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AGILE4CIRC

Agile leadership transformation for business in circular economy

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Adult and new business opportunities in Circular Economy (CircEc) and Social Responsibility (SR) report

Luxembourg

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Introduction

A circular economy is an economic system aimed at minimizing waste and making the most of resources. This regenerative approach is in contrast to the traditional linear economy, which has a take, make dispose of model of production.

The scope of the report is the initial methodological framework based on a research on Circular Economy and Social Responsibility at the Policy Maker level. The results of the report will be used as to designing the training course (IO2). National circular economy ecosystem will be examined focusing in the existing needs, lessons learnt, new Business Opportunities for adults in the new economy and best practices.

AGILE4CIRC operates in understanding how the ecosystem of the Circular Economy and Social Responsibility is implemented in Luxembourg which provides clues for capitalizing in market niches, potential business replicability in an adaptation of existing models attending the local needs and regulations. The research focuses on "detecting opportunities for Adult entrepreneurs in the new economy". The reason for this focus lies on the concept that many adult EU funded projects are concentrated in general in providing " basic skills" and mentoring to an adult just to become "another one to compete with thousands on the market for a job" without a "value proposition" that gives them a competitive advantage.

The research is needed because spots the existing business model across different economic realities and enables to detect market niches and potential partnership target group cooperation. Understanding the state of the art of the Circular Economy through a Matrix that classifies and organize them is what the research brings, clarity. The Methodology identifies how local stakeholders can contribute to the implementation of the new economy mindset generating a win-win situation.
In general, the objective of the current report is to understand the potential of the circular economy in Luxembourg where the business is, best practices, and market niche

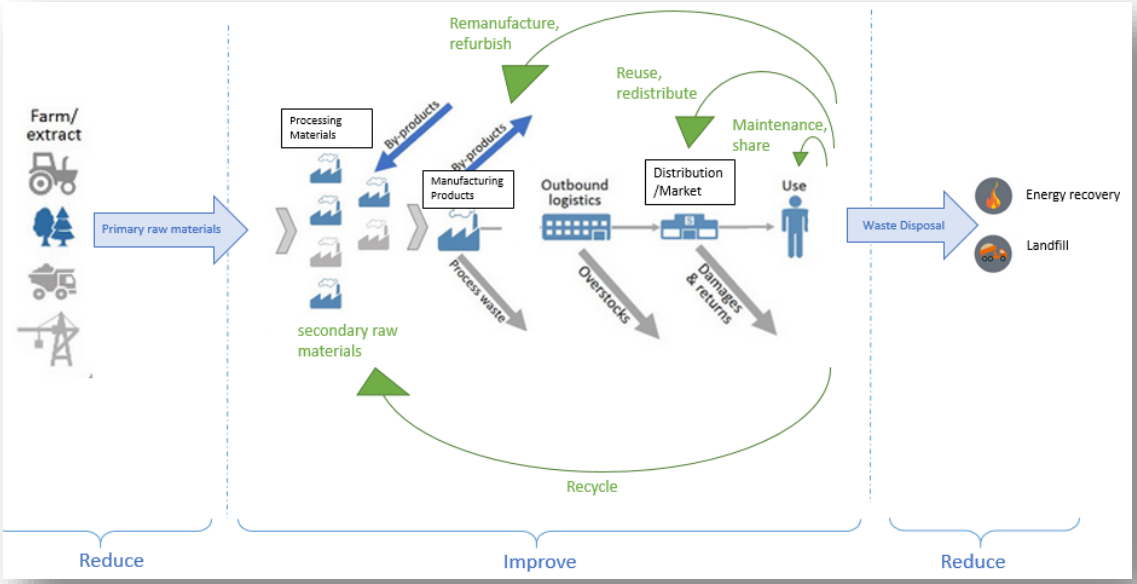
1. Definition of methods to be used in the research and creation of tools

Data will be obtained mainly by interviewing local stakeholders and collecting data from policies, national reports, case studies, best practices, training materials and market research and forecasts. For the data analysis we will use both qualitative and quantitative research methods, including desk research, survey research and secondary data. We will use qualitative methods for a complete, detailed description of observations, including the context of events and circumstances that makes Circular Economy and Social Sustainability feasible. The quantitative methods used will be related to analysis of researches where hypotheses were tested, features were classified and observations were explained in the area of Circular Economy and Social Sustainability.

2. CircEc & SR at Policy Maker level

Given that a circular economy is a source of competitive advantage, Luxembourg could increase the available job opportunities (more than 2,200 jobs in the next three years), and lead to cost-savings (€300 million to €1 billion per year) and less pressure on the environment[1]. What is more, the introduction of secondary raw materials that Luxembourgish industries rely on would reinforce their interdependency and substantially reduce 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).

[1]European Commission, Eco-Innovation Observatory
Country Profile 2016-2017: Luxembourg, page 14,
https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/luxembourg_eio_country_profile_2016-2017.pdf



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The Ministry of Sustainable Development and Infrastructure of Luxembourg represents the vast majority of policies associated with transport, public works, environment and regional planning. The National Nature Protection Plan (Plan national concernant la protection de la nature 2017-2021) focuses on policies concerning agriculture, forestry, water management, urban planning and land use planning[3]. Some of the priorities mentioned in the National Plan include the restoration of ecosystems and their services, for instance wetlands, valuable structured semi-open landscapes, extensive grasslands, heathland and dry grasslands. Others consist of alternative land usage by implementing biodiversity concepts as part of urban and regional planning and by promoting the concept of Green Infrastructure.

According to the Ministry, Green Infrastructure will be accomplished through the interconnectedness of three policy lines: the biodiversity line, the public works line and the spatial planning line. In this context, the government of Luxembourg has put into place four actions:

[2]Circular Economy: a smart way of using materials, Material Flows-The Material Flow Analysis Portal, http://www.materialflows.net/circular-economy/
[3] Green Infrastructure in Luxembourg, Biodiversity Information System for Europe, https://biodiversity.europa.eu/countries/gi/luxembourg

1. **The Landscape Plan (Plan directeur sectorial "Paysages")**

   It seeks to find the balance between socio-economic developments and conservation of natural resources. The main objectives of the Landscape Plan are conservation and development of Luxembourg's landscapes within the context of the European Landscape Convention. The implementation mechanisms are divided between prescriptions and recommendations. Several prohibitions are formulated for different 'zones'; multifunctional zones (large collection of landscapes, green zones within urban areas) and priority zones that are part of the ecological network. For example, new constructions cannot have adverse effects on green zones within urban areas and zones that are part of the ecological network cannot be fragmented (but some exceptions are formulated) (Gouvernement du Grand-Duche de Luxembourg, n.d.).

2. **Alzette - Ecological valorization of the Alzette's upper valley**

   The project consisted of restoration works on a river corridor along the course of the Alzette between the towns of Esch-sur-Alzette and Hesperange. The corridor was intended to be between 50m and 100m wide running along 16 km between the two towns. By the end of the LIFE funding in 2006, the project had partially achieved its objectives, with 41 ha of land purchased, restoration work carried out on over 5 km of the watercourse, and with a further 2.8 km of restoration in the pipeline.

3. **LIFE grassland Luxembourg - Conservation and management of species-rich grasslands by local authorities**

   The project focuses on protecting endangered grassland habitats as well as a number of animal species that depend on these habitats within 15 Natura 2000 sites in the western part of the 'Gutland' of Luxembourg. These goals will be achieved by strengthening the Natura 2000 network via purchase of grasslands and subsequent restoration and improvement of their conservation status.

