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COMMISSION STAFF WORKING DOCUMENT

Country Report Luxembourg 2020

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN CENTRAL BANK AND THE EUROGROUP

2020 European Semester: Assessment of progress on structural reforms, prevention and correction of macroeconomic imbalances, and results of in-depth reviews under Regulation (EU) No 1176/2011

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EXECUTIVE SUMMARY

Whereas growth prospects remain shaped by a less supportive external environment, to which the economy is highly sensitive, Luxembourg has made some progress in diversifying its economy, potentially easing the way to a more resilient growth path. Some progress was achieved by focusing investment on fostering digitalisation and innovation, stimulating skills development and developing the transport system. The resilience of the economy would be further strengthened by encouraging private investment and fostering technological diffusion and innovation among firms, while also further improving sustainable transport infrastructure and housing supply. The country could also bolster its economy and improve the conditions for sustainable growth that benefits the whole of society by ensuring that the labour supply and skills levels match labour market needs. This, in turn, would help to better address the long-term health of government finances ([1]).

Economic growth has slowed and is set to stabilise. After reaching 3.1 % in 2018, GDP growth is estimated to have slowed to 2.6 % in 2019. It was driven by stronger domestic demand, partly offsetting the weaker contribution from the external sector. Consumer spending growth also strengthened in 2018, building on an improvement in the labour market and higher disposable incomes, resulting from taxation reforms and wage indexation.

Despite a less dynamic growth trend, Luxembourg's economy is projected to continue outpacing growth in the EU as a whole. Growth in Luxembourg's annual real GDP (adjusted for inflation) averaged 3.2% in the period 2010-2018, compared with an EU average of 1.4%. The economy is set to continue growing at a steady pace over the coming years. Against a backdrop of global uncertainty, regulatory and technological changes, and weak profit expectations, business investment is expected to remain subdued, despite favourable financing conditions. By contrast, public investment may increase faster.

Luxembourg's government finances remain sound but concerns remain for the long term. The general government balance is estimated to have posted a surplus of around 2.7% of GDP in 2019 and it is forecast to remain in surplus in 2020. General government debt is expected to continue to fall in 2020, from an already low level of around 20% of GDP in 2019. Concerns remain regarding the long-term sustainability of public finance. From now until 2070, Luxembourg is expected to face one of the sharpest increases among the EU countries in ageing-related spending (pensions, long-term care, and healthcare costs). With no policy change, this would have a major impact on public debt.

Investment remains relatively weak in sustainable housing and transport infrastructure, research and innovation, and digitalisation, especially in the business sector. This might slow down the development of activities that add higher value to the economy. Greater private investment in research, technological innovation and digitalisation may ease the transition to a data-driven economy. Investment in sustainable housing is insufficient for the level of demand, and housing prices have increased further. Growth that benefits all of society might largely depend on education and lifelong learning.

Overall, Luxembourg has made limited ([2]) progress in addressing the 2019 country-specific recommendations.

There has been some progress in the following area:

- Focusing economic policy related to investment on fostering digitalisation and innovation, stimulating skills development and improving sustainable transport.

There has been **limited progress** in the following areas:

([1]) This report assesses Luxembourg's economy in light of the European Commission's Annual Sustainable Growth Strategy, published on 17 December 2019. In this document, the Commission sets out a new strategy on how to address not only the short-term economic challenges but also the economy's longer-term challenges. This new economic agenda of competitive sustainability rests on four dimensions: environmental sustainability, productivity gains, fairness and macroeconomic stability.

([2]) Information on the level of progress and actions taken to address the policy advice in each respective subpart of a country-specific recommendation is presented in the overview table in the Annex.

- Increasing employment among older people, by enhancing their employment opportunities and employability, and further limiting early retirement.

- Further reducing regulatory restrictions in the business services sector. Despite some recent changes, such restrictions remain above the EU average in most regulated professions.

- Increasing the housing supply, including by increasing incentives and lifting barriers to build.

- Addressing features of the tax system that may facilitate aggressive tax planning, in particular by means of outbound payments.

There has been **no progress** in the following area:

- Improving the long-term sustainability of the pension system, including by further limiting early retirement.

Luxembourg performs well overall on most indicators of the Social Scoreboard supporting the European Pillar of Social Rights. The labour market is performing rather well, and indicators on inequality, poverty and social exclusion remain close to or better than the EU average, despite some signs of weakening. Significant skills shortages have emerged recently in certain sectors and school pupils' opportunities are still strongly influenced by their socio-economic status.

Luxembourg's progress towards its national targets under the Europe 2020 strategy paints a mixed picture. The employment rate target of 73% is still out of reach despite substantial job creation. Luxembourg almost meets the municipal waste recycling target of 50% and is broadly on track to reach the targets for energy efficiency. On the other hand, it is at risk of failing to achieve the targets for reducing the risk of poverty or social exclusion, the school drop-out rate ('early school leaving'), post-secondary educational attainment, research and development intensity and reducing greenhouse gas emissions.

Overall, Luxembourg performs well in achieving the Sustainable Development Goals. This is particularly the case for 'Good Health and Wellbeing' (SDG 3). Some deterioration can be observed, however, in indicators related to the reduction of inequalities (SDG 10) ([3]).

Despite robust job creation, the proportion of people in certain population groups who are working or looking for work remains insufficient. Employment continued to increase in 2018 and in the first three quarters of 2019 and at 5.5% unemployment is low. The youth unemployment rate fell to 13.8% in the first three quarters of 2019, while the rate of young people not in employment, education or training is one of the lowest of the EU. The employment rate of older workers went up in 2018, to reach 40.5% but it remains substantially below the EU average. Older and low-skilled workers, especially those with a migrant background, are less likely to find or stay in work.

The labour market remains robust, but many firms have difficulties filling vacancies. Ensuring that the labour supply and skills match labour market needs is key to achieving growth that benefits the whole of society. The public employment service continues to cooperate with employers to address the most critical skills shortages and the government has announced reforms to ensure the quality and relevance of training.

The overall risk of poverty or social exclusion increased in 2018, reaching the EU average (21.9%). The impact of social benefits in lifting people out of poverty remains strong, but it has been weakening since 2015 and income inequality rose in 2018. The proportion of people in work at risk of poverty is still among the highest in the EU. In this context, the newly implemented *Revenu d'inclusion sociale,* an activation benefit consisting of an allowance for activities organised by the social inclusion office, such as community work or

([3]) Within the scope of its legal basis, the European Semester can help drive national economic and employment policies towards the achievement of the United Nations Sustainable Development Goals (SDGs) by monitoring progress and ensuring closer coordination of national efforts. The present report contains reinforced analysis and monitoring on the SDGs. A new annex (Annex E) presents a statistical assessment of trends in relation to SDGs in Luxembourg during the past five years, based on Eurostat's EU SDG indicator set. Measures to increase labour market participation of under-represented groups would contribute to advancing towards SDGs 5 and 10.

activities favouring social stabilisation, is expected to help reduce poverty.

Education performance is below the EU average and closely linked to socioeconomic status. Luxembourg's average performance, worsened between 2012 and 2018. The impact of socio-economic status on performance is one of the strongest in the EU. In response to this challenge, the government has taken measures to close the achievement gap between pupils of different backgrounds and to reduce early school leaving rates.

Key structural issues analysed in this report, which point to particular challenges for Luxembourg's economy, are the following:

- **Recent reforms have not addressed concerns regarding the long-term sustainability of the pension and long-term care systems.** Long-term projections for pensions and long-term care spending point to risks to the sustainability of government finances. Several measures have been adopted, but their impact has been limited. More fundamental reforms have not been considered yet or are pending approval, such as the 'Age Pact', which is intended to keep workers in employment for longer.

- **Evidence suggests that Luxembourg's tax rules are used for aggressive tax planning.** Specifically, the absence of or exemption from withholding taxes on outbound payments is a cause for concern. Reforms in Luxembourg have focused on the implementation of European and internationally agreed initiatives, and Luxembourg reported that it plans to address the issue of outbound payments.

- **Despite clearly identified money laundering risks linked to the misuse of legal entities, application of anti-money laundering measures by certain professionals providing services to companies and trusts should be further enhanced.** The low reporting of suspicious transactions/activities by such professionals, the sector's fragmentation and the widespread use of complex legal structures make it difficult to implement preventive measures. Effective supervision and guidance, and properly functioning beneficial ownership registers are key to mitigate risks.

- **Luxembourg's financial sector is well integrated in the international financial industry's global value chain and continues to drive economic growth.** The financial sector is the main economic engine, accounting for 25 % of GDP and 11 % of employment. Luxembourg's banks display solid capital ratios, although their profitability has weakened due to the low interest rate environment and rising operational and regulatory costs.

- **Households have high levels of debt compared to their incomes.** Rising household indebtedness stems in particular from increasing property prices, as mortgage loans account for most of household debt. Increasing debt means that some lower income households may struggle to make ends meet if interest rates go up or if there is an economic downturn.

- **Housing prices continue to increase, driven by the large gap between demand and supply.** Housing demand is influenced by dynamic population growth, benign financing conditions and a large cross-border workforce. Housing supply and investment are insufficient, largely due to a lack of incentives for landowners to build new housing and to an insufficient supply of social housing.

- **Relatively weak investment in research and innovation, especially in the private sector, weighs on Luxembourg's innovation potential.** This might slow down the development of activities that add higher value to the economy. Stronger private investment in research, technological innovation and digitisation can be key drivers of productivity growth and ease the transition to a data-driven economy. The connection between the public science base and businesses is weak, limiting firms' potential for innovation. The lack of a national research and innovation strategy and insufficient public support for business research and development investment, are just two of the challenges that prevent Luxembourg from exploiting the full potential of its innovation eco-system.

- **Regulatory barriers remain in the business services sector, and some bottlenecks weigh on the business environment.** Regulatory restrictions in business services remain above the EU average for several economically important professions. Measures have been taken to ease restrictions in the retail sector.

- **Despite challenges on climate, energy and mobility, the green transition offers growth opportunities.** The country is the EU's highest greenhouse gas emitter per capita. With existing measures, it would fall short of its 2030 target for reducing greenhouse gas emissions. This highlights the considerable efforts needed to deliver on Luxembourg's climate and energy objectives, in particular in the transport and housing sectors. The National Energy and Climate Plan (still to be delivered by Luxembourg's authorities at the time of writing)will outline the scope of the envisaged policy response and will play a key role to assess investment needs. The impact of the transition on some economic sectors and households is likely to require mitigating policies, the costs of which still need to be quantified. Road traffic congestion weighs on the economy and environmental sustainability, and Luxembourg is investing in a more sustainable mobility. Its financial sector has taken innovative steps in the sustainable finance market, while eco-innovation and circular economy policies can support job creation and the diversification of the economy.

- **A Just Transition Mechanism under the next multi-annual financial framework for the period 2021-2027 will contribute to ensuring that the transition towards EU climate neutrality is fair** by helping the most affected regions in Luxembourg to address the social and economic consequences. Key priorities for support by the Just Transition Fund, set up as part of the Just Transition Mechanism, are identified in Annex D, building on the analysis of the transition challenges outlined in this report.

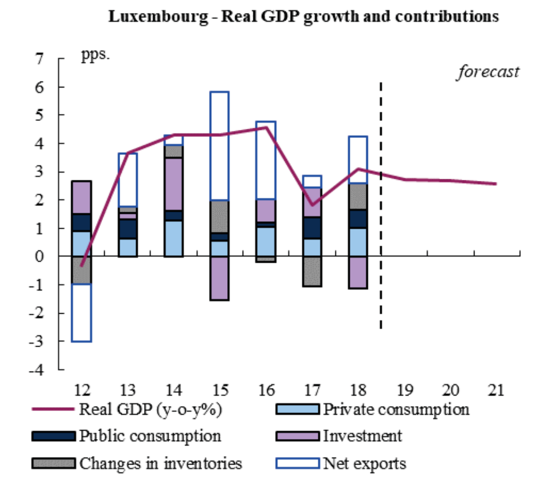
1. ECONOMIC SITUATION AND OUTLOOK

GDP growth

Economic growth in Luxembourg is set to weaken, mostly due to external headwinds. Real GDP growth in Luxembourg is set to have reached 2.6% in 2019, a moderate slowdown compared with the 3.1% for 2018. Growth was driven by stronger domestic demand, partly offsetting the weaker contribution from the external sector (Graph 1.1). Private consumption picked up in 2018 and the resulting higher growth momentum was maintained in 2019, accompanied by robust job creation. Employment growth remained above 3½% in 2018 and 2019. Another stimulus for consumption was provided by expected income gains from the automatic wage indexation mechanism. Wage growth was 3.6% on an annual basis in 2019 and an indexed increase was triggered on wages and pensions in December 2019 and applied in January 2020. These factors concurred in a period of relatively lower inflation (1.6% in 2019, with stable prospects for 2020, after 2.0% in 2018) to further support private consumption growth in 2020 (4).

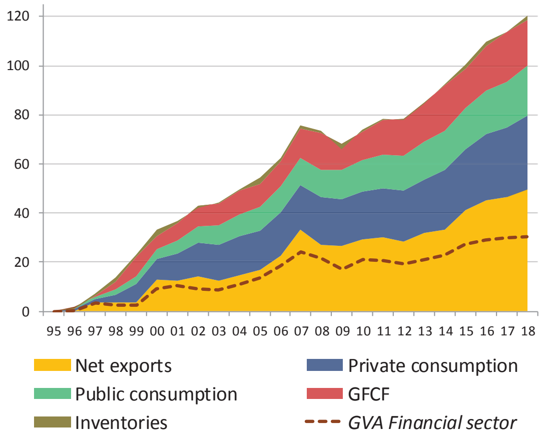
Despite a less dynamic growth trend, Luxembourg's economy is projected to continue outpacing growth in the EU. Luxembourg's annual real GDP growth averaged 3.2% in the period 2010-2018, compared with 1.4% for the EU average. The economy is set to continue growing at a steady pace, around 2½% over the coming years (around 1.5 percentage points faster than growth expected in the EU). On the face of favourable financing conditions, business investment is expected to remain subdued, against a backdrop of global uncertainty, regulatory and technological changes and weak profit expectations. By contrast, public investment may accelerate. On the fiscal side, the government has gathered robust buffers and has recently stepped up financial efforts to support its main policy objectives, as announced in the 2020 budgetary plan, which would keep public investment above 4% of GDP in the coming years (Section 3.1).

Graph 1.1: **Real GDP growth (y-o-y %) with contributions and output gap**



Source: European Commission

Graph 1.2: **Real GDP level relative to 1995 (1995 = 0) and contributions (pps cumulated)**



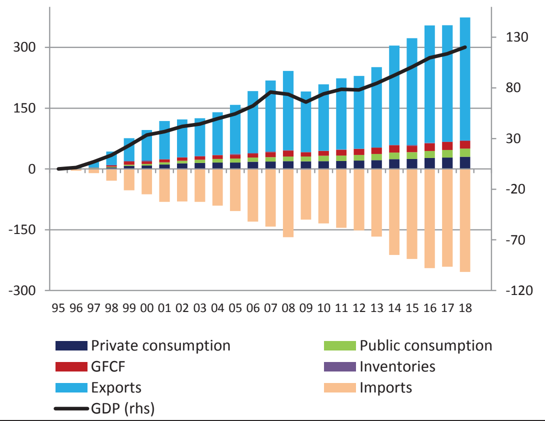
Source: STATEC. (European Commission calculations)

Indicators point to a weakening of economic growth, especially in the financial sector, traditionally Luxembourg's economic engine. Luxembourg is a small open economy with a relatively large international financial sector. In 2018, real GDP was 120% higher compared to its

(4) It should be noted that a number of elements discussed in this report, such as the economic developments described above, are subject to a high degree of uncertainty due to data issues. These issues are specific to Luxembourg and related to weak or insufficient data coverage, or for instance, due to the relatively frequent and substantial revisions, in international comparisons, to Luxembourg's statistics on GDP and its components of the national accounts and the balance of payments data (Krebs, 2019). These revisions have a significant impact on monitoring and prospective reporting carried out by the Commission services. As those statistics are used in important analyses such as evaluations under the Stability and Growth Pact, and serve to support policymaking, including the Sustainable Development Goals monitoring, it would be beneficial for Luxembourg to improve the accuracy of first statistical estimates.

level in 1995. Net exports contributed 50 percentage points to growth (Graph 1.2), 80% of which were from financial services. After the crisis, the contribution from financial services has been relatively lower, reflected in real GDP growth. Recently, market deepening has slowed somewhat, although Luxembourg maintains high productivity gains, accumulated in the past from access to external markets. While GDP growth appears rather stable in 2019, Luxembourg trading partners have been more affected by the current slowdown. Increased uncertainty is weighting on international trade and some international integrated production structures may be affected. Overall, the economy is expected to grow at a slower pace in the coming months.

Graph 1.3: **Real GDP level relative to 1995 (1995 = 0) and contributions (pps cumulated)**



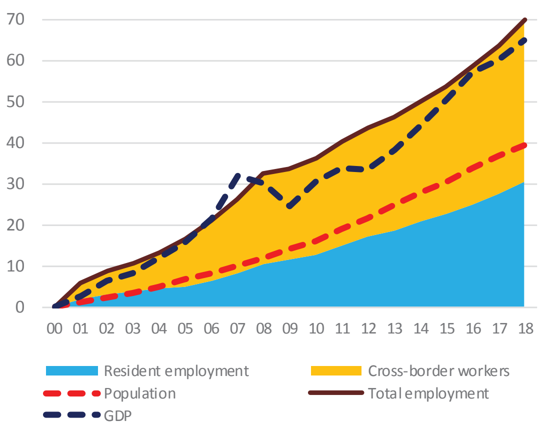
Source: Eurostat

Luxembourg shows high dependence to foreign trade, as it contributes strongly to economic activity. Although at a slower pace, trade integration has expanded further and the large gross trade flows are increasingly higher, compared with the net exports balance (Graph 1.3). Luxembourg displays one the highest levels of market integration among the Organisation for Economic Co-operation and Development (OECD) countries, with both exports and imports accounting for more than twice the level of GDP. Intermediate inputs account for the largest share of the country's trade. National Accounts data show that around 70% of operating costs are determined by intermediate inputs, more than half of which are imported. High market integration also implies higher exposure to external shocks to the supply chain, whereas barriers to trade have a cumulative impact on costs thus on competitiveness (Section 3.4.1).

Labour market

The labour market remains robust. Employment growth peaked at the beginning of 2018 at 3.9% over one year**.** This strong pace of job creation was maintained at around 3.7%, on average, in the period 2018-2019 before employment started slowing down in September 2019. Even though growth was never close to pre-crisis rates, Luxembourg’s labour market has remained one of the most dynamic among the EU Member States. Employment growth is expected to continue decelerating in 2020 in line with the global economic slowdown.

Graph 1.4: **Employment growth cumulated and contributions by residence (2000=0)**



Source: Eurostat

Luxembourg's economy is highly labour intensive. Employment increased by 70% in the period 2000-2018 (Graph 1.4). At the same time, employment growth was 17% in Belgium, 12% in Germany, 9.8% in France and 6.8% in the whole of the European Union. In the aftermath of the economic crisis of 2008, employment declined in the EU for two consecutive years. In Luxembourg, only cross-border employment fell marginally. Cross-border workers, i.e. people who do not live in Luxembourg but commute there every day for work, account for 41% of paid employment. Cross-border employment appears to be more sensitive to economic developments than resident employment and it has often acted as a buffer for resident workers and the economy. Favourable employment conditions have also attracted a large number of migrant workers. As a result, population has increased by 40% in the period 2000-2018, among the largest increases in the EU. Migrant population count is almost at the same level as resident people born in Luxembourg.

Competitiveness and investment

Cost competitiveness conditions in Luxembourg appeared stable in 2018. Nominal compensation per employee grew by 3.3% in 2018 and it is expected to continue growing in 2019 and 2020, albeit at a slightly lower pace. In 2019 nominal compensation per employee is expected to grow with 3.2%, a faster pace than the internal wage benchmark (0.2%), which is a predicted nominal compensation based on inflation, productivity and unemployment (European Commission, 2019). With inflation also growing, real wages have seen a rather moderate increase of 0.7% in 2018 and 1% in 2019. Market shares appeared also relatively stable in 2018. The role of domestic and foreign services is particularly important for explaining the aggregate competitiveness in Luxembourg (Section 3.4.1).

Measuring and interpreting Luxembourg's productivity is specially challenging. This is due to the uncertainty surrounding national statistics on external trade and the large difference between GDP and Gross National Income. Ratios based on GDP (either as numerator or denominator) do not take account of outflows of foreign income, while ratios based on population do not account for the number of cross-border workers, which would raise the population count by 30%. The OECD ([5]) has reported that other categories of the population live temporarily in the country but are not registered as residents. This is the case, for instance, of posted workers ([6]) (around 6% of resident population in 2016) or tertiary education students (more than 70% of all tertiary education students in Luxembourg). Altogether, the number of non-resident workers is equivalent to 60% of Luxembourg's resident population, according to OECD estimates, accounting for 67% of full time equivalent employment. On a similar note, traditional statistics on the trade of gross exports and imports may be inflated by re-imported exports in the presence of global value chains, while some intragroup accounting practices may have a large impact on reported foreign direct investment values. Additional caution is required when interpreting some model-based results computed using these variables as inputs. For instance, total factor productivity for Luxembourg, given the large number of non-resident workers.

Luxembourg enjoys a very high level of productivity compared with other EU countries. However, productivity growth has been lagging behind. In the period 1995-2018, productivity in Luxembourg increased by 0.3% on average per year, compared with 1.0% in Belgium, 1.4% in France and Germany and 1.6% for the EU average. Against this background, positive wage differentials with trade partners in the euro area might translate into competitiveness losses that cumulate over time, while the drivers that had boosted the financial sector expansion in past decades appear to be waning (2019 Country Report for Luxembourg, European Commission). Even though most advanced countries have seen productivity slowing down as from the early 2000s, Luxembourg's weaker dynamics do not appear likely to be fully explained by the increasing share of services observed in most EU Member States ([7]). Moreover, Luxembourg's trade openness and its financial specialisation had begun at an earlier stage and was already quite advanced in 2000.

Both employment and GDP tend to grow at a similarly strong pace over time, which keeps labour productivity growth barely changed. Graph 1.5 presents a decomposition of the labour productivity level relative to 1995 and its components GDP and employment cumulated changes (the latter with a negative sign), for the whole economy. As shown in figure 1.5, high

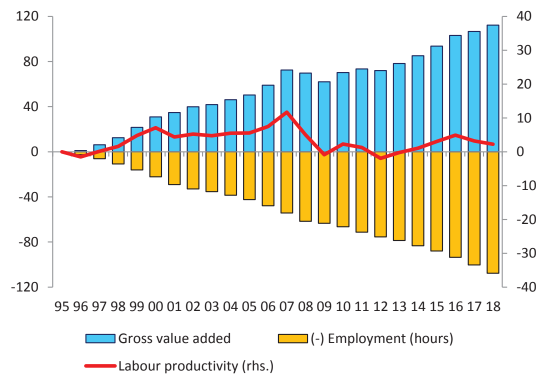
([5]) OECD, International Migration, Outlook, 2019.

([6]) Inside the EU/EFTA, posted workers are defined as salaried or self-employed workers who generally carry out their activity in another member country while staying affiliated to the social security system in their home country. When workers are posted in one other member country, the posting cannot exceed 24 months (EC No 987/2009 Article 12).

([7]) It may also be related to statistical issues (broadly acknowledged): the difficulty of measuring productivity in financial services is an important methodological issue in the case of LU, stemming from a range of shortcomings, including unobserved indicators (e.g., Financial Intermediation Services Indirectly Measured), unpriced and aggregated services or intermediate consumption in supply global value chains.

labour intensity is also concurrent with a high elasticity of employment (close to one in cumulated terms). This means that employment and GDP in levels tended to increase at a similar pace in the period 1995-2018, which implies that labour productivity growth remained close to zero while the economy was generating robust economic growth and strong job creation on a sustained basis.

Graph 1.5: **Labour productivity level relative to 1995 and contributions (percentage points)**

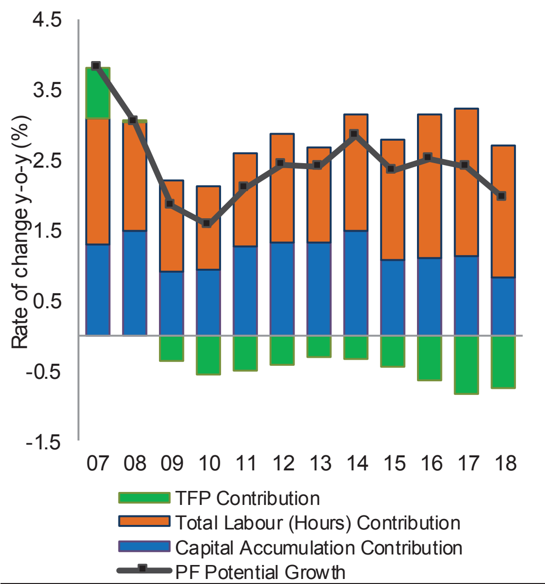


Source: European Commission

Productivity gains originating from high annual GDP growth rates might not be sustainable. The adjustment of employment is persistently slower than GDP growth. In a context of strong employment demand, firms may not swiftly adjust employment in response to a slowdown ([8]). Inversely, employment supply may not react immediately when demand picks up. Figure 1.5 shows how employment did not react accordingly, during both recent slowdowns in the period 2008-2009 and 2012. There seems to be further evidence of some resistance in the adjustment pace of employment. As a result, annual productivity growth appears to be mostly driven by GDP growth, with a persistent positive gap between annual changes in GDP and productivity ([9]). Short-term productivity gains correspondingly are obtained when GDP grows above the amount of this gap on a sustained basis.

