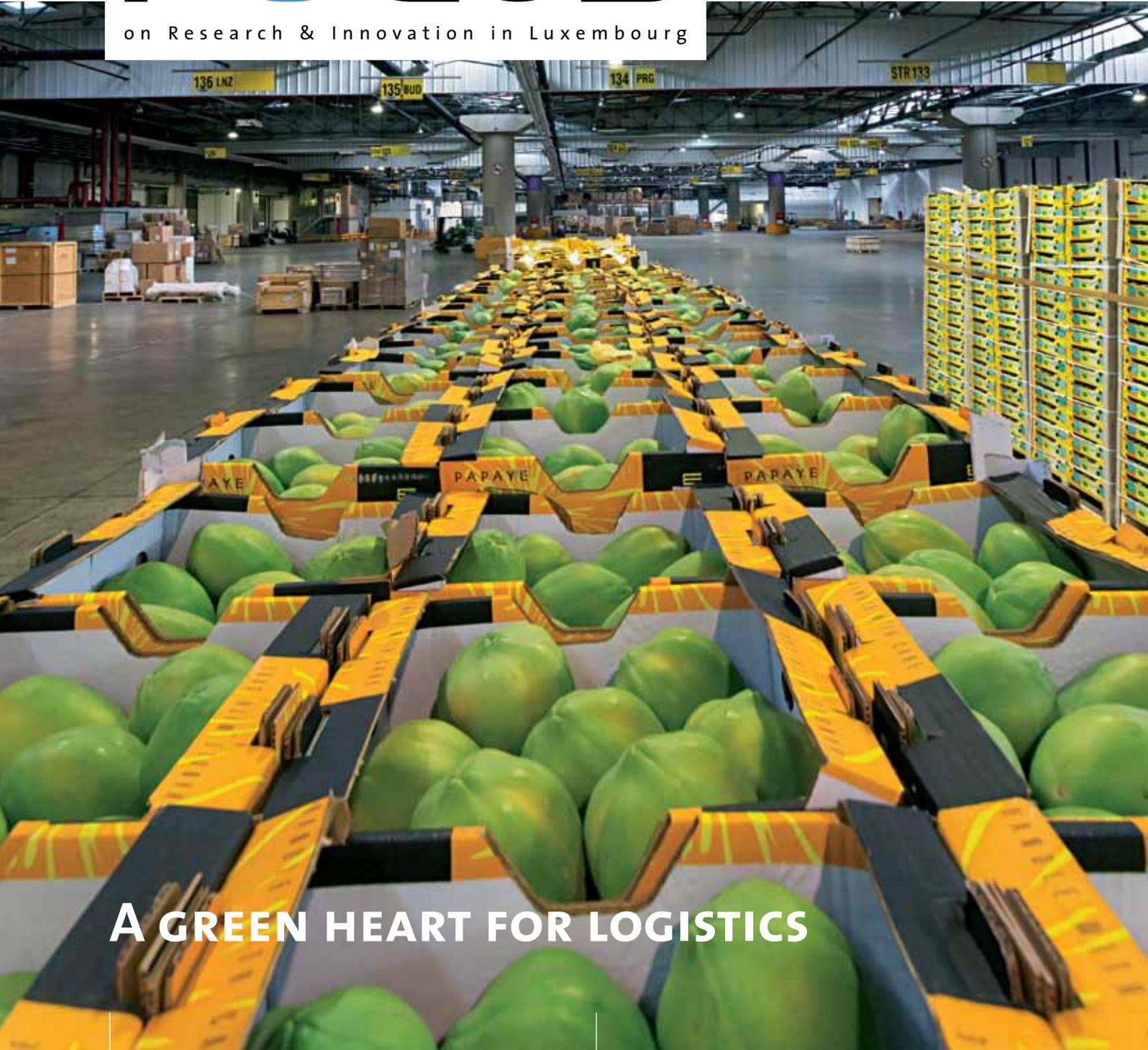


FOCUS

on Research & Innovation in Luxembourg

N° 8 / 2013



A GREEN HEART FOR LOGISTICS

INNOVATION FOR ALL
PAGES 08–09

COLLABORATIVE CREATIVITY
PAGES 30–33



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EDITORIAL

Innovation is crucial for any organisation that wants to develop and grow. It plays an important role for skilled craft companies that work in daily, close contact with their customers and provide individual, tailor-made solutions to respond to the evolving needs and expectations of their clients.

Modern craft firms often act as catalysts for the uptake of innovations because they are able to present the latest technological developments to their customers. In order to stay competitive, the craft sector needs skilled and technology-savvy people. This is why I hope that more scientists, engineers, economists and other highly qualified individuals will discover the career opportunities offered by this vibrant sector.

The Chambre des Métiers promotes innovation as essential and vital for the future development of its members, and its biennial innovation award for the crafts sector, the “Prix de l’Innovation dans l’Artisanat”, highlights how the sector benefits from innovation. The three winners of the latest edition are portrayed in this issue of *FOCUS on Research and Innovation in Luxembourg*, showcasing different faces of innovation: new products, new organisational methods and new ways of delivering a service.

Our work to stimulate innovation is carried out hand in hand with Luxinnovation, the National Agency for Innovation and Research, of which the Chambre is a stakeholder. Boosting competitiveness and business development through innovation is a cornerstone of the Agency’s strategic orientations. In this edition of *FOCUS*, Managing Director Jean-Paul Schuler outlines his vision for Luxinnovation as a provider of inspiring ideas, concrete solutions and links to relevant sources of expertise that can take companies and research organisations to new heights.

In this issue, Luxinnovation devotes the magazine’s main section to the logistics sector – a field that is highly innovative itself and also plays a key role for the successful evolution of other sectors. Luxembourg is an international logistics hub with numerous strategic advantages. The following pages will allow you to discover what Luxembourg has to offer in terms of infrastructure and government



Paul Ensch, Director General, Chambre des Métiers du Grand-Duché de Luxembourg

support, as well as a variety of companies driving innovation in the sector. A special focus is put on green logistics innovation as a way of securing commercial advantages and environmental benefits at the same time.

FOCUS also presents award-winning public research and research projects that bring public and private R&D actors together. Collaboration is, in fact, essential for innovation. You will read about meeting places set up over the past few years to facilitate this interaction, offering students, entrepreneurs, researchers and anyone else with ideas the opportunity to jointly explore and challenge their creative projects and turn them into reality. ♦



Paul Ensch
Director General
Chambre des Métiers du Grand-Duché de Luxembourg

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NEWS

Innovation output: Luxembourg among Europe's top performers

According to a new innovation indicator developed by the European Commission, Luxembourg is among the EU member states benefiting most from innovation. The Grand Duchy ranks fourth in the Indicator of Innovation Output, after Sweden, Germany and Ireland.

The new indicator measures the extent to which ideas from innovative sectors reach the market, leading to the creation of better jobs and a more competitive Europe. The top performers in the EU do well on several or all of the following factors: an economy with a high share of knowledge-intensive sectors, fast-growing innovative firms, high numbers of patents and competitive exports.

The results from this analysis indicate that Luxembourg is a place where innovative ideas are turned into successful products and services. ♦

Record Google reward to uni.lu researcher

IT security researcher Dr Ralf-Philipp Weinmann has received \$31,336 from Google for reporting three bugs in the Google Chrome internet browser. The amount paid to Dr Weinmann was a record in the Chromium Vulnerability Rewards programme, Google's bug bounty initiative remunerating those who identify security issues that may jeopardise the system. The three-bug chain that he uncovered exploited a JavaScript application programming interface and the supporting browser plug-in created by Google.

Dr Weinmann was, at the time, a research associate at the Laboratory of Algorithmics, Cryptology and Security of the University of Luxembourg's Faculty of Science, Technology and Communication. The outstanding award highlights the talent available in Luxembourg's computer security research community. ♦

www.uni.lu



Joint research programme for Delphi Automotive and the SnT

Leading global automotive supplier Delphi Automotive, and the Interdisciplinary Centre for Security, Reliability and Trust (SnT) of the University of Luxembourg have signed a four-year agreement to cooperate on a joint research programme involving electronic control units (ECUs) for automotive applications.

The amount and complexity of software used in modern vehicle ECUs is increasing and requires rigorous safety testing. The Luxembourg-based Powertrain Systems division of Delphi and the SnT set up this strategic partnership to develop cost-effective and efficient automated verification and validation technologies for Delphi's ECU software systems. With the signing of this agreement, Delphi becomes the 15th member to join the SnT Partnership Program. This initiative fosters the development of innovative ideas by sharing know-how and resources. ♦

www.delphi.com
www.uni.lu/snt



© CRP-Santé

Strategic partnership for brain cancer research

The biomedical research centre CRP-Santé in Luxembourg and the Arthur and Sonia Labatt Brain Research Centre in Toronto have signed a framework agreement to collaborate in the field of brain cancer research.

The opportunity to launch research activities with this renowned partner institute opens up new horizons for CRP-Santé. The new partnership also underlines the international recognition of the Centre's scientific expertise. More particularly, it emphasises the work performed by CRP-Santé's NorLux Neuro-Oncology Laboratory in cooperation with its partner in Bergen, Norway, which together represent one of the largest European research centres focused on glioma – the most common and most aggressive form of brain cancer.

The collaboration with the Canadian institute presents an opportunity to exchange knowledge, materials and human resources and to conduct joint projects both in advanced fundamental research and applied translational research. ♦

~ www.crp-sante.lu
www.norlux.lu

LCSB discovers endogenous antibiotic in the brain

Scientists at the Luxembourg Centre for Systems Biomedicine (LCSB) of the University of Luxembourg have discovered that immune cells in the brain produce a substance that prevents bacterial growth. It was previously assumed that only fungi could produce the antibiotic substance, called itaconic acid.

This is the first proof that an antibiotic can be produced by the brain. This discovery could help to understand how the immune system

responds to infections in the brain. Such infections might be linked to the development of Parkinson's disease, which is a main research focus at the LCSB.

Results of the research, which was led by Dr Karsten Hiller and Dr Alessandro Michelucci, were published in the prestigious scientific journal *Proceedings of the National Academy of Sciences*. ♦

~ www.uni.lu/lcsb

Max Planck Institute Luxembourg officially opened

The Max Planck Society, a renowned German research organisation, inaugurated its Luxembourg Institute for International, European and Regulatory Procedural Law in May 2013. Combining different fields of law at the national and international level, the new institute will focus on procedural law and investigate modern tendencies in dispute resolution from various perspectives.

This is the first Max Planck Institute on legal matters outside Germany. Due to the presence of key EU institutions and Luxembourg's long-standing commitment to the construction of Europe, the Grand Duchy is a promising environment for research into European law development.



© Max Planck Institute

The new institute envisages a continuous and productive dialogue with the nearby European Court of Justice and a close collaboration with the University of Luxembourg's Faculty of Law. It is entirely funded by the Luxembourg government as part of the broader strategy to develop the Grand Duchy as a centre for academic and research excellence. ♦

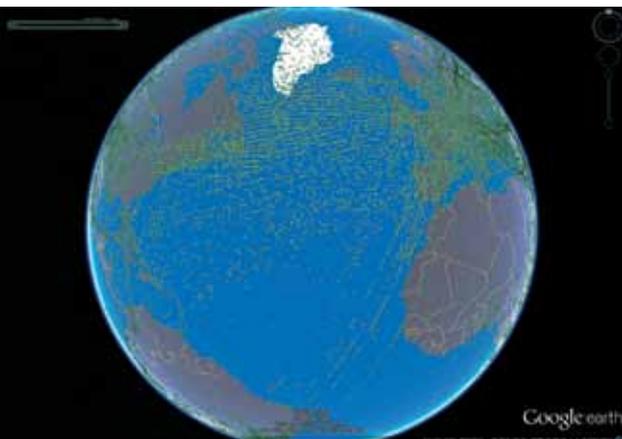
~ www.mpi.lu

SES Techcom supports aircraft tracking from space

Satellite company SES Techcom has launched the first space-based Automatic Dependent Surveillance – Broadcast (ADS-B) system to monitor air traffic around the globe. Operating on the Proba V satellite of the European Space Agency, the instrument has the potential for worldwide coverage and can detect and track aircraft in areas not covered by ground-based radars, such as oceans.