4. **LIFE Orchis - Restoration of calcareous grassland in eastern Luxembourg**

   The project's main objective centers on securing and restoring all calcareous grasslands that have been known to exist in southeast

> Luxembourg. This will be achieved by improving the conservation status of grassland habitats through removal of moss and dead biomass; expanding the surface area of target habitats by clearing of shrubs and removing non-native forestation; cross-linking habitat patches through extension of adjacent farmland; and providing long-term protection through land purchases and management.

Looking at the concrete measures taken at the national level, Luxembourg adopts several policies for industries, start-ups, entrepreneurs, and companies. One of these policies is the 'Air Quality Plan for Luxembourg City' which applies restriction methods against exceeding the nitrogen oxide (NOx) limits in the city centre of Luxembourg. In particular, its scope covers various public transport segments, such as the renewal of the city bus fleet, the creation of a tramway, and the prohibition of trucks in certain critical sectors of the city.[4]

Another angle of Luxembourg's policy-making is related to advisory support for technology adopters, and specifically for those who are interested in the innovative construction sector. In this respect, 'Neobuild' is the centre of competence dedicated to the research of sustainable solutions for future construction projects by offering its technological expertise to companies and individuals.

Finally, Luxembourg hosts a thriving Cleantech sector comprised of a growing number of companies that work mainly in the fields of eco-construction, renewable energy, waste management, water and electro mobility. These companies are supported by various public agencies and research organizations. The idea of innovation in Cleantech is the result of common action between governments, companies and individuals that has the ultimate goal to improve energy and water security, increase competitiveness, create employment and reduce waste and emissions.

[4] Ibid., page 23

Under the Luxembourg Government's Clean Technology Action Plan, a private initiative backed by the Ministry of the Economy, a dedicated zone is being built where cleantech companies can establish operations and access services and infrastructure that permit them to grow[5]. This action plan is oriented around the development of two different fields of capability:

a) the rational use of natural materials
b) innovative materials

Research activities in environmental technologies focus on environmental management, life-cycle assessment, clean technologies and process engineering, environmental modelling as well as the sustainable management of aquatic and terrestrial ecosystems.

3. What has been done in Luxembourg

With regard to businesses, the government has developed a trademark – the SuperDrecksKëscht – in order to incentivize businesses to better manage their waste, rationalise their resource consumption and transition towards a more circular model.[6] 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 government aims to encourage circular economy through the development of economic activity zones and the so-called 'eco-neighbourhoods' in accordance with circular principles. These zones can 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.). Successful examples of this policy can be found in the city of Wiltz and at the creation of the eco-park Windhof13, which was established in 2011.

[5] Luxembourg, Let's make it Happen, Grow Your CleanTech Business from Luxembourg, page 2, https://www.luxinnovation.lu/wp-content/uploads/sites/3/2017/05/brochure-cleantech-web.pdf

[6] European Commission, Eco-Innovation Observatory Country Profile 2016-2017: Luxembourg, page 16, https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/luxembourg_eio_country_profile_2016-2017.pdf

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 neighboring regions.

Eco-innovation and circular economy in Luxembourg are accomplished through public-private partnerships in which the key actors are the Ministry of Economy, the Ministry of Sustainable Development and Infrastructure, the EcoInnovation Cluster, MyEnergy and LuxInnovation (the national agency for innovation and research). On the one hand, Eco-Innovation Cluster gathers companies, research institutes and public organizations involved in the field of eco-technologies.[7] It focuses on the establishment of new opportunities that can be sustainable through collaborative Research & Development (R&D) and innovation projects related to material flows, industrial material loops and the bio economy. On the other hand, LuxInnovation encourages businesses and researchers in developing and implementing projects which further support the government in its innovation and R&D policies. Apart from being a network of reference in the domain of R&D and EU innovation, it also serves as a contact point for the European Horizon 2020 Programme in Luxembourg. Some of tts focus areas include ecotechnologies, materials and production technologies.

In this context, the Ministry of Economy, LuxInnovation and the Luxembourg Eco-Innovation Cluster put their efforts together to promote circular economy. A case in point is the support scheme “Fit4Circular” which was intended to help small and medium-sized enterprises (SMEs) transition towards a more circular economy. Fit4Circularity, created in 2015 by LuxInnovation and targeting SMEs, commits its actions towards sustainable

[7] Ibid, page 6

initiatives such as the Fit4Digital and the Fit4Innovation. The goal is to limit the use of raw materials by maximizing the use of renewable sources for innovative products and services of a sustainable growth. It also has as an objective to reduce energy consumption and to increase recyclability. Fit4Circularity improves competitiveness and helps to increase SMEs' revenues. The kinds of projects that can be eligible for support are those associated with technological innovation, organizational innovation and investment.

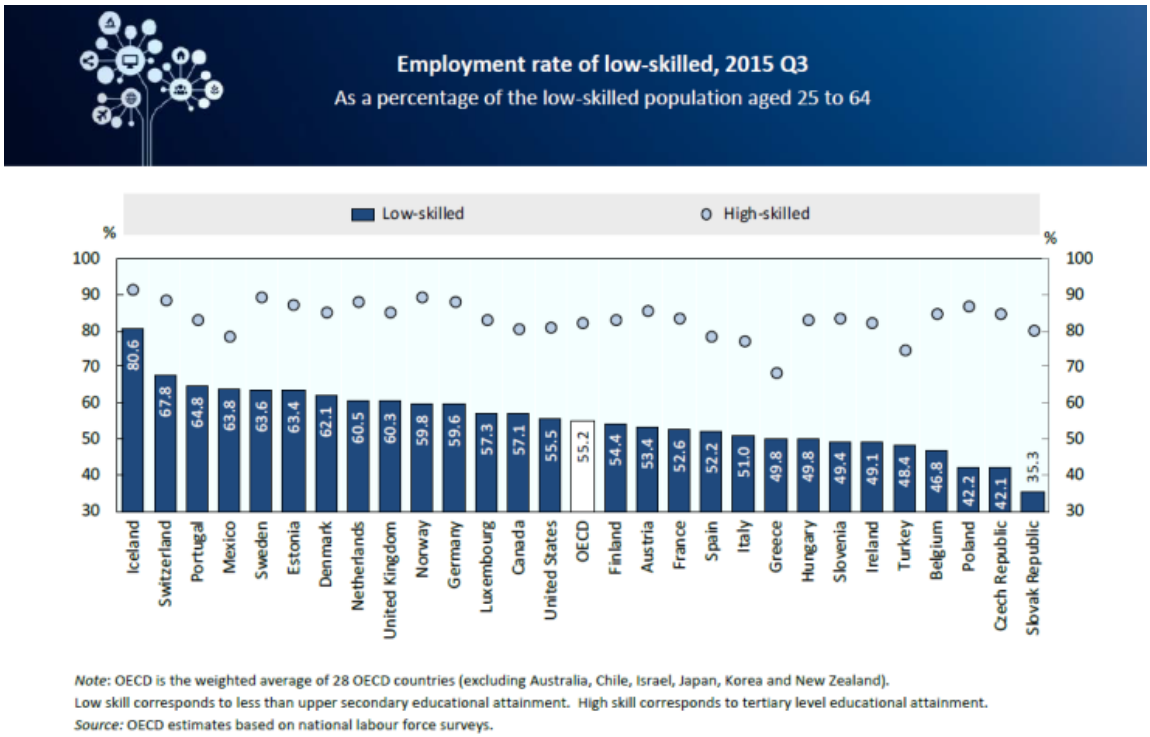
4. Level of low-skilled or low-qualified adults involved

In Luxembourg, it is generally accepted that a low-qualified worker is a person without educational qualifications beyond lower secondary level. The great majority of low-qualified workers work under employment contracts (almost 97%), with men working most commonly in the construction sector (32.9%), and women working most commonly in the retail and sales sector (19.1%)[8].

