inter-organizational business relationships (e.g. strategic alliances), Intra-organizational strategy development process, Optimization of logistics systems, Application of theoretical concepts and methods to different industry contexts (e.g. aviation, logistics service providers), Flexible production systems, Production planning and control, Inventory management, Warehouse location</td>
</tr>
</tbody>
</table>
Technical University Dortmund

Univestity / Academia

Profile Area Production and Logistics

Faculty of Mechanical Engineering:
Chair of Haulage and Storage
Chair of Industrial Robotics and Production Automation
Chair of Production Systems and Industrial Engineering
Chair of Factory Organization
Department IT in Production and Logistics
Institute of Transport Logistics

Faculty of Business, Economics and Social Sciences:
Chair for Production Management and Logistics

Mechanical Engineering Economics

Within the Profile Area "Production and Logistics" future topics of integrated research and teaching are oriented towards the whole life cycle of products and production plants: ranging from product development to production technology through to production plants. In all these phases efficient production, logistics and business processes are necessary. And their further development and exploration follows three overall concepts:
- digital, flexible companies
- sustainability of products and processes as well as
- application of integrated methods.
The high degree of interdisciplinarity is achieved by closely linking work groups of mechanical engineering, mathematics, statistics and computer science, biochemical and chemical engineering, electrical engineering and information technology as well as economics and social sciences.

The single Chairs within the Faculty of Mechanical Engineering focus especially on:
- Intralogistics: planning, engineering and controlling of material flow systems in logistics (Haulage and Storage)
- Industrial robot systems, Simulation of robot handling and surface processing tasks, Development of user-friendly robot programming and workcell simulation systems, Handling and assembly systems and micro-production (especially micro-assembly) and multimedia assistance systems (Industrial Robotics and Production Automation)
- Planning and organization of enterprise processes in production, logistics and service: Time Management (Production Systems and Industrial Engineering)
- Production Management, Planning of Logistic Systems, Production-related services, Qualification (Factory Organization)

The Department IT in Production and Logistics (itpl) focuses on the deployment of future-oriented concepts of information technologies for logistics and production technologies (networked enterprises, self-controlled systems and concepts of the "Internet of Things and Services"). Institute of Transport Logistics is dealing with traffic logistics and logistic system (e.g. intermodal transport-terminal, distribution center or forwarding system) with its strategic, tactic and operative issues.
<table>
<thead>
<tr>
<th>University of Duisburg-Essen</th>
<th>Universitäts - / Akademie</th>
<th>Centre for Logistics &amp; Traffic (ZLV) and all its members (institutes):</th>
<th>Humanities Social Sciences Economic Sciences Engineering Natural Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Communication Technology; Construction Operation and Construction Management; Discrete Mathematics and Optimisation; Economic Education and Vocational Studies; Economic Geography esp. Transport and Logistics; Energy Economics; Energy Technology; Environmental Economics and Controlling; Environmental Management; Information Logistics; Information Systems and Operations Research; International Automotive Management; Microeconomics and International Trade; Mobility and Traffic Education; Physics of Transport and Traffic; Power Transmission and Storage; Procurement, Logistics and Information Management; Production and Industrial Information Management; Production and Operations Management; Production Technology and Product Development; Road construction and traffic engineering; Service Management and Retailing; Ship Technology and Transport Systems; Social Research and Political Consulting; Transport Systems and Logistics; Transportation Research and Consulting; City Planning and Urban Design; Discrete Mathematics and Algebra; Logistics and Operations Research; Production and Supply Chain Management; Production Technology</td>
<td></td>
</tr>
</tbody>
</table>

As a centre of excellence, the Centre for Logistics & Traffic (ZLV) defines itself as platform for knowledge transfer and dialogue, in its associated areas of expertise, between the University and both business and society. It dedicates itself to the interdisciplinary conception, management and transfer of scientific work from across the University in the areas of logistics, mobility and traffic.

Main research areas of ZLV members (xxx institutes of the UDE) are:
- Technical environments, effects on humans, e.g. radio systems; Applications in supply chain management; Mobility behaviour, analysis and its control; Flow of goods and persons; Waste management systems and disposal logistics; Profitability analysis of products and services; Recycling and resource sparing products/ production; Complexity reducing product planning (mass customization); Software solutions, e.g. in inland waterway transportation or rail freight traffic; Optimization of energy transmission networks, e.g. with regenerative energies; Management, technical optimization and simulation of passenger and goods transportation; Urban structure and sustainable traffic; Informational networks, new information structures