ADS-B signals are regularly emitted from suitably equipped aircraft, giving flight information such as speed, position and altitude. They are captured by the Proba V satellite and retransmitted to the ground. SES Techcom developed and implemented the ground data processing centre, which retrieves, processes, analyses and stores all ADS-B data received. This objective was achieved in collaboration with the German Aerospace Center. The intention is for all aircraft entering European airspace to carry ADS-B systems in the years ahead as a supplementary data source to the ground-based radar. ♦

www.ses.com



International interest in unique biobanking course

The second edition of a professional development course on the principles of biobanking took place in Luxembourg in June 2013. The course, which is organised jointly by IBBL (Integrated BioBank of Luxembourg) and the University of Luxembourg, is endorsed by ISBER (International Society for Biological and Environmental Repositories).

Luxembourg's biobanking course is the only one in the world to cover approaches for both biological and environmental biobanks in just a few weeks. It has so far attracted students from over 10 countries, including Australia, Egypt, Germany and Qatar, not least due to the growing international reputation of IBBL as a high-quality biobank.

Drawing on the expertise of senior scientists at IBBL and the University of Luxembourg, as well as their national and international partners, the course teaches theoretical background in the science and management of biobanks and also includes hands-on practical sessions in IBBL's laboratories. ♦

www.ibbl.lu

Euro-Composites invests €40 million in Luxembourg

Euro-Composites S.A., a global player in the field of advanced and demanding composites products, will spend approximately €40 million on the further development of its site in Echternach. This massive programme will include the acquisition of new high-tech manufacturing equipment and the construction of new production halls.

The investments will allow Euro-Composites to increase its production capacity and create at least 60 new jobs. They are part of an investment plan supported by the Ministry of the Economy and Foreign Trade. Founded 25 years ago, the company contributes to the development of an industrial sector with added value and innovative character in Luxembourg. ♦

www.eurocomposites.com



Eric Chenal

Jean-Paul Schuler, Managing Director, Luxinnovation

INNOVATION FOR ALL

Luxinnovation is a key partner for all who are interested in launching innovation activities in Luxembourg – from researchers, entrepreneurs and managers of start-up companies to foreign enterprises and investors. It is currently updating its strategy to meet the evolving needs of its clients. Jean-Paul Schuler, the newly appointed managing director, outlines the three key concepts that shape his vision for the National Agency for Innovation and Research: improvement, innovation and internationalisation.

Luxinnovation offers clients a wide variety of services, which notably include advice on national and European funding opportunities, support for innovative start-ups and assistance with innovation management, technology transfer and intellectual property management. Its help is available to both innovators in Luxembourg and entrepreneurs and researchers from abroad who are interested in the Grand Duchy. “These services are essential, and boosting innovation activities in companies and public research centres remains a main priority,” Mr Schuler confirms. However, he is planning to take the Agency another step further.

Enabling businesses to move forward

“Innovation is sometimes thought of as being the same as research and development, but this is far from the full picture,” Mr Schuler says. “Many smaller firms don’t undertake R&D activities themselves, but need to incorporate new technologies to remain competitive. For them, innovation is about improving their performance through better products and services, more

efficient production methods, improved quality and better ways of organising the work.”

“Our task”, he says, “is to show these businesses that this is where their future lies, and help them access the expertise they need to move forward.” Luxinnovation thus works with enterprises to assess their needs and identify areas with a potential for improvement. The Agency then puts client businesses in contact with suitable partners, such as research laboratories or business development experts. Luxinnovation also strives to broaden its client base and to intensify its interactions with sectors that are less technology-oriented – skilled crafts, trade and financial services, for example.

Fostering an international mindset

Looking beyond national borders is essential. Luxinnovation is stepping up its drive to establish international R&D and innovation collaborations and help firms and research centres position themselves in high-performance international networks. In its

role as National Contact Point for the EU's Seventh Framework Programme for Research and Innovation and the forthcoming successor programme Horizon 2020, the Agency also helps entities in Luxembourg, especially SMEs, to prepare for participation in European projects. Part of this service involves helping clients to find partners with good track records in applying for European research funding.

The Luxembourg Cluster Initiative, which is managed by Luxinnovation, also plays an important role in raising international awareness of the Grand Duchy's expertise. It covers key economic sectors – automotive components, biohealth, ecoinnovation, ICT, materials and space technologies – and its new strategy, developed in close cooperation with the Ministry of the Economy and Foreign Trade, is strongly focused on internationalisation. “Our aim is to contribute to generating more business for cluster members and to attract new economic activities to Luxembourg,” Mr Schuler underlines. “We promote the skills of the clusters internationally and provide strategic information for foreign companies that are considering locating activities in Luxembourg.”

Business development is another priority of the cluster strategy. “The clusters play an active role in helping members develop technologies, products and services for emerging markets where we have identified a potential for future economic growth,” Mr Schuler says.

Inspiring ideas

Creative thinking features prominently in the Managing Director's vision for the Agency. “We should be a source of new, innovative ideas and creative solutions for our partners and challenge them to think outside the box,” he says. As an example, he points to the advice that the Agency provides to help companies integrate design thinking as a way to generate innovative ideas and systematically transform them into marketable and viable products and services. For the younger generation, Luxinnovation runs an annual competition for creative ideas, which is open to contestants aged 5 to 20.

“There are also new exciting areas such as creative industries to develop in Luxembourg,” Mr Schuler continues. “Building links between culture and entrepreneurship, for example, can bring forth promising new business ventures.”

Making innovation happen

Luxinnovation is backed by three national ministries and three leading business organisations: respectively, the ministries of the Economy and Foreign Trade, for Higher Education and Research, and of Small and Medium-Sized

Businesses and Tourism, and the Chamber of Commerce, the Chambre des Métiers and Fedil – Business Federation Luxembourg.

“This means that we have all the key players behind us,” Mr Schuler emphasises. “Our greatest asset as an agency, however, is our staff – a committed group of highly skilled and international experts that are able to react quickly to new trends and needs. This combination of commitment and capability ensures that we can continue to make innovation happen for many years to come.” ♦



Jean-Paul Schuler

Mr Schuler holds a master's degree in mechanical engineering from the University of Karlsruhe in Germany. He started his professional career at Galvalange Sàrl before joining TradeARBED as general manager of Flat Products Sales in Export Markets. He then held several different senior management positions at Arcelor in Europe and Asia. In 2007 he was appointed vice president and head of the Operational Excellence Department at ArcelorMittal, before moving on to become the chief operating officer at Valin Steel in Hunan, China. Mr Schuler has been the managing director of Luxinnovation since 1 September 2013.

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A GREEN HEART FOR LOGISTICS

Luxembourg's central location in Europe and its excellent air, road, rail and waterway infrastructure position the country as a competitive intercontinental logistics hub. The Grand Duchy is home to leading logistics players – Cargolux, CFL Multimodal, CLdN Cobelfret, Kuehne + Nagel, LuxairCARGO and Panalpina, to name but a few – and benefits from a stable business environment, a highly skilled and multilingual workforce and strong government support for developing the logistics sector. A number of strategic projects are being implemented to unlock Luxembourg's full potential.

Logistics is an innovative field that is constantly evolving. One of the sector's key orientations is green: new products and services are increasingly helping logistics operators to address both their clients' business requirements and their environmental concerns.

MULTIMODAL LUXEMBOURG

“Let me be clear. Luxembourg is already an international logistics hub,” the Minister for Sustainable Development and Infrastructure, Claude Wiseler, declares emphatically. And indeed, the facts speak for themselves. With resources supporting multimodal transport via air, rail, road and water, the Grand Duchy offers world-class shipping and distribution facilities. Plans to further expand and enhance this infrastructure are under way as part of a government strategy to make the logistics sector an even stronger contributor to Luxembourg’s economy.



The Luxembourg government has identified logistics as one of four key sectors for the nation’s economic development, along with eco- and health technologies and ICT. “In fact,” says the Minister of the Economy and Foreign Trade, Etienne Schneider, “the government has had an action plan for logistics and transport since 2004 and has many tangible accomplishments to show for its investments.” Key figures include an increase in logistics-related companies from 694 in 2005 to 780 in 2011 and an increase in workers from 10,967 in 2005 to 12,809 in 2011, which represents 4 % of all employment.

A decade of development

The overall plan includes continuing to improve the regulatory and administrative framework, support the emergence of new activities, promote Luxembourg as a logistics hub and develop the Grand Duchy’s multimodal transport network and distribution facilities. In addition, Luxembourg maintains its strategy to actively search for and exploit niche areas in the logistics sector, such as pharmaceutical logistics and the handling of valuable goods.

An important initiative mentioned by Minister Schneider is the implementation of the “Single Window for Logistics”. This initiative fosters the collaboration between the Luxembourg Customs Administration, the Ministry of the Economy and Foreign Trade, the Luxembourg State’s IT Centre, the Chamber of Commerce and other regulatory agencies. The aim of the project is to enable economic operators to use a single electronic platform for handling all regulatory information required for the efficient cross-border flow of goods.

Minister Schneider also points to ways in which sectoral knowledge is being shared and human resources are developed. “A Cluster for Logistics was formed in 2009 and research projects in logistics are being undertaken by CRP Henri Tudor. In addition, the Centre is offering a master’s degree in supply chain management.” Certification in best practice in pharmaceutical distribution is under discussion and training as a logistics technician is in progress. Finally, to promote Luxembourg as a logistics hub, a booklet has been produced and a web site, www.logistics.lu, has been launched. Representatives of the Grand Duchy also participate in logistic fairs and forums, and Luxembourg is now included in the Logistics Performance Index.

A pharma hub at Findel Airport

A recent example of how Luxembourg is finding logistic niches in which to specialise is LuxairCARGO's new Pharma and Healthcare Centre at Findel Airport. The centre is fully compliant with Good Distribution Practice (GDP) and certified to handle pharmaceutical goods according to World Health Organization (WHO) and International Air Transport Association (IATA) guidelines. The 3,000 m² centre, which opened in April 2013, offers two dedicated temperature zones for goods handling: "cold", at 2° to 8°C, and "ambient", at 15° to 25 °C. A constant temperature monitoring is required for distributing medical products for human use.

With slots for eight planes at a maximum of 350 m from the facility, no waiting time on the tarmac before goods are unloaded and six temperature-controlled, dedicated truck docks, the facility is state of the art. Luxembourg also offers the advantage of not requiring VAT pre-financing when goods are imported, while its central location makes subsequent distribution efficient.

The greening of logistics

"The conveyance of consumer goods by truck represents more than 40 % of CO₂ emissions linked to transport and 10 % of emissions of CO₂ overall. One barge can carry the equivalent of 120 truckloads, while a train can replace 40 trucks. Therefore using rail and water to move goods rather than the highway will result in significant reductions in carbon emissions," explains Minister Wiseler. "Consequently, we are strong advocates of multimodal transport and have the facilities to enable this."