Given the high labour intensity of the economy, there may be potential to raise productivity in the long term via increasing capital deepening. Gross fixed capital formation persistently shows one of the lowest records, in terms of GDP, among the EU Member States. In this vein, the contribution of capital stock to potential GDP growth has declined in recent years (Graph 1.6). Moreover, there seems to be a stronger correlation between the contributions of capital accumulation and total factor productivity to potential GDP growth ([10]). These trends suggest untapped potential to raise productivity and potential growth through capital investment.

Graph 1.6: **Contributions to potential growth - Luxembourg**



Source: European Commission

Compared with the high potential of the digital and technological environment, technological integration is low in the broad business sector, while private investment remains weak. Public

([8]) This occurrence, known as labour hoarding, refers to the practice in which a company does not lay off employees when it otherwise would; in order to avoid incurring a loss (as during an economic slowdown), equivalent to negative productivity growth.

([9]) In cumulated terms, there is a strong relationship between changes in employment and changes in GDP in the period 1995-2018, with a correlation coefficient of 0.99. In annual terms, by contrast, employment elasticity shows high volatility and correlation between employment growth and GDP growth appears comparatively low (0.47 in the period 1995-2018). Conversely, correlation between annual productivity growth and GDP growth is high (0.92 in the period 1995-2018).

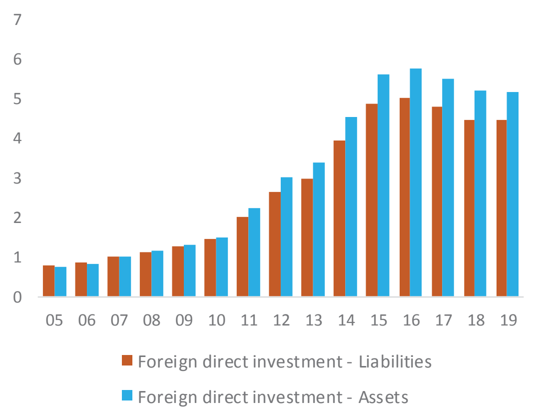
([10]) This would be consistent with the economic theory of endowments, according to which relatively higher productivity gains would result from increasing the share of the least abundant factor. Figures for the latest years should be taken with care, given the large and frequent revisions to Luxembourg's national accounts.

investment is high, in support of knowledge-intensive activities. For years, Luxembourg has focussed on developing a few selected knowledge-intensive clusters to diversify the economy. Among them, the Information and Communication Technology (ICT) sector has thrived and matured, and can play a pivotal role in improving the digital integration in the economy. However, this favourable environment has not leveraged private investment, including in research and innovation (OECD economic surveys: Luxembourg 2019, p.49, Digital Economy and Society Index 2019; EIB Investment Survey Luxembourg 2019), which remains weak in a long-term perspective, in line with the low digital integration in the broad business sector. All this points, in turn, to an inability by firms to reap productivity gains from leveraging investments on the country's digital and technological environment, despite its high potential (Section 3.4).

Capital markets

Luxembourg's foreign direct investment (FDI) positions contracted further in 2018. Luxembourg's FDI is concentrated in a few financial holding companies (*SOciétés de PARticipations FInancières*, SOPARFI), which channel FDI from foreign investors to foreign recipients, representing almost 95% of both total FDI assets (outward investment) and FDI liabilities (inward investment) in Luxembourg. Both liabilities and assets contracted by €343 billion and €315 billion, respectively, in 2018 (Graph 1.7). This contraction was explained by divestments, which have been observed since the second half of 2017. These operations concerned a number SOPARFIs, which either restructured, or ceased or relocated their activities (BCL, 2019).

Graph 1.7: **Foreign direct investment position, gross components - Luxembourg (euro trillion)**



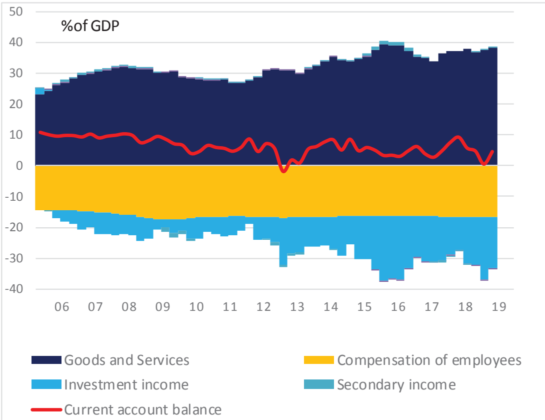
Source: Eurostat

The recent FDI trends in Luxembourg mirror developments in international financial markets, which are being shaped by several factors. FDI is declining worldwide. Possible explanatory factors include changes in the international framework of the fight against the erosion of the tax base and profit transfers (Base Erosion and Profit Shifting initiative of the Organisation for Economic Co-operation and Development, OECD). Another possible factor has been the large-scale repatriations of accumulated foreign earnings by United States multinational firms, after the tax reforms introduced in the country at the end of 2017. United Nations estimates by ultimate investors show that United States is by far the main source of inward FDI in Luxembourg, accounting for almost ¼ of Luxembourg total FDI liabilities (UNCTAD, 2019). Beyond these events, lower returns on FDI, a less favourable environment for investment and the underlying changing patterns in global trade and production, where international investment is increasingly driven by intangibles, which are growing faster than FDI, contribute the declining trend of FDI.

External position

Luxembourg's net international investment position is volatile, due to its role as an international financial centre. The net international investment position reached 60% of GDP in 2018, against 52% of GDP at the end of 2017. Movements in asset prices and asset relocations, as well as inflows of international liquidity explain the volatility and the relative increase in gross assets and liabilities positions in previous years (see Section 3.2).

Graph 1.8: **Current account, gross components - Luxembourg.**



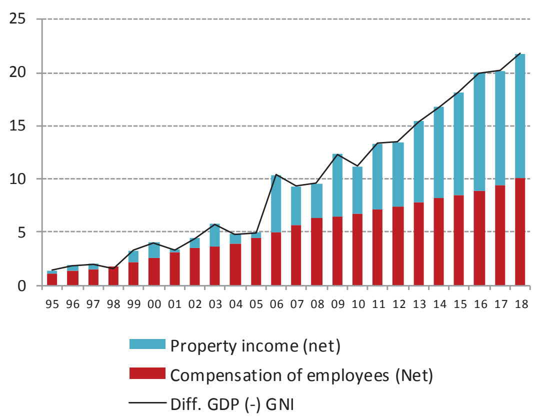
Source: Luxembourg

The current account balance reflects Luxembourg's economy features of output concentration, trade and financial integration and cross-border labour intensity. The current account balance has been posting comfortable and stable surpluses, of around 5% of GDP, for several years (Graph 1.8). The surplus in services (about 40% of GDP) is mainly related to private banking, the investment fund industry and corporate cash management entities. Most of these financial institutions are part of large international financial groups and multinational corporations, which mainly operate cross-border. The stable surplus is driven by strong net financial services exports, counterbalanced, to a large extent, by the outflows registered in the primary income balance. This reflects a threefold dependency defining Luxembourg's economy: high value added sector concentration, high external trade integration and high (foreign) labour intensity.

Real effective exchange rates have appreciated somewhat over the past years compared to their long-term trend. Real effective exchange rates based on the harmonised index of consumer prices and the unit labour costs index have appreciated by a moderate trend. The recent appreciation based on unit labour costs remains in line with developments in neighbouring countries, while real effective exchange rates based on the harmonised index of consumer prices have increased more strongly The current account "norm" ([11]), as computed by the European Commission, suggests that Luxembourg's external position has remained broadly consistent with fundamentals. A small positive current account gap relative to the norm mostly reflects the deviation of the favourable fiscal balance outcome in 2018 from its medium-term objective.

A large contribution to gross value added is made by foreign corporations and non-resident workers. This inflates the primary income deficit, which is the share of generated income flowing out of the country. In 2018, the balance of primary incomes with rest of the world amounted to (-) €22 billion, 36% of GDP. The primary income deficit has widened sharply since 2005, explaining the large gap between GDP and gross national income (Graph 1.9).

Graph 1.9: **Difference between GDP and GNI (euro billion)**



Source: Eurostat

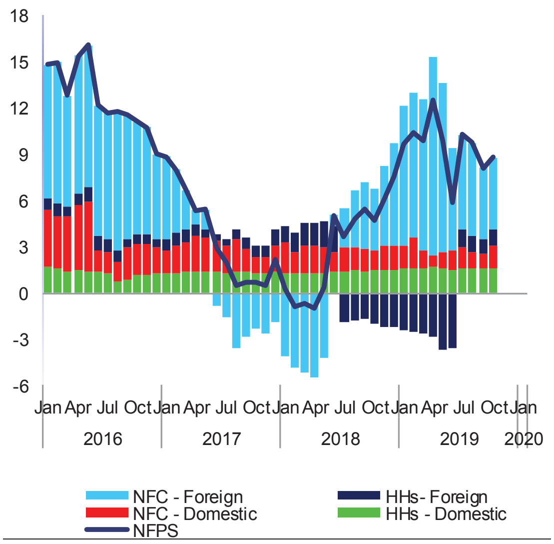
([11]) Current account norm denotes the current account explained by fundamentals according to European Commission model based on European Commission 2019 autumn forecast. 'Current account stabilising the net international investment position above -35% by 2038' is the average current account balance as % of GDP that would allow the net international investment position to stabilize at is current level (for countries with an net international investment position above -35% of GDP), or reach -35% of GDP in the next 20 years. Required current account denotes the average current account as % of GDP needed to attain the higher of two net international investment position targets within ten years: i) reaching the prudential net international investment position threshold, or ii) halving the gap to the fundamental net international investment position benchmark (see 'EU Monitor of Macroeconomic Imbalances 2019', European Commission).

Private debt

Non-financial corporations' debt is one of the highest in the EU. At around 242% of GDP in 2018, it is expected to fall to 223% of GDP in 2019, of which more than 80% is foreign owned intragroup lending, although it remains well below pre-crisis levels. Within the current low interest rate environment, domestic banks have maintained their profitability mostly by increasing lending. Most of this expansion is linked to cross-border intercompany debt (Graph 1.10). A significant active deleveraging took place in 2017 and 2018, which was partly linked to holding companies' exceptional operations (*SOciétés de PARticipations FInancières*, SOPARFI. See *capital markets* above).

Mortgage debt has been increasing in line with rising house prices. A higher debt service burden, for a larger share of households, has built up compared with other EU Member States. However, regular internal stress tests suggest sound macro-prudential oversight and effective risk contention (see Section 3.2).

Graph 1.10: **OUTSTANDING LOANS TO THE NON-FINANCIAL PRIVATE SECTOR (YoY %)**



Source: Banque Centrale Luxermbourg

Housing

Soaring housing prices amplify inequalities, increase household indebtedness and may undermine Luxembourg's attractiveness. Housing prices have been growing strongly, with affordability deteriorating, in particular for low-income households. This can be explained by insufficient land availability, high population and employment growth, a large number of cross-border workers with challenging transport conditions (Section 3.5). There is a broad consensus that the shortage of affordable housing presents a structural challenge in the economy (Section 3.1).

Social developments

Poverty and inequality are increasing despite the positive impact of social transfers. In 2018, Luxembourg registered one of highest increases in income inequality in the EU, with the S80/S20 income quintile share ratio going up from 5.00 in 2017 to 5.72 in 2018 ([12]). The overall risk of poverty or social exclusion has increased to 21.9 % in 2018, reaching the EU average. In-work poverty is still among highest in the EU. Although social transfers play a pivotal role in lifting people out of poverty, their impact has weakened further, against the rise of market income inequality. The newly implemented *Revenu d'inclusion sociale,* an activation benefit replacing the minimum guaranteed revenue as of 2019, which consists of an allowance for activities organised by the social inclusion office (such as community work or activities favouring social stabilisation), is expected to foster social inclusion (See section 3.3). The gross minimum wage has been raised in 2019 (in addition to regular indexation).

The impact of students' origin and socioeconomic background on their performance is one of the strongest in the EU. The latest results of the Programme for International Student Assessment (PISA) led by the Organisation for Economic Co-operation and Development (OECD) ([13]), show that in Luxembourg, the proportion of 15 year-old students with a low socio-economic background who underperform in reading is 37.5 percentage points greater than that of 15 year-old students

([12]) The years refer to the EU SILC survey year and correspond to income data of the previous year.
([13]) The Programme for International Student Assessment (PISA) led by the Organisation for Economic Co-operation and Development measures 15-year-olds' ability to use their reading, mathematics and science knowledge and skills to meet real-life challenges. Since 2019 Luxembourg will carry the PISA survey every two years.

with a high socio-economic background (see Section 3.3).

Public sector

The budgetary surplus is expected to shrink in the next years. From a surplus of 2.7% of GDP in 2018, to 2.3% of GDP in 2019, it is expected to drop further to 1.4% of GDP in both 2020 and 2021 ([14]). The surplus in 2018 was again, to a large extent, the result of a large increase in revenues from current taxes on income and wealth. In particular, tax revenues from corporations increased for the third year in a row by more than 10% year-on-year. A moderate evolution of public expenditure also contributed to the improvement.

Revenues are projected to be less buoyant in the short-term forecasts. After overperforming for several years, revenues are expected to increase in line with GDP growth in the next few years. The introduction of the electronic tax declaration in 2017 accelerated the collection of revenues for corporations ([15]). An increase in expenditure, in particular social outlays, will contribute to the fall in the surplus.

The level of public debt is low. It stood at 21% of GDP in 2018 and it is projected to fall even lower by 2021. A commitment to maintain the debt below the 30% of GDP threshold has been confirmed by the new government that took office at the end of 2018.

Concerns remain regarding the long-term sustainability of public finance. From now until 2070, Luxembourg is expected to face one of the sharpest increases among the EU countries in ageing-related expenditure (pensions, long-term care, and healthcare costs). With no policy change, there would be a large impact on public debt. Several measures have been adopted to address the sustainability of public pensions, but their impact has been limited (Section 3.1).

Overall, Luxembourg performs well in its progress towards the Sustainable Development Goals (SDGs). According to Eurostat's SDGs indicators (see Annex E), Luxembourg has been making progress in a majority of the goals over the past 5 years. This is particularly the case, on average, for indicators on good health and wellbeing (SDG 3 – where Luxembourg registers a better performance than the EU average regarding most indicators), affordable and clean energy (SDG 7) and gender equality (SDG 5). There is a more mixed picture on indicators related to quality of education (SDG 4) and responsible consumption and production, in particular on waste generation and management (SDG 12). Some deterioration can be observed in indicators related to the reduction of inequalities within countries (SDG 10), the risk of poverty (SDG 1), or industry, innovation and infrastructure (SDG 9). The indicators related to the mitigation of climate change (SDG 13) are improving but remain below the EU average.

([14]) European Commission 2019 autumn forecast.
([15]) Law 7020/2017. The reform amongst else reduced the statutory corporate income tax rate from 21% to 19% in 2017 and then to 18% in 2018, increased tax credits for investment.

Table 1.1: **Key economic and financial indicators**

Key economic and financial indicators - Luxembourg

	2004-07	2008-12	2013-16	2017	2018	forecast 2019	2020	2021
Real GDP (y-o-y)	5.1	0.2	4.2	1.8	3.1	2.7	2.7	2.6
Potential growth (y-o-y)	4.1	2.2	2.5	2.4	2.0	2.5	2.7	2.7
Private consumption (y-o-y)	1.5	1.6	2.8	2.2	3.3	.	.	.
Public consumption (y-o-y)	3.0	2.1	2.1	4.7	4.1	.	.	.
Gross fixed capital formation (y-o-y)	5.1	4.1	1.7	5.6	-5.9	.	.	.
Exports of goods and services (y-o-y)	9.3	1.9	7.1	0.7	0.5	.	.	.
Imports of goods and services (y-o-y)	9.1	3.1	7.2	0.6	-0.3	.	.	.
Contribution to GDP growth:								
Domestic demand (y-o-y)	2.0	1.6	1.6	2.4	0.5	.	.	.
Inventories (y-o-y)	0.2	-0.2	0.4	-1.1	0.9	.	.	.
Net exports (y-o-y)	2.9	-1.2	2.2	0.4	1.6	.	.	.
Contribution to potential GDP growth:								
Total Labour (hours) (y-o-y)	1.9	1.4	1.7	2.1	1.9	2.2	2.1	2.0
Capital accumulation (y-o-y)	1.1	1.2	1.2	1.1	0.8	0.9	0.9	0.9
Total factor productivity (y-o-y)	1.1	-0.4	-0.4	-0.8	-0.8	-0.5	-0.3	-0.1
Output gap	0.5	-3.6	-1.9	0.3	1.5	1.5	1.4	1.2
Unemployment rate	4.6	4.9	6.2	5.6	5.5	5.3	5.3	5.3
GDP deflator (y-o-y)	3.9	3.2	1.3	1.7	2.5	2.2	1.9	2.0
Harmonised index of consumer prices (HICP, y-o-y)	3.2	2.7	0.6	2.1	2.0	1.6	1.7	1.9
Nominal compensation per employee (y-o-y)	4.0	2.0	2.1	3.0	3.3	3.2	2.5	2.3
Labour productivity (real, person employed, y-o-y)	1.7	-2.3	1.7	-1.6	-0.6	.	.	.
Unit labour costs (ULC, whole economy, y-o-y)	2.3	4.4	0.4	4.6	3.9	4.3	3.3	2.8
Real unit labour costs (y-o-y)	-1.5	1.1	-0.9	2.8	1.3	2.1	1.4	0.8
Real effective exchange rate (ULC, y-o-y)	1.2	2.1	-0.4	4.3	2.9	1.4	1.1	1.0
Real effective exchange rate (HICP, y-o-y)	1.1	0.1	0.0	1.1	1.6	-0.5	-0.4	0.1
Net savings rate of households (net saving as percentage of net disposable income)	10.8	13.3	14.6	16.0	16.0	.	.	.
Private credit flow, consolidated (% of GDP)	40.9	5.3	17.6	27.4	-0.5	.	.	.
Private sector debt, consolidated (% of GDP)	220.3	301.4	320.8	322.9	306.5	.	.	.
of which household debt, consolidated (% of GDP)	46.7	57.7	61.1	64.5	65.0	.	.	.
of which non-financial corporate debt, consolidated (% of GDP)	173.6	243.7	259.7	258.5	241.6	.	.	.
Gross non-performing debt (% of total debt instruments and total loans and advances) (2)	.	.	.	0.6	0.7	.	.	.
Corporations, net lending (+) or net borrowing (-) (% of GDP)	2.1	-4.0	-4.4	-6.4	-7.2	-2.6	-1.8	-1.9
Corporations, gross operating surplus (% of GDP)	28.2	28.1	29.6	29.7	29.0	28.4	27.8	27.5
Households, net lending (+) or net borrowing (-) (% of GDP)	2.6	3.5	3.1	3.5	3.9	3.9	4.0	4.0
Deflated house price index (y-o-y)	8.1	1.3	5.9	3.7	4.8	.	.	.
Residential investment (% of GDP)	3.2	3.4	3.9	3.6	3.8	.	.	.
Current account balance (% of GDP), balance of payments	10.6	6.6	5.1	4.9	4.8	4.4	4.4	4.4
Trade balance (% of GDP), balance of payments	26.4	29.6	35.2	36.4	37.0	.	.	.
Terms of trade of goods and services (y-o-y)	0.1	0.8	0.1	-0.7	0.2	-0.1	-0.1	0.0
Capital account balance (% of GDP)	0.0	-0.7	-0.8	-0.4	1.4	.	.	.
Net international investment position (% of GDP)	10.2	10.9	55.7	51.8	59.8	.	.	.
NENDI - NIIP excluding non-defaultable instruments (% of GDP) (1)	-2167.1	-1786.4	-3363.0	-3875.6	-3523.8	.	.	.
IIP liabilities excluding non-defaultable instruments (% of GDP) (1)	7892.3	7807.5	9860.4	10749.7	10178.5	.	.	.
Export performance vs. advanced countries (% change over 5 years)	28.9	13.9	25.5	18.0	8.5	.	.	.
Export market share, goods and services (y-o-y)	4.7	-1.1	6.0	-3.9	0.7	0.5	-1.3	-1.2
Net FDI flows (% of GDP)	39.3	-32.2	-16.5	251.5	29.2	.	.	.
General government balance (% of GDP)	1.2	0.6	1.4	1.4	2.7	2.3	1.4	1.4
Structural budget balance (% of GDP)	.	.	2.2	1.2	2.0	1.6	0.8	0.9
General government gross debt (% of GDP)	7.6	18.2	22.1	22.3	21.0	19.6	19.2	18.6
Tax-to-GDP ratio (%) (3)	38.0	39.0	38.8	39.1	40.7	41.7	41.5	41.7
Tax rate for a single person earning the average wage (%) (4)	26.3	27.4	30.3	29.0	29.6	.	.	.
Tax rate for a single person earning 50% of the average wage (%) (4)	15.7	16.0	17.7	15.9	16.2	.	.	.

(1) NIIP excluding direct investment and portfolio equity shares

(2) domestic banking groups and stand-alone banks, EU and non-EU foreign-controlled subsidiaries and EU and non-EU foreign-controlled branches.

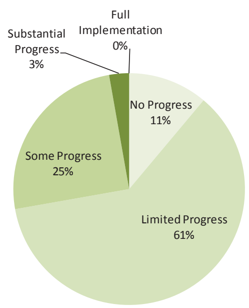
(3) The tax-to-GDP indicator includes imputed social contributions and hence differs from the tax-to-GDP indicator used in the section on taxation

Source: Eurostat, ECB and European Commission

2. PROGRESS WITH COUNTRY-SPECIFIC RECOMMENDATIONS

Since the start of the European Semester in 2011, 28% of all country-specific recommendations addressed to Luxembourg have recorded at least 'some progress" ([16]). Looking at the multi-annual assessment of the implementation of the country-specific recommendations (CSRs) since these were first adopted, 61% of all the country-specific recommendations addressed to Luxembourg have recorded 'limited' or 'no progress' (see Figure 2.1). Substantial progress and full implementation have been achieved in several areas of the fiscal policy, for instance preserving a sound fiscal position and strengthening fiscal governance.

Graph 2.1: **Luxembourg - Level of implementation today of 2011-2019 CSRs**



* The overall assessment of the country-specific recommendations related to fiscal policy excludes compliance with the Stability and Growth Pact
** 2011 annual assessment: Different CSR assessment categories
** The multiannual CSR assessment looks at the implementation until 2020 Country Report since the CSRs were first adopted.

Source: European Commission

Over the past years, Luxembourg has significantly strengthened its budgetary framework. In 2014, Luxembourg transposed in national legislation the requirements of the 2011 Council Directive on budgetary frameworks and the fiscal compact. In 2017, the authorities further adjusted the domestic regulation to bring it into full compliance with the 2011 Council Directive on budgetary frameworks. Since then, Luxembourg, which is under the preventive arm, has remained committed and compliant with the provisions of the Stability and Growth Pact. The implementation of the savings measures identified by the 2014 spending review is largely on track. The national authorities have implemented 80% of the measures identified in the review, most of them spending cuts integrated in the domestic budgetary planning. After overachieving savings target in 2015 (the first year of the multi-year budgetary strategy), the targeted savings for the 2016-2018 period were revised downwards by 25-35 %, partly linked to the reconsideration of a number of reform steps in vocational education and social transfers.

Several measures have been adopted to address the long-term sustainability of public pensions, though their impact has been limited. A pension reform was adopted in 2012, but its impact on pension expenditure has been limited. A law aiming at keeping workers with disabilities longer in the labour market entered into effect at the beginning of 2016. In 2017, some new measures have been put in place for older jobseekers (specific ALMPs since 2016, measures to fight long-term unemployment since 2017 and in the ADEM, specific mandatory information sessions about activation and training measures). Additionally, the 2017 tax reform introduced some incentives for increasing working time. A reform of the long-term care public insurance was enacted at the beginning of 2018, which keeps the evolution of long-term care costs in line with that of the share of dependent people in the total population, which is expected to ensure financial viability until 2030. Meanwhile, the expenditure projections reveal a heightened requirement for long-term care spending in the future. Additionally, the '*pré-retraite de solidarité*', a special scheme allowing people to retire from the age of 57, was abrogated in 2018 but its impact might not be significant, as some restrictions on other kinds of early retirement were loosened. The employment rate of older workers went up by 7.5% in 2018 but it remains substantially below the EU average. More fundamental reforms have not been considered yet or are pending approval, such as the so-called 'Age Pact', which includes a whole package of measures to keep senior workers longer in employment. Finally, no measures have been taken on the recommendation for aligning the

([16]) For the assessment of other reforms implemented in the past, see in particular section 2 statutory retirement age to changes in life expectancy.

Some progress has been made on enhancing participation in the labour market, but challenges remain. The main efforts have focussed on reducing youth unemployment, where progress has been substantial. The recommendation on skills development has been recently addressed: the vocational education and training system had identified several fields for improvement. Students with lower socio-economic status are the most likely to fall behind in all subjects and to be oriented towards the technical tracks of secondary school. In response, the government recently took a number of measures to close the achievement gaps among pupils of different backgrounds and to reduce early school leaving. The law on vocational education and training, amended in 2016 and in application since 2016/2017, aims at improving the qualitative skill sets and study success rates of students. The employment of older workers remains among the lowest in the EU, particularly for the low-skilled, who are also particularly affected by long-term unemployment.