Beyond the research activities of its associated chairs and institutes, the ZLV supports these special focal points:
- Humans in technical environment; Future-oriented logistics and traffic concepts; Resource and product circulation; Sustainable energy concepts.
<table>
<thead>
<tr>
<th>University Name</th>
<th>University Name</th>
<th>Faculty of Business Administration and Economics - Business Information Systems: Chair of Computer Science - Computer Integrated Manufacturing Chair of Computer Science - Decision Support &amp; Operations Research</th>
<th>Economics</th>
<th>Production Planning and Control, Supply Chain Management, Knowledge-Based Control Systems of Logistics, Material Flow Simulation, Transport and Traffic, SCM and Production, Public Supply Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Paderborn</td>
<td>University of Wuppertal</td>
<td>Faculty of Mechanical Engineering &amp; Mechatronics</td>
<td>Engineering</td>
<td>Integrated city and traffic planning, Road safety, Network planning and design, Traffic model calculation, Traffic system / Mobility management, Traffic engineering and traffic control, Environmental protection and planning, Noise protection, mobility research, Planning and operation of transport systems, Analysis and calculation of transport demand, Planning of infrastructure networks, Commercial traffic in cities, Environmental effects and the integration of commercial transport in the national transportation planning,</td>
</tr>
<tr>
<td>University of Applied Science Aachen</td>
<td>University of Applied Science Bielefeld</td>
<td>Department of Architecture / Construction Engineering</td>
<td>Architecture / Construction Engineering</td>
<td>Project Management (Infrastructure/Logistics) in all transport modes: road, rail and waterway as well as in both perspectives: technical and economic-wise</td>
</tr>
<tr>
<td>University of Applied Science Internationale Hochschule Bad Honnef · Bonn</td>
<td>University of Applied Science Cologne</td>
<td>Faculty of Business Administration and Economics</td>
<td>Business Administration</td>
<td>Globalization of the Transport Industry, Infrastructure Management, Sustainability and Environmental Aspects, Transport Policy, Strategic Transport &amp; Logistics Marketing</td>
</tr>
<tr>
<td>University of Applied Science Cologne</td>
<td>University of Applied Science Hochschule Fresenius Cologne</td>
<td>Faculty of Business Administration</td>
<td>Economics</td>
<td>Logistics, Production Engineering and Automotive Industry</td>
</tr>
<tr>
<td>University of Applied Science Dortmund</td>
<td>University of Applied Sciences FOM Hochschule für</td>
<td>Faculty Business Administration</td>
<td>Economics</td>
<td>Supply Chain Management; Procurement Logistics; Marketing Logistics; Production Logistics; Distribution Logistics; Logistics Costs</td>
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<tr>
<td>Oekonomie &amp; Management</td>
<td>University of Applied Science Gelsenkirchen</td>
<td>Universitäts- / Academica</td>
<td>Department of Electrical Engineering / Department of Informatics</td>
<td>Engineering / Informatics</td>
</tr>
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<td>------------------------</td>
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<td>---------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>University of Applied Science Hamm</td>
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<td>School of Logistics and Economics</td>
<td>Logistics</td>
<td>Supply Chain Management, Logistical Communication and Information Systems, Terminal Handling, Controlling, Warehouse Management</td>
</tr>
<tr>
<td>University of Applied Science Münster</td>
<td>Universitäts- / Academica</td>
<td>Faculty Business Administration</td>
<td>Economics</td>
<td>Process management, Operations research, Supply Chain Management; Procurement Logistics; Production Logistics; Distribution Logistics; Logistics law; technical logistics</td>
</tr>
<tr>
<td>University of Applied Science for Internationa l Business, Neuss</td>
<td>Universitäts- / Academica</td>
<td>Logistics School</td>
<td>Economics</td>
<td>Logistics and Supply Chain Management; International Industry and Trade Management; Contract Logistics and Forwarding; International Transport, Traffic and Mobility; Supply Chain Management; Intralogistics</td>
</tr>
<tr>
<td>University of Applied Science Niederrhein</td>
<td>Universitäts- / Academica</td>
<td>Faculty of Industrial Engineering</td>
<td>Engineering</td>
<td>Management processes (such as process management, personnel management, etc.), logistics management, production management, planning methods, Business IT systems, production machinery, logistics</td>
</tr>
<tr>
<td>University of Applied Science Ostwestfalen-Lippe</td>
<td>Universitäts- / Academica</td>
<td>Department of Production and Economics</td>
<td>Production and Economics</td>
<td>Procurement; Production; Distribution</td>
</tr>
<tr>
<td>University of Applied Science Ruhr-West</td>
<td>Universitäts- / Academica</td>
<td>Faculty Business Administration</td>
<td>Business Administration</td>
<td>International Trade, Logistics Management, E-commerce, Digital Media, Social Networks, RFID Technologies, IT-Logistics and Intercultural Management</td>
</tr>
<tr>
<td>University of Applied Science Südwestfalen</td>
<td>Universitäts- / Academica</td>
<td>Faculty of Engineering and Economics</td>
<td>Economics</td>
<td>Supply-Chain-Management; Materials Management and Logistics; Special areas of logistics; handling</td>
</tr>
<tr>
<td>University of Applied Science Unna</td>