Supporting multimodal logistics further, the rail/road terminal at Bettembourg is being expanded at a cost of €210 million to provide four additional tracks for container trains and extra new facilities for loading and unloading the containers onto trucks. Destinations include Antwerp, Helsingborg, Le Boulou, Lübeck and Milan. In 2012, a shuttle train connection to Trieste was established to handle goods shipped by sea from the Turkish ports of Istanbul, Izmir and Mersin. From origin to final destinations in Belgium, France, Germany, the Netherlands and the UK, each trailer will travel more than 2,500 km. With 10,000 mega-trailers anticipated to be transported in the first year alone, the shift to rail will reduce CO₂ emissions by 13,000 tonnes throughout the same period – a 75 % reduction compared to road transport.

Using the trains of the logistics and transport operator CFL Multimodal will also significantly reduce road congestion.

The Port of Merttert on the Mosel is also being expanded and improved. Traffic increased from 525 boats in 2009 to 571 boats in 2012, while the amount of material shipped grew by 10.6% to 1,092,110 tonnes. Quays are being extended and other infrastructure – including a maintenance facility and a petrol depot – is being improved.

At Findel Airport, the apron area has been widened by 30 m to accommodate larger aircraft and the old maintenance hangar is being renovated. Meanwhile, runways have already been adapted for the new Boeing 747-8F cargo planes.

As trucking will remain an essential part of the transport network, the government is improving highway infrastructure to alleviate congestion on routes shared by both freight and commuter traffic. The A6 and A3 highways are being widened from two to three lanes, the A7 is under construction and a new bridge has been built across the Mosel at Grevenmacher. Other projects to improve traffic flow are also under way.





Aerial of Architecture 3000 SA

A veritable treasure trove: the Luxembourg Freeport

Another project that illustrates the government's strategy of developing niches in the logistics sector is the Luxembourg Freeport. Described as "the ultimate secured storage and trading platform for valuables", the Freeport will provide a hub for managing and storing valuable goods for an indefinite period without their being subject to VAT and customs duties, whether the items originate from within or outside the EU. Goods can include works of art, fine wines, precious metals and jewellery. Even works of art in electronic format, such as videos and photos, can be stored in dedicated data rooms. Services offered include customs handling, crating and shipping, framing, restoration, art advisory and evaluations, photographic documentation and private showrooms.

Findel Airport was chosen as the Freeport's location because it is one of the largest air cargo hubs in Europe. According to the Freeport's operators, "the efficiency of the existing airport infrastructure will significantly reduce transfer costs and the related risks of loss or damage, while offering a high degree of accessibility and security." Construction began in November 2012 and is expected to be completed in 2014.

Minister Wiseler stresses that "despite a highly competitive market, Luxembourg's multimodal platforms have weathered the difficult economic situation precipitated by the financial crisis of 2008. Consequently, these hybrid logistics facilities are a source of economic growth and validate the significant investments that have been made, and continue to be made, by the government."

Minister Schneider concurs: "I praise the National Action Plan 'Transport and Logistics', which has been implemented despite a period of crisis, and wish to thank all stakeholders, both public and private, for their support and their respective initiatives." ♦

A website for logistics in Luxembourg

The website "Luxembourg for Business – Proud to promote Logistics" provides comprehensive information on the Grand Duchy's logistics sector. It targets in particular international enterprises active in the logistics field and highlights the advantages offered in Luxembourg.

www.logistics.lu

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LUXEMBOURG'S ALLIANCE FOR LOGISTICS

“Location, location, location” is how the wise old man responds to the novice’s question about how to succeed in retail. The same applies to logistics, and Luxembourg is fortunate in its central location in western Europe. The Grand Duchy is situated within 350 km of the sea and air freight traffic of Antwerp, Brussels, Frankfurt, Paris and Rotterdam, and centred in a network of freight corridors that run from the Baltic and North Seas to the Mediterranean and the Adriatic. These advantages support the Cluster for Logistics in promoting Luxembourg as an international logistics hub.

The Cluster for Logistics was formed in 2009 in response to the Luxembourg government’s decision to make logistics a key sector for economic development. The Cluster’s Board is chaired by Pierre Gramegna, Director General of the Chamber of Commerce, and includes members representing CRP Henri Tudor, Fedil – Business Federation Luxembourg, the Luxembourg Trade Confederation, Luxinnovation, the Maritime Cluster and the University of Luxembourg.

A dynamic cluster

“The goal of the Cluster is to support and enhance the competitive advantages of Luxembourg as a logistics hub,” Mr Gramegna explains. “We serve as a platform where members can pool knowledge and support the development of new products and services.” He adds that the Cluster conducts lobbying activities to help improve Luxembourg’s legislative and regulatory framework for logistics, and works with the government to promote the Grand Duchy’s logistics capabilities.

The members of the Cluster, more than 100 in 2013, represent logistics companies and industrial actors who are main users of logistics, as well as financial institutions, consultancies and service providers. Together, they cover the full range of logistics modalities – sea, air, water, rail and road. The presence of educational and research institutions and public bodies such as the Chamber of Commerce and the University underlines the private-public partnership backing the Cluster.

Delivering expertise

Members are encouraged to participate in one of the Cluster’s working groups. The E-Cargo group focuses on the implementation of a paperless system to make shipping more efficient in a “Single Window for Logistics”. The Education group works with human resources



Pierre Gramegna, Director General, Luxembourg Chamber of Commerce

managers and the Luxembourg Ministry of National Education and Vocational Training to develop training for logistics technicians at the secondary school level. The first courses are expected to be offered in 2014.

The Green Logistics group centres on the development of a strategy that includes the use of alternative energy, the re-engineering of supply chains, the use of multimodal transport and urban logistics.

Reflecting the growing importance of information technology in the logistics sector, the Logistics IT group is collaborating with the Luxembourg ICT Cluster, which is managed by Luxinnovation. Meanwhile, the Marketing group is working with the Ministry of the Economy and Foreign Trade and Luxembourg for Business to develop a communications strategy and ensure that Luxembourg is represented at local and international trade events.

The way ahead

The Cluster for Logistics also contributes to the crafting of a national strategy for the development of logistics. The strategy highlights the potential of the Port of Mertert and Bettembourg freight terminal as parts of the “Extended Gates” of Antwerp, Zeebrugge and Rotterdam, recommends developing the airport as a specialist in logistics niche activities for pharmaceuticals, valuable goods and perishables, and highlights opportunities for Bettembourg within a pan-European rail/road network.

Greater sustainability is another priority. The Cluster advocates the development of a regional green distribution network to reduce the numbers of trucks delivering goods to city centres. “A national label for green logistics would allow companies to benefit from incentives and continue investments in eco-friendly technologies and processes,” proposes Cluster Manager Alain Krecké.

A detailed roadmap

In view of national elections held in October 2013, the Cluster’s Board issued a report that put forward its position on what is needed to realise the country’s full potential in the area of logistics. It identified priorities that include widening the main highways, implementing the “Single Window for Logistics”, adopting flexible “night curfew” rules for aircraft, improving rail freight handling and providing vocational training for logistics. The implementation of these recommendations will increase the competitiveness of Luxembourg as an international logistics hub and produce tangible results in terms of bringing new business to Luxembourg and generating employment. ♦

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DRIVING THE GAS REVOLUTION

Liquefied natural gas (LNG) is on course to become an increasingly important transport fuel. Global prices are falling and there are environmental advantages as well: natural gas releases a quarter less CO₂ than oil-based fuels, to say nothing of the potential of bio-gas. Logistics operators will require gas refuelling infrastructure in Luxembourg, and businesses are preparing. Leading this push is Dr Antonio Nicotra of the LNG service-provider Gasfin.

“Heavy goods vehicles, non-electrified locomotives and boats are all starting to use LNG, and aircraft are a possibility too,” notes Dr Nicotra, who is in charge of Gasfin’s investments. Although LNG is bulkier than diesel by a factor of 1.8, it weighs less, making it ideal when space is less of a concern. Logistics firms are keen to find alternatives to paying high diesel costs, but switching away from diesel engines is expensive. In the USA and China, natural gas has been over 70 % cheaper than oil over the past five years, motivating the two countries to lead the world in making the change.

Making the case for gas

Progress has been slower in Europe, where gas prices are three times higher than in the USA, but supply and demand factors are changing this picture. The continent has abundant shale gas resources, which several countries

are beginning to exploit. Most national governments are backing bio-gas production, including Luxembourg, where 26 plants are currently in operation. Similarly, many states are seeking to reduce their dependence on imported oil in view of greater supply security.

Gas-powered options also offer environmental benefits. Industry figures suggest that compared to diesel, LNG emits 25 % less CO₂, 85 % less nitrogen oxides, 95 % less sulphur dioxide and 99 % fewer particulates. LNG vehicles already comply with the stringent low-emissions requirements that the EU is phasing in for heavy-duty diesel vehicles.

Fast, flexible liquefaction

The volume of the tank is the main obstacle to widespread gas use in transport. Compressed natural gas from the grid requires a tank five

times the size of one for oil-based fuels, and is therefore primarily suitable for short journeys. For long-range transport, LNG is a better option.

Liquefaction is achieved by cooling the gas to -162 °C, using off-peak electricity to reduce the cost and environmental impact of the process. Gasfin offers this service in Luxembourg and throughout Europe by means of new technology developed by GE Oil & Gas, part of the US-based engineering multinational GE. It provides small units called “LNG-In-A-Box”, which enable temporary liquefied-gas production and fuelling depots to be set up within a few weeks near roads, rail depots, ports and industrial zones. The technology thus allows for a high degree of flexibility, which Gasfin aims to further enhance by minimising capital and operating expenditure and engineering requirements.

There are growing markets for projects such as these. Norway has been particularly keen, and there is demand in Poland, Russia and Sweden. Currently 1.4 million vehicles in the EU are powered by gas. This figure amounts to a mere 0.5 % or so of the total fleet, but technology is progressing.

Prospecting across the continent

Gasfin S.A. Luxembourg and its subsidiaries TGE and AIR-LNG are part of a private group backed by European investors. They have based their European operations in Luxembourg, Bonn in Germany, and Manchester in the UK. “Luxembourg is interesting to us as it is an established, growing logistics hub,” Dr Nicotra notes. It is a favoured fuel-stop for trucks from the North Sea ports, there is a burgeoning rail cargo hub in Bettembourg, and inland navigation along the Mosel adds to the demand. It is also a good location for exploring the use of LNG in aircraft and buses.



Antonio Nicotra, General Manager Gasfin Investments, Gasfin S.A.

“This is a coming technology with momentum behind it,” says Dr Nicotra, adding that the European Commission and several EU countries are supporting schemes to provide fuelling stations along main trucking routes. “When implementation begins,” he predicts, “Luxembourg will be there, adding its own individual twist.” ♦

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TAKING RAIL FREIGHT TO THE NEXT LEVEL

Transporting goods by train is a more price-competitive and green option than road – and CFL Multimodal can help to make the whole journey as smooth and flexible as possible. From its sophisticated logistics centre in Luxembourg, this innovative company provides links to the major European industrial centres and ports, and offers a wide range of value-adding services. *FOCUS* spoke to Barbara Chevalier, in charge of Strategy & Development, about the firm's approach and growth plans.



Barbara Chevalier, Strategy & Development, CFL Multimodal

“What makes us different is our commitment to varied, quality and reliable services,” notes Mrs Chevalier. “We work with clients to develop a complete logistics concept, adding value along the chain.” Being a “multimodal” operator puts the company at the heart of transport links combining rail with any other form of transport.

CFL Multimodal, she adds, is able to offer seamless, punctual services due to its close cooperation with its partners, and notably with sister firm CFL Cargo. Key to this synergy is the CFL facility in Bettembourg, in the south of the country. “It is important to understand that we operate an integrated logistics hub; this is much more than just a combined terminal,” says Mrs Chevalier.