Luxembourg has made some progress in addressing bottlenecks that hamper housing investment. Numerous measures have been adopted or are planned, especially on the supply side, trying to increase the market offer. The "*Fonds de Logement",* a land management agency, was empowered by law to support the supply of housing. While significant investment appears necessary to alleviate tensions in the housing market, measures to stimulate housing supply are under preparation. These include more initiative planning regulations, development of affordable and social housing, land purchase by the government for social renting, stronger tax incentives and support to municipalities. Nevertheless, supply remains limited and the challenge ahead for Luxembourg's authorities continues to be sizeable. House prices have continued rising in 2018 and in the first half of 2019.

Recently, Luxembourg has made some further progress towards the diversification of the economy. In response to somewhat weaker developments recently, two wide-scope strategies have been prepared to foster technological innovation and digital transformation in the broad business sector. Public investment remains high and measures to foster innovation have been integrated in the "Data-Driven Innovation Strategy for the Development of a Trusted and Sustainable Economy", as well as a strategy on artificial intelligence. Their success will depend, to a large extent, on their capacity to activate private investment, especially on innovative technologies and digital integration. Business investment remains low compared with the euro area average, which weighs on Luxembourg's innovation potential and might slow down the development of high-added value activities.

Luxembourg has made overall limited progress ([17]) in addressing the 2019 country-specific recommendations, although some progress was achieved on policies related to investment in a number of areas. In addition to limited progress on employment of older workers as outlined above, progress has been limited in removing regulatory restrictions in the business services sector. Several measures have been taken, although some regulatory restrictions remain above the EU weighted average in several regulated professional business services (according to available indicators). Luxembourg engaged in further reforming the professions of architect and engineer. No progress has been made by Luxembourg to improve the long-term sustainability of the pension system, including by further limiting early retirement. Limited progress was recorded on addressing aggressive tax planning – aside from implementing EU and internationally agreed initiatives, Luxembourg has not yet announced concrete reforms. However, Luxembourg reported that it has plans to address the issue of outbound payments with regard to jurisdictions included in the EU list of non-cooperative jurisdictions for tax purposes. Limited progress was made on economic policies related to investment increasing housing supply, including by increasing incentives and lifting barriers to build. By contrast, some progress was made on economic policies related to investment on improving sustainable transport. Significant investments have been realised and are to be

([17]) Information on the level of progress and actions taken to address the policy advice in each respective subpart of a CSR is presented in the Overview Table in the Annex. This overall assessment does not include an assessment of compliance with the Stability and Growth Pact.

Table 2.1: **Overall assessment of progress with 2019 CSRs - Luxembourg**

Luxembourg	**Overall assessment of progress with 2019 CSRs: Limited**
CSR 1: *Increase the employment rate of older workers by enhancing their employment opportunities and employability. Improve the long-term sustainability of the pension system, including by further limiting early retirement.*	**Luxembourg has made Limited Progress in addressing CSR 1([1])** • Limited Progress has been made in increasing the employment rate of older workers by enhancing their employment opportunities and employability. • No Progress has been made in improving the long-term sustainability of the pension system, including by further limiting early retirement.
CSR 2: *Reduce barriers to competition in regulated professional business services.*	**Luxembourg has made Limited Progress in addressing CSR 2** • Limited Progress. Restrictions remain above the EU average in most regulated professions. However, an assessment on deregulation approaches to regulated professions was announced.
CSR 3: *Focus economic policy related to investment on fostering digitalisation and innovation, stimulating skills development, improving sustainable transport, and increasing housing supply, including by increasing incentives and lifting barriers to build.*	**Luxembourg has made Some Progress in addressing CSR 3** • Some Progress was made on economic policy related to investment on fostering digitalisation. • Some Progress was made on economic policy related to investment on fostering and innovation. • Some Progress was made on economic policy related to investment on stimulating skills development, • Some Progress was made on economic policy related to investment on improving sustainable transport. • Limited Progress was made on economic policy related to investment on increasing housing supply, including by increasing incentives and lifting barriers to build.
CSR4: *Address features of the tax system that may facilitate aggressive tax planning, in particular by means of outbound payments.*	**Luxembourg has made limited progress in addressing CSR4** • Limited Progress was made in addressing features of the tax system that may facilitate aggressive tax planning, in particular by means of outbound payments

For CSR 3: The regulatory framework underpinning the programming of the 2021-2027 EU cohesion policy funds has not yet been adopted by the co-legislators, pending inter alia an agreement on the multiannual financial framework (MFF).

continued to improve the transport system, and in particular public transport. Some progress was also made on economic policies related to investment on fostering digitalisation and innovation and on stimulating skills development.

Box 2.1: EU Funds and Programmes to address structural challenges and to foster growth and competitiveness in Luxembourg

Luxembourg benefits from EU support. The financial allocation from the EU Cohesion policy funds ([1]) for Luxembourg amounts to €88.2 million in the current Multiannual Financial Framework. By the end of 2019, some €92.7 million (more than the total amount planned) was allocated to specific projects, while €41.4 million was reported as spent by the selected projects ([2]), showing a level of implementation well above the EU average.

EU Cohesion policy funding is contributing to transform Luxembourg's economy by promoting growth and employment via investments. Policy areas include, among others, research, technological development and innovation, renewables and energy efficiency, employment and labour mobility. By 2019, investments driven by EU Funds have already led to 22 researchers working in improved Research and Development infrastructure facilities, 12 firms cooperating with research institutions and 2,161 households with improved energy consumption classification. By the end of 2018, the European Social Fund had supported 1,405 disadvantaged participants with a view to improving their social inclusion and 2,999 inactive young people in order to promote their sustainable vocational integration.

For instance, the **European Regional Development Fund** co-financed the Computational and Data Engineering Hub, which will be a springboard providing Luxembourg with a sustainable competitive advantage and will contribute to the training of the next generation researchers and industrialists in Computational and Data Science. The **Interreg Energy Cells Greater Region** project encompasses four energy cells in each Member State of the Grande Région forming a virtual power plant balancing renewable electricity production and consumption by using storage capacity within the cell or by exchanging excess power with other interconnected cells via smart grids. The **European Social Fund** supports many projects in the field of digital education, training and upskilling at various levels. For instance, Digit4All: to promote digital inclusion; Fit4DigitalFuture: for young jobseekers aged 18-30 having completed secondary education; Fit4CodingJobs: aiming at training 60 web developers within two years and; Formation e-Presse: training autistic people in the field of digital newspapers and social media.

Agricultural funds and other EU programmes also contribute to addressing the investment needs. The **European Agricultural Fund for Rural Development** allocates €368 million (including national co-financing). Luxembourg also benefits from other EU programmes, such as the **Connecting Europe Facility**, which allocated €29 million to specific projects on strategic transport networks, and Horizon 2020, which allocated EU funding of €125 million (including 39 small and medium-sized enterprises with about €24 million).

EU funds already invest on actions in line with the Sustainable Development Goals (SDGs). In Luxembourg European Structural and Investment Funds support 8 out of the 17 SDGs and up to 98% of the spending is contributing to those goals.

([1]) European Regional Development Fund (ERDF) and European Social Fund (ESF).
([2]) https://cohesiondata.ec.europa.eu/countries/LU

Upon request from a Member State, the Commission can provide tailor-made expertise via the Structural Reform Support Programme to help design and implement growth-enhancing reforms. Since 2018, such support has been provided to Luxembourg for three projects. In 2019, several projects have been progressing well. The Commission has provided, for example, the authorities with support in the area of digital economy. This involves developing a strategic roadmap and a digital infrastructure map for 5G rollout and exchange of good practices, through the elaboration of an upskilling and awareness-raising plan. Likewise, a study has been launched to assess the feasibility of a reform of the budgetary accounting system at central government level. This study also aims at introducing international good practices for the transition to accrual accounting.

3. REFORM PRIORITIES

3.1. PUBLIC FINANCES AND TAXATION

3.1.1. LONG TERM SUSTAINABILITY

Luxembourg is exposed to low fiscal sustainability risks on the short to medium term. The debt sustainability analysis, as well as the S0 and the S1 indicators ([18]), in the Fiscal Sustainability Report 2019 (European Commission, 2020) point to low risks, due to the low public debt (19.6 % of GDP at end 2019) and the favourable initial budgetary position.

However, risk indicators point to high long-term fiscal sustainability risks. Ageing-related costs are expected to rise up until 2070, as highlighted by a high S2 ([19]) long-term fiscal sustainability gap indicator of 8.6 percentage points of GDP in 2019 (Debt Sustainability Monitor 2019, European Commission 2020), up from 8.1 percentage points in 2018. The projected rise of age-related expenditure is the main driver behind this indicator, in particular pensions (6.1 percentage points of GDP) and health care and long-term care expenditure (3 percentage points of GDP).

3.1.2. PENSION, HEALTHCARE AND LONG-TERM CARE

Despite a favourable position in the short to medium term, the pension system is expected to face rising challenges in the long term. Luxembourg's population ageing is slower than in neighbouring countries due to the continuous inflow of foreign workers (both immigrants and cross-border commuters). This supports pension contributions while only modestly raising the average workforce age, leading to pension system accumulated reserves of €19 billion in 2018. Long-term concerns are linked to expectations of rising age-related expenditure due to the evolution of the age pyramid. According to the government-appointed pension working group, the operational deficit of the general private sector pension scheme is projected to reach 7.6 % of GDP by 2070. Accumulated reserves are expected to ensure the viability of the system until 2041 (Rapport du groupe de travail pensions, 2018). The contribution rate is currently 24 % of the wage mass, with employers, employees and the state each contributing one third. However, based on the latest simulations, the contribution rate would need to increase to 37 % to prevent the reserve of the general pension scheme from falling below the legal threshold of 1.5 times the annual pension expenditure by 2070 (Rapport du groupe de travail pensions, 2018). The next evaluation of the general pension scheme is expected to be issued in 2022.

Projected increases in health care expenditure threaten the long-term sustainability of the system. Luxembourg's per capita spending on health care remains the highest in the EU, as total per capita expenditure accounted for 172 % of the EU average in 2016. However, total expenditure on health accounted for 5.5 % of GDP in 2016, below the EU average (9.9 %). According to the Ageing Report 2018, public health expenditure in Luxembourg is projected to increase by 1.2 percentage points (Ageing Working Group Reference Scenario) by 2070. Although the *Caisse Nationale de Santé* (the national health insurer in Luxembourg) has accumulated financial reserves amounting to 27 % of its health insurance expenditure in 2017 (IGSS, 2019), the projected increase in spending poses a risk to future fiscal sustainability. The country's relatively favourable composition in terms of population age is likely to change in the future. Luxembourg's broad benefits package, with one of the lowest cost-sharing in the EU, as well as other features such as hospital overcapacity, with relatively low bed occupancy rates and high length of stay, and a relatively low share of generics, suggest efficiency-enhancing policies could help mitigate long-term risks.

Long-term care expenditure is projected to increase, posing fiscal sustainability risks. The "Ageing Working Group reference scenario" forecasts public expenditure on long-term care to grow from 1.3 % of GDP in 2016 to 4.1 % of GDP in 2070. This considerable increase is well above

([18]) S0 is an early-detection indicator of fiscal stress in the upcoming year, based on 25 fiscal and financial-competitiveness variables. The S1 indicator measures the fiscal adjustment required to bring the debt-to-GDP ratio to 60 % by 2034. See Annex B for more information.

([19]) The S2 indicator measures the upfront and permanent fiscal adjustment required to stabilise the debt-to-GDP ratio over the infinite horizon, including the cost of ageing.

the EU average. The "Ageing Working Group risk scenario", which captures additional cost drivers to demographic and health-related factors, projects an even larger increase of 405 % by 2070. The 2017 long-term care reform mainly focused on improving quality of care, expanding the benefits package, investing in preventive services and setting clear standards, rather than addressing the long-term fiscal sustainability concerns ([20]).

3.1.3. FISCAL FRAMEWORK

The National Council of Public Finances issued a number of recommendations to improve fiscal forecasts. Luxembourg's independent fiscal body, the new composition of which was approved in March 2019, suggested some improvements to the authorities' fiscal forecasting processes. These notably included necessary improvements to the methodology used by the national statistical office (STATEC) to measure GDP and produce macroeconomic forecasts. The authorities answered to the evaluation formulated by the National Council of Public Finances, and among others highlighted that the macroeconomic scenario underlying the budgetary projections is under the responsibility of the STATEC, which is an independent body.

3.1.4. TAXATION

Luxembourg's tax burden was close to the EU average in 2018, but had a higher share of corporate income tax revenues and a lower share of consumption, property and environmental tax revenues. Total tax revenues amounted to 39.3 % of GDP in 2018, in line with the EU average (39.2 % of GDP). Corporate income tax revenues amounted to 5.8 % of GDP in 2018, which is among the highest in the EU. Corporate income tax revenues have increased in 2019, which is in part due to the introduction of the compulsory electronic tax return. Revenues from value added tax, property taxation and environmental taxation were all below the EU average. Around 43 % of tax revenues came from labour taxation, which is lower than the EU average (around 49%). However, disincentives to work for second earners are among the highest in the EU, which owes in part to taxation. Luxembourg is among the few countries where household-based taxation still applies, although there are plans to generalise individual taxation, which is currently optional. The exact conditions of the reform still need to be defined (Section 3.3.1).

While the statutory corporate income tax rate remains above the EU average, the tax burden effectively borne by a company is not only impacted by the rate, but also by tax incentives. The statutory corporate income tax (CIT) rate decreased in recent years, to 24.9 % in 2020 (17 % excluding surcharges), above the EU average of 21.7 %. The rate at which corporate income was, on average, effectively taxed amounted to 8.5 % in 2017 (European Commission (2019), Taxation Trends Report, implicit tax rate on corporate income). Corporations with taxable income below € 175.000 benefit from a 22.8 % statutory corporate income tax rate (15% excluding surcharges).

Recurrent taxes are low and based on outdated property values. Revenues from recurrent property taxes on immovable property were among the lowest in the EU in 2017. This owes mainly to the definition of the tax base, which is based on a scale that dates back to 1941 and is no longer aligned with current market values. This may impact on the price of housing and on housing supply, in particular regarding unoccupied property. Luxembourg is reflecting on ways to address the housing challenge, including through taxation (Section 3.2.3).

Transport fuel taxes rates are among the lowest in the EU, while these taxes remain the main source of environmental tax revenues in Luxembourg. While revenues from transport fuel taxes are well above the EU average (1.5 % in 2018 vs 1.3 % of GDP in the EU on average), tax rates on transport fuels for private use are relatively low. They are also lower than in neighbouring countries ([21]), inducing cross-border fuel purchasing which enables the country to raise

([20]) OECD/European Observatory on Health Systems and Policies (2019), Luxembourg: Country Health Profile 2019, State of Health in the EU, OECD Publishing, Paris/European Observatory on Health Systems and Policies, Brussels

([21]) It is noted however that Belgium offers a tax rebate on diesel used for professional purposes.

sizeable tax revenues despite low rates. Moreover, the level of tax on diesel remains low compared to the unleaded petrol duty, despite diesel having higher carbon content. Luxembourg increased in 2019 excise duty on petrol (+1 cent/litre) and diesel (+2 cents/litre).

The overall revenues from environmental taxes were the lowest in the EU in 2018. This is the case when considering environmental tax revenues as share of total tax revenues (4.4 % in Luxembourg and 6.1 % in the EU) and as a percentage of GDP (1.7 % in Luxembourg and 2.4 % in the EU). Luxembourg's Government is reflecting on further changes of its environmental taxation to encourage a less polluting behaviour. According to the outline of the National Energy and Climate Plan ([22]) presented in December 2019 (Ministry of the Environment, Climate and Sustainable Development and Energy Department of the Ministry for Energy and Spatial Planning, 2019), Luxembourg would introduce a carbon tax of € 20 per tonne of CO2 from 2021, with incremental increases over the following two years. The tax could bring in an additional €150 million of revenue, half of which would be earmarked to support households in need, while the rest would be invested in measures aimed at advancing the "ecological transition" (Delano, 2019 / Gouvernement, 2019 ([23])).

Economic evidence suggests that Luxembourg's tax rules are used by companies that engage in aggressive tax planning. The rules identified as being of particular concern include the absence of withholding taxes on interest and royalty payments (Graph 3.1.1), and the possible exemption from withholding tax on dividends with treaty partners ([24]). Due to the absence or possible exemption of withholding taxes, outbound payments of dividends, interest, and royalties from Luxembourg-based companies to non-EU jurisdictions could lead to little or no taxation if these payments are not taxed or taxed at a low level in the recipient jurisdiction. Inward and outward foreign direct investments are among the highest in the EU, with a majority linked to special purpose entities ([25]). According to an International Monetary Fund working paper (J. Damgaard, T. Elkjaer and N. Johannesen (2019), What is Real and What is Not in the Global FDI Network?), Luxembourg is the biggest recipient of foreign direct investment held by special purpose entities, worldwide. The level of capital flows (dividends, interest, but also royalties) is also among the highest in the EU, and at a high level compared to the size of the economy (see European Commission (forthcoming), Tax policy survey in the European Union 2019). Luxembourg is a small open economy, with a large financial sector, which partly explains those financial flows. However, they also reflect the large presence of foreign-controlled companies in the country, which undertake intra-group financing or treasury operations (IMF (2018), Article IV Consultation).

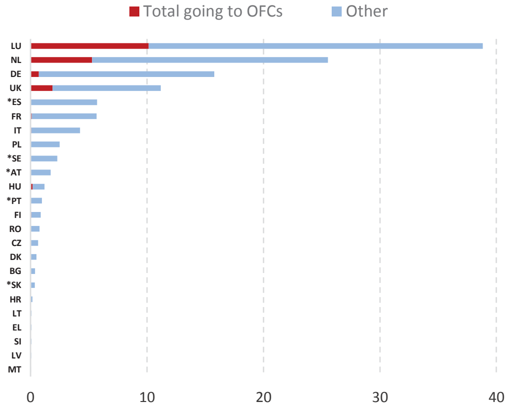
([22]) The Commission will assess, in the course of 2020, the final National Energy and Climate Plan. Luxembourg has not submitted its plan yet.

([23]) Overview of the PNEC: https://gouvernement.lu/dam-assets/documents/actualites/2019/12-décembre/PNEC-synthese.pdf

([24]) There may be an exemption from withholding tax on dividends paid to a company resident in a country that has a bilateral tax treaty with Luxembourg and is fully subject to an income tax comparable to the Luxembourg corporate income tax (Article 147 of the income taxation law –Loi concernant l'Impôt sur le Revenu). In practice, an income tax is considered comparable if it applies to a similar tax base, with a statutory rate which is at least half of Luxembourg's corporate income tax rate. To be applicable, the parent company is required to have at least 10 % participation or a participation with an acquisition cost of at least €1.2 million for an uninterrupted period of at least 12 months.

([25]) A special purpose entity is a legal entity that has little or no employment, operations or physical presence in the jurisdiction where it is located. It is related to another corporation, often as its subsidiary, and is typically located in another jurisdiction.

Graph 3.1.1: **Outgoing interest payments in the EU and share going to offshore financial centres. Average 2013-2017, (€ billion)**



Countries which do not publish the share of interest payments going to OFCs. BE, CY, EE and IE do not publish data on separate incoming and outgoing interest payments.
Source: Eurostat

Luxembourg is implementing European and internationally agreed initiatives to curb aggressive tax planning. Further to the transposition of the Anti-Tax Avoidance Directive ("ATAD1") Luxembourg adopted the transposition of the Anti-Tax Avoidance Directive as regards hybrid mismatches ("ATAD 2") on 19 December 2019. On 1 August 2019, the Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting ('Multilateral Instrument') entered into force in respect of Luxembourg. Luxembourg has chosen to apply this instrument to all its Treaty partners. Currently, 21 Treaties have been affected by the Multilateral Instrument, given that both Luxembourg and its Treaty partners need to have joined the convention, ratified the Multilateral Instrument and included each other in the list of covered tax agreements. Luxembourg has put a reservation on numerous articles of the Multilateral Instrument not forming part of the minimum standards. The country plans to rely on bilateral negotiations to amend its double tax treaties and bring them in line with the Base Erosion and Profit Shifting principles ([26]). Luxembourg codified the advance tax ruling procedure in 2014, including that rulings cannot have a period of validity longer than five tax years. Therefore, all advance tax rulings granted before 2015 are automatically invalidated as of the end of fiscal year 2019 (pursuant to Article 5 of the 2020 Budget). Beyond implementing EU and internationally agreed initiatives, Luxembourg has not yet announced concrete reforms to address aggressive tax planning, in particular by means of outbound payments (since the publication of the 2019 country report). However, Luxembourg reported that it has plans to address the issue of outbound payments with regard to jurisdictions included in the EU list of non-cooperative jurisdictions for tax purposes. No specific information has been provided allowing to assess the effect of these measures in limiting the scope for aggressive tax planning, in particular by means of outbound payments, and their impact on the corporate income tax revenue in the medium term. These effects remain to be assessed.

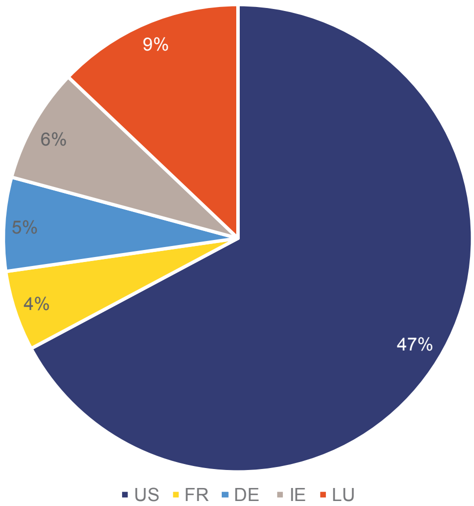
([26]) For example, the recently amended France-Luxembourg Treaty includes the amended definition of permanent establishment, while Luxembourg had reserved on this article in the MLI. The bilateral (re)negotiation of treaties is subject to a prioritisation exercise, of which the BEPS implementation is one criterion.

3.2. FINANCIAL SECTOR

3.2.1. FINANCIAL SECTOR

Luxembourg is one of the world's largest financial centres. After the United States, Luxembourg is the second biggest fund administration centre worldwide with € 4.5 trillion of assets under management (Graph 3.2.1). Banks channel funds through Luxembourg, which is reflected in high external assets (€ 450 billion or 7.3 times GDP in 2018), mirrored by high external liabilities (€ 422 billion or 6.9 times GDP in 2018). However, comparing these aggregates to national GDP is of limited explanatory power, given the country's size and financial interconnectedness.

Graph 3.2.1: **Five main open-end funds jurisdictions, Q2 2019 (% of world total net assets)**

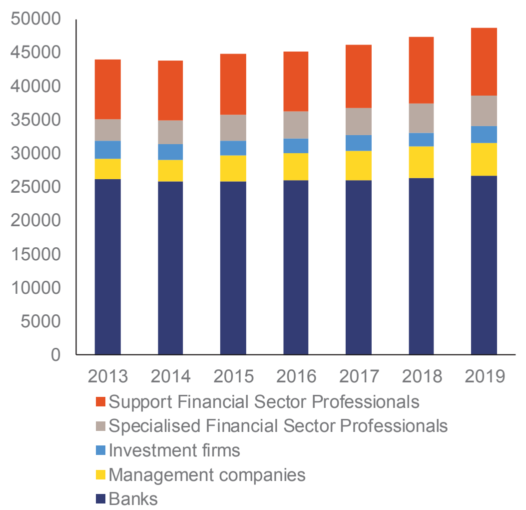


Source: International Association of Investment Funds

Luxembourg's financial centre mostly caters to the need of international clients. While the country hosts the largest financial sector in Europe relative to the size of the local economy, in absolute terms it is smaller than London or Switzerland's financial centres. The financial sector in Luxembourg accounts for a quarter of GDP and 11.5 % of employment directly. The country counts 130 banks in July 2019, of which 7 banks are domestically-oriented commercial banks. Foreign financial institutions mostly come from Europe. Banks established in Luxembourg can be clustered into retail banks, custodian banks, and private wealth banks, corporate finance banks, clearing and settlement and payment institutions. Whereas custodian and private wealth banks' main income source are fees and commissions, retail and corporate finance banks focus on interest income.

Employment in the financial sector remains dynamic. The number of bank employees remains broadly stable around 26,500, although banks increasingly tend to outsource back-office functions to less costly jurisdictions. Employment in the overall financial sector has been growing from 45,500 in June 2016 to some 50,500 in June 2019 (Graph 3.2.2). Job creation has mostly taken place in management companies administering funds, and in auxiliary professions of the financial sector, such as audit companies. Staff counts in the four largest audit companies nearly trebled since 2007.

Graph 3.2.2: **Persons employed in the financial sector**



Source: Commission de Surveillance du Secteur Financier

Banking sector

Luxembourg's banks continue to display strong capital ratios. The consolidated common equity tier 1 ratio ([27]) of 19.2 % in the second quarter of 2019 was 420 and 440 basis points above the EU and euro area averages, respectively. This is largely due to the low average risk profile of Luxembourg's banks, such as custodian banks, which do not grant retail loans, and for which market risk and operational risk outweigh credit risk. This leads to lower risk-weighted assets compared to other European jurisdictions where retail credit risk predominates. Luxembourg's non-

([27]) This details the ratio between share capital to risk-weighted assets.