<td>Universitäts- / Academica</td>
<td>Faculty of Management and Law</td>
<td>Business Administration</td>
<td>Transport Logistics, Supply Chain Management, Procurement Logistics, Distribution Logistics, Risk Management in the Logistics Value Chain</td>
</tr>
<tr>
<td>University of Applied Science Westfälisch e Hochschule</td>
<td>Universitäts- / Academica</td>
<td>Department of Industrial Engineering</td>
<td>Industrial Engineering</td>
<td>Supply Chain Management, Transport, information &amp; material flow systems, Design and implementation of logistics concepts, Intralogistics, Transport logistics, Market liberalisation</td>
</tr>
<tr>
<td>Development Centre for Ship Technology and Transport</td>
<td>Research Institute</td>
<td></td>
<td></td>
<td>Transport Systems (Transport economics / Transport technology), Shallow water hydrodynamics (both experimental and computational), Ship development and shipping operations technology</td>
</tr>
<tr>
<td>Systems, Duisburg</td>
<td>Research Institute</td>
<td>Research Group Future Energy and Mobility Structures, Research Group Energy, Transport and Climate Policy, Research Group Material Flows and Resource Management, Research Group Sustainable Production and Consumption</td>
<td>The Wuppertal Institute undertakes research and develops models, strategies and instruments for transitions to a sustainable development at local, national and international level. Sustainability research at the Wuppertal Institute focuses on the resources, climate and energy related challenges and their relation to economy and society. Special emphasis is put on analysing and stimulating innovations that decouple economic growth and wealth from natural resource use. The Research Group &quot;Energy, transport and Climate&quot; focuses on sustainable policy strategies and instruments for effective and increasingly integrated energy, transport and climate policies at the local, regional, national and international level. The aim is to make greater use of the synergy effects of policy strategies that support the sustainable development of energy and transport systems as well as climate protection in general. Policy instruments in the field of energy end-use efficiency are a particular focus area. Research Group &quot;Sustainable Production and Consumption&quot; analyses material flows in value chains of industrialised societies and their interdependencies with the environment, economy and society. The focus is set on approaches decoupling the flourishing of human well-being from natural resource use through innovations in value chains in the production and consumption system. Therefore the Research Group develops strategies, concepts and instruments for initiating innovation and transition processes in value chains towards lifecycle-wide resource efficiency and sustainability.</td>
<td></td>
</tr>
</tbody>
</table>
| Fraunhofer Institute for Microelectronic Circuits and Systems IMS, Sankt Augustin | Research Institute | Wireless & Transponder Systems | Industrial production and processing processes can only supply high quality products and work cost-effectively if the machines are optimally adjusted, if the haven't got much wear and possess a long durability. For the performance of these requirements it is indispensable to have measurement data which help to optimize the machine settings, to determine the maintenance requirements, to control the manufacturing steps and to make quality recordings. Transponder systems – especially sensor transponder systems – and sensor networks feature an excellent technological basis for the registration of identification and sensor data. The wireless communication and power supply open up new application areas.
<table>
<thead>
<tr>
<th>Research Institute for Telecommunications and cooperation, FTK, Dortmund</th>
<th>Research Institute</th>
<th>Digital Preservation, E-Commerce, RFID use in SMEs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fraunhofer Institute for Material Flow and Logistics (IML), Dortmund</strong></td>
<td><strong>Research Institute</strong></td>
<td><strong>Fraunhofer Institute for Material Flow and Logistics</strong> advises companies of all industries and sizes in all questions about material flow and logistics. It is said to be first address for all questions with respect to holistic logistics. The employees work on all fields of internal and external logistics. At the Institute, founded in 1981, there are at the moment 190 employees as well as 250 post-graduates and students with pre-diploma, supported by colleagues in workshops, laboratories and service areas. Made-to-measure arranged teams create cross-industry and customer-specific solutions in the area of materials handling, warehouse management, supply chain management, simulation supported business and system planning and also traffic systems, closed loop economy, resources logistics, building logistics and e-business. Not least, the Fraunhofer IML is acting as general coordinator for the multi-institute central theme »Internet of Things« within the entire Fraunhofer-Gesellschaft. <strong>Topics:</strong> Material Flow Systems: Quality Management and Organization Systems, Intralogistics and IT Planning, Automation and Embedded Systems, Machines and Facilities, Packaging and Trade Logistics, Software Engineering Enterprise Logistics: Enterprise Planning, Supply Chain Engineering, Production Logistics, International Enterprise Development Logistics, Traffic, Environment: Environment and Resource Logistics, Transport Logistics, Aviation Logistics, Health Care Logistics</td>
</tr>
</tbody>
</table>