Good value and green

“Over long distances, we are price competitive and sometimes even quicker than road,” she says. This advantage is coupled with a much smaller environmental footprint. According to European Commission figures, a 3,000 km multimodal journey, for instance, produces up to 68 % less external costs such as pollution, congestion and accidents.

An impressive figure, but in fact most demand is driven by price and service. Thus CFL Multimodal is striving to expand on its reputation for innovation and quality.

Rail freight transport and the operation of its logistics terminal form the company's core business. CFL Multimodal runs its own trains, and it has developed a sophisticated range of services to facilitate the transition from one form of transport to another. “Combined” trains allow standard containers to be transferred between trucks and trains. Alternatively, with the “rail motorway” system, soft-sided trailers are unhooked from their cabs, the train wagons pivot and the trailers are hauled onto the train.

Tailor-made services

In addition, CFL Multimodal offers varied value-adding logistics services, which can be tailored to each client's needs. The range includes warehousing with related services such as inventory management and picking/packing. For instance, for one client, the company transports rubber by train after it arrives by sea, stores and heats it in Bettembourg and delivers it just-in-time to end clients. In addition, it can assist with customs formalities and fix broken containers. CFL Multimodal's customer services operation also sets it apart from the competition. Partnerships across Europe and beyond extend this offering further.

Most of the company's clients are freight forwarding agents, but CFL Multimodal also serves other operators of combined trains using the Bettembourg platform. The firm, founded in 1997, employs around 350 people. It is state owned via the parent company CFL, Luxembourg's track and passenger-service provider.

A growing network

CFL Multimodal's network has been expanded significantly in the past couple of years, and further expansion is planned. Initially, the focus was on linking western European destinations to the Bettembourg hub. A connection to the North Sea is essential to tap into global trade flows, so the Belgian port of Antwerp is served regularly. Southern France, the Mediterranean and Spain are reached by a link to Le Boulou near the French Pyrenees. A link to Trieste gives access to Italy, the Balkans and Turkey. The German port of Lübeck was added in 2011 as a gateway to markets around the Baltic Sea. The former two destinations are served daily; the latter two to three times a week. Discussions are ongoing regarding a potential link to Poland, with a view to connecting to central and eastern European markets.

Combined trains carrying containers and craneable trailers are used for all these destinations. At the moment, however, only the Le Boulou link features the "rail motorway" services, as these require a specific track gauge. However, this technology is moving forward, and Mrs Chevalier explains that the concept is being developed for standard tracks.

More specialist capacity

Despite the economic downturn affecting trade, CFL Multimodal has maintained volumes. The quality and quantity of the offering are about to take another leap forward thanks to nearly €250 million of new state investment in the hub over the next few years. New tracks, platforms and cranes will be added. Capacity for handling combined trains will rise from 3, the current maximum, to 8 per day, with the rail motorway capability going from 4 to 16. Container storage space will nearly double to 2,300 units, and the terminal will be able to deal with up to 1,600 trailers per day – more than twice its current limit.



CFL Multimodal will also invest in a new warehouse, allowing the consolidation of the current seven storage sites into one. It has a substantial commercial responsibility to find clients. "The decision to run our own trains was essential to the establishment of this hub," she notes. "We have done this for a number of years now and the market sees that we have established a solid reputation for good service."

The modernised hub will enable CFL Multimodal to attract a wider variety of clients from across the continent — helping the company to ensure that its trains are fully used in order to maximise returns and minimise costs. "Much of this building phase is about acquiring critical mass," says Mrs Chevalier. "The greater the network and the higher the traffic flow, the more we will be able pass the benefits of synergies on to our customers." ♦

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BLUE-SKY THINKING

Cargolux is a global pacesetter. Situated at the heart of Luxembourg's logistics sector, this all-cargo airline has been an important player in European and world markets for decades, with a reputation for being highly innovative. It was the first to use the latest Boeing air-freighter with its improved fuel efficiency, enhanced payload and reduced noise footprint. It has also driven new plans to improve the range and quality of services offered at its home airport just outside Luxembourg City. Richard Forson, Interim President and CEO, explains how Cargolux stays ahead of the competition.



Richard Forson, Interim President and CEO, Cargolux

There can be no doubting Cargolux's commitment to cutting-edge technology: its ongoing fleet upgrade will cost in excess of a hefty \$2.5 billion. Thanks to this investment, the company is better able to serve clients, efficiency is increasing and environmental benefits are accruing.

Each of the company's new Boeing 747-8Fs has 16 % more capacity and is considerably more fuel-efficient than the previous generation of 747-400Fs. This improvement reduces CO₂ emissions, and the noise footprint is down 30 % as well. "We have always been at the forefront of technological advancements in the airfreight industry," Mr Forson points out. "Being a launch customer for the 747-8F allowed us to work very closely with the manufacturer in the interests of maximising efficiency and related benefits."

New horizons

As fuel costs are high, any innovation that can cut weight and reduce flight times counts. Routes are reviewed constantly to ensure that client needs can be handled with maximum efficiency, at the lowest cost. Flight documentation is now carried on cockpit and tablet computers, saving the transport of several kilos per journey. A small change, maybe, but with significant advantages for a firm with 20 aircraft serving around 90 destinations worldwide. Less fuel is burnt and efficiency is enhanced.

Given the wide range of goods it carries, Cargolux has no choice but to innovate. In addition to general cargo, the focus is on high-value freight that needs to be transported quickly in optimum conditions. This service covers items as diverse as live animals, artworks and fine wines. Up to four different temperature zones can be maintained in the company's planes.

Top-flight services

A host of different types of delicate, temperature-sensitive commodities can thus be transported on the same flight, many requiring specialised, tailor-made treatment. The company's teams of logistics professionals are trained to handle such goods in an unbroken temperature-controlled environment. Charter flights can be arranged at just four hours' notice.

Cargolux benefits from its close relationship with Luxembourg airport, which is blessed with excellent facilities on the ground, abundant space and little congestion. These advantages help it to offer high-quality services with quick turnarounds. "The distance from aircraft to truck for onward movement is only 108 metres," notes Mr Forson.

The Pharmaceuticals & Healthcare Centre at Luxembourg airport is a further example. Keen to expand its pharmaceuticals and medical material transport business, Cargolux advocated



the creation of specialist warehousing, a suggestion that tied in with the government's eagerness to promote logistics and the country's growing healthcare sector. Semi-state company LuxairCARGO, the airport's main freight handling agent, acted on this suggestion and built the €4 million centre, which opened for business in the spring of 2013. Cargolux was consulted throughout the process.

Innovation in the air and on the ground

The new centre offers 3,000 m² of specialised storage space equipped to maintain products in optimal conditions behind sophisticated air-lock doors. Transport times are kept to a minimum, with just 10 minutes from storage to loading. "It is very important to be able to keep these products under stringent conditions, in a constant cold-chain, avoiding contamination and degradation," Mr Forson notes. "Few airlines can handle this because they do not have the facilities at either end to ensure that cargo is maintained properly." What is more, Cargolux customers can check the arrangements through a remote monitoring service.

"We have seen a steady increase in volumes in this rapidly growing global niche market," he adds. Growing demand from the Middle East, China, India and the rest of Asia is driving much of this development. Air transport is the only option for products that must be used soon after production. Some Cargolux clients, for example, truck pharmaceutical products from manufacturing centres across Europe into Luxembourg for global distribution.

This is not the first improvement for the company's Luxembourg base. In 2009, Cargolux opened its all-new two-bay maintenance hangar, which enables the latest aircraft to be serviced in optimal conditions. It also offers third-party maintenance services from here. Next year a firm will open the "Luxembourg

Freeport", allowing high-value goods to transit and be processed in ideal, secure conditions with a temporary suspension of VAT, customs and other red tape. This 20,000 m² facility will help logistics firms move items such as precious metals, fine wine, jewellery and antiques. There will also be space to provide a range of services such as wrapping, authentication, restoration, photography, showrooms and insurance.

Cargolux's success is one of the reasons why Luxembourg airport ranks among the top five cargo airports in Europe. The mutually beneficial relationship between the company and its home airport enables both to reach new heights. ♦

Cargolux: A history of innovation

- 1970** Founded to operate in the new niche for scheduled all-cargo airlines
- 1993** Launch customer for the first Boeing 747-400 freighter – lowest cost per tonne-km service
- 2000** Acquires first 747-400F flight simulator for pilot training
- 2006** Begins work on new hangar
- 2011** Receives first Boeing 747-8 freighter: 16 % more efficient, 30 % less noise
Acquires first 747-8F flight simulator
- 2013** Acquires ninth Boeing 747-8 freighter, with a further four on order

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RESEARCHERS IN MOTION

FULL SPEED AHEAD FOR INLAND NAVIGATION

As an ancient industry, inland waterway transport has had to innovate to survive. Today, increasingly powerful and nimble craft are able to bring more goods closer to consumers. Not only does this make river and canal shipping even better value, but it enables more clients to consider using this relatively ecological form of transport. *FOCUS* spoke to Willem Macleanen, CEO and part-owner of Inland Navigation Luxembourg S.A. (INL), about his company and current industry trends.

“Inland navigation is an ancient industry. It may not appear to be very innovative, but the vessels have changed beyond all recognition in recent decades,” notes Mr Macleanen. Ships and boats have become much longer, with 4,000 tonnes now common when 1,000 to 2,000 was the norm only two decades ago. It is even possible to handle 12,000 tonnes using so-called “push boats” to move several barges lashed together.

Low cost, low emissions

Mr Macleanen points to improved construction techniques, better design, increased power and easier steering due to innovations such as front-located propellers. Enhanced safety features have been added to reduce the risk and impact of accidents. Modern radar and wireless telephony also help to boost efficiency and safety. That said, there can be no replacement for a captain's skill in navigating currents, winds and other unpredictable factors.

The chief appeal of inland waterway shipping is the cost, but it is also a low-carbon transport option, and the EU is actively promoting it for this reason. According to industry figures, it uses a third less energy per tonne transported than long-haul truck and trailer options, and about a quarter less than electric rail. Further advances are imminent, with more efficient engines under development and moves to run vessels on lower-carbon liquid gas.

Charting an innovative course

Other innovations include processing goods while in transit. INL, for example, operates a custom-built ship that is equipped to process goods for the paper industry.

In suitable locations, inland navigation can also help to bring goods closer to the consumer. Mr Macleanen points to a new trend in his native Netherlands, where deliveries in urban areas can be handled through a dense network of rivers and canals. “Vessels are being equipped to load and unload pallets directly to distributors in city centres,” he says. “This is

reducing the need for big trucks to drive on busy town roads.”

As CEO and part-owner, Mr Macleanen is one of seven employees working in INL's offices in the Luxembourg village of Ahn. From here, the team supports the work of the firm's 37-strong fleet of tankers, push-boats and other specialised vessels, which are crewed by a further 150 employees.

The firm mainly serves clients along the Rhine, the Rhine Delta and its tributaries, reaching the Benelux, Germany, France and Switzerland. Its vessels are also frequent visitors to inland ports along the Danube and any other navigable waterway in Europe. In line with the rest of the industry, it primarily transports raw materials, manufactured items, fuels and grain. However, INL also handles goods such as fresh and frozen fruit and vegetables, glassware, ceramics and textiles.



Plain sailing

Mr Macleanen is generous with his praise for Luxembourg as a base for his business. Situated a mere 120 km from the Rhine, Europe's main inland waterway thoroughfare, Luxembourg has also established an excellent reputation, he says. "It has a very professional image and all the big inland navigation companies are based here."

