Eco-innovation in Luxembourg

EIO Country Profile
2016-2017
The Eco-Innovation Observatory functions as a platform for the structured collection and analysis of an extensive range of eco-innovation information, gathered from across the European Union and key economic regions around the globe, providing a much-needed integrated information source on eco-innovation for companies and innovation service providers, as well as providing a solid decision-making basis for policy development.

The Observatory approaches eco-innovation as a persuasive phenomenon present in all economic sectors and therefore relevant for all types of innovation, defining eco-innovation as:

“Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle”.

To find out more, visit www.eco-innovation.eu and ec.europa.eu/environment/ecoap

Any views or opinions expressed in this report are solely those of the authors and do not necessarily reflect the position of the European Commission.
Eco-Innovation Observatory

Country Profile 2016-2017: Luxembourg

Coordinator of the work package: Technopolis Group Belgium
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A note to Readers

Any views or opinions expressed in this report are solely those of the authors and do not necessarily reflect the position of the European Union. A number of companies are presented as illustrative examples of eco-innovation in this report. The EIO does not endorse these companies and is not an exhaustive source of information on innovation at the company level.

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Summary

Eco-innovation and the circular economy continue to be a major priority for Luxembourg. Like in 2015, the country is ranked fourth in the 2017 Eco-Innovation Scoreboard (Eco-IS), which confirms its leadership in this field. In 2012 and 2013, Luxembourg was ranked 11th and seventh respectively.

The most relevant eco-innovation trend over the past few years has been the government’s focus of the on the circular economy model, as a way to diversify Luxembourg’s economic activities and promote competitiveness.

Eco-Innovation and the circular economy are considered to be cross-sectorial topics and are therefore implemented by a large number of public authorities. As a result, these are fully integrated in the “Third Industrial Revolution (TIR)” Strategy in which circular economy is a horizontal axis that is integrated into the 6 vertical pillars, food, industry, building, energy, mobility and finance.

In 2015, an inter-ministerial committee was created under the leadership of the State Secretary to bring together public actors and to foster a consensus in regards to the circular economy. The committee established four working groups that are focusing on finance and regulation, new business models, products and services as well as public procurement and education.

Besides the traditional actors like the Ministry of the Environment and the Ministry for Sustainable Development and Infrastructure, the Ministry of the Economy plays an important role by co-financing sustainable technology developments, setting up and supporting pilot projects in different areas, federating the public and private actors and by building an ecosystem for the circular economy. Luxembourg has recognised the economic potential of the circular economy and is strongly committed to implement this new model in the Grand-Duchy and in close collaboration with its neighbouring regions.

In recognition of the achievements in circular economy, Luxembourg was chosen to organise the 2017 Circular Economy Hot Spot event that hosted more than 500 participants from all over the world.

The main eco-innovation drivers of the country include strong political support and commitment towards eco-innovation and sustainable development, and the recognised need to diversify the economy for economic growth and productivity.
Introduction

Luxembourg is a small and stable high-income economy and has historically featured solid growth, low inflation and low unemployment. The economic strength of Luxembourg relies on an economic model based on attractive fiscal rates and good infrastructure, which has enabled an economic transition from traditional industries to the services sector. Today, Luxembourg’s economy is dominated by services, including banking, insurance, real estate and services to businesses. In 2015, the services sector represented 87.7% of the country’s GDP, and 80% of its exports.

The economy is dependent on cross-border workers (primarily from Belgium, France, and Germany) for about 43% of its labour force. It should also be noted that 75% of the labour force does not have Luxembourg nationality. As a consequence, Luxembourg has experienced increased transport flows, mainly by road, and the population growth has put greater pressure on housing, public services and infrastructure.

The country has little natural resources and imports most of its raw materials and energy sources. Consequently, its economy is particularly exposed to fluctuations in material prices and costs, putting pressure on the country’s industry. As for most European Union countries, Luxembourg’s industry is still suffering from the economic crisis, as well as increasing competition from emerging countries.

With the above in mind, eco-innovation and the circular economy in particular are seen as significant drivers to stop the relative economic decline of the country and to reverse the trend, through adapting new business models, developing new skills and markets and increasing the competitiveness of Luxembourg companies.
1 | Eco-innovation performance

The analysis in this section is based on the EU-28 Eco-innovation scoreboard (Eco-IS) for the year 2017. Via its composite eco-innovation index, Eco-IS demonstrates the eco-innovation performance of a country compared with the EU average and with the EU top performers. Produced by the Eco-Innovation Observatory (EIO), the Eco-IS is based on 16 indicators, which are aggregated into five components: eco-innovation inputs, activities and outputs, and environmental and socio-economic outcomes.

Figure 2.1 EU-28 Eco-Innovation Scoreboard 2017, composite index

Luxembourg is ranked fourth with equal points as Germany in the Eco-IS 2017, which is a solid result as it came up third in the Eco-IS 2015 that was published in the previous report. The country’s performance between 2015 and 2017 confirms that Luxembourg has become an unquestionable top player within Europe in eco-innovation – the country was ranked 11th in 2011 and seventh in 2013. Luxembourg performs above the EU average in resource efficiency outcomes and socio-economic outcomes. Luxembourg also performs significantly above the EU average in the share of total employment dedicated to R&D labour force and researchers and also in resource efficient outcomes such as material productivity and water productivity.
Eco-innovation inputs

Luxembourg’s performance in eco-innovation remains constant with the EU’s average, with an index of 104 against 100, positioning the country 8th in the EU (up one position since the 2015 report. Though that score does not reach the record achieved in 2013 of 142, 104 is a good score. This result is driven by excellent performance in R&D personnel and researchers, which represents 2.01% of total employment in 2016 which makes the country 2nd in Europe for this indicator. This puts Luxembourg just behind Denmark, with a share of 2.19%. It is important to take note that with such a small population, Luxembourg has fluctuating values for a range of indicators.