|   |   |   |

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<table>
<thead>
<tr>
<th>Fraunhofer Institute for Software and Systems Engineering (ISST), Dortmund</th>
<th>Research Institute</th>
<th>Business Unit Logistics-IT</th>
<th>Information Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the business unit »IT in Logistics«, the Fraunhofer ISST supports logistics companies with meeting their requirements in customized and complex services. The ISST models adequate (logistic) business processes and design, migrate and consolidate durable, complex systems. Since 2009 the Fraunhofer IML and the Fraunhofer ISST are doing research in the field of »Cloud Computing for Logistics« within a Fraunhofer Innovation-Cluster together with partners from the industry and science. The objective is to design and organize logistic services supported by IT within a joint design.</td>
<td></td>
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</tr>
</tbody>
</table>
### 4.3 Odessa

<table>
<thead>
<tr>
<th>Name of Institution, Location</th>
<th>Type of organization</th>
<th>Name of Entity (faculty, department, chair)</th>
<th>Professional classification, e.g. economics, mechanical/industrial engineering or logistics itself</th>
<th>Exploratory Focus/Main Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odessa State Ecological University</td>
<td>State University</td>
<td>Ecologic-economical department</td>
<td>Economics of enterprise</td>
<td>Economic assessment of environment protection’s decision making.</td>
</tr>
<tr>
<td>Odessa National Polytechnic University</td>
<td>State University</td>
<td>Institute of industrial technologies, design and marketing</td>
<td>Industrial engineering</td>
<td>Information technologies in machine-building design. Electronic systems and information-computing technologies. Economical systems modeling and optimization with the IT. Management of foreign trade and innovation activity.</td>
</tr>
<tr>
<td>Institution</td>
<td>Role</td>
<td>Field</td>
<td>Description</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ecological Investigations of Academy of Science of Ukraine</td>
<td>Dept. “Economical control of nature use”</td>
<td>Regional ecology</td>
<td>Development of ecological strategies for Odessa region</td>
<td></td>
</tr>
<tr>
<td>International Academy of Ecology, Man and Nature Protection Sciences (Ukrainian Branch)</td>
<td>Public organization</td>
<td>Sections “Engineering ecology”, Environment protection</td>
<td>Control and modeling of environment protection, development of ecological regulation in the marine companies activity</td>
<td></td>
</tr>
<tr>
<td>The regional branch of the National Institute for Strategic Studies in Odessa</td>
<td>State institute</td>
<td></td>
<td>Provides analytical and prognostic support to the President of Ukraine</td>
<td></td>
</tr>
</tbody>
</table>
### 4.4 Wallonia

<table>
<thead>
<tr>
<th>Name of Institution, Location</th>
<th>Type of Organisation</th>
<th>Name of Entity (faculty, department, chair)</th>
<th>Professional Classification e.g. economics, mechanical / industrial engineering or logistics itself</th>
<th>Exploratory Focus / Main Research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rad Research Centre (CRR)</strong></td>
<td>Regional agreed research centre</td>
<td>-</td>
<td>Technical research / engineering</td>
<td>The Belgian Road Research Centre helps private companies and public authorities to find solutions for the design, construction and maintenance of an efficient high-quality road infrastructure under optimum economic conditions, as well as to the problems of safety, mobility and environment raised by modern road transport. The Belgian Road Research Centre helps private companies and public authorities find solutions for the design, construction and maintenance of an efficient high-quality road infrastructure under optimum economic conditions, as well as to the problems of safety, mobility and environment raised by modern road transport.</td>
</tr>
<tr>
<td><strong>Multitel</strong></td>
<td>Regional agreed research centre</td>
<td>-</td>
<td>Telecommunications, Signal and Image Processing</td>
<td>Scientific skills include voice technologies, data fusion, optic fibre applications, image processing, and computer network management. Other services are also provided in optics and telecom, and in company computer networks. More, the Certification department of Multitel is an independent laboratory for the ERTMS certification, specialized in testing solutions, as a support for the certification and validation of industrial solutions and components, in particular for the railway signalling sector (ERTMS). It provides R&amp;D in the design of new tools (hardware and software) as reference for the whole railway sector.</td>
</tr>
<tr>
<td><strong>Cetic</strong></td>
<td>Regional agreed research centre</td>
<td>-</td>
<td>ICT applied research centre dedicated to support industry</td>
<td>CETIC provides expertise in software engineering, innovative service based on service oriented technologies, Cloud and embedded systems. <strong>Software and System Engineering</strong> provides methodological support to help companies develop high-quality IT products and services, ensuring reliability, safety, security, and compliance with international standards.</td>
</tr>
</tbody>
</table>
• **Software and Services Technologies** provides businesses with strong technological expertise to help them implement distributed, service-oriented and dynamic computing architectures. Through the use of semantic technologies and by exploiting the real business opportunities of open source software, this department helps accelerate the transformation of information into knowledge.

• **Embedded and Communication Systems** helps companies prototype innovative embedded systems. This department focuses primarily on embedded software for intelligent wireless systems for a wide range of applications, ranging from road transport to eHealth, consumer electronics, home automation, etc.