"Clients and potential employees are all attracted by this," he says. But, in his view, these are not the only advantages of his chosen location: he also appreciates the constructive attitude of the administration and the support provided by business organisations. ♦

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THE RED LION ROARS

A maritime sector in landlocked Luxembourg? The idea may seem surprising. However, no country can afford to ignore the sea and, according to the 1982 UN Convention on the Law of the Sea, no country can be denied access. With 90 % of the EU's external trade and 40 % of its domestic trade going by sea, the stakes are high. The Luxembourg Maritime Cluster was established to promote the country's relatively new maritime sector, leverage the facilities of the Port of Mertert and the Bettembourg rail freight terminal, and provide a network for the shared interests of its members.



Eric Chenail

The "Roude Leif", the Red Lion flag indicating that a ship is registered in Luxembourg, began to fly on 9 November 1990 when the Luxembourg Maritime Registry was created. The Registry, which is operated by the country's Maritime Authority and supported by the Ministry of the Economy and Foreign Trade, is a customer-friendly one-stop shop.

The rationale for the creation of a Luxembourg registry was based on the continuing flight of ship owners from the EU to re-register in more distant locations, and the strong desire of EU Member States to preserve quality shipping. The initiative therefore gained the support of several European governments.

Nailing Luxembourg's colours to the mast

The Maritime Authority acts as a guarantor of high quality standards. Frequent technical inspections are required, and seamen enjoy fair labour conditions aboard state-of-the-art ships. Paul Marceul, the Maritime Cluster's manager, explains: "While there is an ongoing fight against sub-standard vessels, ships flying the 'Roude Leif' are welcome in ports around

Paul Marceul, Cluster Manager, Luxembourg Maritime Cluster

the world and appear on the 'white lists' of the leading vessel classification societies."

An example of the high quality of Luxembourg-registered vessels is the average age of the ships. Through a system of investment-related tax incentives, ship owners are encouraged to invest in new vessels. Owners renew their fleets on a regular basis, and the average age of a ship is a low 6.3 years.

In September 2013, there were 268 ships registered in the Grand Duchy and, with new EU pressure on European ship-owners to have EU-registered vessels, as many as 200 more are expected in the near future. Although exact figures are difficult to ascertain, it is estimated that about 1,000 jobs in Luxembourg are linked directly or indirectly to the maritime sector.

A flourishing maritime cluster

To support the development of the sector, the Luxembourg Maritime Cluster was created in 2008 by multimodal operator CLdN Cobelfret S.A. – represented by the company's head, Freddy Bracke, who is the Cluster's current chairman – and 15 other companies. In addition to representing the sector both domestically and abroad, the aims of the Cluster include promoting the interests of the maritime sector and bringing all the participants in Luxembourg's "Blue Economy" together in a common network.

The Cluster lobbies on behalf of its members, undertakes media contacts and keeps track of developments in the sector. Since 2011, it has served as the vice president and general secretary of the European Network of Maritime Clusters.

Catching the tide

A maritime sector is not just about ships. In fact, of the Maritime Cluster's 45 members, only a quarter are shipping companies. A plethora of businesses have developed support services for them. These businesses include law offices, insurance companies, banks and finance companies, dredging companies, multimodal and maritime logistics companies, audit and consulting firms and organisations offering homologation and certification.

"All in all, there are several excellent reasons to be part of the maritime sector in Luxembourg. Luxembourg offers a business-friendly, customer-oriented legal and regulatory framework that is exceptionally politically stable. It is a rewarding tax environment for investors, who can enjoy peace of mind about the security of their investments. It also offers participants a full range of highly-skilled, multilingual support services. Participating in the Cluster makes you part of the network that benefits from these advantages," Mr Marceul concludes. ♦



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FUTURE-PROOFING LOGISTICS AND TRANSPORT

Long before a container is loaded onto a ship or a box is put on a truck, systems are needed that determine the most effective schedules, routes and modes of transport. Both the Transport and Logistics Innovation Programme of CRP Henri Tudor and the University of Luxembourg's Interdisciplinary Centre for Security, Reliability and Trust undertake pioneering work to improve logistics flows and optimise transport. Their work will also help to achieve greater sustainability in these areas.



Eric Chenail

David Evaristo, Programme Manager, CRP Henri Tudor

"The work of the Transport and Logistics Innovation Programme has several foci," explains David Evaristo, the programme manager at CRP Henri Tudor. "In addition to undertaking research projects with PhD candidates and post-docs, we also develop training programmes for jobs in the logistics sector and offer a master's degree in supply chain management with the University of Lorraine."

Fast forward for freight

Weastflows – short for "West and east freight flows" – is one of the main projects currently being carried out by the unit. Its goal is to improve freight logistics in north-west Europe by supporting a shift from road-only transport to more environmentally friendly rail, short sea shipping and river transport.

Weastflows is an Interreg IVB North-West Europe project funded by the European Regional Development Fund. While road transport accounts for 21 % of global carbon emissions, maritime transport generates a mere 2.7 %. Therefore, using a more efficient, streamlined freight network less dependent on trucking will make an important contribution to reducing greenhouse gases as well as road congestion.

The €9 million project runs through 2015 and involves 22 partners from countries including China, France, Germany, Ireland, the Netherlands and the United Kingdom as well as Luxembourg. Together, the partners are creating inter-related solutions in infrastructure, multimodal logistics, ICT and telematics. CRP Henri Tudor's role will focus on ICT and the development of a model of freight flows that can be used as an online journey-planning tool.

Mapping out solutions

A second project is called LaMiLo, which stands for Last Mile Logistics. Also an Interreg project, LaMiLo's goal is to change how urban freight deliveries are made and to influence the behaviour of private companies, local governments and consumers by encouraging them to make more sustainable use of transport infrastructures and networks. The project, which has 15 partners, began in January 2013 and will run through 2015.

"While Weastflows has a macro perspective of logistic networks, LaMiLo takes a micro view," explains Mr Evaristo. By taking advantage of outlying centres to collect and distribute goods, and using more environmentally friendly methods such as electric vehicles and even rail and waterborne transport, the project will reduce CO₂ levels in cities in north-west Europe and benefit both citizens and businesses.

The intelligent e-car

Electric cars rank prominently among the concepts associated with sustainable transport, and their development into intelligent vehicles could also help to improve traffic flows and logistics. Politically, the e-car is a top priority among the mobility solutions of tomorrow. Intense one-upmanship is going on between the automotive groups as to who will bring out the first practicable model.

But is a practicable model even possible yet? “The very limited range of electric vehicles on a single battery charge is still a critical issue,” says Holger Voos, researcher at the Interdisciplinary Centre for Security, Reliability and Trust (SnT) and professor at the Faculty of Science, Technology and Communication at the University of Luxembourg. Yet, the e-car’s range is only one concern if it is to become a popular means of transport. Professor Voos continues: “The issues of energy efficiency, safety, riding and driving comfort, and increasingly communication, are all gaining importance.”

There is a mutual dependency between these issues, as Professor Voos notes: “Range can be increased by battery improvements, a light body and highest possible energy efficiency.” The trouble is that the lightness of the body, in turn, influences the safety of the vehicle. He believes the way to solve this dilemma is to make electric cars intelligent by integrating advanced driver assistance systems (ADAS). These driver assistance systems are based on strategically integrated sensors, actuators and electronic components, and even software-based automation functions.

Driver assistance systems for electric cars will have to differ from the existing ones in petrol-driven cars, as Professor Voos explains: “ADAS for electric cars should increase the energy efficiency as well as the safety of the vehicle. At the same time, the sensors and electronic components themselves will have to work as power-savingly as possible.” This is why Professor Voos has set up an automation laboratory at SnT, where he and his team systematically approach, among other things, the issue of ADAS specifically for electric cars.

The object of investigation is an E-Smart. The small car undergoes rigorous testing at the SnT automation lab, and so provides the basis for developing new approaches to the driver assistance systems. As a first step, Professor Voos



Holger Voos, Professor, University of Luxembourg

and his team took a close look at driver operation characteristics as a key to energy-efficient travel. “We adapted the sensors in the vehicle specifically for this. Now they give the driver early indications on how to optimise the range of his vehicle’s battery,” says Professor Voos. This can be done, for example, by using systems that keep an electronic eye on the traffic situation (“Bottleneck around the corner – slow down”) or anticipate the terrain ahead (“There’s a downhill grade ahead – slow down again”).

The SnT automation lab is working together with IEE to develop these new advanced driver assistance systems. Aside from safety technologies, this Luxembourg-based company mainly develops sensor systems for automakers. “IEE, like us, sees the development of special sensor systems for ADAS as a future technological challenge,” Professor Voos says. “Together, we want to be among the first in this field to develop the new concepts for practical application.” ♦

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WHERE LOGISTICS MEETS PUBLIC SAFETY

Having blood taken for a blood test is a common experience. Eventually you receive the results and take the required action – watching your cholesterol, for example, or taking a vitamin supplement. You probably don't think about what happens to your sample once it has been analysed. Or about the fact that, while you personally may not have a disease that can be transmitted by exposure to your blood, the next patient might. DG-Trac is an innovative solution designed to control the risks associated with the transport of hazardous medical materials in the interest of public safety.

Until recently, hospitals and medical laboratories used to handle the disposal of medical wastes and the sterilisation of surgical and other equipment in-house. Now, however, such organisations are centralising these tasks, and hazardous materials are transported in commercial vans and even cars to central processing facilities.

Personnel dealing with these materials need to know how to pack, store and label them properly. In addition, should an accident occur while these goods are being transported, emergency responders must be informed of the risks they may encounter.

Common sense, common rules

DG-Trac is a project funded by the European Space Agency (ESA) and headed by HITEC Luxembourg, which contributes expertise in satellite ground segment and public safety communication technology. "DG-Trac provides a comprehensive solution to the need to properly handle and track hazardous medical goods and ensure that the people who deal with them are appropriately trained and certified," says Harold Linke, HITEC's head of Research and Technology Projects and DG-Trac project manager.

DG-Trac not only appeals to common sense – citizens, handlers and emergency safety personnel should be protected from hazardous materials – but is also mandated by UN regulation ADR 2013, the European agreement concerning the international carriage of dangerous goods by road, which has been applicable since 1 January 2013. Its provision UN2814 specifically relates to the treatment of substances that are hazardous to the health of people or animals or can transmit a potentially fatal disease in case of contact. The regulation requires that all personnel handling the hazardous goods have received the necessary training and are certified.

Launched by LuxLAUNCH

DG-Trac has its origin in several exploratory studies funded by LuxLAUNCH, a programme implemented by the Ministry for Higher Education and Research and supported by Luxinnovation. LuxLAUNCH assists businesses in positioning themselves in the space sector, especially in the areas of satellite telecommunications, satellite navigation and earth observation. Its ultimate aim is to allow companies to develop sustainable business activities, in particular through participation in ESA programmes.

Further valuable inputs for setting up DG-Trac were gathered during a conference on the future monitoring of dangerous goods transport, organised by Luxinnovation in 2010 and supported by several organisations, including HITEC



Harold Linke, Head of Research and Technology Projects, HITEC Luxembourg

Eric Chetail

Luxembourg. “This conference was key to allowing us to better understand the requirements for the transport of dangerous goods from various points of view, including public authorities, specialist associations, road operators and technology providers,” Mr Linke explains.

Satellite-supported safety

HITEC’s next step was to undertake a feasibility study, which ran from February 2012 to March 2013 and was funded directly by ESA. With HITEC Luxembourg as the prime contractor, the other entities participating were CRP Henri Tudor, the Interdisciplinary Centre for Security, Reliability and Trust of the University of Luxembourg, T&E Gefahrgutlogistik (a Luxembourg logistics company that also provides the training and certification required for the handling of dangerous goods), as well as Luxembourg’s Post and Telecommunications company EPT and its State Information Technology Centre (CTIE). Luxinnovation supported the preparation of the ESA proposal at various phases with a full range of advisory services and expertise.