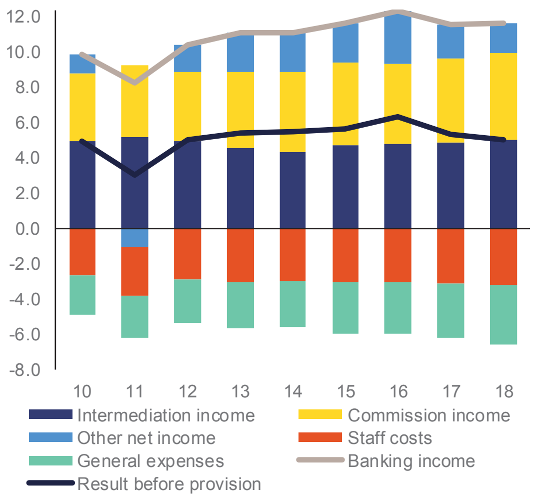
Table 3.2.1: **Key Financial Performance indicators**

	2014	2015	2016	2017	2018	2019q2
Non-performing loans	1.4	1.1	0.8	0.7	0.8	0.7
o/w foreign entities	1.1	0.8	0.5	0.5	0.7	0.6
o/w NFC & HH sectors	3.7	2.6	1.9	1.8	2.2	2.0
o/w NFC sector	4.8	3.1	1.8	1.7	2.3	2.2
o/w HH sector	2.0	1.8	2.2	2.0	1.9	1.5
Coverage ratio	30.8	38.5	37.7	37.3	36.8	39.7
Return on equity(1)	7.2	7.2	7.5	5.7	5.5	5.7
Return on assets(1)	0.5	0.6	0.6	0.5	0.4	0.4
Total capital ratio	19.6	20.9	24.3	22.5	21.4	20.2
CET 1 ratio	18.4	20.1	23.5	21.3	20.3	19.2
Tier 1 ratio	18.5	20.2	23.6	21.8	20.8	19.7
Loan to deposit ratio	91.5	88.0	83.3	76.6	75.6	77.8

(1) Annualised data
Source: European Central Bank

performing loans ratio is among the lowest in the EU at 0.7 % of gross loans as of Q2 2019, compared to 2.5 % and 3.0 % in the EU and euro area, respectively. However, the large amount of intra-group loans inflates the denominator in Luxembourg. Very low default rates over the last decade have influenced banks' internal risk models. Like in other Member States, once Basel III reforms are fully implemented, they will lead to significantly higher capital requirements (European Banking Authority (2019) ([28])).

Graph 3.2.3: **Luxembourg banks - Aggregate profits and losses**



Source: Commission de Surveillance du Secteur Financier

The low interest rate environment and rising operational costs weigh on banks' profitability. The return on equity declined slightly over the past five years in Luxembourg, whereas it rose on average in the euro area. Banking income fell by 2.0 % between June 2018 and June 2019, mainly due to the drop in interest margin income, while commission fees continued to increase. Intermediation income accounts for less than 45 % of banking income. For comparison, the latter amounts to 73 % in neighbouring Germany. This divergence reflects the relatively lower share of traditional retail banking in Luxembourg and high share of custodians and private wealth banks, with their main income source being fees and commissions. They rely mainly on fees charged for

([28]) European Banking Authority (2019), Basel III reforms: Impact study and key recommendations. https://eba.europa.eu/sites/default/documents/files/documents/10180/2886865/62e63ce7-2e78-445e-be66-5afacf54c7b7/Basel%20III%20reforms%20-%20Impact%20study%20and%20key%20reccomendations.pdf?retry=1 specialised or custodial services provided to clients. Overall, the intermediation margin remained broadly constant as deposit and loan rates hardly moved during the past three years. The cost-to-income ratio rose to 62.3 % in June 2019 compared to 58.3 % in June 2018, as operating costs soared by 8.1 % over this period. This was driven broadly equally by staff and non-staff operating costs, among others due to wage increases, the need for regulatory adaptations and investments in digitalisation.

Luxembourg has introduced some macro-prudential buffers to prevent excessive risk-taking. For banks using the internal ratings based approach the risk weight for residential mortgage loans is floored at 15 %. In addition, the counter-cyclical capital buffer was also activated and set at 0.25 % of risk-weighted assets as of January 2020 and will increase to 0.5 % of risk-weighted assets as of January 2021 ([29]) ([30]). Like in other jurisdictions, Luxembourg's supervisor annually reviews the buffers for other systemically important institutions. From January 2020, a capital buffer of 0.5 % for other systematically important financial institution will be applied to seven banks, while an eighth bank's other systemically important financial institution buffer will be set at 1 % of risk-weighted assets.

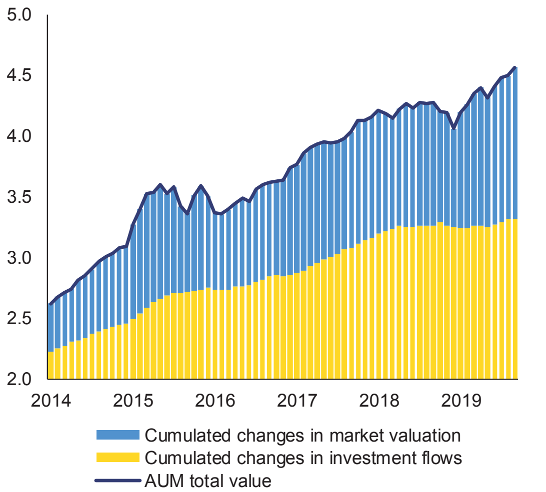
Investment funds

Luxembourg accounts for a quarter of European investment funds net assets. Net assets in Luxembourg's funds have increased by 12.4 % in the first nine months of 2019, to about € 4.57 trillion (Graph 3.2.4). Most of the increase (86 %) was due to positive valuation effects. Luxembourg's funds account for 26.8 % of money under management in Europe. The number of funds has remained quite stable around 4,000 since 2014. Two thirds of them are multiple compartment funds and the number of fund units is also relatively stable around 14,000 since 2014.

([29]) https://www.esrb.europa.eu/national_policy/ccb/html/index.en.html

([30]) In accordance with Art. 130(2) CRD IV, the supervisor exempted small and medium-sized investment firms from the countercyclical capital buffer.

Graph 3.2.4: **Net assets under management, € trillion**



Source: European Commission

Liquidity stress in the fund sector seems contained due to the low-risk profile of most funds. 94 % of funds are invested in highly-liquid, standard financial assets, while less liquid categories make up the remaining 6 %, which generated concerns regarding some funds' potential liquidity stress under very severe market conditions (CSSF January 2020 newsletter, p. 7 ([31])). However, the financial crisis of 2008/2009 showed that fund managers can adopt conservative strategies in stress episodes, selling securities and increasing their cash holdings. In addition, the supervisory authorities have increased their monitoring of liquidity risk and dedicate more attention to funds invested in less liquid asset classes.

Luxembourg's institutions keep up with financial innovation, including green finance. The country's position as the world's second largest fund administration centre is supported by the high degree of specialisation of its financial sector. Luxembourg counts on a variety of banks concentrating only on custodian activities, a large supply of professionals covering the full array of fund administration functions, and one of Europe's two central securities depositories. Luxembourg's track record of fast transposition of EU directives has given it a first-mover advantage and a legal environment that keeps up with financial

([31]) https://www.cssf.lu/fileadmin/files/Publications/Newsletter/Newsletter_2020/newsletter228.pdf innovation. For instance, Luxembourg hosts the lion share of Europe's environmental sustainability funds, as its stock exchange was the first to launch a green bond in 2007 and in 2016 it established a dedicated section which lists half of the world's green bonds (see also sections 3.2.5 and 3.5).

Insurance

The Luxembourg insurance sector continues to grow, and is expected to be supported by the relocation of some UK-based insurance companies. The balance sheet of the insurance sector amounted to € 241 billion (32) in 2018 (roughly 4 times GDP), making it one of the largest in Europe in relative terms. 76 % of total assets stem from life insurance, 18 % stem from re-insurance, and 6 % is non-life insurance business. Gross premiums were € 24 billion for life insurance, up by a 2.5 % vis-à-vis 2017, re-insurance premiums fell 2.5 % to € 10 billion, and non-life increased 22.3 % to € 5 billion. Profitability has declined in 2018 compared to 2017 (see table 3.2.2), notably due to the low interest rates environment. So far 11 non-life insurance and one life insurance companies have decided to relocate their EU-focussed business units from the UK to Luxembourg. Establishing their base in the country allows them to branch out into the remaining EU member states, but they also benefit from facilities such as the possibility to communicate officially in English with the insurance supervisor. Luxembourg is one of the few member states with a separate body exercising insurance supervision.

Luxembourg remains a competitive destination for intra-group reinsurance captives (33). The Grand Duchy counts 197 reinsurers, which profits amounted to € 273 million in 2018, a lower level compared to previous years, notably due to the volatile results in some large re-insurance companies and the closure of some small undertakings. The re-insurance industry in Luxembourg has a relatively large size and maintains a healthy profitability. This underlines the attractiveness of domiciling intra-group re-insurance captives in Luxembourg, inter alia for tax purposes. Only 19 % of reinsurers' staff is actually based in Luxembourg. Aggregate employment in the insurance sector grew from 6,607 in 2014 to 8,582 in 2018 but only half of them work in Luxembourg, as many companies use the country as a platform to branch out into the euro area.

Table 3.2.2: **Key Insurance Figures**

	Sector	2014	2015	2016	2017	2018
Total assets (EUR bn)	Life	147	160	173	179	183
	Non-life	11	12	12	13	15
	Reinsurance	47	46	42	43	43
After tax profits (EUR M)	Life	253	224	225	307	215
	Non-life	175	112	172	175	159
	Reinsurance	1202	906	1412	295	273
Employment		6607	7045	7136	8299	8582

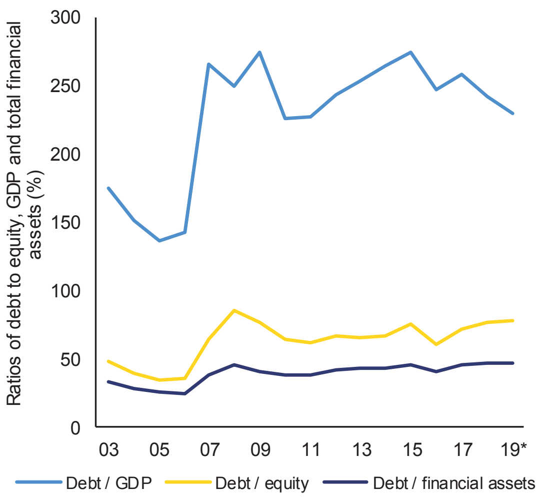
Source: Commissariat aux Assurances

3.2.2. PRIVATE SECTOR INDEBTEDNESS

Corporate indebtedness remains high, although leverage appears moderate. The consolidated debt of non-financial corporations accounted for 2.2 times GDP as of 2019, down from 2.4 in 2018. This remains well above the EU average. The ratio of gross non-consolidated corporate debt, as a share of GDP, is also well above prudential and fundamental-based benchmarks, with gaps of 190 % and 239 % of GDP respectively in 2018. As explained in previous reports (see e.g., Country Report for Luxembourg, 2019), this high level of indebtedness stems from Luxembourg's position as an international business treasury centre and reflects large amounts of intra-company cross-border loans. Liabilities are therefore usually matched by equivalent assets, which is illustrated by the relatively moderate leverage ratios when comparing debt to equity or financial assets.

(32) Rapport Annuel Commissariat aux Assurances 2018 http://www.caa.lu/uploads/documents/files/rapport_annuel_2018_chiffres_cles.pdf
(33) A reinsurance captive is a an special purpose entity set up by an international business group so as to provide tailor-made reinsurance services

Graph 3.2.5: **Non-Financial Corporations Indebtedness Ratios**

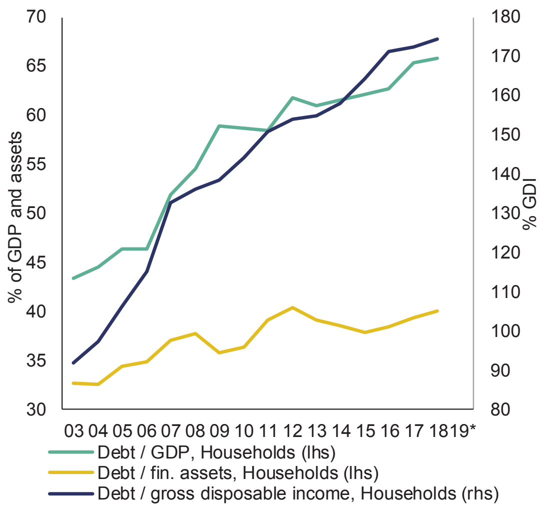


Source: European Commission

Households' indebtedness is high compared to income, although the aggregate net wealth position is favourable. Household debt remains moderate as a share of GDP (66 % in 2018) and accounts for a modest share of households' financial assets (40 % in 2018). This results in a largely positive aggregate net asset position of households of about 100 % of GDP. However, Luxembourg's GDP per capita ratio is biased due to the large number of cross-border workers, and therefore debt sustainability is better measured when compared to income levels. Household debt accounted for 174 % of gross disposable income in 2018, one of the highest levels in the EU, as housing prices, and mortgages, continue to rise faster than income. A majority of household debt stock is composed of variable-rate contracts (BCL, 2019), although new loans now incorporate a majority of fixed-rate contracts. This increases households' exposure to a potential significant rise in interest rates.

Rising indebtedness generates some concerns as to the solvency risks for some lower income households. As illustrated in previous country reports (European Commission, 2018, 2019), these concerns would arise notably in case of rising interest rates or economic downturn. A recent stress scenario applied to households in Luxembourg (Giordana, Ziegelmeyer, ECB, 2019) highlighted a substantial default risk among socio-economically disadvantaged households (i.e. those with low net wealth, low income, low education, three or more dependent children). For these different categories of disadvantaged households, the probability of default ranges from 7.7 % to 14.8 % and the bank losses range from 8.7 % to 14.1 % of their exposure to these household groups. In parallel, an increasing share of households have reported difficulties in paying rent or mortgage instalments (Statec, report Travail et cohésion sociale au Luxembourg 2019), with vulnerable households (such as single-parent families) disproportionately affected.

Graph 3.2.6: **Key households indebtedness ratios**



Source: European Commission

The European Systemic Risk Board (ESRB, 2019) issued a recommendation in 2019 to address vulnerabilities in the residential real estate sector. Following a warning from the European Systemic Risk Board in 2016, the 2019 recommendation singled out the high mortgage stock and house price growth, which suggests some price overvaluation, in combination with high and rising household indebtedness. Referring to a law on borrower-based measures approved after the publication of the recommendation, the European Systemic Risk Board recommends activating loan to value, debt to income, debt-service to income and maturity limits. Furthermore, the board assesses the already enacted macro-prudential measures as only partially sufficient to address medium term vulnerabilities. Inter alia, it recommends Luxembourg to tackle the structural housing under-supply.

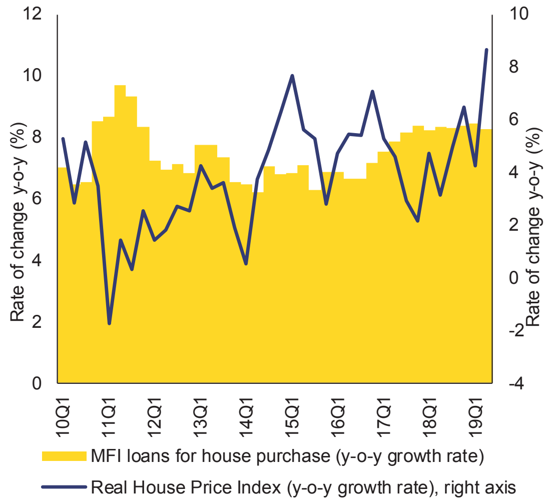
The legislation authorising the activation of mortgage borrower-based tools was adopted in December 2019. The law authorises Luxembourg's designated authority, the *Commission de Surveillance du Secteur Financier* (CSSF), to impose stricter limits on loan to value, loan to income, debt to income, debt service-to-income ratio, and loan maturities. Limits can only be applied following a unanimous recommendation issued by Luxembourg's systemic risk committee (SRC). The supervisory role of the Luxembourg Central Bank has been further reinforced by a broader access to residential real estate related information held by central government bodies.

3.2.3. HOUSING

The growth of housing prices has accelerated. Real residential property prices increased by 8.7 % on an annual basis in June 2019, a clear acceleration compared to recent years. The recent acceleration might have been influenced by the sale of a series of high-end housing projects. At the same time housing loans have continued to progress at a relatively stable annualised rate of 8.3 % in June 2019, while real gross disposable income rose at a more moderate pace of 1.6 % in 2018. However, no short-term macro-financial stability concerns emanate from housing loans. Recent sensitivity analyses signal that banks could withstand a substantial rise of loan defaults and dramatic house price corrections without their capital ratios falling below regulatory minima given their large capital cushions (see European Commission, 2019). Nonetheless, the ESRB recommendation aims to prevent the build-up of unsustainable exposure to credit risk stemming from the residential housing sector.

Valuation gap estimates point to a risk of price overvaluation in Luxembourg. Prices appear markedly above their long-term average when compared to the level of rents and income, with a gap of 51 % and 44 % respectively in 2018. This rather large overvaluation estimate contrasts with a negative model-based valuation gap estimate taking into account other fundamental variables (Graph 3.2.8). The overall house price gap calculated by the Commission, an average of the above indicators, shows signs of an overvaluation of prices of 28 %. Other institutions have estimated overvaluation of 10 % (Banque Centrale du Luxembourg, 2019) and 7.5 % (International Monetary Fund, 2019). Although the range of estimates is wide, there seems to be a consensus pointing towards some overvaluation of housing prices.

Graph 3.2.7: **Evolution of mortgage loans and real housing prices**

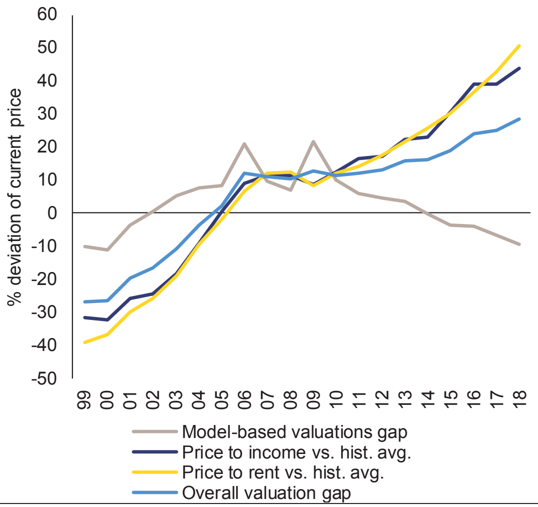


Source: European Commission

The growth in housing prices is driven by dynamic demand, largely exceeding supply. Housing demand is notably stimulated by demographic growth, which reached 19.9 % in total from 2010 to 2018, mostly due to the high workforce needs of Luxembourg's dynamic economy. This also results in a large share of commuting cross-border workers. Benign financing conditions have also supported housing price increases (Banque Centrale du Luxembourg, 2018). In parallel, housing supply remains insufficient, as pointed out in previous country reports (European Commission, 2019). Investment in dwellings remains low, as the pace of construction of new dwellings remains only slightly above the annual average observed since 2000 (2,700 new housing units per year). As a result the built-up areas in Luxembourg increased marginally in the past two decades (Luxembourg's built up area only moved from 8.1 % of the territory in 2000 to 9.8 % in 2017).

Housing supply is limited by insufficient incentives to extend built-up areas. Landowners have little incentive to sell or develop land as the latter represents a virtually risk-free and low-taxed asset. Given the fundamental supply/demand mismatch, prices are expected to increase further; therefore, ensuring real estate remains a very attractive asset class in the current low yield environment. Although higher recurrent land taxes could put a dent on expected returns, this would not fundamentally alter the incentive to hoard land. The European Systemic Risk Board advised Luxembourg to review its mortgage interest tax deductibility which may incentivise households to over-borrow, thus worsening the fundamental supply/demand mismatch further.

Graph 3.2.8: **Evolution of housing prices compared to valuation benchmarks**



Source: European Commission

Some initiatives are planned to raise housing supply. The Luxembourg government plans to review the legislative framework regarding social and affordable housing to make it easier for municipalities and social housing bodies to use public land to build new units. The focus is expected to shift away from selling affordable housing towards increasing the supply of affordable rental housing. Regulations are also expected to be adapted so as to make local planning contracts more binding on landowners. The government also intends to review land and property taxes in order to increase the opportunity costs of holding vacant land (see also section 3.1.4).

3.2.4. ANTI-MONEY LAUNDERING

Luxembourg displays very high levels of foreign direct investment associated with widespread use of highly complex corporate structures. In 2018, Foreign Direct Investment (FDI) assets and liabilities amounted to around €5 trillion and €4.5 trillion (Eurostat) respectively, 95% of which is concentrated in special purpose entities (*Sociétés de Participations Financières*, SOPARFI – Banque Centrale du Luxembourg, 2019). These entities appear to be mainly foreign direct investment conduits, i.e., foreign investment that does not flow into Luxembourg’s economy, but is further transferred to other jurisdictions.

Mitigating secrecy is key to prevent illegal use of companies and systemic abusive practices. Insufficient registers connecting foreign direct investment conduits to ultimate investors make it difficult to identify the source of financial flows and the purpose of transactions. Clear identification of the ultimate beneficial ownership of special purpose entities and other legal entities drastically reduces the incentives to use them for money laundering. Luxembourg's Register of beneficial owners includes 87% of the legal entities active in the country. While this figure shows a very good population of the register, agencies of non-financial, foreign-owned companies have been less responsive (between 30 and 40% of them have registered).

The National Risk Assessment highlights a risk of exposure to money laundering for professionals involved in the provision of trust and company services or investment services ([34]). Tax crimes are among the most likely external threats in terms of money laundering that Luxembourg faces, for which it has received most requests for mutual legal assistance from other countries. Professionals involved in the provision of trust and company services, including accountants, lawyers and tax advisors, as well as in the investment sector, present a high inherent risk of exposure to money laundering given their role as gatekeepers and due to the sector’s fragmentation. Supervision by their collective bodies remains however limited. Out of almost

([34]) Government of Luxembourg, Ministry of Finance, National risk assessment of money laundering and terrorist financing, 2018

2,500 lawyers operating in the country, only 41 anti-money laundering inspections have been reportedly performed by the Luxembourg Bar Association between 2016 and 2018 ([35]). Very few suspicious transactions/activities are reported by these and other professionals involved in the provision of trust and company services despite their high risk profile (only 0.5 % of reports received by the FIU in 2018), pointing to limited understanding and identification of risks. Reporting by specialised companies (*sociétés de domiciliation*) is higher (3% of all reports received by the Financial Intelligence Unit (FIU) in 2018), but supervisory activities still highlight important weaknesses in the application of the anti-money laundering framework, including lack of adequate risk analysis and customer due diligence and failures to report suspicious transactions/activities to the FIU ([36]).

3.2.5. SUSTAINABLE FINANCE

Luxembourg's financial sector, and the sectors exposed to it, are adapting to policies and instruments developed to promote sustainability practices. A growing number of international investors are integrating environmental and social governance objectives in their strategies. As these sustainable investment trends take root and expand, they can have a stronger influence on the operational policies and practices of multinational corporations. In expectation of these trends, Luxembourg launched in 2018 its Sustainable Finance Roadmap ([37]), which established a strategy for sustainable finance contributing to the Agenda 2030, while promoting Luxembourg's financial centre as a first-mover in sustainable finance initiatives and a sustainable finance ready provider.

Luxembourg's large financial sector can benefit from the growing sustainable finance market, while supporting the environmental transition (Section 3.5)**.** In recent years, Luxembourg has taken some pioneering initiatives in the field of sustainable finance, including launching, in 2016, the Luxembourg Green Exchange as the world's first platform exclusively dedicated to sustainable securities. In 2018, Luxembourg established the first legal framework for green covered bonds in the world. The country has an opportunity to lead on climate finance, playing a key role at the international level to foster a green transition through financial instruments, while diversifying its financial sector.

Significant investments are certainly needed for Luxembourg to achieve the ambitions set out in its Sustainable Finance Roadmap. However, no formal assessment on the size of these investments appears to have been undertaken. In any case, it may be expected that the financial sector should be able to make the investments necessary to maintain employment and develop the skills of its workforce without recourse to public funds, national or EU. When ratifying the Paris agreement, the government of Luxembourg committed to supporting international climate finance with a contribution of € 120 million between 2014 and 2020 (European Investment Bank, 2016). By focusing on sustainable finance and on the disclosure of climate related risks, Luxembourg can manage the risks and maximise the opportunity that the low carbon transition brings to its financial sector (Organisation for Economic Co-operation and Development, 2019).

([35]) https://www.wort.lu/fr/luxembourg/barreau-de-luxembourg-la-vigilance-est-maintenue-concernant-le-blanchiment-5baa3607182b657ad3b93868
([36]) https://www.cssf.lu/fileadmin/files/Publications/Rapports_annuels/Rapport_2018/CSSF_RA_2018.pdf
([37]) See the Luxembourg Sustainable Finance Roadmap.