<table>
<thead>
<tr>
<th>Cenaero</th>
<th>Regional agreed research centre</th>
<th>-</th>
<th>Computer-aided engineering</th>
<th>Cenaero provides services in manufacturing of aero structure components; structural design analysis and optimization; cost performance tradeoffs; process design, modeling and simulation for composite parts; structural integrity and damage tolerance analysis; materials selection, constitutive &amp; damage modeling and optimization; large scale structural analysis on HPC infrastructure; CFD-based analysis. Cenaero has developed its competences in Aerospace, Turbomachinery, Automotive, Railway, Composites, Energy, Biomedical, Civil engineering, Project Management, High Performance Computing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sirris</td>
<td>Regional agreed research centre</td>
<td>-</td>
<td>Collective centre of the Belgian technological industry</td>
<td>Sirris provides companies with its expertise in materials engineering, production technology, mechatronics, additive manufacturing, software engineering and ICT and technology coaching.</td>
</tr>
</tbody>
</table>

**ADISIF (interface)**

<table>
<thead>
<tr>
<th>High School in Hainaut</th>
<th>High School Department</th>
<th>CREHEH</th>
<th>Intelligent systems, automation, sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Lucia De Brouckère (Brussels)</td>
<td>High School Department</td>
<td>ISIPACK</td>
<td>Ecopackaging</td>
</tr>
<tr>
<td>High School Lucia De Brouckère (Brussels)</td>
<td>High School Department</td>
<td>Meurice Institute</td>
<td>Analysis of Volatile Organic Compounds, Food Allergies and microbiological, sensory analysis</td>
</tr>
<tr>
<td>High School of the Province of Liege</td>
<td>High School Department</td>
<td>CECOTEPE</td>
<td>Ingénierie, DataMining</td>
</tr>
</tbody>
</table>

**University of Liege**
| University of Liège > HEC Management School | University research centre | QuantOM Research Center: Quantitative Methods and Operations Management | Supply Chain Management & Quantitative Methods | Expertise and activities are particularly centered on: Production Planning and Prioritization, Design and Coordination of Supply Chains, Transport Economics and Management, Financial Modeling, Mathematical Optimization and Statistical Modeling. This specialization aims to give them the knowledge and the skills required to manage complex systems of production, distribution and freight transport in global supply chains. It also prepares students for careers in industrial companies and service organizations which have to deal with complex logistical and production processes. The teaching staff at HEC-ULg regularly collaborate on applied research projects for companies including Arcelor-Mittal, CMI, Jost Group, Magotteaux, Corman, Akers Yards (Chantiers de l’Atlantique) and for local governments (shires, regions...). |
| University of Liège | University department | Aerospace and Mechanical Engineering Department | Aerospace and Mechanical Engineering | Research in the areas of Computational and Experimental Mechanics and more particularly in the fields of Solid Mechanics and Materials, Fluid Mechanics, Biomechanics, Energetics and Applied Thermodynamics. |
| University of Liège | University department | Transportation Group | Transport | Gathers all stakeholders of the university in the field of mobility and transport. The group is composed of the following research units: >Applied acoustics (Faculty of Applied Sciences) > SEGEFA - Fundamental & Applied Economic Geography (Faculty of Sciences) > General sociology (Faculty of Law and Human Sciences) > ANAST - Analysis of Transport System (Faculty of Applied Sciences) > General Economy, Public Management and Transport Economy (ULg-HEC Management School) |
| University of Liège | University department | ArGEEnCo Department of Architecture, Géologie, Environnement et Constructions > TLU+C: Transport, Logistics, Urbanisme and Conception | Transport, Logistics, Urbanism & Conception | Gathers 3 research units: > ANAST (Architecture Navale et Analyse des Systèmes de Transport) > LEMA (Local Environment Management & Analysis) > LuciD Group (Lab for User Cognition & Innovative Design) and 1 test laboratory: > Bassin de Carènes |
| University of Liège | University department | Phytopathology unit | | 1. Développement de biological control methods and alternatives to... |
| University of Liège | University department | Microbiology of food | - Control and management of the microbiological quality of food
- Quantitative assessment of microbiological hazards in foods
- Characterization of microbial ecosystems food by molecular methods (real-time PCR, metagenomics) |
| University of Liège | University department | Microsys Electronics and microsystems | - Microsystem (multi-physics simulation and thermomechanical)
- Packaging advanced electronics
- Autonomous system and energy harvesting
- Test and electrical characterization (functional test, reliability test climate leak detection, electrical testing high and low frequency)
- Automatic assembly of small series of electronic circuits and standard point
- Automatic assembly of chips (dicing, placement, wire bonding)
- Simulation Multiphysics
- Test and electrical and thermal characterization
- Prototyping
- Embedded Software Development
- Reverse engineering electronics (decapsulation) |
| University of Liège | University department | Engineering for land vehicles | - Simulation & optimization (simulation of mechatronic systems, flexible mécanismes, Multiphysics problem ...)
- Clean technologies (hybrid vehicles, Fuel cell propulsion system,...) |
| University of Liège | University department | Analysis, quality and risk unit | Chemical analysis of food composition, verification of residues of various contaminants in food and nutritional quality |
| University of Liège | University department | ACE Applied and Computational Electromagnetics | Simulations tests and electromagnetics, electromagnetic compatibility |
| University of Liège | University department | BEMS Building Energy Monitoring | - Rational Use of Energy (Building Energy Management, Audit of the Energy Performance of Buildings, |
| University of Liège | University department | Unit of Food Science and Formulation | Facilities Commissioning HVAC, Methods and regulatory standards, tests in a climatic chamber | - Renewable energy (Management and control of solar buildings, solar refrigeration, solar energy storage) - Preparation and preservation of products, product features and food chain. - Sensory room |
| University of Liège | University department | Systmod Laboratory and modeling systems | Systems and control, machine learning, computer vision, bioinformatics, power systems |
| University of Liège | University department | Energy biology Lab | Biofuels |
| University of Liège | University department | Unit of animal and micobial Biology | Microbiological aspects |
| University of Liège | University department | Multibody & Mechatronic Systems Lab | - Expertise in the field of kinematics, dynamics and control of production machines - Development of tools for modeling and optimization for various applications of machine tools and industrial robots - Analysis and active vibration control - Design of mechanical components |