Eco-innovation activities

Luxembourg ranks 8th for this indicator (up 6 positions since the 2015 report), with a score of 124, above the EU average of 100 and slightly above its 2015 performance (score of 115). The country’s average score is very much impacted by its low number of ISO 14001 registered organisations. With only 87 registered organisations, this is in absolute value, the second weakest performance in the EU, with only Cyprus scoring lower with 67. However, in proportion to its population, Luxembourg is ranked 20th, above Austria and Germany. Data regarding firms that have implemented innovation activities aiming to obtain benefits, both for the company and the end user, is above the EU average however this indicator is not available for a number of countries, such as France, the United Kingdom and Spain.

Eco-innovation outputs

Luxembourg tops the ranking for eco-innovation outputs once again, with a score of 220, which represents an increase of 15 points compared to 2015 and makes it first in the ranking as that score is more than double the EU average and is significantly higher than in 2013, when it achieved
a score of 121. The country is ranked as a top player with Greece and Spain in regards to the number of hits per electronic eco-innovation related media. Although the absolute number of electronic media sources related to eco-innovation is among the lowest in the EU, Luxembourg is still the most active country when considering the number of inhabitants. The absolute number of eco-innovation related publications is also very low (29) which makes it the 3rd lowest in the EU however once again, in regards to its population it achieves the 4th best score with 50, behind Finland who is first (56), Sweden (54) and Latvia (52).

Luxembourg also performs above the EU average for eco-innovation-related patents per million people (18.8), despite only 10 patents being registered in Luxembourg in 2014, compared to 4367 in Germany the same year.

**Resource efficiency outcomes**

Luxembourg is 1st in the EU ranking for resource efficiency outcomes with 183 points. The country has the 4th best score in material productivity which stands at €3.53 of GDP per kilogramme of domestic material consumption (EUR/kg). That is an increase of €0.24 compared to the result that was published in the 2015 report. Luxembourg performs better than the EU average regarding energy productivity, with €10.75 GDP per tonne of oil equivalent (EUR/toe) which is an increase of €2.14 compared to the data published the 2015 report, while the EU has got an average of €9.66 EUR/toe. Its greenhouse gas (GHG) emissions intensity stands at 0.26 CO₂ equivalent per euro of GDP, lower than the EU average at €0.30 but higher than the best performers, Sweden (0.16) and Malta (0.22). Finally, regarding water productivity, Luxembourg tops the ranking equally with Sweden.

**Socio-economic outcomes**

The socio-economic outcomes index (72) improved for Luxembourg since 2015 report, but is still below the EU average (100). The result is driven by a low eco-industry employment share of the total workforce (0.5%), in comparison to the EU average (2.53%). In 2016, total eco-industry exports amounted to €123 million compared to €147 million in 2014, translating into 0.86% of total exports and that actually makes it a top player in proportion to its capacity. However, the generated revenue in eco-industries in 2016 was 1.02% of total revenue across all companies, below the EU average at 1.82% and that makes Luxembourg 25th out of 28.
2 | Selected circular economy and eco-innovation areas and new trends

Efforts to promote eco-innovation and the circular economy in Luxembourg are mostly led by public-private partnerships and structured around the TIR strategy including key actors like the Ministry of Economy, the Ministry of Sustainable Development and Infrastructure, the Eco-Innovation Cluster, MyEnergy and LuxInnovation (the national agency for innovation and research).

The Eco-Innovation Cluster gathers companies, research institutes and public organisations involved in the field of eco-technologies, with the objective of creating and developing new sustainable opportunities through collaborative R&D and innovation projects focusing on material flows, industrial material loops and the bio economy.

LuxInnovation accompanies businesses and researchers in developing and implementing innovative projects in order to support the government in its innovation and R&D policies. It is a network of reference in the EU regarding R&D and innovation and represents the Luxembourg contact point for the European Horizon 2020 programme. Its main focus areas include eco-technologies, materials and production technologies.

Leading innovative areas in Luxembourg have been stable since 2013. However there has been a noticeable rise in the attention given to the circular economy and related initiatives. Over the past few years, focus on the circular economy has been reinforced, in line with the government’s commitment in December 2013 to further encourage the development of a circular economy in Luxembourg as a lever for competitiveness. The circular economy model is viewed as an opportunity for Luxembourg to diversify its economic activities and to enhance companies’ competitiveness. Luxembourg wants to position itself as the material hub and service provider with its bordering regions and beyond.

The Ministry of Economy, LuxInnovation and the Luxembourg Eco-Innovation Cluster work closely together to promote circular economy. In 2015, LuxInnovation created a new support scheme – “Fit4Circular” – to help small and medium-sized enterprises (SMEs) transition towards a more circular economy (see box below). The President of the Eco-Innovation Cluster, Roman Poulles, heads the strategy of the cluster, focusing on the following themes: material flows, industrial loops and the bio economy.

The Cluster has set up working groups working on material loops including plastics and paper. It is collaborating with partners in the Greater Region (neighbouring regions from Germany, France and Belgium) and is an active founding member of the Greater Green initiative\(^1\), a meta-cluster established through an Interreg project.