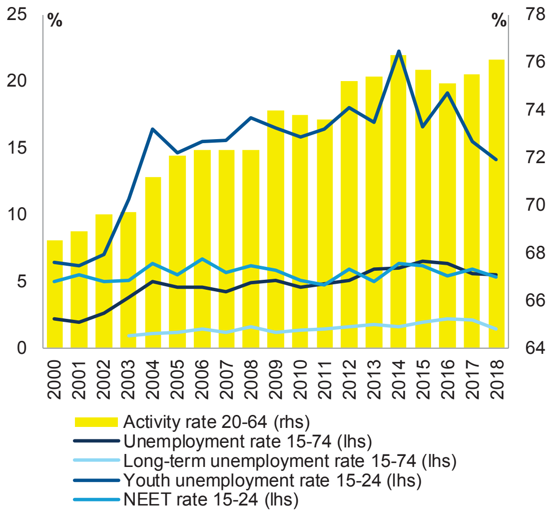
3.3. LABOUR MARKET, EDUCATION AND SOCIAL POLICIES

3.3.1. LABOUR MARKET

Strong job creation continues on the back of good economic performance. Employment growth remained robust in 2019 at 3.8% year-on-year in the second quarter ([38]). This trend is expected to slightly slow down over the following months. According to national data ([39]), this slower growth would largely be the result of the deceleration of resident employment, whereas cross-border employment growth should remain almost at the same level (4.7 % in 2019) ([40]). This is related to reported unemployment traps([41]) (see European Commission 2017, page 29 and 2018, page 29, and Organisation for Economic Co-operation and Development 2019 ([42])) and difficulties experienced in Luxembourg in providing the resident workforce with the required skills. Despite an increase, precarious work remains below the EU average (1.6 % against 2.2 % in 2018).

The level of unemployment remains low but its decrease seems to have stalled. The sustained fall in unemployment over the last three years came to a halt in February 2019. This could be due to the compulsory registration of the *Revenu d'inclusion sociale (REVIS)* beneficiaries with the employment service, following the entry into force in January 2019 of the law reforming the social minimum income, which requires every member of the household who is considered capable of seeking ordinary employment to register ([43]). The *Revenu d'inclusion sociale* is an activation benefit consisting in an allowance for activities organised by the social inclusion office, such as community work or activities favouring social stabilisation. It is expected to foster social inclusion. In October 2019, the number of resident jobseekers registered with the public employment service (*Agence pour le développement de l'emploi – ADEM*) had grown 1.8 % year-on-year and the national seasonally adjusted unemployment rate, as calculated by the national statistics institute (STATEC) was 5.3 % ([44]) (as in 2018). However, long-term unemployment has dropped sharply, from 2.1 % in 2017 to 1.4 % in 2018. The significant increase in the number of people registered as unemployed for six to eleven months since 2018 signals that this positive trend could come to a halt ([45]). Youth unemployment decreased further to 13.8% in 2018 and the Social Scoreboard indicator representing the rate of young people not in employment, education or training fell from 5.9% in 2017 to 5.3% in 2018. The rise in the unemployment rate of people with medium and high qualification levels is partly due to an increase in registrations and a higher job rotation but may also point to increasing skills mismatches.

Graph 3.3.1: **Activity, unemployment, long-term unemployment, youth unemployment and NEET rates**



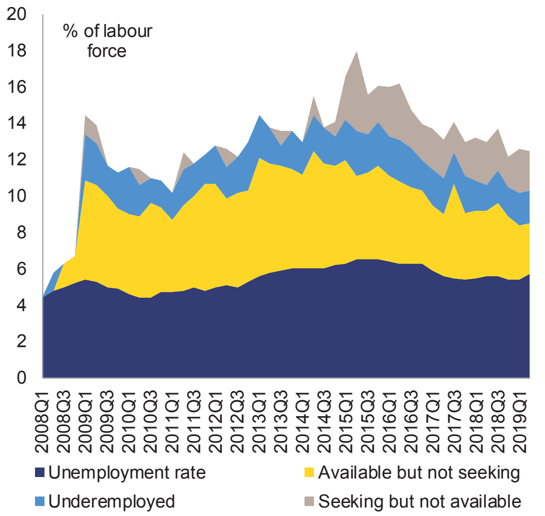
NEET: Not in employment, education or training
Source: Eurostat, LFS (Labour Force Survey)

Employment and activity rates continued to grow, but remain below the EU average. They reached respectively 72.1% and 76.1% in 2018

([38]) Eurostat Press Release 05.12.2019 https://ec.europa.eu/eurostat/documents/2995521/10081871/2-05122019-AP-EN.PDF/ca0d3450-07e5-082b-f7bc-4486502c285a
([39]) https://statistiques.public.lu/catalogue-publications/note-conjoncture/2019/PDF-NDC-01-19.pdf
([40]) Cross-border employment accounts for 44% of total employment in 2018.
([41]) The 'unemployment trap' measures what percentage of the gross earnings (after moving into employment) is 'taxed away' by the combined effects of the withdrawal of benefits and higher tax and social security contributions.
([42]) OECD Economic Survey - Luxembourg - July 2019 (pages 27-28)
([43]) In October 2019, the beneficiaries of this scheme represented 13% of people registered in the public employment service.
([44]) ADEM, Chiffres-clés Octobre 2019
([45]) The increase is 28 % between September 2018 and September 2019. It is also interesting to note that the public employment service provides statistical data according to the following age groups: <30 – 30/44 - > 45. ADEM - Chiffres-clés - Septembre 2019

(against 71.5% and 75.5% respectively in 2017). More could nonetheless be done to increase the activity rate of certain groups and reach Luxembourg's Europe 2020 employment target of 73%, particularly with regard to older workers and the low skilled. The share of the labour force partially disconnected to the labour market (discouraged workers who have given up looking for a job because they believe it is not possible to find one and people seeking work but not immediately available for work in the next two weeks) is rather high in Luxembourg (6.2%), with the young being the largest component and the low-educated representing more than half of it.

Graph 3.3.2: **Unemployment rate and potential additional labour force**



Source: Eurostat, LFS (Labour Force Survey)

The activity and employment rates are particularly low for older workers. Workers aged 55-64 record activity and employment rates of respectively 42 % and 40.5 %, far below the EU average. With activity and employment rates of people above 60 remaining very low, the situation has improved somewhat for workers aged 55-59. There are significant differences according to educational attainment though. While only 42.9 % of people aged 55-59 having completed only lower secondary level (levels 0 to 2 of the International Standard Classification of Education) are still active (against 62.5 % on EU average) and 12.4 % of those aged 60-65 (35.6 % on EU average), figures jump respectively to 77.8 % and 40.5 % for people having a tertiary degree. Early exit from the labour market linked to early retirement or retirement remains a concern especially for men: in 2018, 55.8 % of inactive men aged 50-59 were inactive due to retirement. This figure rises to 81.1 % for those aged 55-64. Some schemes targeting senior jobseekers such as the professionalisation placement programme (six-week work placement) and the reintegration employment contracts (12 months) have poorer outcomes in 2019 for people aged 45 and more. The government intends to relaunch the legislative process concerning the Age Pact with a focus on health and safety at work, which could help keeping older workers in employment. Raising the participation of seniors would require additional measures aiming at reinforcing or creating new incentives, for example to help them better integrate life-long learning programs conducive to longer stays in the labour market. Limiting access to benefits for early retirement appears to be a key factor in integrated policy approaches to population ageing in Luxembourg (see section 3.1).

People born outside the EU tend to face a weaker social situation. Non-EU born residents face a high unemployment rate at 14.3% in 2018, below average incomes and a very high risk of poverty or social exclusion, at 40.8% in 2018. On the other hand, the employment rate of second-generation people (aged 15-34) moved closer to that of the natives with a low gap of 3.7 percentage points.

Despite the increasing participation of women in employment, there is still untapped potential. The labour market features overall high levels of gender equality and social protection coverage. The gender employment gap has halved to 8 percentage points since 2011 and is below the EU average. The gender pay gap, at 5% in 2018, is one of the lowest in the EU. The part-time employment gap has also narrowed over the last years but remains high (26.1 percentage points in 2018), with more than 80% of part-time jobs being held by women. Despite a high percentage of children under 3 years old in formal childcare (60.8% in 2017 against 34.2% in the EU according to Eurostat), the female employment rate has only slightly improved to 68 % in 2018 and 31.4% women work part-time in 2018 (35.1% in 2017), slightly above the EU average. The employment rate of non-EU-born women remains particularly weak, as compared to national and EU averages

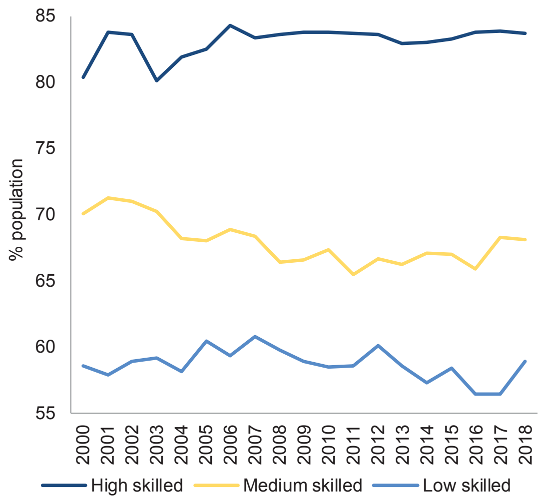
(53.2 % against 69.2 % and 73.6 % respectively) and no data is available on the use of childcare by non-EU born mothers.

Recent policy measures aiming at improving work-life balance for parents, such as the reforms of parental leave and childcare allowance schemes, might further encourage women participation in employment ([46]). The government coalition agreement of December 2018 envisaged upgrading the childcare allowance ([47]), including free childcare services for pupils in early and primary education (non-formal education/youth centres) ([48]). Further expanding the availability of affordable day care and after-school programmes could further improve female labour market participation. Seeking to foster employment participation among women, the government agreement also considers the possibility of taking part-time work for family reasons. The single form of the personal income tax, which household members are entitled to choose since 2018 is intended to replace progressively the joint mode, as the Prime Minister announced in October 2019. The government's intention to phase in the individualisation of taxation is expected to improve labour participation of women too. Moving to fully individual income taxation would make the tax system more gender neutral by reducing the marginal tax rate applied to the earnings of second earners, often women.

Training and upskilling

The high inactivity rate among the low-skilled (36.7 %) leaves room for improvement. In 2018, the share of low-qualified adults aged 25-64 in employment stood at 60.8 % (EU average at 56.8 %), against 72.8 % for people with medium-level qualifications and 84.9 % for those with tertiary education. Differences in unemployment rates according to the level of qualification are more contained, with unemployment among low-skilled workers aged 25-64 at 6.5 % in 2018, against 4.1 % for the high-skilled([49]). However, almost 50 % of the unemployed have just completed lower secondary education and tend to display much longer unemployment spells.

Graph 3.3.3: **Employment rate by educational attainment**



Source: Eurostat, LFS (Labour Force Survey)

Despite substantial improvement in adult participation in learning since 2008, there is scope for further progress to strengthen low-skilled and older workers' employability. In Luxembourg, the share of adults with at least upper secondary education attainment has increased between 2008 and 2018 (+10.7 percentage points), reaching 78.6 %, slightly above the EU average. For basic and advanced digital skills, Luxembourg scores highest together with Finland, according to the Digital Agenda Scoreboard. 18% of adults surveyed in 2018 had a learning experience in the previous four weeks, against an EU average of 11.1 %, with the country being among the Member States recording the most significant improvements over the last decade. Despite the higher public support (35% instead of 20% of the costs) to firms' training for low-skilled employees and people over 45, those categories participate in training twice less than the employed population overall. Low-skilled employees represent 13.9 % of the workforce but

([46]) A reform in place since October 2017 introduced 20 hours of free childcare per week and per child and a means-tested hourly childcare price.
([47]) It would involve a new formula to determine parents' financial participation according to their income.
([48]) In the last national statistics institute's report, cost appears as the main barrier for 36 % of interviewees about childcare provision (one person out of seven seeing barriers to childcare)
https://statistiques.public.lu/catalogue-publications/analyses/2019/PDF-Analyses-02-2019.pdf) (pages 81-82)

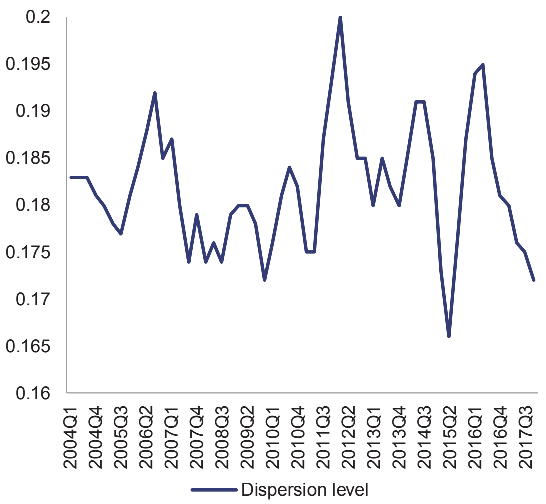
([49]) Eurostat (NB national data from the national statistics institute show a higher gap with respectively 8.4 % and 4.3 %)

participate to just 6.9 % of the trainings ([50]). This increases the risk of them opting for early retirement or becoming unemployed. At the same time, the share of unemployed adults participating in learning in Luxembourg in 2018 is one of the highest of the EU (almost 30 % against 10.7 % on EU average).

Against the background of low unemployment, possible skills mismatches and labour shortages become a greater concern, particularly in sectors facing rapid technological development. The variation in employment rates for different skills levels (macroeconomic skills mismatch) is slightly above the EU average with little change since 2010. In turn, on-the-job skills mismatch (reflecting over- or under-qualification and a mismatch by field of education) is the lowest in the EU. This notwithstanding, the number of open positions registered by employers at the national public employment service has increased by 30 % between 2015 and 2018, with many job offers in the accountancy and information technology sectors but also secretarial support, kitchen staff, maintenance of premises, front-office in financial markets. The umbrella business association (*Union des entreprises luxembourgeoises*) also points regularly to labour shortages in the sector of crafts and trade. There was no candidate for 30 % of those job offers in 2018, with the highest share in information and communications technologies ([51]), banking and finance ([52]), which might explain the increase in businesses' requests to hire non-EU staff in 2018. In 2019, the public employment service conducted an analysis on labour shortages to identify the current needs in specific trades and occupations in cooperation with the Luxembourg business association. The Chamber of Crafts also released a study and policy proposals about labour shortages in the craft and small business sector according to which their most significant labour needs appear in the construction and engineering sectors due to the need to replace workers and develop new skills and to the good economic climate. The 2018 Sustainable Finance Roadmap has the ambition to raise awareness and integrate sustainability into education and professional training and includes recommendations in this sense.

Luxembourg's sustained economic growth, its demographics, geographical position and size have led to a very large increase in the number of cross-border workers over the last decade, together with an increase in its population. 80% of the overall population increase of Luxembourg in this period is due to people with a foreign background ([53]). 78 % of cross-border workers of the *Grande Région* actually work in Luxembourg ([54]) and their number is estimated to further increase by 100,000 between 2014 and 2035 ([55]). The consequences on the provision and prices of housing and office premises, on transport system efficiency and mobility comfort could severely hinder Luxembourg's attractiveness and growth in the future (see box and section 3.5.2).

Graph 3.3.4: **Dispersion of employment rates by level of education**



Source: Eurostat, LFS (Labour Force Survey)

The share of employment in jobs requiring at least upper secondary education in

([50]) Formabref, « L'Accès à la formation des salariés du secteur privé en 2017 », octobre 2019, Observatoire de la formation

([51]) Luxembourg ranks first together with Netherlands in the share of firms reporting hard-to-fill vacancies for information and communications technology specialists (firms with 10 or more employees excluding the financial sector – OECD: https://doi.org/10.1787/888933951589)

([52]) https://adem.public.lu/dam-assets/fr/publications/adem/2019/Rapport-annuel-2018-FINAL-WEB.pdf

([53]) Resident foreigners represent 47.5 % of the total population in Luxembourg in 2019. Among them, 84.4 % are EU nationals.

([54]) https://iba-oie.eu/Berichte-zur-Arbeitsmarktsitua.24.0.html?&L=1

([55]) Les Cahiers de la Grande Région - La Grande Région face à ses évolutions démographiques, septembre 2019

Luxembourg is higher than EU average and has increased significantly over the last decade. Almost all countries in the EU recorded a significant increase in the average intensity of non-routine cognitive (high-skill) tasks, with Luxembourg being among those having experienced the largest increases compared to 2000. According to the European Centre for the Development of Education and Vocational Training's skills forecasts([56]), the overwhelming majority of total job openings (including replacements for vacated jobs) till 2030 will be split evenly between high- and medium-level qualification requirements([57]). The most recent study conducted by the Luxembourg's industry federation (*Fédération des industriels luxembourgeois*) in the field of information and communication technologies emphasises that 69 % of foreseen job openings in surveyed companies will be newly created positions. It also points to an increase in the level of qualification required, with only 3 % of the job created requiring only upper secondary education (level 3 of the International Standard Classification of Education)([58]). Low-skilled and vulnerable job seekers are particularly at risk in this changing labour market.

In this context of rapid technological change and growing demand for higher-level qualifications, better anticipation of skills and matching with labour market needs are essential to achieve inclusive growth. Due to the specificity of the labour market in Luxembourg with its high level of cross-border workers, there are only a limited number of studies monitoring or anticipating skills needs in the country, many of which focus on specific sectors. Skills needs anticipation activities rely on a social partnership approach involving representatives of business and employees. There is no established pattern to take into account skills needs anticipation in the policy-making. The Luxembourg's industry federation *(Fédération des industriels luxembourgeois)* and the Luxembourg bankers' association *(Association des banquiers du Luxembourg),* together with the Chamber of Commerce, the Ministry of Education, the Ministry of Higher Education and Research and the public employment service, have launched a new survey on skills requested by businesses over the next two years in the field of information and communication technologies. This survey aims at assessing the evolution of professions and skill levels requested in this area to improve the orientation of young people and adapt vocational training and adult learning to the needs of businesses. The results should help improve academic and vocational orientation.

The Coalition agreement gives particular attention to the development of skills among workers and unemployed people. It focusses particularly on improving orientation of young people, employees and job seekers, introducing a personal training account and training vouchers allowing all employees to follow a free basic training that facilitates access to digitised professions. The government also committed to promote the quality of life-long learning. To this end, it intends to create an accreditation agency. Social dialogue is a key component of Luxembourg's social model, and will remain essential for reforms in the field of life-long learning.

A smooth functioning of the labour market in Luxembourg is key for maintaining high economic growth and low unemployment rates. Labour market policies have played an important role in the functioning of the labour market in Luxembourg, which is being increasingly challenged by changes in both the labour supply and demand. During the crisis, active strategies in support of keeping workers in employment proved to be effective in helping achieve a quick economic recovery, despite the budgetary costs associated (Efstathiou, 2019) ([59]). A major step forward was made by the government when active policies previously in place, were combined and reinforced to ensure a steady supply of skilled workers. This gave support to Luxembourg's growth model, based on a strong and increasing demand for high-skilled workers. Today Luxembourg is confronted with a new setting in which strategies will continue playing a key role in

([56]) Offering quantitative projections of the future trends in employment by sector of economic activity and occupational group up to 2030.

([57]) http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/skills-forecasts-main-results

([58]) https://www.fedil.lu/wp-content/uploads/2018/03/FE_TIC2018_BROCH_A4_web_final.pdf

([59]) Efstathiou et al. J Labour Market Res (2019) 53:12 https://doi.org/10.1186/s12651-019-0262-3 ensuring sustained growth. The acceleration of digital, technological and environmental transformations are rapidly changing labour demand needs, which take longer to be fulfilled and may limit economic activity; while finding a (*suitable*) job may become increasingly difficult for people lacking the skills needed, raising unemployment and social exclusion ([60]). Meanwhile, the labour force is also changing, being shaped by three forces: ageing, education and migration. Understanding how all these changes interact in Luxembourg may help design more effective targeted policies, which are key for achieving a more sustainable, competitive and inclusive growth path.

3.3.2. SOCIAL POLICIES

Despite some negative trends, Luxembourg shows relatively good social outcomes. The overall risk of poverty or social exclusion has increased in 2018 and reached the EU average (21.9%), in movement away from the UN Sustainable Development Goal 1 (No poverty), mainly driven by an increase in the share of people living in households with very low work intensity (up to 8.3 % in 2018 from 6.9 % in 2017). The risk of poverty or social exclusion decreased for young people (16-24) from 31.7 % in 2017 to 31.1 % in 2018, remained stable for working age adults (25-54) at 20.4 %, and continued increasing for the elderly (beyond 65), from 11.8 % to 12.1 %. The Social Scoreboard shows that social transfers continue to have a strong, albeit decreasing, impact on poverty reduction (33.5 % in 2018). Material and social deprivation ([61]) in Luxembourg represents 4.5%, which is well below the EU average of 12.9%, but keeps slightly increasing from 3.2 % in 2016 to 4.1 % in 2018 (Eurostat – European statistics on income and living conditions). A similar trend is noticed among EU citizens living in Luxembourg. Overall, the single-parent households with children (40.7 %) and single women (31.6 %) are facing the highest risk of poverty.

The housing sector is an amplifier of inequalities. In 2018, the income inequalities rose by 2 percentage points compared to 2018 (the Gini coefficient reaches 0.33) ([62]). Housing costs represent an important burden for the most disadvantaged. In 2017, the share of housing expenditures in disposable income of the 20 % most disadvantaged households (first income quintile) was 42 %, three times greater than that of the 20 % of the wealthiest households (14.5 %, last income quintile) ([63]). For low-income households (first and second quintile), housing costs represent a very important burden, having increased faster than their disposable income, which may intensify households' potential financial vulnerabilities and represent one of the main sources of inequality in the medium term. On homelessness, Luxembourg lacks data. Luxembourg's definition of homelessness is based on the European Typology of homelessness and housing exclusion ([64]). An evaluation of the strategy against homelessness will take place in 2020/2021.

([60]) Or taking jobs for which they are overqualified, increasing frustration among workers and inefficiencies in the production structure.

([61]) The Material and Social Deprivation indicator (MSD) is the result of a revision of the material deprivation indicator (MD). It takes into consideration a broader concept of deprivation as it also includes items related to social activities, whereas the MD measured only material deprivation. It is based on 13 items (of which some are common to MD). The MSD rate is the share of people in the total population lacking (because of an enforced lack) at least 5 items out of the 13 MSD items (as opposed to 3 or more out of 9 items for MD).

([62]) STATEC, Rapport Travail et cohésion sociale, 2019.

([63]) STATEC, N° 18/2019 - Le logement, amplificateur des inégalités au Luxembourg https://statistiques.public.lu/fr/publications/series/regards/2019/18-19-Logement-amplificateur-d_inegalites/index.html

([64]) This typology (known as ETHOS) was developed by the European Federation of National Organisations Working with the Homeless (FEANTSA) as a transnational framework definition for policy and practice purposes.

Box 3.3.2: **< Monitoring performance in light of the European Pillar of Social Rights >**

The European Pillar of Social Rights is a compass for a renewed process of upward convergence towards better working and living conditions in the European Union. It sets out twenty essential principles and rights in the areas of equal opportunities and access to the labour market; fair working conditions; and social protection and inclusion.

The Social Scoreboard supporting the European Pillar of Social Rights shows that Luxembourg performs well in most areas. The labour market in Luxembourg shows good results with a low unemployment rate and gender employment gap. Luxembourg performs better than the EU average in providing access to childcare services. Although there are signs of weakening on income inequality, this remains at a level close to the EU average. The overall risk of poverty or social exclusion and the impact of social transfers on poverty reduction remain close or better than in the EU.

Social Scoreboard for LUXEMBOURG

SOCIAL SCOREBOARD		SDGs
Equal opportunities and access to the labour market	Early leavers from education and training (% of population aged 18-24)	4 QUALITY EDUCATION
	Youth NEET (% of population aged 15-24)	
	Gender employment gap	5 GENDER EQUALITY
	Income quintile ratio (S80/S20)	10 REDUCED INEQUALITIES
	At risk of poverty or social exclusion (in %)	
Dynamic labour markets and fair working conditions	Employment rate (% of population aged 20-64)	8 DECENT WORK AND ECONOMIC GROWTH
	Unemployment rate (% active population aged 15-74)	
	Long-term unemployment rate (% active population aged 15-74)	
	GDHI per capita growth	
	Net earnings of a full-time single worker earning AW	
Social protection and inclusion	Impact of social transfers (other than pensions) on poverty reduction	1 NO POVERTY
	Children aged less than 3 years in formal childcare	
	Self-reported unmet need for medical care	3 GOOD HEALTH AND WELL-BEING
	Individuals' level of digital skills	

Critical situation	To watch	Weak but improving	Good but to monitor	On average	Better than average	Best performers

Members States are classified on the Social Scoreboard according to a statistical methodology agreed with the EMCO and SPC Committees. It looks jointly at levels and changes of the indicators in comparison with the respective EU averages and classifies Member States in seven categories. For methodological details, please consult the proposal for a Joint Employment Report 2020, COM(2019) 653 final; NEET: neither in employment nor in education and training; GDHI: gross disposable household income. Update of January 2020.

Despite good overall labour market performance, important skills shortages have recently emerged in some sectors. Luxembourg is facing challenges in providing the resident workforce with the required skills. At the same time, the activity rates of older and low-skilled workers are lagging behind. Inequalities of opportunities are present among pupils in relation to their socioeconomic and migrant background.