**University of Louvain**

<p>| University of Louvain &gt; Louvain Management school | University department | POMS: Unit of logistics management and modeling | Production and operations management | 1. Empirical research based on data collection and statistical and econometrical data analysis methods. The objective is to gain some insight on production processes and supply chain management. 2. Conceptual analysis of organizational phenomenons and principles based on economical analysis models of management. The objective is to develop general explanatory models for management practices, especially in the area of operations management. 3. Development of operational methods for solving management problems; based on mathematical modelling and operation research techniques. The objective is to provide enterprises with efficient methods for solving their problems in operations management. This is done jointly with the operation research team of CESCM. |
| University of Louvain &gt; Louvain Management school | University department | CESM Center for Supply Management | Supply Chain Management | The center performs research, development and advanced teaching in all areas of supply chain management, both modeling, optimization, systems and strategy and offers its services in these areas to industrial firms in |</p>
<table>
<thead>
<tr>
<th>University of Louvain &gt; Louvain Polytechnic school</th>
<th>University department</th>
<th>Department of Materials and Process Sciences &gt; Division of Materials and Process engineering</th>
<th>Materials and Process engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(1) Chemical and physical analysis (X-ray, EBSD, SEM, TEM)</td>
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<td>(2) Expertises in the field of microstructure analysis and fracture analysis (damage, cracking, fatigue, creep, decohesion)</td>
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<td>(3) Mechanical or thermo-mechanical testing</td>
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<td>(4) Computational fluid dynamics applied to reactor engineering</td>
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<td>(5) Process development</td>
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<td>(6) Micro and nanomechanical testing on thin films and multilayers</td>
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</tbody>
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<table>
<thead>
<tr>
<th>University of Louvain &gt; Louvain Polytechnic school</th>
<th>University department</th>
<th>Department of Architecture and Civil Engineering &gt; Division of Civil and Environmental Engineering</th>
<th>Civil and Environmental Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Civil Engineering Department has different topics of research following hydraulic, soil and rocks mechanics and structure sectors.</td>
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<tr>
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<td></td>
<td>• Fundamental research in hydraulic concerns the field of planning and natural hazard control and more particularly rising and flood control.</td>
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<td>• Research in soil and rock mechanics is landing the study of thermo-hydro-mechanical behaviour of natural or artificial material under different loads and the survey of damage process by non-destructive techniques. The problem of environmental nuisance (domestic, industrial and radioactive waste) is also studying.</td>
<td></td>
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<td></td>
<td>• Research in the field of structural behaviour concerns especially the prediction for real behaviour of structures.</td>
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<thead>
<tr>
<th>University of Louvain &gt; Louvain Polytechnic school</th>
<th>University department</th>
<th>Department of Mechanics</th>
<th>Mechanical Production and Machinery</th>
<th>The research activities of the PRM division focus on 3 areas : modelling, design and manufacturing methods for mechanical systems. Particular emphasis on :</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>• modelling and development of simulation and optimisation softwares for such systems, based on a symbolic approach:</td>
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<td>• development of assistance tools for product design, taking into account functional, manufacturing and assembly constraints</td>
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<td>• development of micro-systems (micropumps)</td>
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<td></td>
<td>• development of surgery tools</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>• design and manufacture of prototypes of novel mechatronic systems (e.g. mobile robots, overactuated manipulators, ...)</td>
</tr>
<tr>
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<td></td>
<td>• analysis of machinery and structures (kinematics, vibrations, ...)</td>
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<tr>
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<td></td>
<td>• manufacturing techniques and more</td>
</tr>
<tr>
<td>University of Louvain &gt; UCL Mons</td>
<td>University department</td>
<td>Transportation and Mobility Group (GTM)</td>
<td>Transportation Economy: &gt; Analysis of the trans-European multimodal network of freight transport &gt; Optimal location research for container terminals</td>
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</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>ICTEAM Microwave Engineering and Applied Electromagnetism</td>
<td>Tracking of mobile assets Surveillance System radar sensor for cold cold chain break</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>ICTEAM Information Security</td>
<td>Information Security, Access Control, Traceability in the luxury industry, Security analysis of radio frequency identification (RFID)</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>ICTEAM Software Engineering and Programming Systems</td>
<td>Constraints programming, planning - Mobile systems programming</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>ICTEAM Cryptography</td>
<td>Cryptographic tools</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>CEREA Research Centre in Mecatronics</td>
<td>Energy recovery braking trains Control and security of railway lines</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research centre</td>
<td>IMCN Molecules, Solids and Reactivity (MOST)</td>
<td>Control of the cold chain, intelligent markers for traceability, labeling and safety of manufactured goods</td>
<td></td>
</tr>
<tr>
<td>University of Louvain</td>
<td>University research institute</td>
<td>ELI Earth and Life Institute - Microbiologie Appliquée (ELIM)</td>
<td>Food security, food microbiological</td>
<td></td>
</tr>
</tbody>
</table>
| University of Brussels           | University research centre | GOM Graphe et Optimisation Mathématiques | Development of algorithms and tools for optimizing transportation, logistics, telecommunications, in particular:  
  - The strategic location of facilities and service  
  - The routing of transport networks and telecommunications  
  - The design of transport networks and telecommunications  
  - The pricing of products, networks, and bi-level optimization  
  - The production planning  
  - The development box (packing) and cutting |
| University of Brussels | University research centre | **BEAMS**<br>Bio-, Electro- And Mechanical Systems | Energy; embedded systems |  > ENERGY:<br>- The conduct, supervision and protection of electrical networks<br>- Decentralized production of electricity and renewable energy<br>- Modeling, simulation and control of electrical machines and drives<br>- SMPS: modeling and simulation aspects of electric, magnetic and thermal regulations analog and digital supervision<br>  > EMBEDDED ELECTRONICS:<br>- Multiprocessor Systems<br>- Real Time<br>- Programming of Microprocessors |