The graph below presents the placing of Luxembourg among other EU Member States based on a ranking of employment percentage rates of low-skilled adults (aged 25-64 years old) in 2015[9]. It is obvious that Luxembourg holds the 12th position among its counterparts and its representative percentage of 57.3% shows that the country responses positively in favor of the employment placement of low-skilled adults.

[8] Wlodarski, Odette. Luxembourg: Quality of work and employment of low-qualified workers, Observatory: EurWORK, 2009, https://www.eurofound.europa.eu/publications/report/2009/luxembourg-quality-of-work-and-employment-of-low-qualified-workers

[9] Employment Rate of low-skilled, 2015 Q3, Policy Forum on the Future of Work, Employment and Labour Ministerial Meeting, OECD Better Policies for Better Lives, https://www.oecd.org/employment/ministerial/employment-in-figures.htm



Note: OECD is the weighted average of 28 OECD countries (excluding Australia, Chile, Israel, Japan, Korea and New Zealand).
Low skill corresponds to less than upper secondary educational attainment. High skill corresponds to tertiary level educational attainment.
Source: OECD estimates based on national labour force surveys.

Taking a closer look at the labour market of Luxembourg, the insurance as well as the working status of the employed population helps us to identify the gap in skills and to conceptualize new opportunities in the circular economy. In this way, the following table illustrates the employment nature to which adults have so far adapted, but also the working conditions that would potentially help the circular economy to become a stable part of the growing economy.

Employment and unemployment x 1,000 (annual average)	2000	2010	2017	2018
1. Domestic employment	264.0	359.6	432.7	448.9
Wage-earners	245.7	337.4	406.5	422.0
Employers, self-employed, unpaid family workers	18.3	22.1	26.3	27.0
2. Net borderers (a) - (b)	79.3	141.2	175.4	184.4
a. Non-resident borderers	88.1	152.4	188.0	197.0
Employers, self-employed, unpaid family workers	1.1	3.1	4.6	4.9
Wage-earners	87.0	149.3	183.4	192.1
of which from: France	46.5	74.1	92.9	98.2
Germany	16.4	37.5	45.4	47.2
Belgium	24.2	37.8	45.0	46.7
b. Resident borderers	8.8	11.2	12.6	12.6
of which: International agents and civil servants	7.8	10.1	11.3	11.3

3. National employment (1) - (2)	184.7	218.4	257.3	264.5
4. Unemployed	4.5	13.5	16.2	15.3
5. Active population (3) + (4)	189.2	231.9	273.4	279.7
6. Unemployment rate in % (4) : (5)	2.4	5.8	5.9	5.5[10]

The following table compares different employment sectors in Luxembourg. Given that there are over ten industries occupying the labour force of the country, it is necessary to highlight the most dominant areas in terms of their size between the years 2000 and 2018. According to the figures, there was a moderate drop in the Agriculture, Forestry, and Fishing sector just 600 workers till 2018 from roughly 4.500 workers in 2000. There also was a slight decline in manufacturing just 1.200 employees till 2018 from just under around 34.000 workers in 2000. However, the number of workers in Human Health and Social Work activities increased significantly to 47.000 from 17.600 servants in 2000. In conclusion, the construction industry received a rise of well over 1.500 workers after eighteen years from 28.600 workers in 2000.

Domestic employment by branches	**2000**	**2010**	**2017**	**2018**
x 1,000				
Agriculture, forestry and fishing	4.3	4.0	3.7	3.7
Mining and quarrying	0.3	0.3	0.2	0.3
Manufacturing	34.0	32.7	32.5	32.8
Electricity, gas, steam and air conditioning supply	1.2	1.4	1.5	1.5
Water supply	2.1	2.6	2.7	2.8
Construction	28.6	39.0	43.9	45.7
Wholesale and retail trade; Repair of motor vehicles and motorcycles	37.2	44.7	52.3	53.6
Transportation and storage	17.5	24.2	26.1	27.4

[10]The Portal of Statistics of the Grand Dutchy of Luxembourg, Luxembourg in Figures-2019, STATEC, page 13, https://statistiques.public.lu/catalogue-publications/luxembourg-en-chiffres/2019/luxembourg-figures.pdf

Accommodation and food service activities	12.9	16.5	20.8	21.7
Information and communication	8.8	14.1	18.5	19.4
Financial and insurance activities	30.1	40.9	47.3	48.8
Real estate activities	1.4	2.9	4.2	4.6
Professional, scientific and technical activities	15.4	29.7	42.1	44.3
Administrative and support service activities	14.7	22.4	29.6	31.0
Public administration and defence	15.0	20.1	24.6	25.5
Education	11.7	16.5	19.2	19.9
Human health and social work activities	17.6	32.1	45.4	47.0
Arts, entertainment and recreation	2.1	3.4	4.2	4.4
Other service activities	5.2	7.1	8.3	8.6
Other service activities	5.2	7.1	8.3	8.6
Total	264.0	359.6	432.7	448.9

Regarding the construction industry, it appears to be one of the most promising areas of circular economy in Luxembourg. Indeed, the idea of sustainable building has been introduced by Neobuild, the first technological innovation pole for the sustainable construction sector in Luxembourg[11]. Neobuild follows a transparent, responsible and collaborative approach, in order to highlight the benefits of the sustainable construction. The latter is a vast and varied topic that embraces materials and construction processes as well as renewable energies or certification systems. Some of Neobuild's services include ethical and sustainable principles, such as the support of the companies in their development and in their search for value creation, in accordance with the community and the future generation interests.

Moreover, the Ministry of Labour, Employment and the Social and Solidarity Economy in Luxembourg has created the Digital Skills Bridge programme to develop a common national strategy and a support mechanism. This programme aims to aid the future skills development of the national workforce and assist companies' in their response to the digital transformation of their businesses.[12] Since the development of new skills

[11] Home page, NEOBUILD, http://neobuild.lu/en/neobuild/innovation-center
[12] Home Page, Skills Bridge, https://www.skillsbridge.lu/

within the country's companies has risen, employers have to meet the needs of the market whilst allowing their employees to secure their career path. In this way, entrepreneurship activities acquire a major additional asset that allows them to safeguard and advance their competitiveness. The programme thus emphasizes the importance of a proactive and preventive strategy regarding companies and employees' skills development in order to meet the challenges posed by digital transformation. secure career paths in a sustainable way.

In addition, seniors, migrants, or people with disabilities can benefit from training courses and guidance by some actors described below. Especially the unemployed people of Luxembourg can take advantage of the initiative Fit4Entrepreneurship, which offers coaching and mentoring in self-employment. The programme has been developed in partnership with the Ministry of Labour and Employment and the Chamber of Commerce with the financial support of the ESF[13]. The trainers come from the House of Entrepreneurship initiative. The first edition of the programme was made available in 2015-2016 and led to 37 company creations with an overall amount of 125 jobseekers who participated in the programme.

With regards to women, there is a network of over 20 informal and private associations which cover business counselling and mentoring, such as the Women in Digital Empowerment (WIDE) initiative[14]. Finally, disadvantaged target groups deriving from all age categories can receive assistance from training organized by the Agency for the Development of Employment (ADEM). They can also find tailor-made and sector-specific professional training courses offered within the House of Training.