The Amendment to the Labour Code of the 1st of August 2019 intends to improve the access to the regular labour market of employees with disabilities or those in external job reclassification (i.e. those who cannot fulfil any more their last job tasks for physical or health reasons, but do not qualify for disability benefits) and to help them stay in employment through accompanying measures that may last up to 2 years, under the guidance of an "inclusion in employment assistant". This is a positive step towards the transposition of the Convention on the rights of persons with disabilities and could have an impact on the employment rate of people with disabilities or in external reclassification (often older workers).

In-work poverty remains a growing challenge. In 2018, it was 13.5 % against 9.2 % in the EU. It has been increasing (by 3.6 percentage points) since 2011 and remains above the EU average. Most at risk are single-parent families (28.6 % 2018) and single persons (22.3 %), for which the country ranks among the worst performers in the EU (EU averages being 22.8 % and 13.0 % respectively). Moreover, Luxembourg still ranks one of the highest, in terms of in work poverty, among employees with a temporary job (33.0 % vs 16.2 % in the EU). At the same time, the gross minimum wage has been increased by 2% in 2019 (1.1% of this increase is due to the review of the minimum wage every two years). Furthermore, the budget law of 26 April 2019 introduced a tax credit on the social minimum wage paid out monthly by the employer together with the earned salary, for monthly salaries up to €3,000 (full time equivalent).

People born outside the EU tend to face a social disadvantage. The in-work poverty gap is particularly high for non-EU born people versus Luxembourg natives aged 25-54 (21.7 percentage points), compared to the EU average in 2018 (12.5 pps). Particularly of concern is in-work poverty for non-EU born employees, at 28.1 % in 2018, one of the highest in the EU (20.2 % for the EU). Although the at-risk-of poverty rate for children whose parents are citizens of a non-EU country is far below the EU average, children with a migrant background are facing linguistic and integration issues that have an impact on their educational performance. Among non EU-born young people aged 15-29, 19.1 % are under the category 'not in education, employment or training', much more than among the native-born (8.1 %).

The *Revenu d'inclusion sociale* scheme is expected to alleviate poverty and foster social and professional inclusion. The adequacy of the minimum income scheme in Luxembourg was one of the highest in the EU in 2017. The coverage was also above the EU average. The new *Revenu d'inclusion sociale* scheme introduced in January 2019 is expected to further alleviate poverty, foster social inclusion and active participation in the labour market. It focuses on children and single-parent families and seeks to activate beneficiaries to help them gain entry into employment. According to civil society actors, its real impact on poverty will actually depend largely on whether the new activation measures succeed in promoting active inclusion and ensuring transitions towards employment. Authorities in charge already simulated the effects of the reform in terms of income and the fight against inactivity traps ([65]) (see European Commission, 2019, section 3.3.1). 2019 and 2020 are years of transition with the challenge of profiling beneficiaries by the public employment service and setting up activation programs for people close to the employment market. The National Office for Social Inclusion (ONIS) will take care of people who are further away from the labour market with specific social inclusion measures. The evaluation of the scheme is expected by 2021.

3.3.3. EDUCATION AND SKILLS

Education performance is below the EU average and strongly linked to socioeconomic status. Luxembourg's average performance, as measured in the Programme for International Student Assessment, was lower in 2018 than in 2015 and in 2012 in reading and science. However, it remained stable in mathematics. The share of low achievers is well above the EU average in all three areas measured. The impact of socio-economic status on performance is the strongest among EU countries. These results need to be read in a context of an increasingly diverse school population, where some 55% of 15-year-old students have a migrant background. Unlike in other countries, students born abroad perform better than students born in Luxembourg from parents born abroad. Students with lower socio-economic status are the most likely to fall behind in all subjects and to be oriented towards the technical tracks of secondary school. The provision of free quality childcare should work to reduce these educational inequalities and facilitate the early familiarisation with at least two of the country's official languages, in particular to foreigners.

Educational tracking is particularly rigid. Pupils of foreign nationality are less frequently oriented towards the higher tracks of secondary education. Between 2006 and 2016, the proportions of pupils guided to the academic track (*enseignement secondaire classique*) and the technical track (*enseignement secondaire général*) fell steadily, while those going to the lowest, vocational track (*voie préparatoire*) increased from 6 % to 15 %. Pupils with lower socio-economic status and foreign nationality are the most likely to fall behind in all subjects and to be guided towards the lower tracks. Changing tracks is extremely rare (Klapproth et al., 2013). In 2017, the orientation process was reformed to give parents a say in the decision. Following this, 98.2% of orientation decisions were in line with

([65]) STATEC, Rapport Travail et cohésion sociale, 2018 the parents' wishes, whereas previously this had been the case with 84%. This may explain the trend shift in 2017/2018, when the proportions of pupils in the two higher tracks increased again and the proportion in the lowest vocational track dropped from 15% to 12.2%. Monitoring is needed to determine whether pupils with lower socio- economic status are benefiting equally from this shift.

Luxembourg's rate of early leavers from education and training is significantly below the EU average but national surveys indicate a steady increase. The early school-leaving rate, as measured by the Labour Force Survey, stood at 7.3 % in 2017. However, this data should be interpreted with caution because of the limited sample size in Luxembourg.

New policy initiatives aim to close the achievement gaps among pupils of different backgrounds and to reduce early school leaving. A 2017 amendment of the Act on Youth established national quality standards in early childhood education that all providers had to comply with by September 2017. The Law on secondary education of 2017 introduced several measures to improve school quality and better adapt the school offer to the needs of an increasingly diverse school population.

Several ongoing measures aim to improve vocational education and training, particularly to tackle grade repetition. In 2017, the proportion of pupils enrolled in upper secondary vocational education and training programmes was 61.6 %, against an EU average of 47.8 %. Graduates in vocational education and training enjoy excellent prospects with an employment rate of 95.4 % among recent vocational education and training graduates, well above the EU average of 79.5% and even above that for tertiary graduates. However, grade repetition remains a major challenge in technical secondary education. In June 2019, the 2008 vocational training reform act was amended to address a series of technical issues, including: extending the length of the training period to improve completion rates, introducing a form of training for people already in employment and integrating the contracts for apprenticeships and work placements in the labour law in order to improve legal certainty.

Cross-border cooperation has been strengthened to ensure apprenticeship places. In March 2018, Luxembourg signed a bilateral agreement with the German Land of Rhineland-Palatinate that was modelled on the 2017 agreement with the Lorraine region in France. Both are based on a 2014 framework agreement aimed at boosting cross-border mobility in vocational education and training and thereby strengthening the labour market in the *Grande Région* (i.e. Luxembourg and the bordering regions of Belgium, France and Germany). In September 2018, 150 vocational education and training students were involved in apprenticeship mobility across the *Grande Région*.

The attainment rate in tertiary education for people with disabilities is lower than the EU average (22.8 % against the EU average of 32.4 %). The tertiary education attainment gap between people with and without disabilities is the second largest in the EU (30 percentage points against an EU average of 10.2 percentage points). This could partly be due to the distorting impact of the high share of tertiary educated migrants in Luxembourg. However, the United Nations Committee on the Rights of Persons with Disabilities pointed out critically in 2017 that the education laws still allowed for the segregation of students with disabilities and issued a number of recommendations([66]). Subsequently, the Law *Loi du 27 juin 2018 relative à l'organisation de l'Université du Luxembourg* is expected to improve the inclusion rate of students with special needs in tertiary education.

([66]) Committee on the Rights of Persons with Disabilities (2017). Concluding observations on the initial report of Luxembourg CRPD/C/LUX/CO/1.

Box 3.3.3: **Labour shortages and skills gaps in Luxembourg's labour market in a multidimensional perspective**

Employers in Luxembourg report persistent challenges in finding the right skills profiles to fill a large number of different vacancies. The number of open positions registered by employers at the national public employment service has increased by 30% between 2015 and 2018. Domestic SMEs find more difficulties to hire qualified workers who fall short for the level of demand. This is mainly due to competition with large firms and internationally oriented subsidiaries of foreign companies.

In general, the vast majority of the bottleneck professions in Luxembourg can be classified as high and medium skilled profiles. In 2019 the ADEM services together with employers have compiled the list of to 100 bottleneck professions ([1]) The largest number of bottleneck occupations (32) is in the business support sector with a focus on highly skilled jobs, and on ICT in particular. There are 16 bottleneck occupations reported in the installation and maintenance sector with profiles leaning toward high skilled and medium skilled jobs. Similarly, in industry (13) and construction (11) sectors, bottleneck vacancies tend to require medium level of qualifications with only few low skilled profiles in demand. In banking the study identified 7 bottleneck profiles, all with high skills. In the rest of the list, in particular, in hospitality, trade and personal services sectors there are present a number of low skills profiles.

Luxembourg's sustained economic growth and labour market dynamics attracted a large number of cross-border workers over the last decade, which allowed in part addressing the labour shortages and skills gaps. At the beginning of 2018, Luxembourg employed around 188 000 cross-border workers residing in France, Belgium and Germany (according to the IGSS/CCSS, (Pigeron-Piroth, I. (2019)). The main sectors of employment, where the share of cross-border worker exceeds 50%, include the manufacturing industry (primarily at the metal production and the manufacture of metal products), trade, administrative and support services, construction, mining and quarrying, but also communication and scientific activities (with a focus on legal and accounting activities). The share of cross-border workers in financial sector is just below the half (48.8%). On average, cross-border workers have a higher education compared to resident workers.

The main sectors of cross-border employment largely coincide with the sectors reporting most labour shortages in Luxembourg. Without the use of the cross-border workforce, economic growth in these sectors would have been less strong. The University of Greater Region (UniGR) research indicates that cross-border workers not only contribute to alleviating labour shortages, but also bring a variety of skills and know-how, strengthening those present in Luxembourg. However, at this moment the cross-border flows may not be sufficient to fully alleviate the existing skills shortages.

Trans-border interdependencies related to labour force flows can have many impacts throughout the Greater Region, including in such areas as infrastructure, spatial planning, and housing. One remarkable finding of the UniGR study is that in two sectors employment leans predominantly towards non-Luxembourg nationals residing in Luxembourg and not commuting (more than 50%). These sectors are accommodation and food service activities (hotels and restaurants) and services to households, which are also among the ones reporting higher skills shortages. In other sectors reporting shortages, the share of foreign employees residing in Luxembourg is mainly above one quarter.

Cross-border flows of workers have an impact on the transport systems of both Luxembourg and the neighbouring regions (Gerber et al. (2019)). At peak hour, transport conditions for cross-border workers may become challenging. In terms of transportation mode, 85% of cross-border commuters travel by private car, 6% by bus and 9% by train. The share of train users is unevenly distributed: with 12% among the French commuters, 3% among German and 7% among Belgian. Correspondingly, occupancy rates of passenger trains at peak hour are close to 100% on trains entering from France, with free capacity available on trains entering from Belgium or Germany. Addressing the infrastructure capacity issues in terms of transporting cross-border employees requires continued medium and long term planning.

The challenges in filling skills gaps are not specific to Luxembourg, but also have a bearing on the neighbouring regions. A recent study by Eurofound and JRC (Eurofound and JRC (2019)) provides some insights into general labour market shifts in Luxembourg's neighbouring regions: Belgium's Luxembourg province, France's Lorraine region, Germany's lands Saarland and Rheinland-Pfalz. Between 2002 and 2017, the number of high skilled jobs increased in all of Luxembourg's neighbouring regions, as well as employment in services sectors ([2]). As these trends are expected to continue in the future, the potential of the Luxembourg's neighbouring regions to serve as a source of high skilled employees may weaken. There is, however, a possibility of some inflow of high-skilled workers from further away regions who could decide to settle down in the neighbouring regions in order to pursue their employment in Luxembourg.

Overall, addressing the challenge of labour shortages and skill gaps in Luxembourg would benefit from a multidimensional approach combining effective skills management and development domestically with favourable conditions for attracting and retaining foreign talent. As more European regions start to face similar challenges, there is a scope for continued action in Luxembourg along a set of measures with a medium and long term perspective in all of the following areas: education and training, transport infrastructure, and housing.

([1]) The list is based on the collection of the job vacancies declared to ADEM and in a second step validated and amended by the experts from sectoral employer's federations. All the vacancies for regular jobs were included. Vacancies for subsidised employment and vacancies declared by temporary work agencies were not taken into account. The available data give a picture about the number of bottleneck occupations, but not the actual numbers of difficult to fill workplaces. To be identified as a bottleneck, the job should have a vacancy created at least every month, the vacancies should remain unfilled for at least 53 days on average, and the total number of job seekers per vacancy should be less than 0.5 (or more than two vacancies per job seeker).

([2]) Based on the EU-LFS data.

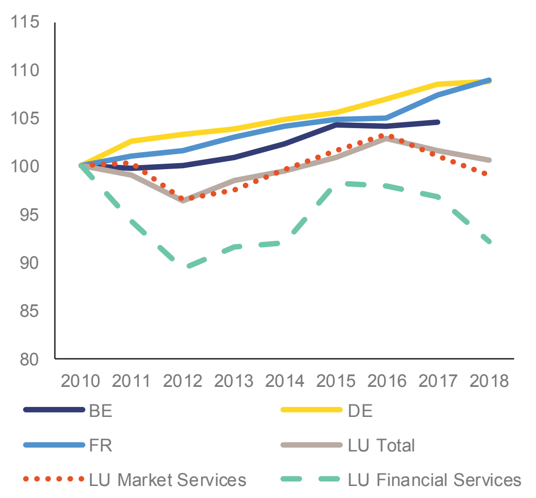
3.4. COMPETIVENESS AND INVESTMENT

3.4.1. PRODUCTIVITY AND ECONOMIC DIVERSIFICATION

Overview

Labour productivity in Luxembourg remains broadly stable since 2010. Luxembourg is characterised by a high productivity level compared to other European economies, which helps to maintain the high levels of labour costs. However, labour productivity in Luxembourg is growing at a slower pace since 2010 comparing to its neighbouring countries (see Graph 3.4.1). While the level of productivity in manufacturing remained rather stable in the period 2016-2018, it fell in market services. This negative trend is particularly observable in financial services, which represent one quarter of total gross value added. The decline in labour productivity occurred on the back of the negative evolution of both Capital Growth per Worker and Total Factor Productivity since 2007.

Graph 3.4.1: **Labour productivity evolution (2010=100)**

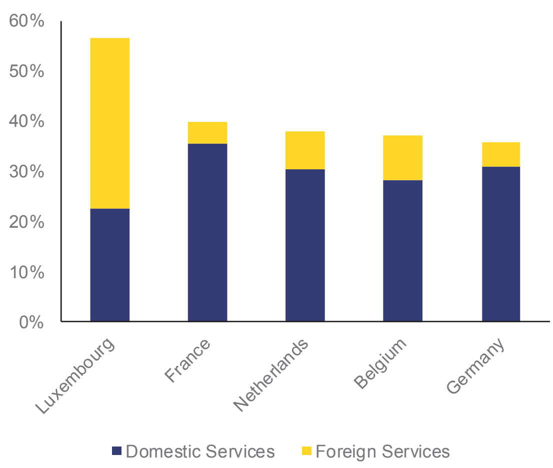


Source: Eurostat

The role of domestic and foreign services is particularly important for explaining the aggregate competitiveness in Luxembourg. The share of services in terms of activity and employment in Luxembourg is higher than in neighbouring countries. Market services represented 69% of value added and 56% of total employment in 2018. In particular, financial services play a central role in the overall economy as they represent a quarter of the country's GDP and 11.5% of total employment. Moreover, the country's intermediate use of market services in its total production is also above neighbouring countries, representing 56% of the value added of the final demand produced in Luxembourg (see graph 3.4.2), and it has been increasing in recent years. A specific characteristic of Luxembourg's economy is that services used in its final production are more imported than domestically produced. This suggests that the actual cost-competitiveness in Luxembourg is affected by the respective evolution of the costs of its foreign inputs, which are mainly services and consequently, characterised across most of the countries by higher increases in their unit labour costs compared to manufacturing sectors.

The slowdown in productivity can be also explained by some country-specific characteristics. Specific potential factors to Luxembourg include a number of microeconomic weaknesses, including low R&D activity among firms compared to other EU countries, shortages of qualified workers (Section 3.3) and lower levels of digitisation than top performers.([67]) In parallel, capital per worker declined in recent years.

Graph 3.4.2: **Share of services in final demand**



Source: European Commission

([67]) Top performers include Finland, the Netherlands, Belgium, Denmark or Sweden.

Box 3.4.4: **Investment challenges and reforms in Luxembourg**

Section 1. Macroeconomic perspective

Productivity is high, reflecting the relative importance of an efficient financial sector. Economic growth has become increasingly dependent on a narrow base of goods and services and is sensitive to external shocks. Productivity gains from off-shoring have been significant and linked to Luxembourg's integration to global value chains, which may contribute to widening productivity gaps vis-à-vis more domestically-focussed sectors. The business investment to GDP ratio is among the lowest in the EU and remains below pre-crisis levels, which might in part be linked to some domestic challenges. The perceived shortage of qualified workforce across sectors in Luxembourg and its bordering areas, mobility concerns and high housing prices are likely to weigh on the country's attractiveness.

Section 2. Assessment of barriers to investment and ongoing reforms

Public administration/ Business environment	Regulatory/ administrative burden		Financial Sector / Taxation	Taxation	
	Public administration			Access to finance	
	Public procurement /PPPs		R&D&I	Cooperation btw academia, research and business	
	Judicial system			Financing of R&D&I	CSR
	Insolvency framework		Sector specific regulation	Business services / Regulated professions	CSR
	Competition and regulatory framework			Retail	
Labour market/ Education	EPL & framework for labour contracts			Construction	CSR
	Wages & wage setting			Digital Economy / Telecom	CSR
	Education, skills, lifelong learning	CSR		Energy	
				Transport	CSR

Legend:

	No barrier to investment identified		Some progress
CSR	Investment barriers that are also subject to a CSR		Substantial progress
	No progress		Fully addressed
	Limited progress		Not assessed yet

Infrastructure bottlenecks and the lack of skilled labour remain the main barriers holding back investment in Luxembourg. More than 70 % of firms surveyed by the European Investment Bank in 2019 highlighted that the unavailability of skilled labour was a barrier to investment in Luxembourg.

Selected barriers to investment and priority actions underway:

1. Insufficient housing supply and inadequate transport infrastructure remain major barriers to investment. Investment in dwellings is constrained by the lack of available land, among other due to insufficient incentives for landowners to build. A set of reforms planned by the authorities could improve the outlook for the provision of housing if implemented. Nevertheless, the gap in dwellings investment is expected to remain significant in view of the expected increase in population. This should continue to push the already high prices up, which might weigh negatively on the attractiveness of working in Luxembourg, and exert upwards pressure on wages and commercial real estate.
2. The public investment strategy aims to promote technologies with the potential to support a broader digitalisation of the economy. In contrast, business investment and innovation remain low and appear insufficient to significantly stimulate digital economic integration and productivity growth. The lack of attractiveness of the R&I environment, including the disconnection between private sector R&I and the public research system, hampers investment in business R&I. This is compounded by shortages of skilled workforce, which are increasingly perceived as an obstacle for R&I investment.

The EU supports investment in Luxembourg also via the European Fund for Strategic Investments (EFSI). By December 2019 total financing under the EFSI amounted to EUR 119 million, intended to trigger EUR 549 million in additional investments.

The current experience with the EU financial instruments and the EFSI budgetary guarantee demonstrated a need for simplification, streamlining and better coordination of the EU's investment support instruments during the next 2021-27 programming period. By the end of 2020, EFSI and other EU financial instruments will come under the roof of the new InvestEU programme that promotes a more coherent approach to financing EU policy objectives and increases the choice of policy implementation options and implementing partners to tackle country specific market failures and investment gaps. In addition, under InvestEU, Member States can set-up a national compartment by allocating up to 5% of their structural funds to underpin additional guarantee instruments supporting the financing of investments with a higher level of local specificities. InvestEU will be policy-driven and focus on four main areas, all relevant for Luxembourg: Sustainable Infrastructure, Research, Innovation, and Digitisation, Small Businesses, and Social Investment and Skills.

Beyond the EIB Group, other multilateral financial institutions and national promotional banks may have direct access to the Invest EU guarantee. At this stage, Luxembourg's national promotional bank, the SNCI (Société Nationale de Crédit et d'Investissement), has not signalled its interest in participating to the scheme.

Luxembourg relies on the SNCI to provide financial support to domestic firms for development investments, including fixed assets, innovations or commercial projects, either in Luxembourg or abroad. SNCI grants transfer loans to start-ups and SME's and may take equity positions, either directly or in association with financial partners or its subsidiary, CD-PME S.A.

Despite the high productivity growth potential of Luxembourg's environment, technological and digital integration, and investment, remain low in the business sector. Given the country's high productivity level and high labour intensity, increasing productivity would rely on developing high value added activities driven by innovation and investments that capitalise on the high potential of Luxembourg's digital and technological environment. Luxembourg's digital infrastructure is well developed, as the country has been reported for displaying one of the most digital transformation enabling environments in the EU (Country report 2019, European Commission). The government has stepped up efforts to implement its digital integration and innovation strategy. This, however, contrasts with low levels of digital and technological integration and low productivity growth in the broad business sector, which also shows one of the lowest investment, including R&I (OECD economic surveys: Luxembourg 2019, p.49, Digital Economy and Society Index 2019; EIB Investment Survey Luxembourg 2019), among the EU Member states. All this suggests a low capacity by the business sector to capture productivity gains from incremental investments based on the country's digital and technological environment.

Stimulating private investment may help increase productivity growth and technological integration, conducive to a more resilient and sustainable growth path. Identifying bottlenecks and disincentives to invest might help increase private investment and improve technological diffusion and innovation among firms. Substantial public and private investments are likely to be required in order to succeed in the digital transformation and diversify the economy. Maintaining a balanced, attractive and enabling environment will also be key in the transition. Perceived trade-offs from the economic, social and environmental linkages could be mitigated by enhanced coordination among different policy areas and long-term approaches to address the country's main challenges; including housing supply, skills development; sustainable mobility and intergenerational fairness (see Sections 3.1 and 3.5).

Digital economy

While Luxembourg is among the EU leaders in connectivity with high coverage of next-generation access networks, the roll-out of 5G in Luxembourg risks being delayed. While assignments of the 700 MHz and 3.6 GHz bands are planned for mid-2020, the decisions on whether or not to conduct an open (not only addressed to potential operators) second public consultation, on whether or not to hold an auction and on the auction design have yet to be made. Meanwhile, the demand for fast and ultrafast broadband services, which are available to 98% and 92% of households respectively, is increasing. Next-generation access networks and fibre (ultra-fast broadband) are available to 91 % and 37 % of households in rural areas, respectively.

Luxembourg is among the high-performing EU Member States in terms of Information and Communication Technologies (ICT) sector (5.4 % of GDP), but digital integration in the broad economy remains low. Although the number of ICT companies is increasing, the number of ICT specialists has not followed the same pace of growth, broadening the gap between labour supply and demand (and with a significant gender gap ([68])). Despite the higher potential of the ICT sector in Luxembourg compared to most EU countries as a proportion of GDP, business digitalisation indicators are close to the EU average. Indicators include: the share of enterprises using software packages for information sharing (40.6 % against 34.4 % in the EU), social media (29.3 % against 25.2 % in the EU), Big Data for their analyses (16 % against 12 % in the EU) and cloud services (16 % against 18 % in the EU). The Government expects the new strategy to transition to a data-driven economy ([69]) will help improve those readings in the medium term.

Measures have been implemented by the government to promote the digitalisation of small and medium-sized enterprises. As of 2016, several initiatives were implemented, including the Fourth National Action Plan to support small and medium-sized enterprises and the 'Fit4Digital' programme, a programme managed by Luxinnovation ([70]) to boost the use of digital solutions within small and medium-sized enterprises. In September 2019, the Luxembourg Digital Innovation Hub (L-DIH), a platform of industry and on-demand solutions providers, was set up to boost the digitalisation of the industry, addressed to companies of any type and size based in Luxembourg. Additionally, the Fifth National Action Plan to support small and medium-sized enterprises, which includes financial support measures, is under consultation by stakeholders and its approval is expected for the first half of 2020.

The adoption of enabling technologies such as cloud, big data, and robotics remains a challenge. More than one third of enterprises do not invest intensively in digital technologies and do not exploit the opportunities of digitalisation. Luxembourg's enterprises scored very low in the digital intensity index (38 % vs 41 % in the EU). Small and medium-sized enterprises are lagging behind big companies in e-commerce. In 2019, 9% (17.5% in the EU) of small and medium-sized enterprises were selling online, against 19% (39% in the EU) of big firms. The uptake of several enabling technologies by Luxembourg's enterprises is close to the EU average.