| University of Brussels | University research centre | BEAMS / Qalinc®<br>**Innovation for Quality, Logistics Transport and Supply chain management** |  |  > The supply chain and its relationship with its environment both internal and external (systemic formulation and process mapping logistics and supply chain);<br>- Articulation and integration of the supply chain with other business functions (sales, production, purchasing, distribution, transport, ...);<br>- Modeling, simulation and optimization of logistic processes, supply chain and process quality through an integrated approach to continual improvement and control of cost, time, quality and service level;<br>- Flow management, design plans supply and distribution, forecasting and process optimization, traceability and the consideration of new technologies (RFID);<br>- Management tools and planning solutions based on information systems and communication (APS, ERP, etc.). Well as tools BRP (Business Process Reengineering);<br>- The parameters, guidelines and quality standards of industrial processes (ISO, environmental standards, etc...), Total quality concept;<br>- Monitoring technology in the field of logistics management;<br>- The establishment and organization of innovative logistics solutions, integrated, efficient and environmentally particularly, implementation and evaluation of intelligent logistics;<br>- The introduction of innovative monitoring and benchmarking of quality, fitness for purpose, cost and performance of a chain / logistics |
| University of Brussels | University research centre | OPERA Wireless communication group | Designing networks without son, sensor networks, location-based, mobile:
- Emerging communication systems - ECS: Develop new technologies to increase by an order of magnitude data rates offered by wireless networks.
- Environment-aware devices - EAD: Developing cognitive terminals nouveaux becoming aware of their environment to maximize their communications.
- Platform-oriented designs - POD: Develop new coding strategies consistent with the constraints of the electronic platform. |
| University of Brussels | University department | MLG Machine Learning Group | • Prediction of the evolution of economic data / financial
• Spatial Datamining
• Networks of sensors without son for environmental monitoring and indoor localization
• Fraud Detection
• Decision support systems (medical, healthcare)
• Medical data analysis (eg microarray data analysis)
• Intelligent Control
• Development of statistical methods Implementation of methods in open-source statistical software solutions |
| University of Brussels | University department | BATir Group | Construction, Architecture and Urbanism Service which gathers research activities around 4 themes: Civil Engineering and Geo-materials, Structural and Material Computational Mechanics, Architecture, Urbanism. |
| University of Brussels | University department | CODE The Computer & Decision Engineering department | Business intelligence, decision support, optimization metaheuristic & multi, object-oriented design, process modeling, database geographical and temporal dynamic routing of IP packets, expert systems. The main topics of research are:
• optimization metaheuristic, collective intelligence
• distributed robotics
• complex interaction networks (including biological networks, neural,...)
• object-oriented design
• databases spatial and temporal
• web technologies
• assistance in multicriteria decision |
| University of Brussels | University department | IGEAT Géographie | • urban transport policy
• liberalization of air transport and |
<table>
<thead>
<tr>
<th>University of Brussels</th>
<th>University department</th>
<th>Centre d’études économique et sociale de l’environnement</th>
<th>Study of the environmental impact of transport policies</th>
<th>Analysis of life cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Brussels</td>
<td>University department</td>
<td>Chimie Physique et Matériaux Catalyse Tribologie</td>
<td>• catalysis; reduction of pollutant emissions</td>
<td>• catalyst for the development of new fuels</td>
</tr>
<tr>
<td>University of Brussels</td>
<td>University department</td>
<td>Embedded Electronics</td>
<td>Conception and implementation of embedded systems: numerical electronic/microelectronic (classis or advances architectures such as microprocessors, FPGAs, DSPs, MPSoCs, NoCs, etc); instrumentation (data collect); real time system control. The research unit disposes of a big experience in control-command of power-equipments (electronic converters of power, electric motors, etc), image processing, measurement or control systems for biomedical applications.</td>
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</thead>
<tbody>
<tr>
<td>University of Mons</td>
<td>University research institute</td>
<td>Infortech Institute</td>
<td>Engineering</td>
<td>Logistics - Internet of Things - Electronics - Operationnal research - Multicriteria analysis - Planification - Security positioning (Indoor-Outdoor) - Support to decision - Energy efficiency</td>
</tr>
<tr>
<td>University of Mons</td>
<td>University research institute</td>
<td>Institute for risks</td>
<td>Planification tool - Predictive maintenance - Equipment life duration estimation - Optimisation of maintenance operations based on fiability - Workshops location - Production flows optimisation - Industrial and transport-related risks - Vibration noises - Accident simulations</td>
<td></td>
</tr>
<tr>
<td>University of Mons</td>
<td>University research institute</td>
<td>Institute for Materials</td>
<td>Chemical sciences</td>
<td>New polymers and nanocomposites - Food packaging - Functionalization of surfaces - Dynamic interfaces (wetting coating …) - Gas sensors and biosensors</td>
</tr>
<tr>
<td>University of Mons</td>
<td>University department</td>
<td>Architecture &amp; Society</td>
<td>Territory</td>
<td>Activities based on grounds - How to organize the territory of a sociology</td>
</tr>
<tr>
<td>University of Mons</td>
<td>University of Mons</td>
<td>UDE Department</td>
<td>Development focus</td>
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</tr>
<tr>
<td>University of Mons</td>
<td>University of Mons</td>
<td>Health Institute</td>
<td>Sociology - Health</td>
<td>Movement Science - Management and development of new scientific methods dedicated to the problem of health financing and organizational management improving - Logistics optimization including hospital care patient or inter-hospital transport.</td>
</tr>
<tr>
<td>University of Namur</td>
<td>University of Namur</td>
<td>Complexys Institute</td>
<td>Analysis systems - Statistics</td>
<td>Modeling and simulation of complex systems - Numerical Analysis Tools - Dynamical Systems - Probability and Statistics - Theory of automata</td>
</tr>
<tr>
<td>University of Namur (FUNDP)</td>
<td>University of Namur (FUNDP)</td>
<td>Management Science Department</td>
<td>Engineering and Management of Advanced Information Systems</td>
<td>Development and dissemination of high quality scientific knowledge in the area of information system engineering and management.</td>
</tr>
<tr>
<td>University of Namur (FUNDP)</td>
<td>University of Namur (FUNDP)</td>
<td>GRT Research Group on Transport</td>
<td></td>
<td>* Modeling: model development of road networks, traffic studies, impact studies,... * Collection and analysis: a national survey on household mobility, transportation surveys in Europe, handling and correction of data, interfaces for data retrieval Internet,... * Software and technologies: software development (simulators, software for managing transport systems’), research on the use of GIS (Geographical Information systems) and GPS (Global Positioning system)</td>
</tr>
</tbody>
</table>
### 4.5 Istanbul