Together, the partners have designed a service that includes continuous, real-time tracking of the dangerous goods from the sender to the receiver via satellite or the Universal Mobile Telecommunications System (UMTS), provision of information about how to handle the goods, a check of the certification of all people involved, and a secured handover at the destination, with verified digital signatures.

DG-Trac step by step

The DG-Trac process begins with the person with the dangerous medical goods requesting transport or entering pre-arranged transport data into the DG-Trac portal. A barcode or RFID tag is then assigned to the box (or item). The transport driver’s certification is checked and the bar code or RFID is re-scanned into the system when the box is loaded onto the vehicle. The vehicle is then tracked from its origin to its destination. The bar code or RFID is again scanned when the box is unloaded from the vehicle, and scanned a final time when it is accepted by the receiver. DG-Trac maintains a record of all the documentation relating to the delivery in its database.



With the feasibility study successfully completed, the next step for DG-Trac is a demonstration project, which will begin in early 2014. It is expected to involve the Kirchberg Hospital Centre in Luxembourg and a second hospital in Germany. “We expect DG-Trac to be fully operational in 2015,” Mr Linke says.

This timing will coincide with the launch of eCall, a European initiative under which vehicles will be fitted with a device that automatically dials the emergency number 112 in the event of a serious road accident. The device then transmits GPS coordinates as well as information about the vehicle. If the accident involves a vehicle transporting dangerous medical goods, DG-Trac will provide additional information to ensure that responding personnel are aware of any hazards.

DG-Trac will be centred in Luxembourg. In particular, data relating to personnel certification will be housed on servers at an EPT data centre. This choice reflects the high levels of privacy and information security provided in the Grand Duchy. ♦

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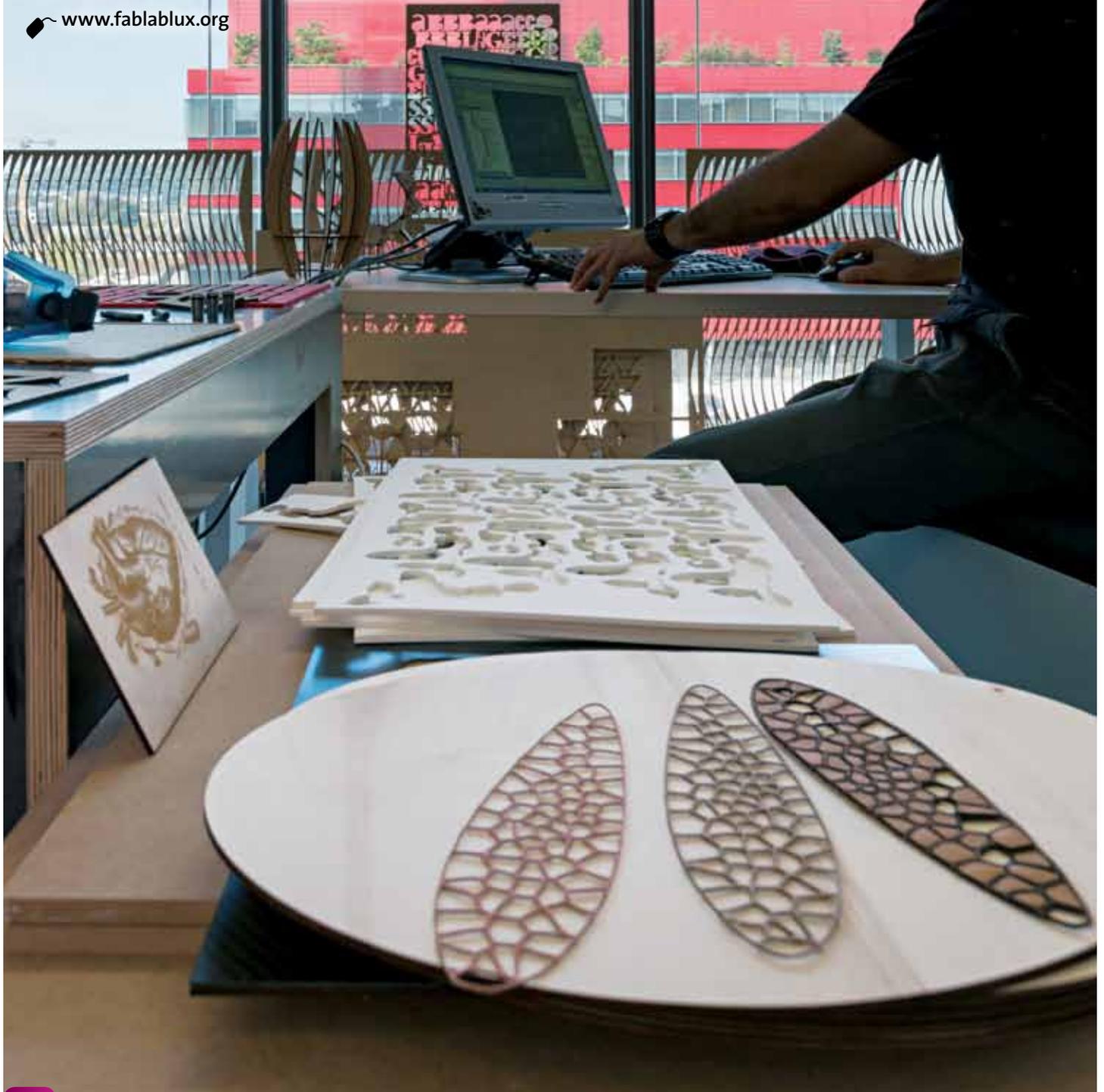


EVERYONE IS A MAKER

Nowadays, with access to technology and knowledge via the internet, everyone can be a “maker” and come up with ideas to create something new. But how do you realise your idea? FabLab (Fabrication Laboratory) Luxembourg provides a community space for knowledge exchange and a prototyping platform for digital fabrication. Tools such as 3D printers, laser cutters or milling machines as well as technical, financial and logistical assistance are available to facilitate invention. Equal emphasis is put on fostering a multidisciplinary and intergenerational dynamic between startups, artists, designers, architects, engineers, hobbyists, researchers, students, and so on.

Located near the Technoport business incubator and coworking centre in Esch-Belval, FabLab Luxembourg is part of a global network of fabrication laboratories. Designs and processes developed in these labs can be protected and sold by the inventor but should remain available for others to use and learn from. “Fab Labs are empowering what has been defined by several writers as the third industrial revolution, having a real impact on personal manufacturing,” says Fab Lab Manager Rodolfo Baiz.

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Do you wish to develop a project or a business idea in a dynamic community of like-minded peers? The Impactory is a new coworking space in central Luxembourg where business creation and social innovation happen. Entrepreneurs, freelancers, students and representatives of companies or institutions meet and work at the Impactory, which offers access to desks, meeting rooms, printers and the internet.

The Impactory also organises conferences, workshops and hands-on training sessions on entrepreneurship, social enterprise and social innovation, and gives its members the opportunity to share, discuss, brainstorm and co-create solutions for themselves or others.

Co-founder Per-Fredrik Hagermark describes it as “a place people go to build their business or work on a project that matters. The diverse trusted community is the real power, supported by a fun, efficient and affordable space to work from.”

 www.theimpactory.com





1535°C

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BURNING CREATIVITY HUB

To stimulate the combined use of artistic creativity, innovation and entrepreneurship in the creative industries, the City of Differdange has initiated 1535°C, an applied creativity and networking centre. Individual members, organisations and enterprises will have access to three buildings in Differdange that will be successively remodelled to contain work spaces, a co-working area, a photo studio, a brasserie, an events venue and a professional development centre. The first building is due to open in December 2013.

1535°C is the melting temperature of steel. The name refers both to the industrial heritage of Differdange and to the aim of creating a workshop where exciting new initiatives are forged in a community spirit of knowledge sharing.

 www.1535.lu

INCUBATING ENTHUSIASTIC ENTREPRENEURS

Whether a young graduate, professional or skilled individual – all enthusiastic entrepreneurs require networking and mentoring at the crossroads of their professional development. The lux future lab in the heart of Luxembourg City supports exactly this: the development of professional skills and entrepreneurial projects in an interactive and educational environment where companies can grow.

Besides providing office space, reception areas and access to a network of economic actors, the lux future lab also offers training, advice and know-how to help develop business ideas. It is located in the BGL BNP Paribas building in the city centre, close to all relevant institutions, offices and ministries that entrepreneurs will need to visit to establish and develop their start-up.

 www.luxfuturelab.lu



THE MANY FACES OF INNOVATION

Mention innovation and most people automatically think “high tech” – along the lines of a smart phone application, a driverless vehicle or a bionic prosthesis. However, any organisation can be innovative, whether it supplies tyres, produces stair railings or repairs hydraulic systems. Recognising that innovation takes many forms, Luxembourg’s *Chambre des Métiers* has introduced an award for innovation in skilled crafts. The 2013 winners illustrate the creativity to be found in diverse businesses and the multiplicity of ways in which they respond to internal challenges and changing customer requirements.

March 2013 was the fourth time the *Chambre des Métiers* presented its awards for innovation in skilled crafts. The 23 competing projects demonstrated the range of forms that innovation takes in the skilled crafts sector and showed that every business has the capacity to be innovative. Gold, silver and bronze prizes were awarded, and four projects were given awards of merit.

Continuous improvement through “lean” thinking

The gold prize winner was Luxforge for its project “Lean thinking applied in an SME”. Based in Troisvierges in the far north of Luxembourg since 1993, Luxforge makes specialised metal building products that include stairways, balustrades, balconies, gates and railings for clients in Luxembourg and the surrounding region.

“In addition to quality and price, what is most important to a client is being able to have a reliable delivery date,” explains Jean-Louis Blanken, Luxforge’s Deputy Director. “Around six years ago, issues with our production process and constraints in capacity began to mean that we could not meet our commitments to our customers on a timely basis. We knew something had to be done. We looked for a solution and discovered Lean.”

“Lean”, short for lean production or lean manufacturing, is an approach that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination or improvement. Originally popularised by

Japanese car manufacturer Toyota, Lean is not a one-off exercise, but includes the concept of continuous improvement. It also assumes that every single staff member is involved in the achievement of greater organisational efficiency throughout the company.

To implement lean thinking, Luxforge put up a seven metre length of paper along a wall in its premises. A chart detailed projects throughout the production process, step by step from design to product installation. The sheet enabled all employees to check the status of every project at a glance and to see if there were problems or delays.

The display made it obvious who was responsible for what and where weaknesses existed. It also made it easier to identify ways in which the workflow could be improved and gave employees a greater sense of ownership.

“You cannot imagine how much has changed since we implemented Lean,” says Mr Blanken. “It has enabled us to improve the efficiency and quality of our work processes, reduce waste and shorten delivery times. Employees like their jobs more because they feel more involved in production and planning. Teams work more efficiently. The approach has also resulted in greater company profitability.”

In awarding Luxforge the gold prize, the jury reported being especially impressed by the consistency with which Lean had been implemented and by the fact that such a project was undertaken by an SME as a way of aligning more closely with customer expectations.



Bohner



Bohnia

A practical response to customer needs

Ateliers mécaniques Dostert was the silver prize winner for its weighing system for freight containers. Dostert was originally founded in 1884 as a blacksmith and still has workshops that offer services in metal construction and bodywork. Today the company specialises in loading cranes, containers, trailers and superstructures for trucks, as well as hydraulic components and systems.