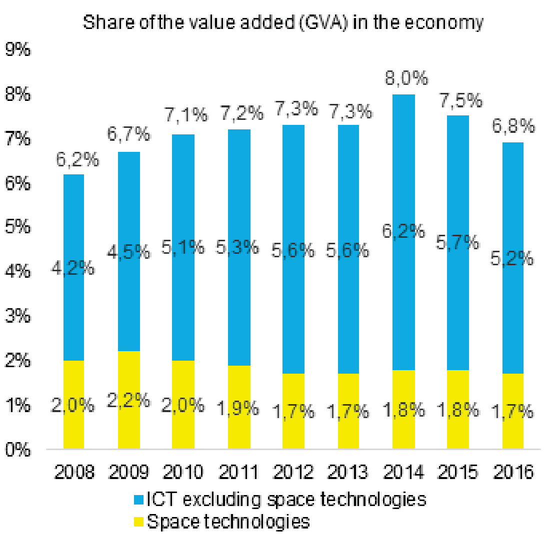
Luxembourg is committed to deploy new digital technologies and engage at European level. The country is a member of the Euro High-Performance Computing (Euro HPC) Joint Undertaking ([71]). It has also signed the Declaration of European Blockchain Partnership ([72]), as well as the Declaration ([73]) on Cooperation on Artificial Intelligence. The government announced in parallel its intention to procure a national supercomputer. In June 2019, Luxembourg was one of the eight sites selected to host the EuroHPC supercomputers ([74]). Luxembourg's, "Meluxina"([75]), will be connected to the EuroHPC network and used for research, personalised medicine and e-health projects, but also to meet the needs of companies, in particular small and medium-sized enterprises and start-ups.

([68]) European Commission (2019), Women in Digital Scoreboard,https://ec.europa.eu/digital-single-market/en/women-digital-scoreboard
([69]) https://gouvernement.lu/en/publications/rapport-etude-analyse/minist-economie/intelligence-artificielle/data-driven-innovation.html
([70]) National Agency for Innovation
([71]) https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking
([72]) https://ec.europa.eu/digital-single-market/en/news/european-countries-join-blockchain-partnership
([73]) https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence
([74]) https://meco.gouvernement.lu/fr/actualites.gouvernement+fr+actualites+toutes_actualites+communiques+2019+06-juin+14-schneider-meluxina.html
([75]) https://www.tradeandinvest.lu/news/luxembourg-supercomputer-meluxina-will-support-digital-transformation/

Diversification of the economy

The government continued implementing its strategy to diversify the economy, but business investment is among the lowest in the EU. Since 2000, the Government has taken a number of measures to support a multi-specialisation strategy focused on five priority sectors: Information and Communication Technologies, Logistics, Space, Health Technologies and Eco-technologies (See Section 3.5). In spite of the efforts made the share of the five priority sectors in the economy total gross value added remains relatively small. In 2016, it accounted for 9.6% of gross value added and 7.8% of employment ([76]). The implementation of the recently approved data-driven innovation strategy is expected to foster the development of the strategy sectors. However, business investment, in terms of GDP, has declined further and in 2018 it stood at 12.9% of GDP, among the lowest in the EU. The estimated contribution of the capital stock to real GDP growth shrank further in 2018 and was set at 1.1 percentage points, the lowest record in recent years. Business investment in R&D, at 0.68% of GDP in 2018, is markedly low.

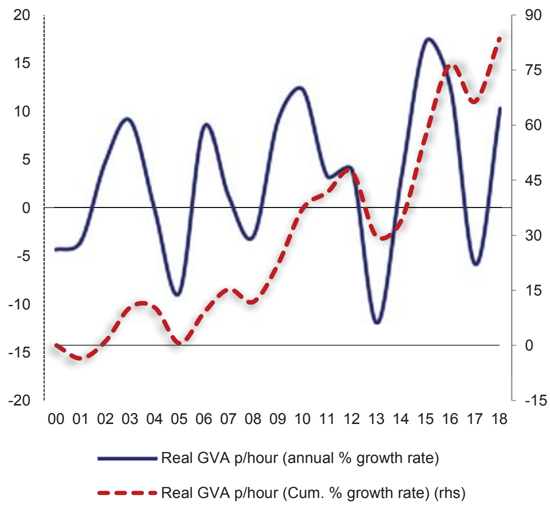
Graph 3.4.3: **Evolution and composition of the GVA created by the ICT sector**



Source: Structural business statistics and RCSL. Calculations: Observatory for competitiveness.

The information and communication technologies sector is the most prominent in terms of share of value added and employment. In the period 2008-2016, its share in the country's gross value added has increased from 6.2% to 6.8%, including the space sector, which accounts for around 2% of GDP (Graph 3.4.3). In the same period, paid employment grew by 28% while the number of firms increased by 46% to 2,266. Luxembourg has stepped up efforts to speed up the space sector development. Luxembourg is one of the most active Member states of the European Space Agency, investing in programmes of space science, satellite communications, satellite navigation and Earth observation. Luxembourg is trying to develop a unique ecosystem in the domain of space resources for the commercial space industry, with sustained investment topped up by EU funding. In 2020, Luxembourg launched the new National Action Plan on space 2020-2024.

Graph 3.4.4: **Labour productivity growth in information and communication technologies (ICT)**



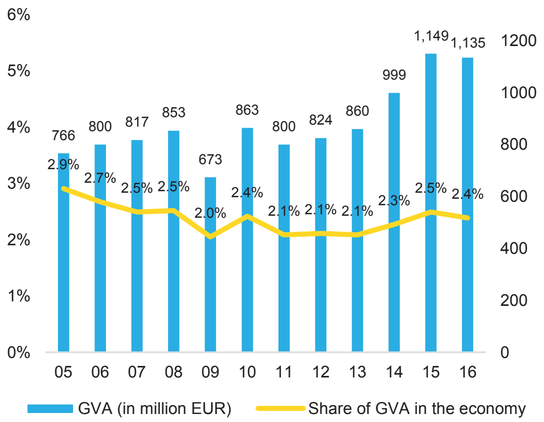
Source: Eurostat

Labour productivity in the information and communication technologies sector has improved markedly since 2014, despite a drop in 2017. Annual productivity growth is highly volatile (Graph 3.4.4) and subject to high uncertainty due to large and frequent revisions, especially to the most recent data. Annual growth has been driven by the highly volatile gross value added growth in the sector, coupled with the lower adjustment pace of employment in recent years (see section 1). In cumulated terms, productivity has increased faster in the period 2014-2018,

([76]) Observatory for competitiveness (https://odc.gouvernement.lu/fr/publications/rapport-etude-analyse/perspectives-politique-economique/perspectives-politique-economique-34.html) around 8.3%, on average per year, compared with 1.2% in the period 1995-2007, despite a sharp drop in 2017 ([77]). This upward trend has been concurrent with a significant increase in the sector's external trade participation, which recorded a cumulated increase in the value of exports of 154% in the period 2014-2018. However, the net external contribution of the sector to GDP growth is difficult to assess due to some inconsistent estimates and missing data points at the sector level of disaggregation ([78]).

Luxembourg's logistics sector ranked among the top performers in the World Bank's international benchmark for logistics performance ([79]). With a score of 4.22, second after Germany, the sector's gross value added increased from € 0.8 billion in 2006 to € 1.4 billion in 2016, though its share in the gross value added has decreased from 2.7% in 2006 to 2.4% in 2016 (Graph 3.4.5). Employment in the logistics sector increased from 11,589 people in 2006 to 12,819 people in 2016.

Graph 3.4.5: **Evolution of the GVA created by the logistics sector**



Source: Structural business statistics

Health technology firms have left a limited footprint in the economy, despite some public investments and initiatives to support start-ups. According to the "Bilan de Competitivité 2019" ([80]), health sciences companies generated EUR 175 million in added value, 0.38% of the country's GDP, with approximately 1,600 jobs. Luxembourg has created an attractive ecosystem for digital health companies. Measures adopted in support of the sector include an inter-ministerial monitoring task force, new funding schemes, the creation of a quality label for digital health products and services, a digital health Living Lab and a favourable taxation. Companies producing eco-technologies accounted only for 0.2 % of gross value added created in 2016, still very low in terms of GDP (See Section 3.5).

Research and Innovation

The decline in labour productivity is concurrent with lower investment in research and development, especially in the private sector. The total Research and Development intensity of Luxembourg has decreased over the last decade to 1.21% of GDP (2018) and is far below the national target of 2.3%. From 2007 to 2013, there was a rapid development of the public science base, only partially compensating the significant decrease of business expenditure in Research and Development. In particular, Research and Development by small and medium-sized enterprises decreased from 0.41% of GDP in 2007 to 0.11% in 2013. From 2013 onwards, public Research and Development intensity ([81]) has stagnated and remains 20% below EU average. Luxembourg's business Research and Development intensity has since then remained stable at around 0.68% of GDP (2018). Addressing these challenges would lead to progress on Sustainable Development Goal 9.

Despite the efficiency of Luxembourg's research and innovation system, cooperation between public research institutions and businesses remain a challenge. Despite the quality of the scientific output in Luxembourg's public research system, which is among the most valued in the EU ([82]), several indicators point to its

([77]) This figure needs to be taken with caution given the large and frequent revisions to the national accounts data, especially in this sector.
([78]) As in the Input/Output tables by ESTAT.
([79])https://lpi.worldbank.org/international/scorecard/radar/254/C/LUX/2018/C/DEU/2018#chartarea
([80]) https://gouvernement.lu/dam-assets/documents/actualites/2019/11-novembre/20-bilan-competitivite/Bilan-Competitivite-2019.pdf
([81]) Research and Development investment performance in the public sector as % of GDP
([82]) Luxembourg ranks first in EU for international co-publication within the top 10% most cited scientific publications worldwide as a share of total scientific publications of the country and ranks third for scientific

relatively weak linkages with the business sector. For instance, concerning the volume of public Research and Development funded by businesses (contract research) ([83]), Luxembourg showed one of the lowest scores in the EU in 2016, after having decreased since 2011. Several initiatives have been implemented since 2016 to foster public-private cooperation. For instance, the Industrial Partnership Block Grant ([84]) established by the Luxembourg National Research Fund aims to foster cooperation between Luxembourg based companies active in research and development and public research institutions in Luxembourg. The JUMP competitive funding programme ([85]) was designed to help bridge the technical and funding gap between research-driven discoveries and their commercialisation/utilisation. However, the impact of these measures has not been monitored or evaluated.

The scope and size of public support to business research and innovation is improving ([86]) but remains relatively limited. The adoption in 2017 of a law to promote Research, Development and Innovation was followed by an increase in the total number of projects supported (+18% in 2019), as well as an increase in the average budget per project, from EUR 1.8 million in 2016 to EUR 3.6 million in 2019. Luxinnovation developed programmes to support innovation in small and medium-sized enterprises such as Fit4Innovation and Fit4Start which provide coaching and financing for start-ups. The numbers of small and medium-sized enterprises benefitting from these initiatives is increasing (+84% for the FIT4 programmes, FIT4Digital not included) but the comparatively higher administrative burden they entail for the limited resources of small firms is hindering broader participation.

publications of the country within the top 10% most cited worldwide as a share of total scientific publications of the country

([83]) As measured by public Research and Developmentfinanced by business enterprises, either as % of GDP or of total public Research and Developmentexpenditure.

([84]) Programme by the National Research FundNR to foster the cooperation between Luxembourg based companies active in Research and Development and public research institutions in Luxembourg; results published on the National Research Fund website

([85]) Programme by the National Research Fund in support to knowledge transfer and innovation

([86]) Support to business Research and Development from 0.041% in GDP in 2009 to 0.054 of GDP in 2015

Several strategies to boost productivity and sustainable development and boost digital integration across the economy were published in 2019. The Data-driven Innovation Strategy proposes specific measures for a secure and data-driven economy. Key initiatives include the support of companies' in-house innovation and of the start-up ecosystem. This strategy is closely linked to the one on Artificial Intelligence as it aligns with Luxembourg's digital ambition to become a data-driven and sustainable economy. Furthermore, the national priorities for public research have been revised and adopted by the Luxembourg government. This will underpin a national strategy for public research, to be in place by mid-2020. However, an integrated research and innovation strategy articulating how to deploy and synchronise actions across all the components and dimensions of the innovation eco-system (including business Research and Innovation) towards a clear, deliberate, overarching strategic direction is currently not planned by the government.

Business Environment

The reform of bankruptcy has been pending approval in the Parliament for more than 2 years. In this regard, Luxembourg remains among the worst performers in the EU, according to the 2018/2019 Small Business Act Factsheet ([87]).While some support is provided to allow for a second chance, the fear of failure in Luxembourg is among the highest in the EU. In 2019, a reform of the right of establishment was introduced, which should reduce the administrative burden for entrepreneurs. One of the main priorities of the fifth action plan for small and medium-sized enterprises, announced in February 2019, is to provide honest entrepreneurs with a second chance. Although Luxembourg is taking steps in the direction of promoting second chance, there is still significant room for improvement in this area. Luxembourg is among the few Member States which have not developed a dedicated strategy for small and medium-sized enterprises. The development of such a strategy might be useful to clarify the framework for the activity of

([87]) https://ec.europa.eu/docsroom/documents/38662/attachments/19/translations/en/renditions/native small and medium-sized enterprises in Luxembourg.

3.4.2. MARKET INTEGRATION AND INVESTMENT QUALITY

Professional services

Restrictiveness in accounting, architecture, civil engineering and legal professional services remains high compared with the OECD average and the EU average, according to the OECD's Product Market Regulation indicator (OECD, 2019 and European Commission's assessment (COM(2016) 820 final and SWD(2016) 436 final). In 2019, Luxembourg continued its efforts to reduce progressively regulatory restrictions in the business services sector, mainly by pursuing the reform of the professions of architect and engineer. Additional reforms to further reduce outstanding restrictions for these two professions have been announced, notably, as regards the wide scope of reserve of activities for architects. Moreover, the Omnibus law ([88]) simplified further some administrative procedures by allowing for horizontal screening. However, there are still regulatory barriers in the business services sector ([89]), which restrict market competition and in particular make it difficult for foreign companies providing certain business services to set up a branch, agency or an office in Luxembourg.

The profession of lawyer is particularly constrained by regulations ([90]). Some regulatory requirements, including the restriction on shareholding exclusively to lawyers and prohibition of multidisciplinary activities for law firms, limit innovation, competition and efficient allocation of resources. Their reassessment by taking into account the proportionality of these restrictions in relation to the independence of the profession, the quality of legal services and to the corresponding supervisory arrangements would be economically beneficial.

Retail

Recent reforms were aimed at improving the functioning of a rather restricted retail sector. According to the retail restrictiveness indicator (European Commission, 2018), at the end of 2017, Luxembourg had some of the most restrictive regulations for retail businesses in the EU, in particular regarding restrictions for establishment ([91]). In the OECD's recently published Product Market Regulation Indicator (2018), Luxembourg scores above the average ([92]) on establishment and the level of operational restrictiveness. However, some positive developments took place in the meantime. As regards retail establishment, the special authorisation procedure for large retail stores (more than 400 square metres) has been repealed. Additionally, to support digitalisation in the retail sector, the initiative Letzshop.lu has been launched in 2018, as a platform for online sales that retailers in Luxembourg may use to introduce themselves and sell their products online.

Territorial supply constraints are a concern for the business sector in Luxembourg. Following Benelux inquiries, Luxembourg is monitoring developments related to the businesses concerns in Benelux and reporting at the European level. Territorial supply constraints are likely to have a negative impact on the choice of products and prices for consumers. According to Eurostat, food prices in Luxembourg are among the highest in the EU.

3.4.3. INTER -REGIONAL DIMENSION

Luxembourg is at the cross-roads of the *Grande Région.* Luxembourg lies at the heart of the *Grande Région*, which gathers five regions from four countries (Luxembourg, Germany, Belgium and France). This political organisation aims at

([88]) The law of 27 February 2018 on interchange fees and amending several laws relating to the financial sector, the so-called "Omnibus Law", published the 5th March 2018.

([89]) European Commission's assessment (COM(2016) 820 final and SWD(2016) 436 final) and the OECD PMR (OECD, 2019).

([90]) European Commission's assessment (COM(2016) 820 final and SWD(2016) 436 final) and the OECD PMR (OECD, 2019).

([91]) A European retail sector fit for the 21st century COM(2018) 219 final - SWD(2018) 237 final https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018SC0236&from=EN

([92]) Measured for 22 Member States which are OECD members fostering cross-border cooperation in a region where cross-border mobility is particularly important. The *Grande Région* also promotes a more sustainable way of life, encourages the development of health and social care services and supports research and innovation.

The *Grande Région* shares Luxembourg's priorities as regards high value-added sectors. Luxembourg scores higher (0.93) than any other member of the *Grande Région* in the Regional Competitiveness Index. Every member of the *Grande Région* has developed a smart-specialisation strategy, which in Luxembourg focuses mainly on sustainable resources management, industry, eco-technologies and information and communications technologies. The share of employment in "high-tech" sectors is increasing across the area, reaching 4.2% of total e employment in Luxembourg in 2018 ([93]). Sectors such as health, industry, information and communications technologies and sustainable management of resources are priorities for many of the members of the *Grande Région*, which underlines the relevance of cross-border cooperation.

Cooperation at interregional and national level is crucial to build a critical mass and improve access to markets. It seems particularly relevant for Luxembourg to continue building partnerships in research and innovation, notably by reinforcing cooperation not only among researchers but also between academia and business. In this context, the University of the *Grande Région* is one of the most integrated academic consortia, which offers 19 cross-border university courses focussing chiefly on the rational use of resources, cross-border issues and biomedicine.

3.4.4. GOVERNANCE AND INSTITUTIONAL QUALITY

Policy decision and planning

The central government's decision making is open and predictable in Luxembourg. However, sub-national strategic planning prevails and policy monitoring remains low. The legislative procedure and decisions are transparent and legally compliant, scrutinised by the parliament, and accessible to the public. By contrast, strategic planning is unevenly developed and implemented and vertical integration is lacking in key areas. While strategic plans for the sectors of the diversification strategy are well developed and regularly updated, the country lacks a national strategic framework for research and development. The recent territorial management reforms have improved coherence between the different layers of government, without achieving full vertical integration. In many cases, ex-ante impact assessments, structured monitoring and evaluations are seldom carried out, reducing the likelihood of policies to produce the intended results.

The reliability and availability of statistics remain a challenge, beyond undisclosed information, which hampers the effectiveness of the policy making. Significant revisions and incomplete data series (e.g. housing occupancy monthly) reduce the informative content of statistics. Policies aimed at enhancing productivity would greatly benefit from firm-level analysis. However, the availability of micro-founded data in Luxembourg remains scarce. For instance, identifying firm-level determinants of productivity, comparing multinationals' productivity to that of domestic firms, or quantifying the role of financial frictions on firm-level productivity are all issues that can only be satisfactorily studied with firm-level data. The recently created National productivity Council may improve this situation.

Accountability

The right to information of records held by the government is subject to a number of restrictions. This limits in practice the access to a broad range of public information by stakeholders, national and international institutions, which reduces their capacity to participate and collaborate in the policy process. Several institutions assess regularly the quality of access to data and public reporting. In 2018, Luxembourg only notified two draft technical regulations under the Single Market Transparency Directive, which is very low. Effective participation in this notification mechanism would lead to a more effective prevention of barriers to trade in the Single Market.

([93]) Eurostat https://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.scitech&lang=en

Service delivery

The country's performance in digital public services has been improving faster than the EU average over the last few years. Luxembourg ranks close to the EU average (59.3 against 62.9 in the EU) in digital public services (e-government and e-health). 55% of people submit official forms to administrative authorities electronically (the EU average is at 64 %). Luxembourg scores close to the average in the provision of digital public services for businesses. Luxembourg performs well above the EU average (76 % against 64 %) regarding the maturity of Open Data. The businesses and citizens can exploit the opportunities that opening data to the public provides. The Ministry of Digitalisation was created in 2018, following the last elections, supporting digitalisation of public services.

Luxembourg effectively implemented the regulation regarding Electronic Identification, Authentification and Trust Services (eIDAS) ([94]). The country is among the Member States who have notified their e-ID scheme. Since September 2018, citizens from other Member States that have notified their home country e-ID scheme can thus prove their identity on 'MyGuichet' using their own national e-IDs, thus obviating the need to get a separate Luxembourg e-ID. In March 2019, the Government Council adopted the National Interoperability Framework – whose governance set-up is ongoing – which facilitates the reaching of greater levels of interoperability by public sector organisms.

Public financial management

Several institutions assess regularly the quality of public finance management. For instance in the context of the Budget Framework; assessments are published the Central Bank of Luxembourg, the National Public Finance Council and the Court of Auditors, among other. Public reporting is improving in this area, although further improvements are called for by these institutions.

([94]) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.

3.5. ENVIRONMENTAL SUSTAINABILITY

Despite challenges on climate, energy and mobility, the green transition offers growth opportunities. Luxembourg, one of the EU's highest greenhouse gas emitter per capita, needs to increase efforts to deliver on its climate and energy objectives. Although the just transition of some specific industrial sectors requires attention, its relatively benign financial situation and its service-based economy make it less vulnerable to costs and likely to benefit from the transition. Road traffic congestion weighs on Luxembourg's economy and environmental sustainability. The country is taking action towards a more sustainable mobility, which requires significant investments. The country's large financial sector can benefit from the growing sustainable finance market, while eco-innovation and circular economy policies can support job creation and the diversification of the economy.

Climate and energy challenges

The impact of climate change on temperatures and rainfall is expected to have consequences on various sectors of Luxembourg's economy. The average temperature in the country between 1981 and 2010 was 1°C warmer than in the period 1961-1990, while rainfalls are expected to increase in winter and decrease in summer, with fewer but more intense rainy summer events. Climate change is predicted to impact human health, water quality and quantity, and to have consequences, not yet quantified, on various sectors of the economy, notably agriculture and forestry (Ministère du Développement Durable et des Infrastructures, 2018a and 2018b). This is likely to affect the country's crisis and disaster management strategy([95]). The costs of adaptation measures are not yet identified. The draft climate law (*Projet de loi relative au climat*) envisages the financing of adaptation measures by the Climate and Energy Fund.

Extreme weather events caused €718 million of economic losses over the period 1980-2017, and are projected to increase. Luxembourg is the EU country where extreme weather events have caused some of the highest economic loss per squared kilometre (€ 277,817), per capita (€ 1,627), and percentage of insured losses (59%). Prolonged periods of drought or heavy floods occurred in recent years (e.g. May 2016, June 2018), and climate simulations estimate that extreme flooding events could increase by 19% because of climate change (Ministère du Développement Durable et des Infrastructures, 2015). A higher risk of climate-related events could lead to an increase in insurance premiums, potentially affecting disproportionately people on low income ([96]).

Luxembourg has the highest greenhouse gases emissions per capita in the EU, despite a relatively less carbon-intensive economy. Luxembourg's economy is now less carbon-intensive than the EU average (249 g CO_2eq per euro of GDP in 2018 compared to 303 g CO_2eq per euro of GDP at EU level). However, in 2018, Luxembourg remained the EU country with the highest greenhouse gas emissions per capita (20.2 t CO_2eq), more than double the EU average (8.6 t CO_2eq) (European Environment Agency, 2019b ([97])). Transport is the main source of emissions (47%), reflecting Luxembourg's position as logistical hub and the impact of its large cross-border commuting workforce.

The predominance of the services sector reduces the economy's overall exposure to carbon-intensive sectors affected by the climate and energy transition. Emissions from the Emission Trading System's sectors, including heavy industry, represented 15% of total emissions in 2017 ([98]), to be compared with the EU level of 40%. This makes Luxembourg the EU country with the lowest percentage of emissions from carbon-intensive sectors. The iron and steel industry, which was the engine of Luxembourg's economy, now employs 7.7% of the total labour force, and industrial production accounts for 5.3% of the total value added (Grand Duchy of Luxembourg, 2019).

([95]) The national strategy on adaptation to climate change mentions that crisis and disaster management in the country could have to deal with a changed fire potential, an impairment of the transport infrastructure, a threat to the security of supply related to energy and drinking water, and stronger effects of extreme events.

([96]) As the insurance sector has already warned (The Guardian, 2019)

([97]) Data excluding land use, land use change and forestry (LULUCF), but including international aviation.

([98]) Freely allocated emissions represented 84% of verified emissions to all stationary installations in 2017; this ratio was 33% in aviation.

The industrial sectors most impacted by the climate and energy transition have been identified for further policy action. The main industrial emitters are the cement industry in Rumelange and the steel industry in Esch-sur-Alzette (respectively 42% and 27% of the total industrial greenhouse gas emissions in the country). The three most energy-intensive sectors are special cement, steel and glass, with the steel industry accounting for 40% of power consumption in the country. Luxembourg intends to engage the industry with voluntary agreements on reducing energy consumption by 12% in 12 years. These sectors will require specific attention to ensure a just transition, by promoting economic diversification (see section 3.4.1) and reskilling. Luxembourg is already making efforts to support the transition of previously carbon-intensive regions – the Alzette-Belval region is an example.

The Just Transition Fund might focus on mitigating the impact of transition for the cement and steel industries. Given their highest emission intensities and the likely socioeconomic impact of the transition, it could focus its intervention on Rumelange and Esch-sur-Alzette. The Just Transition Fund could promote economic diversification, reskilling and multi-specialisation, in line with the smart specialisation strategy (RIS3) of Luxembourg, which identifies the sectors with most potential: clean & eco-technologies, health technologies, information and communication technologies and digitalisation of industry. The first three sectors have notably been the fastest growing in terms of employment in the country in 2008-2016.

Luxembourg is less affected by energy poverty than other EU Member States ([99]). 2.1% of households were unable to keep the home adequately warm in 2018, compared to 7.3% at the EU level. Energy poverty appears more prevalent in households that rent their dwellings. Energy poverty is primarily addressed through social policy and multiple programmes, including public information, to stimulate energy efficiency and renewable energy in households.