<table>
<thead>
<tr>
<th>Name of Institution, Location</th>
<th>Type of Organisation</th>
<th>Name of Entity (faculty, department, chair)</th>
<th>Professional Classification e.g. economics, mechanical / industrial engineering or logistics itself</th>
<th>Exploratory Focus / Main Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beykent University</td>
<td>University/Academia</td>
<td>College of Administrative Sciences and Economics</td>
<td>Logistics</td>
<td>International Logistics and Transportation</td>
</tr>
<tr>
<td>Istanbul Arel University</td>
<td>University/Academia</td>
<td>Faculty of Economic and Administrative Sciences</td>
<td>Logistics</td>
<td>International Logistics and Transportation</td>
</tr>
<tr>
<td>Istanbul Bilgi University</td>
<td>University/Academia</td>
<td>School Of Applied Sciences</td>
<td>Logistics</td>
<td>International Logistics and Transportation</td>
</tr>
<tr>
<td>Istanbul Gelsim University</td>
<td>University/Academia</td>
<td>Faculty of Economic and Administrative Sciences</td>
<td>Logistics</td>
<td>International Logistics and Transportation</td>
</tr>
<tr>
<td>Istanbul Kemerciburgaz University</td>
<td>University/Academia</td>
<td>Faculty of Economic and Administrative Sciences</td>
<td>Logistics</td>
<td>International Logistics Management</td>
</tr>
<tr>
<td>Istanbul University</td>
<td>University/Academia</td>
<td>College of Transportation and Logistics</td>
<td>Logistics</td>
<td>Transportation and Logistics</td>
</tr>
<tr>
<td>Kadir Has University</td>
<td>University/Academia</td>
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4.6 Normandy

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<th>Name of Entity (faculty, department, chair)</th>
<th>Professional Classification e.g. economics, mechanical / industrial engineering or logistics itself</th>
<th>Exploratory Focus / Main Research</th>
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1 A full list of the group is attached in Doc. 1