[13] OECD, Inclusive Entrepreneurship Policies: Country Assessment Notes, Luxembourg 2018, OECD Better Policies for Better Lives, page 22, http://www.oecd.org/cfe/smes/LUXEMBOURG-IE-Country-Note-2018.pdf

[14] Home Page, Women in Digital Empowerment, http://wide.lu/

5. New Business Opportunities for low-skilled or low-qualified adults in the CircEc

Luxembourg is best described as a country in a constant state of transformation, having reinvented itself in an economy based upon technological development. The country has shown a remarkable resilience amid the turbulence of recent years in the EU and prepared its people to face future economic challenges[15]. Concerning the employment sectors, excluding government organizations and hospitals, here are the top 10 industries by number of employees as of 1 January 2017[16]:

01 **Telecommunications**	POST LUXEMBOURG	**4,350**
02 **Rail transport**	CFL	**4,170**
03 **Steel industry**	ARCELORMITTAL	**4,160**
04 **Retail outlet**	CACTUS	**4,030**
05 **Banking**	BGL BNP PARIBAS	**3,700**
06 **Cleaning**	DUSSMANN LUXEMBOURG	**3,650**
07 **Automotive industry**	GOODYEAR DUNLOP	**3,410**
08 **Consultancy**	PRICEWATERHOUSECOOPERS	**2,840**
09 **Air transport**	LUXAIR	**2,630**
10 **Banking**	BIL GROUP	**1,940**

However, it is important to draw our attention on the latest figures regarding the amount of wastes as well as the consumption of energy in the country in order to define new business opportunities in Luxembourg. By doing so, general conclusions will allow us to determine which waste management methods can be implemented and under which conditions the reuse of raw materials is feasible. Below we can see in table the total amounts of waste in Luxembourg measured in one thousand tones, in percentages, and in kgs in seventeen years.

[15] The Government of the Grand Dutchy of Luxembourg, Luxembourg Cluster Initiative, page 50, http://luxembourg.public.lu/en/publications/k/cc-economie-luxembourg/cc-economie-luxembourg-en-pdf.pdf
[16] Ibid, Page 13

Wastes	2000	2010	2016	2017
in 1,000 tonnes				
Total (without inert wastes)	285.26	344.26	354.62	366.53
of which: Household wastes	238.85	300.01	310.89	321.71
in %				
recycling	21.6	26.9	27.8	28.5
composting	14.2	19.5	20.7	21.7
incineration with energy recovery	43.2	37.7	45.3	43.3
disposal*	21.0	15.8	6.3	6.4
in kg				
Household wastes per capita	547	592	533	540

*before biological treatment[17]

With respect to the use and final consumption of natural resources, the following table of energy sectors will display the division of economic operation activities in Luxembourg.

Examining the EU level, energy is consumed by different sectors of the economy: households (i.e. energy consumed in citizen's dwellings), transport (e.g. rail, road, domestic aviation or inland shipping), industry, services (including commercial and public services) and agriculture & forestry. Looking at which sectors in the EU consume the most energy, the industry sector (31 % of final energy consumption) consumes the most energy, followed by the transport sector (28 %), households (25 %), services (13 %) and agriculture & forestry (2 %)[18].

On the contrary, looking at the national level of Luxembourg and the sectors in which the energy use can be done more efficiently, it is clear that transport

[17] The Portal of Statistics of the Grand Dutchy of Luxembourg, Luxembourg in Figures-2019, STATEC, page 7, https://statistiques.public.lu/catalogue-publications/luxembourg-en-chiffres/2019/luxembourg-figures.pdf

[18] What kind of energy do we consume in the EU? Eurostat, https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-3a.html

holds the primary place (61.1%) in the energy consumption ranking of 2017. There are many factors that impact the energy use for transportation means, for instance, the efficiency of individual transport modes, the take-up of alternative fuels, the advances in transport technology and fuel as well as the lifestyle choices of the total population.

Final consumption of energy	2010	2016	2017	2017
in 1,000 tons oil equivalent				**in % of the total**
By product				
Coal products	67	52	45	1.1
Natural gas (NCV)	675	628	618	14.8
Electricity	567	547	550	13.1
Heat	73	58	66	1.6
Oil products	2,839	2,596	2,721	65.0
Other (wood, biofuel)	108	160	184	4.4
By use				
Transport	2,630	2,434	2,557	61.1
Industries	755	674	642	15.3
Households	511	526	522	12.5
Services	425	402	457	10.9
Agriculture	8	6	6	0.2
Total	**4,328**	**4,042**	**4,184**	**100.0**[19]

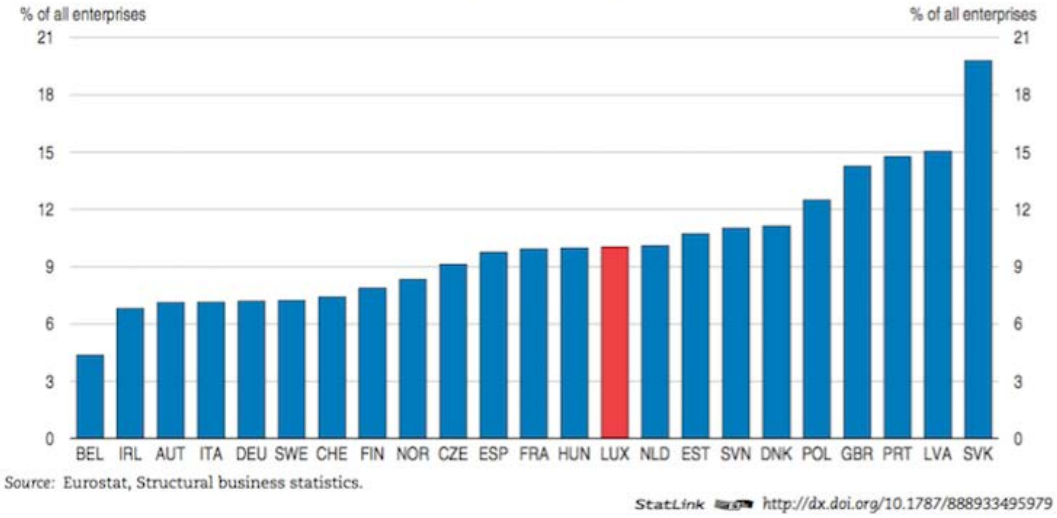
For the purpose of the expansion of the job market and the creation of new employment opportunities, entrepreneurs and start-ups can stimulate the use of new technologies and enhance the productivity rates of the country. Nevertheless, the social perception of entrepreneurship in Luxembourg is relatively low: compared to EU average of 56%, only 45% of Luxembourg residents regard entrepreneurship as a desirable career choice[20]. The share of entrepreneurs and the positive perception of entrepreneurhsip are higher among other social groups, such as among immigrants and especially first-generation immigrants. Looking at the following column bar graph of 2014, it is clear that entrepreneurship is not the preferred career choice in

[19] Ibid, page 8
[20] OECD, OECD Economic Surveys: Luxembourg 2017, page 37, https://books.google.gr/books?id=zMgtDwAAQBAJ&pg=PA33&lpg=PA33&dq=low-skilled+employees+in+luxembourg+circular+economy&source=bl&ots=sBVm_FAR0e&sig=ACfU3U3Gq0eC0OyphlCjmETWAfRtvi2g5g&hl=el&sa=X&ved=2ahUKEwjn45H4_qLlAhXFwqYKHW7FBTkQ6AEwBXoECAkQBA#v=onepage&q&f=false

Luxembourg. EU performers have to deal with the low share of slef-employed and the slow enterpirse birth rate.

Figure 23. **The number of start-ups is lagging the best EU performers**

Business sector start-ups, 2014



Despite these discouraging figures, how is Luxembourg developing skills in other areas related to environmental protection? A total amount of around 200 companies operate in the fields of Eco Construction, Renewable Energy, Waste Management, Water Management, and Electric Mobility[21]. How can these companies back up on government programmes?