The rational use of natural resources and material science are still strategic priorities in Luxembourg. Regarding material science, the focus areas include new advanced materials, biomaterials and materials for sustainable construction. Intelligent design, cradle-to-cradle and life cycle analysis approaches are taken into consideration, with a view to achieving a reduced carbon

\(^1\) https://www.greatergreen.eu/
footprint. With respect to the rational use of natural resources, the following sectors have been identified as being the most promising for Luxembourg’s economy:

- Circular Economy
- Smart Cities
- Water
- Energy
- Buildings

To support the national actors for their efforts, the Ministry of Sustainable Development and Infrastructure and the Ministry of the Economy have established a help desk for the REACH programme in collaboration with the Luxembourg Institute of Science and Technology.

**Low-carbon, sustainable mobility** remains a key eco-innovation priority in Luxembourg and a promising sector to further develop the diversification and greening of the economy through the experimentation of new innovative solutions in a small and integrated environment. In October 2013, the Ministry of Economy and Foreign Trade and the Ministry of Sustainable Development and Infrastructures, together with Sales-Lentz and Volvo Buses, signed a Memorandum of Understanding (MoU) on the establishment of Luxembourg as a test arena for a sustainable public transport system. The MoU is based on the testing of Volvo’s plug-in hybrid system for electric public transportation, which has been integrated into regular scheduled services since 2015. The centre is specialised in the training of bus operators, maintenance, safety and rescue personnel. It also works as an R&D centre and serves as a platform to develop new services in the field of vehicle, fleet and traffic management (Volvo Buses, 2013).

Luxembourg considers itself as a “living laboratory” for smart mobility. Its small size enables it to experiment with new services for the mobility of people and goods (freight), using new clean technologies and the Internet. In 2017, the Government of Luxembourg signed an agreement with their German and French counterparts in order to establish the French-German-Luxembourgish cross-border Digital Test Bed. A collaboration on connected, automated and cooperative cross-border mobility specifically prepared for the highways between Luxembourg-City, Saarbrucken and Metz. It has been recognised as one of the leading test beds in this field by the European Commission.

In order to go forward with the development of electric mobility, Luxembourg has concluded a partnership with the Volvo Bus corporation to test plug-in hybrid buses. The operation is currently rolling out 1,600 charging points for e-vehicles across the country as well as smart meters for all households, and new tax abatements have been decided for 2016 to encourage people and companies to use more electric cars and bikes.²

The popular bike sharing service “Veloh” has undergone a new tendering procedure in 2017 and the operator will replace the regular bikes with electric bikes by July 2018. The public authorities have also tendered an app called “copilot” providing a platform for ride sharing.

The eCoBus project by the University of Luxembourg (UL) and the Luxembourg Institute of Science and Technology (LIST) aim to design and assess a system approach exploiting the potentials of the new Cooperative Intelligent Transportation Systems (C-ITS) paradigm to meet the requirements

of the next generation Public Transport (PT) systems. Such systems put an emphasis on green vehicles, increased comfort, and operating costs reduction³.

Sustainable cities and smart technologies are eco-innovation areas on the rise. In the last few years, projects have been developed to enlarge Luxembourg’s technical competences, in order to foster renewable energy and energy storage and the rational use of natural resources. In particular, households are being equipped with smart metering systems. By 2019, it is expected that more than 90% of households will benefit from this system for electricity and gas, and smart metering systems for water consumption will be added later as well. Those smart metering systems can enable more precise measurements and monitoring of electricity and gas consumption and production, to the nearest quarter of an hour.

In line with the prosumer principles, a new law proposal is currently undergoing the procedure to become effective. The law will support the auto consumption of locally produced electricity for households but also cooperatives⁴.

To support sustainable and low energy housing, Luxembourg introduced a mandatory passive house standard for all housing buildings on January 1st, 2017.

Implementing the circular economy

To establish the circular economy, all actors need to be involved. The TIR strategy includes eco-innovation on all levels, in particular the circular economy that is one of the horizontal axis⁵.

³ For further information, please visit: https://www.fnr.lu/projects/electrified-cooperative-bus-system/
⁴ For further information, please visit: https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2018/03-mars/01-schneider-autoconsommation.html
⁵ For further information, please visit: http://www.troisiemerevolutionindustrielle.lu/
Besides integrating circular economy in all vertical pillars of the strategy and supporting companies to develop circular economy business models, services and products, some specific initiatives have been launched that are targeting specific actors or projects.

To encourage municipalities to take on initiatives in this regard, the government is closely working with the municipality of Wiltz, the circular economy pilot municipality, to integrate circular economy principles in all aspects its operations as well as implement specific circular pilot projects on the territory of Wiltz.

The agency “MyEnergy” is running the “Climate Pact” programme in which all municipalities within Luxembourg participate on a voluntary basis and which was until now focusing on reducing the energy consumption and CO2 production of communes. In 2017, MyEnergy integrated circular economy criteria in the catalogue of measures and after a first test phase with selected municipalities, the circular economy will be fully integrated in the Climate Pact programme to stimulate all areas to start their transition towards the circular economy.

The Ministry of the Economy has recognised the importance of federating actors from industrial parks to increase the efficiency of these areas and to implement the circular economy among all stakeholders of these parks. The ministry has therefore developed a methodology to guide the actors and to identify the circular opportunities that will then be turned into a roadmap for a circular zoning.

The working group on circular education is developing an educational unit to teach the basics of circular economy that should be tested during the scholar year 2018/2019 with the goal of implementing it into the regular school programmes.

In 2015, Luxembourg and the European Investment Bank have cooperated on a study analysing the impact and opportunities of the circular economy for the finance sector. Besides a comprehensive report, the collaboration led to the modification of the eligibility criteria of the InnovFin Advisory programme in order to include circular business innovation.

Luxembourg is also actively participating in the circular economy working group of the BeNeLux Union that is currently running a study on the reparability of goods.