When a customer complained about having been fined for overloaded trucks because it was not able to measure the weight of the container being transported, Dostert created a solution. The new system involves four hydraulic cylinders used to lift a container onto a truck. Sensors measure the pressure in each cylinder

and the weight of the container is calculated. The figure is then displayed to the driver, who can determine whether the weight is within the allowed limits.

The system can be easily installed on both new and existing trucks and is inexpensive compared to other alternatives currently available. For these reasons, Atelier mécaniques Dostert has enjoyed international demand for its product. The jury felt that Dostert epitomised an innovative company that not only devised a solution to a customer problem but created a new product for which there was widespread need. Ateliers mécaniques Dostert was the gold prize winner of the innovation in skilled crafts award in 2006, the first year the competition was held.

Providing convenience and efficiency

The bronze award winner was tyre specialist Pneu Plus, for the project “Mounting Tyres at Home”. The company assembled a mobile workshop with all the tools needed to change tyres at the customer’s residence or office and provide services that include checking tyre wear, pressure and balance.

By bringing the tyre workshop to the customer, rather than the reverse, Pneu Plus offers both convenience and time savings to clients in Luxembourg and throughout the Greater Region. The jury was impressed by the simplicity and originality of the concept and felt Pneu Plus demonstrated that innovation is not necessarily synonymous with complexity.

The jury, chaired by CRP Henri Tudor’s CEO Marc Lemmer, commented that the nominated projects “excelled in including a new skill or technology in their trade, in demonstrating economic and financial realism, and in the ability to manage a project and to create value in Luxembourg”. ♦

Luxforge Metal Conception

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Ateliers mécaniques Dostert s.à r.l.

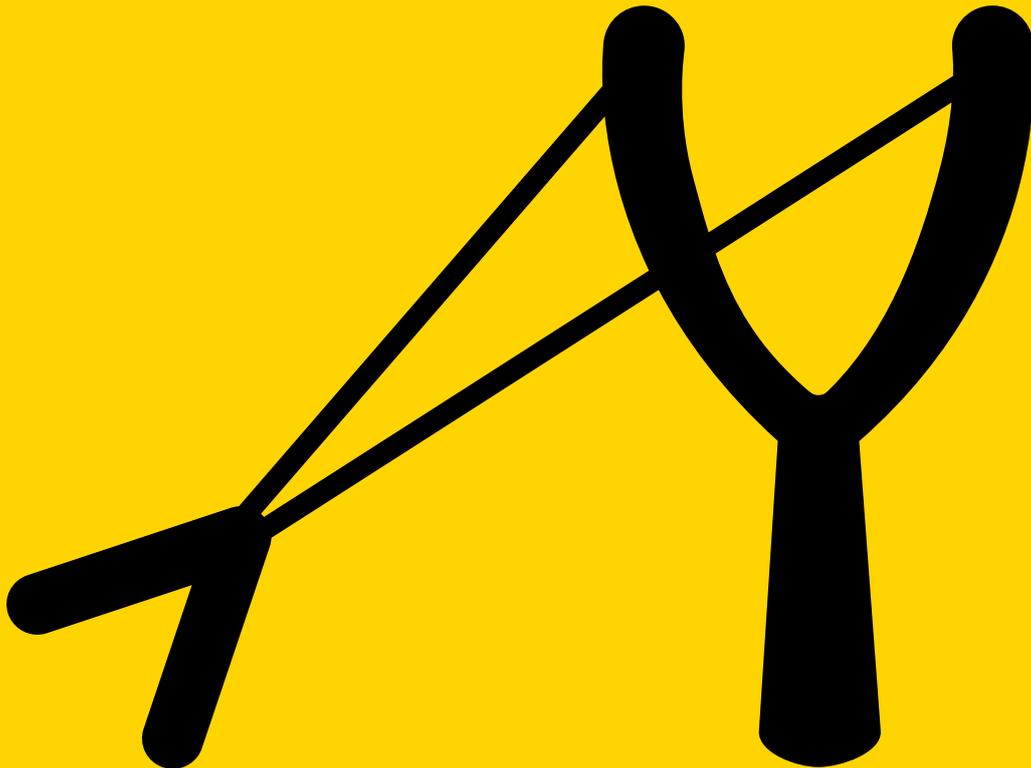
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NEWS



© House of BioHealth

A new home for biohealth

As a next step towards meeting the needs of Luxembourg's growing biotechnology sector, a unique facility, the House of BioHealth, is under construction close to the future City of Sciences in Esch-Belval. The House of BioHealth, which is expected to open its doors in early 2014, will offer office space and laboratories to host start-ups and established companies in the fields of biotech, cleantech and information and communication technology.

The aim of the House of BioHealth is to stimulate the creation, establishment and growth of companies and the transformation of research results into marketable products and services. With a total of around 10,000 m² of laboratory space, the building will be able to host between 500 and 700 researchers. The House of BioHealth is a joint project between the Luxembourg Ministry of the Economy and Foreign Trade, the ZARÉ park for economic activities in Esch-Alzette and private investors interested in boosting the development of the private sector in this field. ♦

www.houseofbiohealth.lu

Moyasoft chooses Luxembourg

Luxembourg is an attractive location for the European operations of international online and mobile game companies. In February 2013, Moyasoft, a leading mobile phone game company from Korea, announced that it had set up its European headquarters in Luxembourg. Moyasoft will manage its European business through the Luxembourg office and will also use it as a platform for other Korean mobile game companies.

Moyasoft chose to set up a branch in Luxembourg after learning about the Grand Duchy's attractive business solutions during the 2012 ICT Spring event in Luxembourg. The online company opted for a Europe4Startups package, which offers e-business and multimedia companies 12 months of unlimited premium cloud hosting, networking and business services. Luxembourg's favourable tax regime was a consideration, but Moyasoft was also attracted by the reasonable costs and quick process of establishing a business in Luxembourg. ♦

www.moyasoft.com
www.europe4startups.com

LuxCloud – a “Cool Vendor” of cloud services

IT company LuxCloud is a leading global, channel-centric marketplace that provides an innovative solution for the distribution of Software as a Service (SaaS) applications. Founded in 2010 and headquartered in Luxembourg, it offers a scalable and flexible platform that fully equips international sales and software partners with all they need to successfully launch and deliver cloud services. Service providers and telecom operators find tools to automate the online sale of their hosted applications, and software partners can deliver SaaS solutions via LuxCloud's vast network of resellers. This system provides a quicker time to market and a smoother revenue path than the fluctuating sales of traditional software licences.

The world-leading information technology research and advisory company Gartner has recognised the innovative character of LuxCloud's solution by proclaiming the up-and-coming ICT company a “Cool Vendor” in 2013. “Cool Vendors” are companies that transform the way businesses operate and consumers engage with technology. ♦

www.luxcloud.com

SOUND INFORMATION FOR SOUND SOCIAL POLICY

Policies promoting greater equality cannot be fully effective unless they are based on relevant, reliable information. CEPS/INSTEAD, a Luxembourg research centre, is determined to provide the necessary data for discussions and decisions in this area. *FOCUS* approached CEPS/INSTEAD's new director, Dr Hilmar Schneider, to find out more about his plans for the Centre and his drive to raise its profile at international level.



Hilmar Schneider, Director, CEPS/INSTEAD

CEPS/INSTEAD – Luxembourg's Centre for Population, Poverty and Public Policy Studies/ International Networks for Studies in Technology, Environment, Alternatives, Development – was founded in 1978, within the framework of the first EU programme to combat poverty. It was formally established as a scientifically, administratively and financially autonomous institute in 1989.

As a public research centre specialising in the social sciences, CEPS/INSTEAD conducts research on social networks, poverty and equality in the wider context of socioeconomic policy. "Social equality is not only an issue in Luxembourg, but an issue all over the EU. Since we do not know enough about these problems, we need an institute to conduct research on social policy based on strong data," Dr Schneider explains.

Exploring equality

"CEPS/INSTEAD's research activities include both applied and basic research," he continues. The Centre's applied research is primarily geared to informing debate and decision making on social policy in Luxembourg, while basic research activities focus on developing models of measurement, e.g. for social mobility.

The Centre's three research departments – Labour Market, Living Conditions, and Urban Development and Mobility – reflect its main areas of interest. Key topics include the dynamics of the labour market, family policy relating to work-life balance, inequality and poverty, as well as health and ageing. With a current staff of 120 employees, 90 of whom are researchers, the Centre has grown remarkably over the past 30 years and now has an annual operating budget of €15 million.

Research across borders...

Luxembourg's central geographical location gives CEPS/INSTEAD a good basis for research into cross-border issues. The unique nature of its labour market, characterised by a very high percentage of the workforce commuting every day to the Grand Duchy from neighbouring regions in Belgium, France and Germany, opens up particularly interesting avenues for research.

One of the most famous offspring of CEPS/INSTEAD is the Luxembourg Income Study (LIS), a massive undertaking launched in 1983 that was an important milestone in the Centre's development. The LIS, which is now conducted independently from the Centre, is a cross-national data centre that provides researchers, educators and policy makers at home and abroad with harmonised micro-data from high- and middle-income countries around the world. CEPS/INSTEAD has since expanded its scope to encompass themes such as housing costs, land availability, child poverty, cross-border metropolis development as well as commuting issues related to the development of cross-border work.

The creation of vast cross-border micro datasets enables researchers to investigate the impact of various differentials on growth and equality. “Research conducted at CEPS/INSTEAD in Luxembourg goes beyond borders and can be expanded to the EU as a whole,” Dr Schneider explains.

... and across disciplines

The Centre is also characterised by its cross-disciplinary staff, which includes demographers, economists, geographers, lawyers, psychologists, methodologists, sociologists and statisticians. Dr Schneider himself holds a degree in social sciences and economics from the University of Frankfurt am Main. Before joining CEPS/INSTEAD in April 2013, he was the policy director of the Institute for the Study of Labour in Bonn. Prior to that, he managed the labour market department of the Halle Institute for Economic Research, also in Germany.

To unlock the full potential of the Centre’s complementary range of expertise, Dr Schneider has initiated a series of cross-disciplinary internal seminars. “This is a very rewarding aspect for me as the new director. I can immediately see the benefits of these seminars and the potential for cross-disciplinary ideas to foster new research,” he explains. Seeing his teammates develop promising ideas for exciting new projects brings his vision for the Centre closer to reality.

The aim of CEPS/INSTEAD is to position itself as Luxembourg’s key entity in social science research, but the new director aims to take the Centre to another level by developing it into a key institute for research into social equality at European level.

Fostering excellence

In order to meet this objective, Dr Schneider intends to strategically position CEPS/INSTEAD to attract world-renowned researchers and promising post-doctoral students in the domain of social policy. He is also planning to expand into the areas of economic geography, residential mobility issues and wage differentials. Dr Schneider is keen to attract highly productive researchers who are committed to academia by offering a competitive research environment with access to quality data. As an added incentive, he intends to introduce a performance-based salary system.



The best way to achieve his goals for the Centre, says Dr Schneider, is to have strategic steps in mind. His approach, he tells *FOCUS*, will be to “foster a creative environment where researchers can prosper and have the tools they need to complete their research through incentives and encouragement”.

The Centre also intends to establish extensive research networks and strengthen its partnerships nationally and internationally. It is combining outstanding research, extensive partnerships and strategic vision in order to claim its place in the global research arena. ♦

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REDESIGNING PENSION SYSTEMS AS POPULATIONS AGE

Professor Rajnish Mehra is the author and researcher behind one of the most cited papers in financial economics – *The equity premium: a puzzle*. He has recently been named Deutsche Bank Chair of Finance at the University of Luxembourg. The Grand Duchy's stable political environment and legal framework, its reasonable taxation, its importance as a financial centre – Luxembourg has the second largest concentration of funds outside the US – and its commitment to education form an ideal backdrop for Professor Mehra's research on capital markets, pension systems and social security.