The answer to these questions is found in the context of digitization initiatives and the circular economy. The fact that the residents of Luxembourg are ready to reduce their energy bills leads to a decrease of their reliance on external suppliers of oil and gas. Towards that end, there are several initiatives taken at the national level for the application of green production methods.

Starting with Luxembourg CleanTech Cluster, which is managed by Luxinnovation, fosters innovation, business development and cross-sector cooperation by focusing on an exciting area for potential growth – sustainable living and clean technologies[22]. The cluster supports it members in the

[21] Luxembourg economy - Open, Dynamic, Reliable, page 26, http://luxembourg.public.lu/en/publications/k/cc-economie-luxembourg/cc-economie-luxembourg-en-pdf.pdf

[22] Innovate in Luxembourg, The Government of the Grand Dutchy of Luxembourg, https://www.luxinnovation.lu/cluster/luxembourg-cleantech-cluster/

generation of new processes, products and services with the goal of turning the concept of the circular economy into a reality in Luxembourg. Some of its objectives include the diversification of the activities of domestic companies by allowing them to gain and to develop new capabilities in the clean technologies field. By contributing to the development of new environmental solutions in the field of eco-technologies and sustainable construction, it also raises public awareness for the uptake of "green technologies" and build public-private partnerships.

Nowadays, the development of the digital economy creates new grounds for the cultivations of skills that are essential for a changing working environment. In this direction, Digital Luxembourg intends to track the process of digital transformation in human resources, and specifically in Education and Youth (e.g. developing maker spaces in secondary schools), in lifelong learning opportunities for professionals (e.g. FIT4Coding to train unemployed, or training in cybersecurity), and in developing ICT specialised profiles (e.g. in the Cybersecurity Competence Centre 3C)[23].

Moreover, the country foresees the inauguration of multiple FEDIL (Luxembourg's Multi-sectoral Business Federation) projects on information and communication technologies (ICT), construction, and public works planning. In the context of eco-innovation projects, 'Hello Future' provides its consulting services. One related project is the 'Travail de demain' which offers reflections on the development of a political position and practical recommendations with regards to digital transformation and labour markets.

In the same view, the government's key projects are:

- Luxembourg Tech School
- Digital 4 Education
- BEE creative
- Fit 4 Coding

[23] Larosse, Jan. Analysis of National Initiatives on Digitizing European Industry-Luxembourg: Digital4Industry, page 10, https://ec.europa.eu/futurium/en/system/files/ged/lu_country_analysis.pdf

- Cyber Security Competence Center(C3): offers training and be a test tool available for new software[24]

Other success stories of Luxembourg include the Digital Skills and Jobs Coalition Lëtzebuerg (DSJC-L), which is a multi stakeholder group with more than 40 Partners. The objectives of the DSJC-L are:

1. To substantially reduce the shortage of IT professionals, to improve the conditions for the private and public sector employees as well as all inhabitants to learn and continuously improve the necessary ICT skills for job, the establishment of IT business and development of the digital market,
2. To attract more young people to choose ICT and other science studies and professions, to ensure the acquisition of digital skills also when learning other professions,
3. To raise public awareness of the importance of digital skills and competences.

Moreover, the Luxembourg Institute for Digital Training (LIDIT) is a nonprofit organization created in 2015 by the House of Training, which covers 655 vocational training programmes. The House of Training together with ISEC-Institut Supérieur de l'Économie, ICT Luxembourg and the Centre de Compétences Génie Techniques du Bâtiment have made possible for LIDIT to become the coordinator of the Digital Skills and Jobs Coalition Lëtzebuerg.

[24] Ibid, page 10

6. The Pocket Library: collection of documents, reports, book, and websites on circular economy

For the documentation of this analysis, we collected data from different online sources. In particular, information was collected through desk research and access to stakeholders and National Government reports.

The information was then verified by government partners, programme managers and other inclusive entrepreneurship stakeholder groups through email exchange.

The notes were based on an assessment framework that was developed by the NOVEL Group team. The assessment framework provided a common analytical outline which contains five pillars:

1) Policy system
2) Government decision-making process
3) Entrepreneurship initiatives
4) Missing skills and competences
5) Funding Opportunities

The data collected can be divided into the following categories:

a) Websites

- **Bee creative**, https://www.bee-creative.lu/ (BEE CREATIVE is the initiative of the government of Luxembourg which prepares the youth of the Grand-Duché for the challenges of digitalization)
- **House of Training,** https://www.houseoftraining.lu/training/explore (The House of Training has the mission of proposing professional education in accordance with the Luxembourgish Economy)
- **Digital Four Industry-Luxembourg**, https://digital4industry.lu/ (The initiative D4I is part of the European Platform for co-ordination of initiatives for digitising industry)
- **Hello Future.lu-Your Job in Industry**, https://hellofuture.lu/secteurs/ecoinnovation/ (HELLOFUTURE is an initiative of the FEDIL, of the Government and the Chamber of Commerce of Luxembourg)
- **The Government of the Grand Dutchy of Luxembourg**, Luxembourg Cluster Initiative, https://www.luxinnovation.lu/cluster/luxembourg-cleantech-cluster/ (Luxinnovation offers a wide portfolio of services to companies and public research organisations in order to foster innovation for the Government's economic development objectives)
- **Circular Economy: a smart way of using materials**, Material Flows-The Material Flow Analysis Portal, http://www.materialflows.net/circular-economy/ (It aims at providing analyses and visualisations of worldwide data on resource extraction, in order to achieve a wider application of the material flow analysis (MFA) approach)
- **Green Infrastructure in Luxembourg**, Biodiversity Information System for Europe https://biodiversity.europa.eu/countries/gi/luxembourg (BISE is a single entry point for data and information on biodiversity supporting the implementation of the EU strategy and the Aichi targets in Europe)
- **Innovation Center,** Neobuild, http://neobuild.lu/en/neobuild/innovation-center (Neobuild is a technological innovation pole for the sustainable construction sector in Luxembourg)
- **The Grand Dutchy of Luxembourg**, Skills Bridge, https://www.skillsbridge.lu/ (Luxembourg Digital Skills Bridge aims to provide technical and financial assistance to upskill employees in companies facing major technological disruption)
- **Women in Digital Empowerment**, http://wide.lu/ (Women in Digital Initiatives Luxembourg Asbl is a non-profit organisation currently acting as WIDE (Women in Digital Empowerment)
- **Eurostat**, What kind of energy do we consume in the EU?, https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-3a.html

(Eurostat is the statistical office of the European Union situated in Luxembourg. Its mission is to provide high quality statistics for Europe)