The Institute of Civil and Environmental Engineering (INCEEN) is a new institute established by the University of Luxembourg. It is an interactive and living research laboratory acting as testbed for new ideas and solutions in civil and environmental engineering that has included life cycle and circular economy oriented construction engineering in its priorities.

The SuperDreckskëscht (SDK, chamber of commerce) already recognised as the best practice in the field of natural resources preservation and climate protection is continuing to improve its offer in the field of circular economy. One of the newest developments is the “product potential”

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6 For further information, please visit: https://www.wiltz.lu/fr/vivre/la-commune/economie-circulaire/charte-pour-l-economie-circulaire
7 For further information, please visit: http://www.pacteclimat.lu/fr/actualites/2018/01/economie-circulaire#article_48
8 For further information, please visit: http://ecocirc-zae.lu/
9 https://wwwfr.uni.lu/recherche/fstc/research_unit_in_engineering_sciences_rues/research_areas/institute_of_civil_engineering_and_environment_inceen
10 For further information, please visit: http://www.sdk.lu/index.php/lu/
scheme\textsuperscript{11}. SDK evaluates and certifies the potential of a product to be reintegrated into new value streams after its use.

The new public procurement law is giving more weight to criteria other than the lowest price and encourages innovative and green public procurement. The laws framing the co-financing measures for R&D and clean procurement demonstrate a clear commitment and important tools to support the clean technologies development and uptake by Luxembourg's companies.

Public procurement is an important enabler for the circular economy. A dedicated working group has been established to develop guidelines and best practices for circular public procurement. Pilot projects like the Automotive Campus, the 2020 World Expo pavilion in Dubai or the numerous urban districts that are under development are creating a market for circular products and are raising awareness.

In 2017, Luxembourg established the “Wood Cluster”, with the aim to maintain, rebuild and develop the wood and timber value chain in Luxembourg. The potential of the locally grown wood is not fully tapped today and over the years, more and more added value was generated outside Luxembourg and the Greater Region or even the EU. By fostering innovation and integrating the circular economy principles in the local, national and regional wood and timber industry, the Cluster is reducing the ecological footprint while at the same time developing new economic activities. The Cluster is working closely with its peers from neighbouring regions.

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<tr>
<th>Fit 4 Circularity</th>
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<tr>
<td><strong>Fit4Circularity</strong> is a new support scheme created in 2015 by LuxInnovation and targeting SMEs, following the Fit4Digital and Fit4Innovation initiatives.</td>
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<tr>
<td><strong>Fit4Circularity</strong> is dedicated to helping SMEs that are willing to make a more substantial commitment to sustainable development practices and to implement a circular economy approach. The objectives are to limit the use of raw materials, maximise the use of renewable sources, develop innovative products and services for sustainable growth, reduce energy consumption and increase recyclability.</td>
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<tr>
<td>LuxInnovation, the Innovation Agency of Luxembourg, along with external consultants, will help SMEs apply for the scheme and implement their projects. Expected results of the Fit4Circularity scheme are improved competitiveness and increased revenues for SMEs. Different kinds of projects can be eligible for support: technological innovation, organisational innovation and investment.</td>
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<td>Key words: circular economy, competitiveness, innovation</td>
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<td>Contacts : Mr. Jean-Michel Ludwig, Head of Department Start-up Creation &amp; SME Performance, LuxInnovation – <a href="mailto:jean-michel.ludwig@luxinnovation.lu">jean-michel.ludwig@luxinnovation.lu</a> / Tel. +352 43 62 63 667</td>
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\textsuperscript{11} www.productpotentials.com
Luxembourg is keen to showcase circularity in action by exhibiting the progress achieved in the last two years during the Luxembourg Circular Economy Hotspot 2017; a major three-day event that offered a forum for debate, exchange, face-to-face meetings and networking for 200 delegates from Europe and beyond complemented by 300 local actors.

From 20 to 22 June 2017, participants heard from high-level government and industry leaders about how to turn challenges into opportunities by embracing the circular economy as a key lever for sustainable growth and profitability. Most of the event, however, was devoted to project and company visits that gave participants insight into Luxembourg’s circular innovations and demonstrated how enterprises and other stakeholders can be an engine for change.

Finally, because the success of circular systems and activities depends on how well stakeholders within and across borders cooperate, the Luxembourg Circular Economy Hotspot 2017 gave participants numerous opportunities to network, interact, and learn in a relaxed and friendly atmosphere in order to speed up the transition to a circular economy.

3 | Barriers and drivers to circular economy and eco-innovation in Luxembourg

The main drivers of eco-innovation in Luxembourg have not changed fundamentally since the last report. However, a growing and distinct attention is paid to the circular economy concept compared to a few years ago and businesses are increasingly aware of the economic benefits entailed. Drivers for eco-innovation include the following:

- **Strong political support and commitment towards eco-innovation, sustainable development and the circular economy.** The government has the political will and commitment to make the country a global technology hub for eco-innovation. The objective is to develop and grow in niche markets. Furthermore, the circular economy as such has clearly been on the agenda of the government since 2014, and has since been anchored in the TIR strategy as one of the three main horizontal topics to be addressed by all stakeholders.

- **Growing awareness from businesses to achieve further commitment to a circular economy.** A strategic committee for a circular economy as well as 4 dedicated working groups (finance and regulation, new business models, products and services, education and public procurement) were set up within the government, working on promoting the concept and its economic and environmental benefits among businesses. Companies are increasingly aware that the circular economy brings concrete solutions to the volatility of energy and raw material prices and enables them to rely on a more stable business model that is beneficial for both their competitiveness and their environmental impact. Support measure like the Fit4Circularity programme have convinced several companies to develop circular economy products and models.