Eric Chénal

Rajnish Mehra, Professor, University of Luxembourg

One year into his Deutsche Bank Chair of Finance position at the Luxembourg School of Finance, Professor Mehra reflects on his time in the Grand Duchy: "I see Luxembourg as a place where my colleagues and I can build something special. For a workforce to be successful it needs to first invest in education; this is why Luxembourg's commitment to and investment in education through funding a top-calibre university was very appealing to me."

Professor Mehra views Luxembourg as an outstanding location to continue his research and delve deeper into pension system analysis. "Luxembourg's comparative advantage arises from its multilingual support systems, giving it a distribution advantage across different cultures, from its comprehensive and transparent regulation environment covering the whole spectrum of financial instruments and investment

vehicles, and from the fact that Luxembourg has experience in terms of product, distribution and reporting expertise," he explains.

Solidarity and sustainability

As one of his main research interests, Professor Mehra studies the demographics of ageing and their impact on pensions. Are the current systems still viable? Throughout history, people tended to die within five years of their retirement age. Today, the population is living longer, but it is not working longer (and is, to some extent, even retiring earlier). In view of these changes, he says, society has to reassess its approach to pensions in the interest of a sustainable economy.

To explain, Professor Mehra draws an analogy with a shrinking pizza: "It is the working population that makes the pizza," he says, "but the entire country that eats it. What happens when we do not have enough people to make the pizza for all of us?"

He also describes how low birth rates could contribute to this decline. "In China, for example, for every two people exiting the workforce, there is only one person entering it," he notes. This extreme example is due to China's one-child policy for population control, as a result of which two working parents generally have only one dependent. A few years on, this single child will have grown into a worker supporting two ageing parents, both of whom can expect to live far longer than their grandparents did.

Longer lives, longer careers?

Professor Mehra sees three possible solutions to this "pizza puzzle". The first would be to increase the tax paid by the people making the pizza. Not an ideal solution, as the workforce could then move to another country where they would have more incentive to work. The second would be to reduce the benefits given to the working and ageing population. Or, third, the retirement age could be increased.

While none of the above seems ideal, the sustainability of the current social system is called into question. Should the EU develop a North American approach to retirement? “The US does not have a mandatory retirement age for most jobs, but the EU has yet to adopt this model. Without a change, countries will find growth (via productivity) difficult to achieve,” he explains. Germany has increased the retirement age, but other countries are hesitant to do so.

Calling attention to the need for stable social systems and viable pension systems supporting them is ultimately the focus of Professor Mehra’s research. Finding suitable solutions, he says, will require a delicate balancing act.

Rajnish Mehra

Professor Rajnish Mehra was named Deutsche Bank Chair of Finance at the Luxembourg School of Finance – the Department of Finance of the Faculty of Law, Economics and Finance of the University of Luxembourg – in 2012. Currently on leave from Arizona State University, he is a research associate of the National Bureau of Economic Research, the largest economics research organisation in the US.

Professor Mehra has published in *Annals of Finance*, *Econometrica*, the *Financial Analysts Journal*, the *Journal of Economic Dynamics and Control*, the *Journal of Monetary Economics*, *The Review of Economic Studies* and other journals. His work has been featured in *Business Week*, *The Economist* and the *Financial Times*. He was awarded a Graham and Dodd scroll for excellence in financial writing by the Association for Investment Management and Research and is the author of the *Handbook of the equity risk premium* (Elsevier, Amsterdam, 2008). He obtained his PhD in finance from the Graduate School of Industrial Administration, Carnegie-Mellon University (Pittsburgh, USA).

Why Luxembourg?

Professor Mehra feels that he is “getting in on the ground floor” to develop something lasting and unique in Luxembourg, a location that he views as a great research environment. “There is a first-rate educational institute, a government that supports an educated workforce, human capital and a future characterised by a knowledge economy. Luxembourg is a financial centre, not just a banking centre,” he explains.

The aspect Professor Mehra most enjoys in his role at the Luxembourg School of Finance is mentoring and teaching the next generation. “The most enjoyable aspect of my day is teaching my PhD students. They are excellent students, on a par with the best I’ve seen in my career,” he explains.

Professor Mehra teaches courses in asset pricing and portfolio management, to name a few. He has high hopes for his department. “We hope to attract more people here, as we have excellent leadership and top-notch PhD students to mentor,” he adds. “The balance between teaching and research is ideal – it has been a very productive year.” ♦

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HOW TO PREDICT FLOODS AND DROUGHTS

Water is essential to life. Despite uneven distribution, there is, as such, no shortage of it – flooding constitutes a major risk in many parts of the world. That said, most of the world's water is unfit for agriculture and consumption. By improving our understanding of complex water systems, hydrologists such as CRP Gabriel Lippmann's Fabrizio Fenicia are increasing our ability to manage our precious reserves of freshwater sustainably and anticipate threats such as floods and droughts. Dr Fenicia's innovative approach to hydrological modelling has won him a National Research Fund award.



Eric Chénal

Fabrizio Fenicia, Project Leader, CRP Gabriel Lippmann

"Innovative research in water science is the key to a sustainable future," Dr Fenicia says of his work in hydrology. With environmental pressures increasingly jeopardising the world's rare resources, he knows that the quality and the availability of water will require extensive research in the years to come. "Our research is about trying to solve problems of water quality and water movements that no one has solved so far. It is a great feeling to think that I am working on something that will have direct benefits for future generations," he adds.

His determination to take the field another step ahead has not gone unnoticed. In October 2012, Luxembourg's National Research Fund presented him with its outstanding scientific

publications award for an article in the journal *Water Resources Research*. This article, entitled "Elements of a flexible approach for conceptual hydrological modelling", sets out fresh insights from his research on water movements. His work will help scientists to forecast water cycles and understand factors that contribute to water quality and floods.

A comprehensive, flexible mathematical model

Hydrology research provides information needed to prevent floods, avoid water contamination and predict droughts. It also produces crucial input for city development, since researchers can determine which regions have to be kept pristine and which can become urbanised. Key activities include analysing and measuring water cycles, water movement and water quality, and anticipating how much rainfall becomes free flowing water, how much evaporates and how much remains in the soil. A wide variety of factors relating to soil, vegetation and geology must be taken into consideration.

Research in modelling is a unique field within hydrology itself, combining scientific knowledge and mathematics to improve the understanding of water systems and solve water-related problems. It involves building mathematical tools that incorporate the many factors affecting water systems. "Modelling is a way to piece certain things together to predict what will happen or to answer a scientific question," Dr Fenicia explains. "For example, it helps us predict how high water levels will be in the streets following a large rainfall event – how will we know whether we can drive to work the next day?"

Usually, a "one-size-fits-all" approach is used, in an attempt to build a general model that applies to every situation. Dr Fenicia's research explains why, in hydrology, it is not possible to have one model that works everywhere.

“A flexible approach based on elements that need to be refined provides a customisable model that will ultimately lead to innovative solutions to water problems,” he explains. His research now focuses on how to continue using the research model he developed and refine it further.

A calling and a career

Last year, Dr Fenicia was asked to become a member of a new strategy unit within the International Association of Hydrological Sciences (IAHS), a non-profit organisation set up in 1922 to establish a structured scientific basis for the optimal utilisation of water resource systems. The IAHS made a conscious decision to select “younger” scientists (in their 30s and 40s) for the new unit, which will work on defining the direction of the association’s research over the coming decade. This appointment highlights the recognition internationally of the value of Dr Fenicia’s research.

“None of us are doing this for potential riches or glory – we conduct our research because we are committed to working in the field of hydrology and finding ways to fix water problems for a better future for all of us,” Dr Fenicia explains.

A pool of hydrological expertise

Dr Fenicia enjoys working inside a community of researchers at CRP Gabriel Lippmann, a public establishment devoted to applied scientific research and technological development as well as permanent technology transfer and high-level training. The hydrology research team is a group of 20 researchers within the CRP’s Environment and Agro-biotechnologies (EVA) Department. All are passionate about their work.

EVA is one of three major disciplines of the research centre, along with IT, Systems and Collaboration, and Science and Analysis of Materials. The EVA group aims to develop assessment tools for safeguarding natural ecosystems to protect their quality. The study of hydrology is the largest division of geosciences within the group. It started out with a single researcher only 15 years ago.



Dr Fenicia says that the CRP is an interesting location for high-level scientific research. “The Lippmann institute is expanding, while research in other countries is shrinking. This is a real opportunity to work in a place that is growing, with public funding and support. The research possibilities are innovative and ever-expanding,” he continues. “You can realise your research ideas in Luxembourg.” ♦

FNR Award for Outstanding Scientific Publications

Each year, Luxembourg’s National Research Fund (Fonds National de la Recherche – FNR) attributes awards honouring outstanding scientific monographs or articles published in peer-reviewed journals by researchers from public research organisations or non-profit associations in Luxembourg. The work’s relevance for Luxembourg is one of several stringent selection criteria for this award.

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FIVE QUESTIONS FOR...

CATHERINE LARUE, CHIEF EXECUTIVE OFFICER, IBBL

Dr Catherine Larue was appointed CEO of IBBL (Integrated BioBank of Luxembourg) in November 2012. Previously, she held numerous senior research and management roles with pharmaceutical and biotechnology companies in France and the USA, with most of her recent work focusing on personalised medicine. She is the author of 85 publications and has filed 13 patents. Like other biobanks, she says, IBBL collects and stores biological samples and associated data for use by researchers. However, it goes further, conducting biospecimen analysis and research using the latest technology.

What attracted you to IBBL?

I saw that Luxembourg is very committed to next-generation healthcare, particularly personalised medicine. I have been passionate about this topic for a number of years, and I was impressed with the people I met during my interview process. I was also excited by the prospect of working in an international environment.

What is your long-term vision for IBBL?

It is important to raise the profile of the Luxembourg healthcare sector through our achievements. We will continue working closely with our partners in Luxembourg on cancer, diabetes and Parkinson's disease. This will give researchers the potential to create disease-risk profiles. We will form international collaborations in order to gain access to large collections of biospecimens and develop the visibility for Luxembourg. This will ultimately allow IBBL to contribute to the improvement of healthcare.

What makes IBBL unique?

Thanks to our advanced and integrated infrastructure, including our laboratories, technologies and informatics platform, as well as our highly qualified and experienced staff, all biospecimens entering our facility are processed under optimal conditions. Our rigorous quality management system allows us to provide researchers with samples of the highest quality to conduct sophisticated, solid and reproducible investigations. In addition, we will soon start collecting unique biospecimens (faeces) to help researchers better understand diseases through the **microbiome**. We want to be one of the first biobanks to collect comprehensive data about the microorganisms present in a large collection of human biospecimens.

What has IBBL achieved in its short life so far?

To date, we have collected and stored 170,000 samples. We have created a functioning infrastructure to enable us to answer requests from researchers, other clients and suppliers. Our work is generating considerable interest — we have already raised €100,000 in EU funding, for example, and we have managed 20 research projects. We have also produced 20 publications and 34 scientific posters. I think this is rather good for a small institution that is only three years old.

What achievements are you targeting in the short to medium term?

We want to reach our goal of collecting one million samples in three years' time. We are focusing on Luxembourg at the moment, but we will expand to the regions neighbouring this country. We are also looking globally and are currently talking to colleagues in Asia about this. In addition, we are working to raise our profile and build projects with leading researchers and large, well-known institutions as well as with industrial partners. We also want to expand our partnerships through EU-sponsored projects. ♦

Microbiome: The totality of microbes (mostly bacteria) present in and on our body, some of which are hallmarks of specific diseases.

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