- **EPEA Internationale Umweltforschung GmbH**, Hansen, Katja. Mulhall, Douglas (Coordinator). Zils, Markus. Luxembourg as a knowledge capital and testing ground for the circular economy. National Roadmap for Positive Impacts. Tradition, Transition, Transformation, 2014, https://www.luxinnovation.lu/wp-content/uploads/sites/3/2017/05/brochure-cleantech-web.pdf
- **CIRC4Life,** A circular economy approach for lifecycles of products and services, https://www.circ4life.eu/circular-economy-business-models
- **European Commission,** The Circular Economy tools and instruments, Environment, https://ec.europa.eu/environment/green-growth/tools-instruments/index_en.htm#ecolabel
- **European Commission,** EU Environmental Technology Verification, ECO-INNOVATION at the heart of European policies, https://ec.europa.eu/environment/ecoap/etv_en

b) Reports

- **Digital Luxembourg Innovative Initiatives,** Progress Report, Spring 2018, https://digital-luxembourg.public.lu/sites/default/files/2018-06/DL_201804022_PROGRESS%20REPORT_08%20BAT.pdf (Digital Luxembourg keeps innovation moving in the sectors of data regulations, simplifying procedures or triggering conversations)
- **OECD**
  - OECD Economic Surveys Luxembourg Overview, July 2019, https://www.oecd.org/economy/surveys/Luxembourg-2019-OECD-economic-survey-overview.pdf (The Organisation for Economic Co-operation and Development (OECD) is an international organisation that works to build better policies for better lives)
  - OECD, Inclusive Entrepreneurship Policies: Country Assessment Notes, Luxembourg 2018, OECD Better Policies for Better Lives, http://www.oecd.org/cfe/smes/LUXEMBOURG-IE-Country-Note-2018.pdf
- **European Commission,**
  - Larosse, Jan. Analysis of National Initiatives on Digitizing European Industry-Luxembourg: Digital4Industry https://ec.europa.eu/futurium/en/system/files/ged/lu_country_analysis.pdf (The European Commission is committed to supporting beneficiaries in complying with open access requirements in Horizon 2020)

  - Eco-innovation Observatory, Eco-Innovation Observatory Country Profile 2016-2017: Luxembourg https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/luxembourg_eio_country_profile_2016-2017.pdf
- **Eurofound**, Wlodarski, Odette. Luxembourg: Quality of work and employment of low-qualified workers, Observatory: EurWORK, 2009, https://www.eurofound.europa.eu/publications/report/2009/luxembourg-quality-of-work-and-employment-of-low-qualified-workers (Eurofound is the EU Agency for the improvement of living and working conditions)
- **The Portal of Statistics of the Grand Dutchy of Luxembourg,** Luxembourg in Figures-2019, STATEC,https://statistiques.public.lu/catalogue-publications/luxembourg-en-chiffres/2019/luxembourg-figures.pdf (The portal of the Grand Dutchy of Luxembourg)
- **The official portal of the Grand Dutchy of Luxembourg**,
  - Luxembourg Sustainable Finance Roadmap, A Journey Towards A Sustainable Financial System, UNEP Finance Initiative, 2018 https://gouvernement.lu/dam-assets/documents/actualites/2018/10-octobre/04-sustainable-finance/Luxembourg-Sustainable-Finance-Roadmap-WEB.pdf
  - Luxembourg economy - Open, Dynamic, Reliablehttp://luxembourg.public.lu/en/publications/k/cc-economie-luxembourg/cc-economie-luxembourg-en-pdf.pdf
- **European Environment Agency (EEA),** Circular by Design Products in the Circular Economy, Luxembourg: Publications Office of the European Union, 2017. https://circulareconomy.europa.eu/platform/sites/default/files/circular_by_design_-_products_in_the_circular_economy.pdf (The European Environment Agency provides sound, independent information on the environment for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public)

c) Forums

- **Policy Forum on the Future of Work,** Employment and Labour Ministerial Meeting, OECD Better Policies for Better Lives, https://www.oecd.org/employment/ministerial/employment-in-figures.htm (The OECD hosted a Ministerial meeting on Labour and Employment on 14-15 January 2016, and a Policy Forum on the Future of Work)

d) Books

- **OECD**, OECD Economic Surveys: Luxembourg 2017, OECD Publishing Paris, 2017. https://books.google.gr/books?id=zMgtDwAAQBAJ&pg=PA33&lpg=PA33&dq=low-skilled+employees+in+luxembourg+circular+economy&source=bl&ots=sBVm_FAR0e&sig=ACfU3U3Gq0eC0OyphlCjmETWAfRtvi2g5g&hl=el&sa=X&ved=2ahUKEwjn45H4_qLlAhXFwqYKHW7FBTkQ6AEwBXoECAkQBA#v=onepage&q&f=false

e) Journals

- Mateusz Lewandowski, Designing the Business Models for Circular Economy—Towards the Conceptual Framework, MDPI, 2016. https://www.researchgate.net/publication/291171892_Designing_the_Business_Models_for_Circular_Economy-Towards_the_Conceptual_Framework

7. Tools and methodologies for CircEc and SR applications

The methodologies applied in the context of Circular Economy in Luxembourg are associated with the maintenance of the value and the functionality of products, as well as of their components and materials. However, losses are inevitable in the process of maintaining a product's value for as long as is sensible. It is not only important to avoid the use of natural resources and to limit the environmental impact caused by a replacement, but to recycle with the minimum losses possible. However, the case for inefficient durable products in which the majority of emissions are caused during their use (e.g. old cars without catalytic converters) is hard to be examined as part of the circulating products[25].

Key mechanisms shaping the role of products in a linear and in a circular economy [26]

Linear system mechanisms	Circular system mechanisms
Business perspective	

[25] European Environment Agency (EEA), Circular by Design-Products in the Circular Economy, 2017, page 10, https://circulareconomy.europa.eu/platform/sites/default/files/circular_by_design_-_products_in_the_circular_economy.pdf

[26] Ibid, page 14

Product as value creation source	*Functionality/performance as a source of value creation*
Profit margins are based on the difference between the market price of a product and the production cost. The strategy for increasing profits is to sell more products and keep production costs as low as possible. Technological innovation makes old products obsolete and urges consumers to buy new products. Protection of intellectual property rights, a main source of value, leads to protective design measures, such as creating barriers to repairing a product, rather than sharing product technical information and repair manuals.	Products are part of an integrated business model focusing on the delivery of a performance or functional service. Competition is mainly based on the creation of added service value of a product, not solely on its sales value. Social/ business model innovation allows the creation of extra value by applying technological innovation to solving societal needs. As products are part of a company's assets, cost minimisation drives product longevity, reuse, reparability and remanufacturing.
Economies of scale in global production chains	*Location of production and use tend to be more linked*
Cost efficiency drives the optimisation of global production chains, minimising the costs of resources, labour and transport.	As the provision of a service is physically linked to the location of the customer, there is an incentive to produce/manage physical products used in a service close to the user.
Steer consumer needs towards product offer	*User needs/wants drive the role of a product*
Products with short lifespans are preferred as they are cheaper to make and support a market for new products that replace old ones. Maintenance and repair are avoided, as it is more profitable to sell new products than to repair old ones.	Offering the best service means matching the (intangible) needs of the user with a combination of services and products.
Tendency to disregard end-of-life phase	*Internal incentive to incorporate end-of-life phase in business model*
There is no economic incentive for product life extension, reuse or remanufacturing as they counteract most linear business models.	As products are assets, minimising life-cycle costs is an implicit incentive for a company, inducing a search for the best economic equilibrium

	between reusing, repairing, remanufacturing and recycling products.
Consumer perspective	
User needs/wants drive the role of a product	*User needs/wants drive the role of a product*
Consumers want new products that keep pace with fashion and technological advances. Consumers must match their needs with the product offerings available.	In a service relationship with a company, the customer experience feeds back more strongly to the service provider, raising consumers' awareness of their actual needs. In other cases consumers become prosumers who co-create or co-produce the products and services they need.
International opportunities for cost reduction	*Local-first attitude*
Consumers seek the cheapest version of a product on international markets, enabled by e-commerce.	Accessibility to the service provider is part of the service experience, which leads to proximity as a customer choice criterion.
Ownership is the norm	*Accessibility is the norm*
Owning a product is regarded as the normal way to fulfil needs. Over time, previously luxury products become commodity goods due to decreasing production costs. Beyond legal warranty, product repair is considered too expensive compared with buying a new product. Do-it-yourself repair is considered too difficult due to complex and protective product design.	Fulfilling needs is driven first and foremost by accessibility of a product and the satisfaction provided by its use. Different consumer segments can access products of their choice through customised services or by sharing products, for instance in peer-to-peer networks. Service agreements provide an incentive for product care for the producer and the user, depending on the agreement.