- **Strong and comprehensive set of national environmental and innovation laws.** These are largely based on European legislation and have been an effective tool for implementing relevant policies and a main driver for the promotion of eco-technologies and eco-innovation. The public procurement law as well as the laws to support R&D and green procurement in companies have recently been renewed and are giving more importance to clean solutions.

- **Economic diversification is a priority.** To lower its dependency on the financial sector, Luxembourg has strived to diversify its economy for years and strongly supports and develops sectors such as clean technologies. The country also wants to continue to promote new concepts such as the circular economy, as a way of increasing competitiveness. Sustainable development in general, and green technologies, eco-innovation and the circular economy in particular, are part of a national plan to diversify the national economy with new promising industries.

While the circular economy is gaining momentum within the government and industry, the downside is that market and the needed enablers are not always available for innovative projects due to a lack of understanding or commitment from actors. A true circular product is not only designed to be circular but also needs to be handled in a circular way throughout the value chain. Getting the timing right to align all actors is a challenging task but crucial. Getting the ecosystem right as well as balancing demand and offer are key issues to be addressed. Other barriers include:
- Stress on resources to balance economic growth and environmental protection. Luxembourg enjoys a central and strategic location in the heart of the European Union. It plays an important role in the greater region, as it is the main economic engine with an important number of commuters and foreign residents. The interdependency of Luxembourg and its geographic neighbours is strong, putting pressure on the demand for housing, services and infrastructures, and to strong transport flows. This leads to rising energy demand, in particular for buildings and transport. All eco-innovations that have a broader impact or that require a holistic approach to development will have to be made in collaboration with the bordering regions, and material flows will need to be coordinated and optimised.

- Small national market for eco-innovations. Luxembourg is a small country with few natural resources and it imports most of its raw materials and energy sources. Its economy is thus particularly exposed to fluctuations in material prices and costs, putting pressure on national industries. Nevertheless, because of the small size of the country and the framework conditions and policies in place, the local market is flexible, which makes the country an ideal place to test innovative R&D. Moreover, in order to make innovations expand, innovators need to look beyond the national borders.
4 | Policy landscape: towards circular economy in Luxembourg

The government pays particular attention on the circular economy model because of its desire to strengthen the competitiveness of the country. The aim of this model is two-fold: reducing the environmental impact of Luxembourg’s industries and raising its competitiveness through innovative business models and cost reductions.

In 2014, the Ministry of Economy, one of the main stakeholders involved in the Eco-Innovation Cluster, commissioned a study entitled “Luxembourg as a Knowledge Capital and Testing Ground for the Circular Economy – National Roadmap for Positive Impacts. Tradition, Transition, Transformation”. The aim of this study was to investigate the current situation in Luxembourg, the economic potential of a circular economy and to develop a strategy to implement such a paradigm shift. The study found that a circular economy is a source of competitive advantage, as it would lead to increased job opportunities (more than 2,200 jobs in the next three years), important cost-savings (€300 million to €1 billion per year) and less pressure on the environment. In addition, embracing a circular economy would increase the inflow of secondary raw materials that industries rely on, reinforcing their interdependency and substantially reducing waste production. Luxembourg is considered to be a fertile ground for the testing of a circular economy, based on the country’s values of “equity, cultural tolerance, economic stability, responsive government and manageable size” (EPEA, 2014).

This study then led to a Rifkin roadmap, which integrated circular economy as a horizontal axis bringing circularity to all the six vertical pillars (see page 8). Energy, mobility, building, food, industry and finance, are all the sectors that have been identified as the essential contributors for an efficient circularity in Luxembourg.

In order to work towards a more circular economy and to reach its expected benefits, the government acknowledges that all relevant stakeholders must be united, in terms of coordinating their actions and sharing information. This was the rationale behind the establishment of the inter-ministerial committee “Strategic group for a circular economy”, which was set up in 2015, led by the State Secretary Mrs Francine Closener.

As demonstrated in the following diagram, the strategic group for Circular Economy still exists but is now embedded in a larger governance in which it reports to the strategic monitoring committee and is itself overseeing the work of four different working groups.
Among these coordinated actions was the organisation of an international conference on the financing of a transition towards a circular economy in December 2015. It was held at the European Investment Bank (EIB) headquarters in the framework of the Luxembourg Presidency of the Council of the European Union from July to December 2015 and the InnovFin Advisory programme\(^\text{12}\) on financing the circular economy. The Presidency provided Luxembourg with the opportunity to engage in a partnership with the European Commission and the European Investment Bank, with the objectives of raising awareness among the business and financial communities, to assess future financing needs and to determine whether the existing financial instruments, in particular the InnovFin financial products, are fit to support the transition to a more circular economy. Conclusions and recommendations were published in a report entitled “Assessment of access-to-finance conditions for projects supporting Circular Economy”. According to the study, transitioning to a circular economy is imperative, but must be done in a systemic and integrated way to be effective, notably taking into account the regulatory landscape, and the need to build intelligence, share information and raise awareness. This could be done, for example, by creating a platform gathering stakeholders from business and financial communities and providing technical and investment advice to help promising projects materialise. The study also found that market forces alone could create a circular economy, but only slowly and with potentially high opportunity costs. Therefore, public intervention and support are crucial. Regarding financing, the European Investment Bank provides financial support through loans to firms, yet more needs to be done, especially for SMEs. Likewise, InnovFin can support projects that entail “technological innovation”, but projects based on innovative organisation or business models, for example, are currently outside its scope. Eligibility criteria thus need to be expanded.

With regard to businesses, the government has developed a trademark – the SuperDrecksKëscht (see box on following page) – in order to incentivise businesses to better manage their waste.

rationalise their resource consumption and transition towards a more circular model. The SuperDrecksKëscht is a particularly effective vehicle for the government to deliver its messages to the private sphere, given the popularity and respect it holds from businesses.

The circular economy is also fostered by the government through the development of economic activity zones and ‘eco-neighbourhoods’ based on circular principles. These zones promote low-carbon mobility, industrial symbiosis and collaborative consumption (equipment, machinery, cars, facilities, nurseries, resources, electricity supply, with purchase agreements at a preferential rate, etc.). The demonstrator city Wiltz (see box below) and the eco-park Windhof\textsuperscript{13}, set up in 2011, are successful examples of this policy. The government’s fiscal reform of February 2016 will also encourage sustainable mobility with a specific tax rebate as of 2017\textsuperscript{14}. The testing phases are about to start for these economic activity zones.

Finally, the Government’s policies and efforts to promote a greener and more circular economy are showcased on its website LetzGreen (see box below).

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**SuperDrecksKëscht**

The SuperDrecksKëscht is a trademark developed by the Luxembourg government to manage waste. Actions and campaigns are carried out by the Ministry of Sustainable Development and Infrastructure, the Chamber of Trade and the Chamber of Commerce, under a state mandate to develop innovative services to businesses and citizens. It is based on the EU waste hierarchy strategy, which prioritises prevention, then reuse and recycling, over waste disposal such as landfill.

The SuperDrecksKëscht encourages sustainable consumption through the provision of guidelines with information on purchasing eco-products or using cleaning products in an environmental friendly way. It also organises the collection and ecological recycling of batteries and chargers. In addition, the SuperDrecksKëscht favours reverse consumption. This entails taking back consumer goods, as well as reverse production. Substances are stored in a warehouse before they undergo a second sorting process and special treatments to achieve a higher recycling rate.

The SuperDrecksKëscht was recognised by the European Commission and awarded the “best practice” label in the field of natural resources preservation and climate protection. It is also ISO 14001 (norm for environment management) and ISO 14024 (quality label) certified. Its concept has also been exported to Norway and Switzerland.

The SuperDreckskëscht continues to improve its offer in the field of circular economy. One of the newest developments is the “product potential” scheme (www.productpotentials.com). SDK does indeed evaluate and certify the potential of a product to be reintegrated into new value streams after its use.

Given SuperDrecksKëscht’s wide popularity, with more than 4,000 members, the government works with it to promote a circular economy among businesses.

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\textsuperscript{13} Ecoparc Windhof website: [http://www.ecoparc.lu/](http://www.ecoparc.lu/)

Wiltz to become circular economy hotspot

On 13 October 2015, the Minister of Economy announced its intention to turn the city of Wiltz into a circular economy hotspot, with several pilot projects being launched to demonstrate their potential and to inspire other actors in the adoption of the circular economy principles. The idea is to build on existing opportunities and to develop a know-how that would then enable new innovative projects to develop.

While unveiling the project, the Minister of the Economy, Mrs Francine Closener, announced that the approach adopted was both bottom-up and top-down, in order to support private innovative initiatives and local authorities willing to implement circular economy projects.

Wiltz has given itself a carta with 10 circular principles it will respect from now on.

The main initiative at Wiltz is the rehabilitation of industrial sites to be replaced by a residential complex on a 28-hectare surface. Other projects include:

- a circular economy educational hub
- the construction of a positive-energy building, including six dwelling units, made of completely reusable materials;
- collaboration with myenergy to integrate the circular economy principles into the “Climate Pakt” programme addressing all municipalities; an extensive study on the municipality’s material flows and the development of pilot projects to harvest the untapped economic potential of these flows;
- Development and dissemination of educational programs for children;
- the integration of circular economy principles in the city’s Salzbaach economic zone.

Key words: circular economy, repair café, fab lab, 3D printing, positive-energy building

References


Ludwig, J.-M., 2015, Fit For Circularity – Présentation du programme, LuxInnovation

Luxembourg Government website, 2017, Predictions on the increase in cross-border commuters over the next 40 years. Available at: http://www.luxembourg.public.lu/en/actualites/2017/05/16-frontaliers/index.html


ANNEX: Policy measures addressing circular economy and eco-innovations in Luxembourg

<table>
<thead>
<tr>
<th>Group of policy measures</th>
<th>Type of policy measure</th>
<th>Specific measure</th>
<th>Focus of policy measure (tick if relevant)</th>
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<tr>
<td></td>
<td></td>
<td>Please provide reference to or brief summary of specific measures (national, regional)</td>
<td>Circular economy</td>
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<tr>
<td>Equity/business support</td>
<td>Publicly co-funded venture capital funds</td>
<td>Legal framework for venture capital and private equity companies (SICAR). The law offers a flexible legal framework for private equity and venture capital companies. The non-profit organisation “Luxembourg Private Equity &amp; Venture Capital Association” (<a href="http://www.lpea.lu">www.lpea.lu</a>) offers a good insight on how the Luxembourg market is structured. Structures with a European reach, such as for example Oraxys (<a href="http://www.oraxys.com">www.oraxys.com</a>), have their offices in Luxembourg and specialise in investments in clean-technologies and public health and energy.</td>
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<tr>
<td>Support for R&amp;D in public sector and industry</td>
<td>Public guarantee funds</td>
<td>The “Luxembourg Future Fund” initiative. The Luxembourg State Bank “Société Nationale de Crédit et d’Investissement” (<a href="http://www.snci.lu">www.snci.lu</a>) is a public-law banking institution specialised in medium- and long-term financing of Luxembourg-based companies. SNCI’s financing instruments are investments in fixed assets, innovations and exports.</td>
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<td>R&amp;D funding</td>
<td>Innovation loan provided by the “Société Nationale de Crédit et d’Investissement” (SNCI) is an instrument aimed at co-financing expenditures of R&amp;D projects involving the launch of a new product or service or the development of new manufacturing or commercialisation processes. The innovation loan is an additional instrument to the R&amp;D incentive scheme of the Ministry of Economy and Foreign Trade.</td>
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**SUPPLY SIDE FOCUS**