In the case of Luxembourg, the tools of Circular Economy have taken various forms, placing public attention on the new Research and Development initiatives. The fact that governments can compensate for market failures related to firms' difficulties in finding external finance is a case under consideration in Luxembourg. Especially in the case of junior corporations,

governments can support R&D and appropriate R&D investment returns. This kind of support is assured directly, through grant schemes, or indirectly, through the promotion of tax incentives.

Luxembourg's share of GDP allocated to R&D activities stands at 1.3%, while its own national 2020 target represents an amount of 2.3%-2.6% of GDP[27]. In particular, the Organization for Economic Co-operation and Development (OECD) suggests that business R&D strongly decreased over the past decade and the underlying drivers of this phenomenon are still unexplored. OECD also explains that although to a lesser extent, the observed decline could be attributed to composition effects, since traditionally low R&D intensive services sectors account for a growing share of the economy.

The implementation of effective R&D policies has thus become a priority for Luxembourg, which implies further expenditures for the government and higher education R&D. Luxembourg has also expanded the list of available grant schemes and has broadened the actions of Luxembourg's innovation agency, Luxinnovation, which now generates a third of business R&D expenditures through its programs[28].

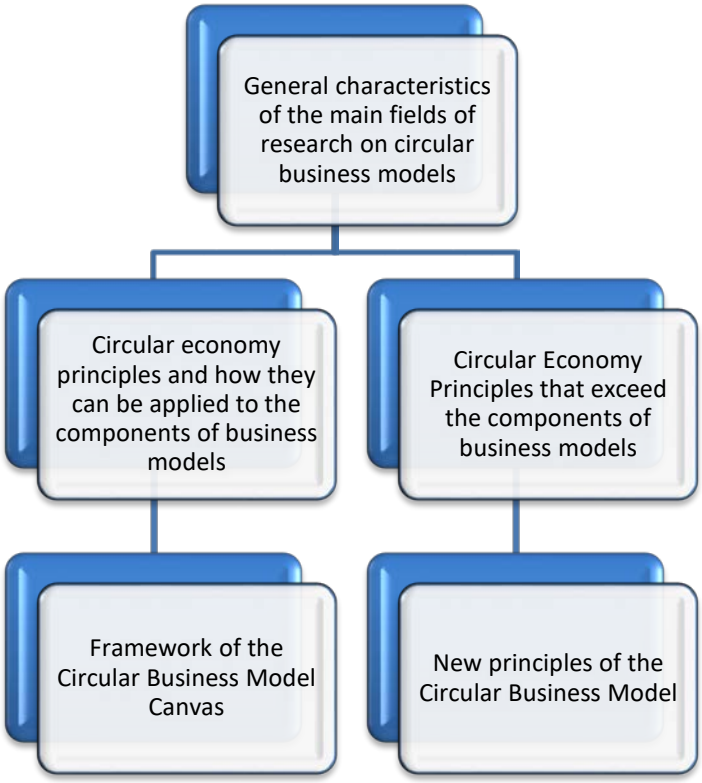
However, how are these businesses going to be organized in a circular context? The following principles are identical for categorizing some of the main business models in a circular economy. In other words, the criteria that we use for conceptualizing the adaptability of a business product into the recycling phases are based upon:

- regeneration,
- share,
- optimization,
- loop,
- virtualization,

[27] OECD, OECD Economic Surveys Luxembourg Overview, July 2019, page 45, https://www.oecd.org/economy/surveys/Luxembourg-2019-OECD-economic-survey-overview.pdf
[28] Ibid, page 45

- and exchange[29]

If we take a closer look at the process of generating a new business model, we will have to focus on its sustainability aspects. The graphic below represents the idea behind every step of the process:

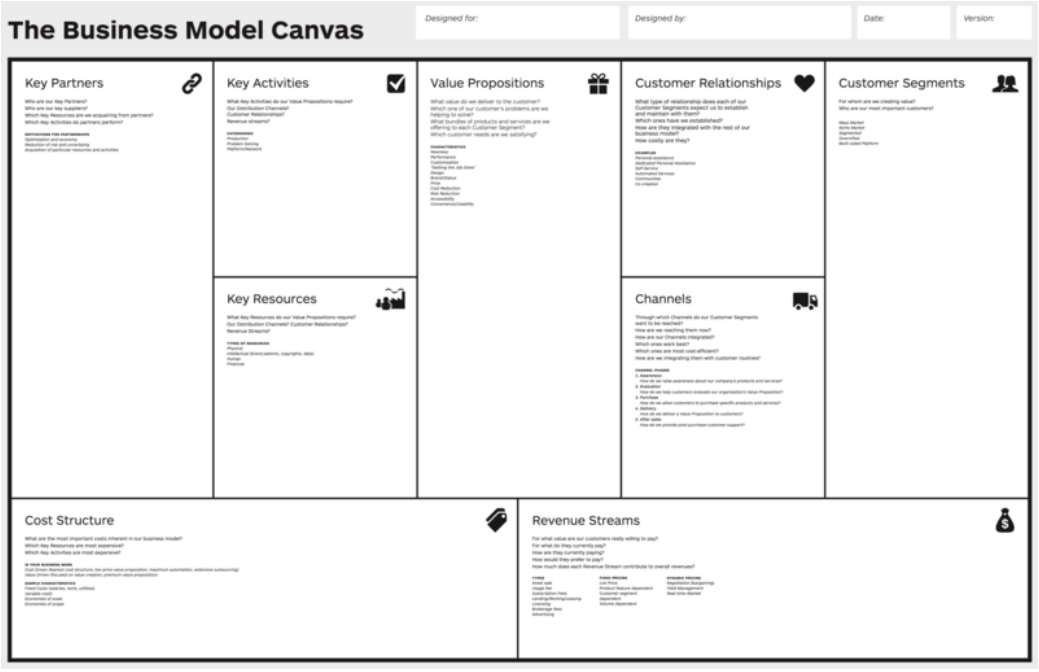


[30]The Concept of Developing a Framework of Business Model for the Circular Economy

The **Canvas Model** focuses on the identification and classification of the product service systems' characteristics. As a design tool for a circular business model, it is especially known for its eco-innovation application. Looking at the infrastructure management of each business model, from the partners and the resources to the activities involved, there are some contextual factors which serve as enablers for a business model to operate in practice. In this regard, the development of marketable eco-innovations, the

[29] Mateusz Lewandowski, 2016, Designing the Business Models for Circular Economy—Towards the Conceptual Framework, MDPI, page 7, https://www.researchgate.net/publication/291171892_Designing_the_Business_Models_for_Circular_Economy-Towards_the_Conceptual_Framework
[30] Ibid, page 2

barriers of sustainable development, and the marketing eco-innovations, can have a direct impact on the operation phase of the Canvas Model.



In addition, there are some elementary skills for any circular economy project team. Among others, the skill of entrepreneurial and developing, craftsmanship of products and services, systems thinking and capability of identifying causal loops are indicative prerequisites of successful projects. Furthermore, some of the necessary qualifications include future oriented and out-of-the-box skills, celebrating diversity, and addressing insecurities. In this context, the designing of circular systems, products and services, become creative, innovative and connected.