**Support for R&D in public sector and industry**

**Equity/business support**

**Publicly co-funded venture capital funds**

Legal framework for venture capital and private equity companies (SICAR). The law offers a flexible legal framework for private equity and venture capital companies. The non-profit organisation “Luxembourg Private Equity & Venture Capital Association” ([www.lpea.lu](http://www.lpea.lu)) offers a good insight on how the Luxembourg market is structured. Structures with a European reach, such as for example Oraxys ([www.oraxys.com](http://www.oraxys.com)), have their offices in Luxembourg and specialise in investments in clean-technologies and public health and energy.

**Public guarantee funds**

The “Luxembourg Future Fund” initiative. The Luxembourg State Bank “Société Nationale de Crédit et d’Investissement” ([www.snci.lu](http://www.snci.lu)) is a public-law banking institution specialised in medium- and long-term financing of Luxembourg-based companies. SNCI’s financing instruments are investments in fixed assets, innovations and exports.

**Support for R&D in public sector and industry**

**R&D funding**

Innovation loan provided by the “Société Nationale de Crédit et d’Investissement” (SNCI) is an instrument aimed at co-financing expenditures of R&D projects involving the launch of a new product or service or the development of new manufacturing or commercialisation processes. The innovation loan is an additional instrument to the R&D incentive scheme of the Ministry of Economy and Foreign Trade.
Financial support of the Ministry of Higher Education and Research provides funds to R&D projects in public organisations. The priority of the programme is to support public organisations in their R&D projects. The R&D incentive scheme of the Ministry of Economy and Foreign Trade (RDI Law of June 17, 2017). The objective of the scheme is to co-finance investments of general economic interest in R&D sought by private-sector businesses and research centres to stimulate the development of R&D activities within these organisations. The beneficiaries are industrial undertakings, service providers with a key impact on economic development, and private-sector research centres. It takes the form of an outright grant. Co-financing covers fundamental research (up to 100%), applied research (up to 80%) and pre-competitive development (up to 60%) depending on the size of the company and whether the company is collaborating with a research institute or not.

Collaborative grants

ERA-Net ECO-Innovera. It funds transnational and multidisciplinary R&D projects considering social, environmental, market and technological issues.

FNR CORE Thematic Programme. The aim of the programme is to foster scientific quality in areas of socio-economic relevance. There are five relevance themes for funding. Two are of particular relevance for eco-innovation: sustainable resource management; and new functional and intelligent materials and surfaces, and new sensing applications. The calls for proposals are addressed to public institutions, Luxembourg administrations, and public establishments authorised to undertake R&D activities or technology transfer in their respective fields of activity.

R&D infrastructure

The Luxembourg University Campus in Esch-Belval. The government has invested more than €1 billion in this campus. It is built on former industrial grounds where the government had to tackle the challenge of decontamination of partially polluted grounds. A study was commissioned by the Fonds-Belval to investigate the potential for renewable energy in the urban context at Esch-Belval. The main technology public research centre, Luxembourg Institute of Science and Technology (LIST) is a merger of two separate entities and has since increased its competences, efficiency and competitiveness. www.list.lu

Fiscal measures

Tax incentives for R&D and start-ups Comprehensive support for start-ups and development is provided by the “Business Portal” (www.guichet.lu)

Education, training and mobility

Tailored training courses for companies, entrepreneurs Training classes are organised by the “Institut national pour le développement de la formation professionnelle continue” (http://www.infpc.lu/INFPC/Article/Accueil/fr) the Chamber of Crafts
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<th>Sector</th>
<th>Description</th>
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<tr>
<td>Advise/consulting for start-ups, companies, entrepreneurs</td>
<td>Technoport – enterprise and innovation centre. The Luxembourg government created the centre in order to diversify the range of support services on offer to innovative businesses in Luxembourg. The mission of Technoport is to support promoters of innovative projects at the idea stage and to provide ongoing assistance up to the start-up phase; as well as to provide temporary accommodation for domestic and foreign businesses at the development stage seeking a temporary foothold in Luxembourg. (See: <a href="http://www.technoport.lu">www.technoport.lu</a>) In 2018, Technoport was recognised by the World Incubation Summit as “European Top Challenger”.</td>
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<td>Within the Technoport, a fab lab has been put into place in order to offer companies an open prototyping platform where knowledge sharing is essential. Tools such as 3D printers, CNC milling machines, a laser cutter or a vinyl cutter, as well as technical and logistical assistance, are available to facilitate invention. But equal emphasis is put on fostering a multidisciplinary and intergenerational dynamic between start-ups, artists, designers, architects, engineers, hobbyists, researchers, students and so on.</td>
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<td>Neobuild is a competence centre dedicated to innovation and green technologies in the building sector. The MIC, the Neobuild innovation centre is building established as a living lab allowing innovative products to be tested in real life conditions.</td>
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<td>myenergy is an agency promoting energy savings and CO2 emission reductions as well as the circular economy principles. It offers guidance to private households as well as to companies.</td>
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<td>The Fit4Circularity programme provides 50% co-financing to companies hiring a consultant to develop a roadmap for a transition to the circular economy.</td>
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<td>Placement schemes for students</td>
<td>Since Luxembourg is a multicultural country with nearly 50% of inhabitants being of foreign nationality, and nearly 70% of the workforce being foreign, multiple universities, research institutions, companies and public institutions promote placement schemes for students abroad and in Luxembourg.</td>
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<td>Support for R&amp;D workers recruitments</td>
<td>ATTRACT Programme. The aim of the programme is to build on the excellence, dynamism and creativity of research in Luxembourg by attracting young researchers with a high level of ability in science or technology and proven experience in a professional research context. The fields of research targeted are those prioritised by public-sector research bodies in Luxembourg. The programme is designed for researchers not yet established in Luxembourg. It offers researchers the opportunity to set up a research team within a public-sector research institution in Luxembourg.</td>
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<td>Networks and partnerships</td>
<td>National Research Training Grant Scheme. The scheme supports PhD and postdoctoral research training in Luxembourg and abroad. It aims at developing human resources in priority research areas in the country. The National Research Fund (FNR) manages the scheme. Grants are awarded for a period of between 3 and 4 years.</td>
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<td>Competence centres, clusters, science-technology parks</td>
<td>The Eco-Innovation Cluster <a href="http://www.ecoinnovation.lu">www.ecoinnovation.lu</a> is part of the Clusters Programme launched by the Ministry of Economy and Foreign Trade in 2002. It is an active network that supports actors of the clean-technologies sector in Luxembourg with the goal of creating and developing new and sustainable business opportunities through collaborative R&amp;D and innovation projects. It is one of the key elements of the Eco-technologies Action Plan of Luxembourg, launched in February 2009. The cluster covers many different areas but is focusing primarily on material flows, industrial loops and the bioeconomy.</td>
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<td>The Automotive Campus is currently under development and will see its first actor move on site early 2019. The 14 ha area is dedicated to open innovation in the automotive and mobility sectors. It will feature common infrastructure as well as a dedicated incubator. IEE and Goodyear are the first companies having announced their presence on the site. Sustainable mobility as well as connected, automated and cooperative mobility are the key focus areas of the campus.</td>
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<td>The Wood Cluster is supporting the national wood and timber industry by creating the required networks, fostering innovation and integrating the circular economy principles in the industry.</td>
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<td>Technology platforms and innovation networks</td>
<td>The National Agency for Innovation “Luxinnovation” (<a href="http://www.luxinnovation.lu">www.luxinnovation.lu</a>) offers a wide range of integrated and personalised services, which are based on a sectoral approach and provided free of charge to businesses of any size, as well as innovative start-ups and public research organisations. It coordinates the Luxembourg Cluster Initiative (<a href="http://www.clusters.lu">www.clusters.lu</a>) and helps companies understand the European and National State Aid Regimes.</td>
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<td>The public research institutes also offer technology platforms (<a href="http://www.list.lu">www.list.lu</a>, <a href="http://www.uni.lu">www.uni.lu</a>, <a href="http://www.liser.lu">www.liser.lu</a>, <a href="http://www.Lih.lu">www.Lih.lu</a>).</td>
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<td>The Ministry of Economy runs the “Observatoire de la Compétitivité” (<a href="http://www.odc-public.lu">http://www.odc-public.lu</a>) delivering on a regular basis the most recent figures on the competitiveness of the Luxembourg economy in comparison with other countries. The national statistics portal <a href="http://www.statec.lu">www.statec.lu</a> is also a very open and transparent portal where information of all sectors and topics are freely accessible to companies and people.</td>
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<td>Regulations and standards</td>
<td>Public procurement</td>
<td>R&amp;D procurement</td>
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<td>Regulations, targets, cap &amp; trade schemes</td>
<td>“Green” public procurement of goods and services</td>
<td>The new public procurement law is putting more weight on sustainable and innovative criteria rather than limiting itself to the cheapest offer. New schemes like the “innovation partnership” allow more flexibility and more appetite for risk in public procurement. In the “innovation partnership” the public authority can act as a partner during the development phase of innovative solutions.</td>
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<td><strong>Demand subsidies (e.g. eco-vouchers, consumer subsidies)</strong></td>
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<td>PRIME House grants are intended to support natural persons, legal entities governed by private law and public corporations (other than the State) engaged in the fields of sustainable housing construction and sustainable energy renovation as well as the development of renewable energy sources. <a href="https://www.myenergy.lu/uploads/editor/files/PRIME-House_FR_2016_VF1.pdf">https://www.myenergy.lu/uploads/editor/files/PRIME-House_FR_2016_VF1.pdf</a></td>
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<td>The remuneration for electricity produced from renewable sources is guaranteed by injection tariffs planned for 15 years for installations whose first injection of electricity takes place from 01/01/2014 onwards in accordance with the Grand-Ducal Regulation of 1 August 2014 on the production of electricity based on renewable energy sources.</td>
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<td>The implementation of climate loans allows pre-financing of works to promote the sustainable renovation of housing with a tenure of more than 10 years</td>
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<th><strong>Awareness raising and information provision</strong></th>
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About the Eco-Innovation Observatory (EIO)

The Eco-Innovation Observatory (EIO) is the initiative financed by the European Commission’s Directorate-General for the Environment. The Observatory is developing an integrated information source and a series of analyses on eco-innovation trends and markets, targeting business, innovation service providers, policy makers as well as researchers and analysts.

Visit EIO and DG ENV EcoAP website and register to get access to more information and to access all EIO resources.

www.eco-innovation.eu
ec.europa.eu/environment/ecoap