Apart from the Canvas model, we can identify other three models concerning the use of circular economy tools:

1. **The Co-creation of products and services model** which offers end-users the design and the manufacturing phases by identifying consumer preferences[31]. Big-data online mining product reviews and evaluating product specifications and prototypes via Living Lab to customize the end-user requirements. In this way, sets of sustainable production methods will be implemented and new products and services will be created from the co-creation features.
2. **The Sustainable Consumption model,** which develops a method to calculate the eco-points of products based on the outcome of myEcoCost project and assesses product environment footprints (PEF). It also provides a traceability solution to monitor product's sustainability along the value chain, and supports end-users and stakeholders to actively implement the circular economy via awareness raising and knowledge sharing activities.
3. **The Collaborative Recycling/Reuse model,** which prepares a system for stakeholders to interact with each other. This system facilitates the use or reuse of end-of-life products, aims to reduce waste, and implements the eco-credits awarding scheme to encourage people to recycle or to reuse.

[31] A circular economy approach for lifecycles of products and services, CIRC4Life, https://www.circ4life.eu/circular-economy-business-models

On the other hand, the European Commission has developed several tools and instruments in order to facilitate the transition of EU member states' linear economy towards a more circular model. The EU Ecolabel, for instance, offers identification methods for products and services that have reduced their environmental impact throughout their entire life cycle[32]. Since it is a voluntary label, it is available for consumers who want to stay informed on sustainable products and boost production efforts in this line.

The process through which EU Ecolabel supports the circular economy is directly linked to producers who work in favor of generating less waste and CO2 emissions during the manufacturing process. Apart from rewarding the existing sustainable production, the EU Ecolabel also encourages companies to develop products that are durable, easy to repair and recycle.

In the end, another tool for applying circular economy initiatives is provided via the Environmental Technology Verification (ETV) method. ETV is a new tool that helps innovative environmental technologies reach the market by reassuring third-party verification of the performance of

[32]European Commission, The Circular Economy tools and instruments, Environment, https://ec.europa.eu/environment/green-growth/tools-instruments/index_en.htm#ecolabel

technologies[33]. This tool can at the same time build trust among potential customers and reduce their technological risk. By using the "Statement of Verification", companies can evidence that the claims made about the innovation procedure are both credible and scientifically sound. The final customers, who are companies, have a proof of performance which is credibly assured, while the linking innovations can enjoy a wider market access or a larger market share for the purchasers.

[33] European Commission, EU Environmental Technology Verification, ECO-INNOVATION at the heart of European policies, https://ec.europa.eu/environment/ecoap/etv_en

8. Bibliography

1) Bee creative, https://www.bee-creative.lu/

2) House of Training, https://www.houseoftraining.lu/training/explore

3) Progress Report, Digital Luxembourg Innovative Initiatives, Spring 2018, https://digital-luxembourg.public.lu/sites/default/files/2018-06/DL_201804022_PROGRESS%20REPORT_08%20BAT.pdf

4) Digital Four Industry-Luxembourg, https://digital4industry.lu/

5) Hello Future.lu-Your Job in Industry, https://hellofuture.lu/secteurs/ecoinnovation/

6) OECD, OECD Economic Surveys Luxembourg Overview, July 2019, https://www.oecd.org/economy/surveys/Luxembourg-2019-OECD-economic-survey-overview.pdf

7) Larosse, Jan. Analysis of National Initiatives on Digitizing European Industry-Luxembourg: Digital4Industry https://ec.europa.eu/futurium/en/system/files/ged/lu_country_analysis.pdf

8) The Government of the Grand Dutchy of Luxembourg, Luxembourg Cluster Initiative, https://www.luxinnovation.lu/cluster/luxembourg-cleantech-cluster/

9) European Commission, Eco-innovation Observatory, Eco-Innovation Observatory Country Profile 2016-2017: Luxembourg https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/luxembourg_eio_country_profile_2016-2017.pdf

10) Circular Economy: a smart way of using materials, Material Flows-The Material Flow Analysis Portal, http://www.materialflows.net/circular-economy/

11) Green Infrastructure in Luxembourg, Biodiversity Information System for Europe https://biodiversity.europa.eu/countries/gi/luxembourg

12) Hansen, Katja. Mulhall, Douglas (Coordinator). Zils, Markus. Luxembourg as a knowledge capital and testing ground for the circular economy. National Roadmap for Positive Impacts. Tradition, Transition, Transformation. EPEA Internationale Umweltforschung GmbH, 2014, https://www.luxinnovation.lu/wp-content/uploads/sites/3/2017/05/brochure-cleantech-web.pdf

13) Wlodarski, Odette. Luxembourg: Quality of work and employment of low-qualified workers, Observatory: EurWORK, 2009,

https://www.eurofound.europa.eu/publications/report/2009/luxembourg-quality-of-work-and-employment-of-low-qualified-workers

14) Policy Forum on the Future of Work, Employment and Labour Ministerial Meeting, OECD Better Policies for Better Lives, https://www.oecd.org/employment/ministerial/employment-in-figures.htm

15) The Portal of Statistics of the Grand Dutchy of Luxembourg, Luxembourg in Figures-2019, STATEC,https://statistiques.public.lu/catalogue-publications/luxembourg-en-chiffres/2019/luxembourg-figures.pdf

16) Innovation Center, Neobuild, http://neobuild.lu/en/neobuild/innovation-center

17) The Grand Dutchy of Luxembourg, Skills Bridge, https://www.skillsbridge.lu/

18) OECD, Inclusive Entrepreneurship Policies: Country Assessment Notes, Luxembourg 2018, OECD Better Policies for Better Lives, http://www.oecd.org/cfe/smes/LUXEMBOURG-IE-Country-Note-2018.pdf

19) Luxembourg Sustainable Finance Roadmap, A Journey Towards A Sustainable Financial System, UNEP Finance Initiative, 2018 https://gouvernement.lu/dam-assets/documents/actualites/2018/10-octobre/04-sustainable-finance/Luxembourg-Sustainable-Finance-Roadmap-WEB.pdf

20) Women in Digital Empowerment, http://wide.lu/

21) Luxembourg economy - Open, Dynamic, Reliablehttp://luxembourg.public.lu/en/publications/k/cc-economie-luxembourg/cc-economie-luxembourg-en-pdf.pdf

22) What kind of energy do we consume in the EU? Eurostat, https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-3a.html

23) OECD, OECD Economic Surveys: Luxembourg 2017, OECD Publishing Paris, 2017. https://books.google.gr/books?id=zMgtDwAAQBAJ&pg=PA33&lpg=PA33&dq=low-skilled+employees+in+luxembourg+circular+economy&source=bl&ots=sBVm_FAR0e&sig=ACfU3U3Gq0eC0OyphlCjmETWAfRtvi2g5g&hl=el&sa=X&ved=2ahUKEwjn45H4_qLlAhXFwqYKHW7FBTkQ6AEwBXoECAkQBA#v=onepage&q&f=false

24) European Environment Agency (EEA), Circular by Design Products in the Circular Economy, Luxembourg: Publications Office of the European Union, 2017.

https://circulareconomy.europa.eu/platform/sites/default/files/circular_by_design_-_products_in_the_circular_economy.pdf

25) Mateusz Lewandowski, Designing the Business Models for Circular Economy—Towards the Conceptual Framework, MDPI, 2016. https://www.researchgate.net/publication/291171892_Designing_the_Business_Models_for_Circular_Economy-Towards_the_Conceptual_Framework

26) A circular economy approach for lifecycles of products and services, CIRC4Life, https://www.circ4life.eu/circular-economy-business-models

27) European Commission, The Circular Economy tools and instruments, Environment, https://ec.europa.eu/environment/green-growth/tools-instruments/index_en.htm#ecolabel

28) European Commission, EU Environmental Technology Verification, ECO-INNOVATION at the heart of European policies, https://ec.europa.eu/environment/ecoap/etv_en