Luxembourg could benefit from the transition, although it lacks a specific assessment of the macroeconomic impact of planned policies. Ambitious climate and energy policies can contribute to Luxembourg's sustainable development and to better manage the adverse effects of climate change. They could provide opportunities for growth and jobs through increased productivity, diversification of exports and business creation. The assessment of the impacts of compliance with the Paris Climate Agreement (European Commission, 2019, and Eurofound, 2019) shows that by 2030 it might have a small positive effect on employment. On the other hand, the transition's impact on energy costs and consequences on production costs and competitiveness remain to be assessed in more detail, together with the associated mitigating measures.

Luxembourg aims at climate neutrality by 2050, but is a long way off achieving its climate and energy objectives for 2020 and 2030. Based on existing measures, the country is expected to miss its targets of reducing greenhouse gas emissions under the effort-sharing legislation in 2020 (20% reduction compared with 2005) and 2030 (40%), with a gap of 5 and 25 percentage points, respectively. Luxembourg would need to increase efforts significantly in order to achieve its 2020 binding target for renewable energy and intends to bridge the gap, through agreements for statistical transfers of renewable energy amounts, under the EU cooperation mechanisms with Lithuania and Estonia (Renewable Energy Progress Report European Commission, 2019). Luxembourg is also at risk of not fulfilling its obligations to increase energy efficiency by 2020. While energy consumption has dropped in the industry and household sectors, it increased by 11% in the services sector and by 1% in the transport sector. Due to its location, Luxembourg already has a very high level of electricity interconnectivity with other Member States, significantly above the EU's objectives, and it is set to further increase by 2030.

To achieve its climate and energy objectives, Luxembourg intends to rollout significant investments, but lacks a specific and quantified assessment of its investment needs. In 2020, public environmental and climate investments will amount to more than EUR 500 million and increase to EUR 661 million in 2023 (Cour des comptes, 2019).

([99]) EU Energy Poverty Observatory, Luxembourg data & statistics factsheet, 20 June 2019

Luxembourg's National Energy and Climate Plan for 2021-2030 will outline the scope of the envisaged policy response, and will play a key role to assess investment needs. The National Energy and Climate Plan is still to be delivered by Luxembourg's authorities. In its June 2019 recommendations, the Commission recommended that in developing its final plan, Luxembourg take action to provide a comprehensive assessment of overall investment needs to achieve the objectives, as well as information on the financial sources to be mobilised for implementation of the existing and planned policies and measures.

To ensure that adequate investments are made, Luxembourg will need to ensure that effective price signals are in place across all sectors, including by stepping up its energy taxation policy. There is no carbon pricing policy in Luxembourg beyond the EU's Emissions Trading System. However, Luxembourg plans to introduce a carbon tax from 2021 (see Section 3.1.4). Schemes are in place to support renewable energy and energy efficiency measures. A climate bank that offers loans at reduced interest rates for renovation is also envisaged. More appropriate price signals appear necessary, as well as flanking measures to ensure the investment decisions are made also in cases where there is an extended time to achieve financial return, such as energy efficiency investments. The impact of these schemes on the government's budget will also need to be evaluated.

Renovations in the building sector can support economic activity while reducing emissions, energy consumption and energy poverty. Luxembourg faces the challenges of having to address the issue of insufficient housing supply and maintaining housing affordable (see section 3.2.3), and at the same time achieving its energy and climate targets – in 2016, private houses accounted for 12.6% of the country's final energy demand and 11.1% of its total greenhouse gas emissions ([100]). Luxembourg's strategy includes the renovation of existing buildings focusing on high efficiency and the construction of efficient new buildings. From 2012 to 2016, building renovations employed 7,000 persons on average.

([100]) Source: draft National Energy and Climate Plan. Excluding land use, land use change and forestry.

Mobility challenges

Mobility issues weigh on Luxembourg's economy and environmental sustainability. Transport is responsible for 47 % of Luxembourg's emissions in 2016 (more than double of the EU average of 21 %) ([101]). As such, improving the situation in the transport sector can significantly contribute to Luxembourg's climate performance (see subsection above), but also alleviate tensions on its economy, as road congestion affects the country's attractiveness and has social and economic spillovers.

Massive and increasing numbers of cross-border commuters, strongly relying on private cars, contribute to road traffic congestion. The demographic development in Luxembourg and its pressure on an insufficient and expensive housing market result in increased distances to work for cross-border workers, who represent 41 % of Luxembourg's labour force (see section 3.3). The car remains the dominant means of transport, and the country has the highest number of passenger vehicles per inhabitant in the EU (Eurostat, 2019b). Over 70 % of commuters use cars, compared to 19 % who use public transport ([102]), contributing to road traffic congestion in the *Grande Région* at peak hours. Car taxes are particularly low in Luxembourg compared to other EU countries (Eunomia et al., 2016). In addition, the low taxation on transport fuels in Luxembourg encourages the use of personal cars. The taxation of diesel in Luxembourg remains amongst the lowest in the European Union. As a result, in 2015, non-residents contributed € 745 million out of € 871 million (around 86 %) of total fuel excise revenues (Eunomia et al., 2016).

Traffic congestion affects the economy, including through time losses and impacts on air quality, can eventually damage Luxembourg's attractiveness and productivity, and may have social impacts. Luxembourg is among the member states with the most time lost in road congestion (36.9 hours per capita in 2017, up from 31.1 in 2014) (European Commission,

([101]) Data excluding land use, land use change and forestry (LULUCF), but including international aviation.
([102]) https://transports.public.lu/dam-assets/publications/contexte/situation-actuelle/20171207-enquete-mobilite-luxmobil-2017-premiers-resultats-presse-v2.pdf

Hours spent in road congestion annually). Despite improvements over the last decades, Luxembourg's air quality continues to give cause for concern ([103]) and has consequences on public health and the environment as a whole ([104]). Short-term measures to cut emissions from existing vehicles have been identified as a priority ([105]). Traffic congestion can damage the country's attractiveness and productivity, and have social spillovers, as it contributes to exacerbate inequalities, with poorer households having to set aside more time to access their place of work. A recent study estimated the total negative externalities of transport (including accidents ([106]), congestion, air pollution, climate, noise, energy production, and habitat damage) in Luxembourg reached 7.5% of GDP in 2016, which is the highest in the EU (EU average is 5.7%) (European Commission, Handbook on the external costs of transport, January 2019, p.128).

Luxembourg continues to take action to encourage a more sustainable mobility, although a comprehensive strategy articulating transport policies with other policies is lacking. Luxembourg's Sustainable Mobility Strategy, Modu 2.0 (see European Commission, European Semester country report for Luxembourg, 2019), aims at reducing the economic and environmental impact from congestion, while transporting 20% more people by 2025 than in 2017. Additional measures were announced by the new government, but the current approach lacks a comprehensive vision across policy areas of analysis of expected outcomes, social spillovers, and linkages with housing and labour market issues (reducing distances to work, developing teleworking).

A cross-border approach to mobility issues remains essential. Bilateral agreements with neighbouring countries aim to co-finance the improvement of road infrastructures and transportation services of common interest. In the framework of the *Grande Région*, prices for cross-border transportation are expected to be reduced by German, French and Belgian network operators (Ministry of the Economy, 2019b). Nevertheless, inconsistencies remain (e.g. Belgium developed a reserved carpool lane in 2019 which stops at the border with Luxembourg) as well as concerns, for instance on possible border effects of upcoming measures on free public transport in Luxembourg.

Significant investments are underway to improve the transport system, and in particular public transport. The Modu 2.0 strategy includes investments in rail network modernisation, better cross-border connections and new multi-modal exchange hubs, involving investment with the three neighbouring countries. In 2020, environmental and climate investments will amount to more than € 500 million, of which two thirds will be in the field of mobility or in favour of public transport. Until 2023, the government is expected to invest a total € 2.2 billion into the rail network and the rail operator CFL is expected to spend €400 million in new rail rolling stock ([107]). In addition, € 380 million should be invested in the tram network.

Luxembourg intends to incentivise the use of electric vehicles. It aims to develop the densest network of electric charging infrastructure in the EU (Organisation for Economic Co-operation and Development, 2019). Changes to the subsidy scheme for electric vehicles in January 2019 aim to boost the purchase of electric cars. Cooperation with the Netherlands and Belgium to ensure Benelux users could charge their electric vehicles in any station belonging to the three networks may help to accelerate the development.

Public transport (bus, tram, train) will be fully free of cost from 1 March 2020. The cost of the measure for the public budget is estimated at around €30 million in 2020 and €41 million per year in years after, which represents only around 10% of the total cost of operating the network (State Budget, 2020). Whether the free public

([103]) In 2016, 2,500 years of life were lost due to exposure to fine particulate matter (PM2.5). In 2018, nitrogen dioxide levels exceeding EU air quality standards were recorded in the City of Luxembourg (EEA, Central Data Repository). Target levels of ozone concentrations were also exceeded.

([104]) EEA Report No 10/2019: Air quality in Europe – 2019 report

([105]) See conclusions of the Air Quality Dialogue in Luxembourg in 2017, as well as the EIR 2019.

([106]) Road safety can be further improved in Luxembourg. The low number of fatalities does not allow to compare with other Member States, but the high number of motorcycles and non-residents involved in accidents requires attention. Recommended measures include speed cameras and stricter law enforcement, which can be easily implemented.

([107]) https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2019/01-janvier/21-bausch-transport.html.

transport will have the expected result of limiting or decreasing the use of the car remains uncertain. It will also largely depend on the offer of adequate public transport services.

Luxembourg intends to increase excise duties on fuel. This reform would be part of a broader fiscal reform. Additional revenues generated by increased excise duties on fuel could be allocated to the Climate and Energy fund and geared towards the financing of fossil fuel alternatives (see also section 3.1.4).

Synergies to leverage for a greener economy

Luxembourg's large financial sector can benefit from the growing sustainable finance market, while supporting the environmental transition (see section 3.2.5). The country has an opportunity to lead on climate finance, playing a key role at the international level to foster a green transition through financial instruments, while diversifying its financial sector.

In 2018, Luxembourg ranked first within the EU in terms of eco-innovation ([108]), up from 11th in 2012, due to a strong political support of the government. Two main barriers to eco-innovation are small national market for eco-innovations and pressure on resources due to the need to balance economic development and environmental protection (European Commission, 2018). Luxembourg has recently confirmed its commitment to drive industry transition to a low-carbon economy by joining the "Leadership Group for Industry Transition", a global public-private initiative launched in September 2019 (UN Department of Global Communications, 2019).

Luxembourg is well advanced in the field of the circular economy. Building on the "Third Industrial Revolution" strategy ([109]), Luxembourg promotes small and medium-sized enterprises' transition to a circular economy (e.g. the "Fit4Circularity" ([110]) programme and the "SuperDrecksKëscht fir Betriber" label ([111])), and gave a strong environmental dimension to its Small Business Act ([112]). Luxembourg performs better than the EU average on resource productivity, but the use of recycled materials has decreased and is now below the EU average. It will probably comply with the 2020 municipal waste recycling targets, but further efforts will be needed to comply with post-2020 targets, and waste generation per capita is much above the EU average ([113]). The lack of a comprehensive national strategy on circular economy is addressed in the 2018 national waste management plan ([114]) and the government intends to start drafting a dedicated strategy during 2020. All in all, Luxembourg is as regards several key indicators moving away from the objectives of SDG 12 (see also Annex E).

([108]) European Commission, Eco-innovation Observatory: Eco-Innovation scoreboard 2018.
([109]) The Ministry of the Economy, "Third Industrial Revolution" strategy.
([110]) http://www.innovation.public.lu/fr/innover/pme-artisanat/fit-for-circularity/index.html
([111]) https://www.yde.lu/labels-clubs/labels/le-label-superdreckskescht-fir-betriiber
([112]) European Commission, 2018 SBA fact sheet - Luxembourg, p.12.
([113]) Directive (EU) 2018/851, Directive (EU) 2018/852, Directive (EU) 2018/850 and Directive (EU) 2018/849 amend the previous waste legislation and will set more ambitious recycling targets for the period up to 2035.
([114]) Plan national de gestion des déchets.

ANNEX A: OVERVIEW TABLE

Commitments	Summary assessment ([115])
2019 country-specific recommendations (CSRs)	
CSR 1: Increase the employment rate of older workers by enhancing their employment opportunities and employability. Improve the long-term sustainability of the pension system, including by further limiting early retirement.	Luxembourg has made **Limited Progress** in addressing CSR 1
– Increase the employment rate of older workers by enhancing their employment opportunities and employability.	– **Limited Progress** Activity and employment rates of people above 60 remain very low. Luxembourg has one of the highest rates of inactive people aged 60-64, at 80.6 % against 53.1 % on EU average, but the situation has improved for workers aged 55-59. Some measures adopted in 2017 and 2018 may explain the slight increase in the employment rate of older workers, but this rate remains substantially below the EU average and there were no new measures in 2019. The Age Pact, a draft law on age management measures intending to help keeping senior workers at work, though introduced in 2014, is still pending in Parliament.
– Improve the long-term sustainability of the pension system, including by further limiting early retirement.	– **No Progress.** No evolution since 2017. The 'pré-retraite de solidarité', a special scheme allowing people to retire from the age of 57, was abrogated in 2018, but the impact of this on the average effective retirement age and on expenditure is still difficult to assess due to an

([115]) The following categories are used to assess progress in implementing the country-specific recommendations (CSRs):
No progress: The Member State has not credibly announced nor adopted any measures to address the CSR. This category covers a number of typical situations to be interpreted on a case by case basis taking into account country-specific conditions. They include the following:
no legal, administrative, or budgetary measures have been announced
in the national reform programme,
in any other official communication to the national Parliament/relevant parliamentary committees or the European Commission,
publicly (e.g. in a press statement or on the government's website);
no non-legislative acts have been presented by the governing or legislative body;
the Member State has taken initial steps in addressing the CSR, such as commissioning a study or setting up a study group to analyse possible measures to be taken (unless the CSR explicitly asks for orientations or exploratory actions). However, it has not proposed any clearly-specified measure(s) to address the CSR.
Limited progress: The Member State has:
announced certain measures but these address the CSR only to a limited extent; and/or
presented legislative acts in the governing or legislative body but these have not been adopted yet and substantial further, non-legislative work is needed before the CSR is implemented;
presented non-legislative acts, but has not followed these up with the implementation needed to address the CSR.
Some progress: The Member State has adopted measures
that partly address the CSR; and/or
that address the CSR, but a fair amount of work is still needed to fully address the CSR fully as only a few of the measures have been implemented. For instance, a measure or measures have been adopted by the national Parliament or by ministerial decision but no implementing decisions are in place.
Substantial progress: The Member State has adopted measures that go a long way towards addressing the CSR and most of them have been implemented.
Full implementation: The Member State has implemented all measures needed to address the CSR appropriately.

	easing of restrictions on other kinds of early retirement schemes. In 2018, the working group on pensions mandated by the Government concluded that the pension system appears to be not sustainable, amid high uncertainty, in the long term projections at unchanged policies. Following the 2018 general elections, the coalition agreement mentions that the government intends to submit a draft law on partial retirement (i.e. a combination of partial retirement and part-time work) to social partners.
CSR 2: Reduce barriers to competition in regulated professional business services.	Luxembourg has made **Limited Progress** in addressing CSR 2. Regulatory restrictions remain above EU weighted average in several regulated professions (according to available indicators).
CSR 3: Focus economic policy related to investment on fostering digitalisation and innovation, stimulating skills development, improving sustainable transport, and increasing housing supply, including by increasing incentives and lifting barriers to build.	Luxembourg has made **Some Progress** in addressing CSR 3
– Focus economic policy related to investment on fostering digitalisation	– **Some Progress** The data-driven innovation strategy for the development of a trusted and sustainable economy in Luxembourg was published in May 2019 and actions have been implemented to promote the digitalisation of small and medium-sized enterprises. However, digital integration in the broad economy remains low and despite the higher potential of the Information and Communication Technologies sector, business digitalisation indicators are close to the EU average.
– and innovation,	– **Some Progress** Tax measures were introduced to encourage investments in innovative companies (adjustments on the level of tax law in 2018). Furthermore, Luxinnovation developed programmes to support innovation in Small and Medium-sized Enterprises such as Fit4Innovation and Fit4Start which provides coaching and financing for start-ups.
– stimulating skills development,	– **Some Progress** 18 % of adults surveyed in 2018 had a learning experience in the previous four weeks, against an EU average of 11.1 % and for basic and advanced digital skills, Luxembourg scores highest according to the Digital Agenda Scoreboard. The share of unemployed adults participating in learning in Luxembourg in 2018

	was one of the highest of the EU (almost 30 % against 10.7 % on EU average). Against the background of possible skills mismatches and labour shortages, the public employment service conducted an analysis to identify the needs in cooperation with the Luxembourg business association. Luxembourg's industry federation and Luxembourg's bankers' association, together with the Chamber of Commerce, the Ministry of Education, the Ministry of Higher Education and Research and the public employment service, also launched a survey on skills requested by businesses over the next two years in the field of information and communication technologies to improve the orientation of young people and adapt vocational training and adult learning to the needs. In June 2019, the 2008 vocational training reform act was amended to address some technical issues. The Coalition agreement gives specific attention to the development of skills with several projects about the quality of life-long learning, the orientation of young people, employees and job seekers, the introduction of a personal training account and training vouchers.
– improving sustainable transport,	– **Some Progress** Significant investments have been realised and are to be continued to improve the transport system, and in particular public transport. In line with the Strategy for sustainable mobility (MoDu 2.0) the focus remains on a well-functioning multi-modal mobility. Major investments took place on improving the railway system, including cross-border railway connections and the extension of the Luxembourg railway station. The extension of the tramway in the Capital has been continued (phase B) and the installation of a public electric charging infrastructure is progressing.
– and increasing housing supply, including by increasing incentives and lifting barriers to build.	– **Limited Progress** Housing prices continued to increase and they have accelerated in 2019, compared to previous years. Given the fundamental supply/demand mismatch, prices are expected to increase further. Investment in dwellings remains low, as the pace of construction of new dwellings remains only slightly above the annual average observed since 2000. Housing supply is limited by insufficient incentives to extend built-up areas. Regulations are being adapted so as to make local planning contracts more binding on landowners. The

	recent territorial management reforms have improved coherence between the different layers of government, yet without achieving the degree of vertical integration that would be needed to significantly improve the effectiveness of national policies aiming at fostering investment in dwellings in the country.
CSR 4: Address features of the tax system that may facilitate aggressive tax planning, in particular by means of outbound payments.	Luxembourg has made **Limited Progress** in addressing CSR 4: Beyond implementing EU and internationally agreed initiatives, Luxembourg has not yet announced concrete reforms to address aggressive tax planning, in particular by means of outbound payments. However, Luxembourg reported that it has plans to address the issue of outbound payments with regard to jurisdictions included in the EU list of non-cooperative jurisdictions for tax purposes.
Europe 2020 (national targets and progress)	
Employment rate target set in the National Reform Programme: 73 % of population aged 20 to 64	The overall employment rate of the resident population continued to slightly increase, from 71.5% in 2017 to 72.1% in 2018, but it is still below both its Europe 2020 target and the EU average of 73.2%.
Research and development target set in the National Reform Programme: 2.3%-2.6% of GDP, of which 0.7% to 0.9% for public spending (1.6%-1.7% for the private sector)	In 2018, investment in research and development decreased further to 1.21% of GDP and reached its lowest point compared to the last decade. It is therefore far below its national target of 2.3% of GDP (Eurostat) and the EU average of 2.11% of GDP. Business enterprise expenditure in research and development is further decreasing (0.68% of GDP) compared to the EU average of 1.41% of GDP in 2018. Luxembourg has not reached its 2020 target for public expenditure on research and development (0.7% to 0.9%) which decreased slightly to 0.54% of GDP from 0.56% of GDP in 2017.
National greenhouse gas (GHG) emissions target: - 20% in 2020 compared with 2005 (in sectors not included in the EU emissions trading scheme)	Preliminary data for 2018 shows that Luxembourg has reduced its greenhouse gas emissions by 10% relative to 2005 in the sectors not included in the EU emissions trading system. This is 6 percentage points below the annual emission allocation for that year (-16%). According to the latest national projections

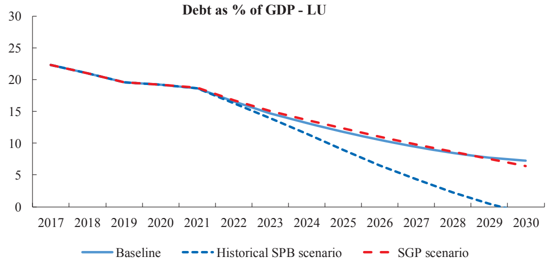
	submitted to the Commission and taking into account existing measures, it is expected that Luxembourg will have reduced these emissions by 15% in 2020 compared with 2005 – the 2020 target would be missed by a projected shortfall of 5 percentage points.
2020 renewable energy target: 11%, with a share of renewable energy in all modes of transport equal to 10%	Preliminary data for 2018 indicates a strong increase from 6.3% in 2017 to 9.1%, which means that Luxembourg is on track to achieve its target in 2020. The large increase is mainly due to two statistical agreements, which added 2.2 percentage points to the renewable energy share. However, the renewable energy share in transport share remains steady at 6.5% compared to 6.4% in 2017. The share in renewable electricity and heating and cooling have increased by 1 percentage point, to 9.1% and 8.8% respectively.
Energy efficiency, 2020 energy consumption targets: Luxembourg's 2020 energy efficiency target is 4 481,6 Mtoe expressed in primary energy consumption (4 239,2 Mtoe expressed in final energy consumption)	The latest progress report based on 2017 data for energy consumption shows that Luxembourg met the indicative energy efficiency target both in final and primary energy consumption, with a final energy consumption of 4.2 Mtoe and a primary energy consumption of 4.3 Mtoe for that year. However, both final and primary energy consumption rose by 3.5% since 2016. Preliminary data for 2018 shows further increase in energy consumption to levels higher than the 2020 target in both final and primary energy consumption. The achievement of the target is therefore uncertain.
Early school/training leaving target: 9.5 %	Early school leaving stood at 6.3 % in 2018, well below the EU average of 10.6 %.
Tertiary education target: 50 % of population aged 17-33.	The rate of tertiary attainment reached 56.2 % in 2018, well above the EU average of 40.7 %, but below the national target of 66 %.
Target for reducing the number of people at risk of poverty or social exclusion, expressed as an absolute number of people: -6000 (base year 2008)	In 2018, 126 000 people were at risk of poverty or social exclusion, 54 000 more than in 2008.

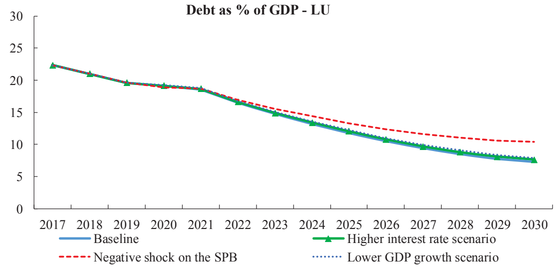
ANNEX B: COMMISSION DEBT SUSTAINABILITY ANALYSIS AND FISCAL RISKS

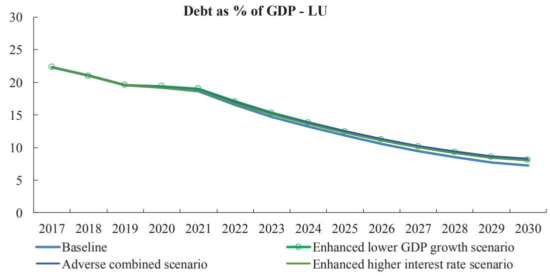
Luxembourg

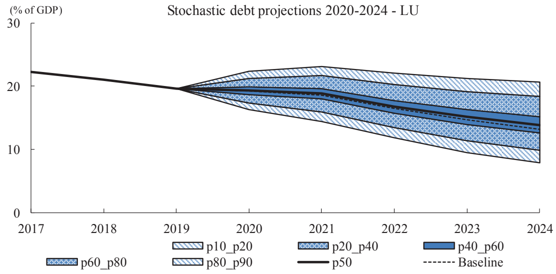
General Government debt projections under baseline, alternative scenarios and sensitivity tests

LU - Debt projections baseline scenario	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Gross debt ratio	**21.0**	**19.6**	**19.2**	**18.6**	**16.5**	**14.7**	**13.2**	**11.8**	**10.5**	**9.4**	**8.5**	**7.8**	**7.3**
Changes in the ratio (-1+2+3)	*-1.3*	*-1.4*	*-0.4*	*-0.5*	*-2.1*	*-1.8*	*-1.5*	*-1.4*	*-1.3*	*-1.1*	*-0.9*	*-0.7*	*-0.5*
of which													
(1) Primary balance (1.1+1.2+1.3)	**3.0**	**2.6**	**1.7**	**1.7**	**1.5**	**1.3**	**1.1**	**1.0**	**0.9**	**0.8**	**0.7**	**0.5**	**0.3**
(1.1) Structural primary balance *(1.1.1-1.1.2+1.1.3)*	***2.3***	***1.9***	***1.0***	***1.1***	***1.2***	***1.1***	***1.1***	***1.0***	***0.9***	***0.8***	***0.7***	***0.5***	***0.3***
(1.1.1) Structural primary balance (bef. CoA)	*2.3*	*1.9*	*1.0*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*
(1.1.2) Cost of ageing					*0.0*	*0.1*	*0.3*	*0.4*	*0.6*	*0.8*	*1.0*	*1.2*	*1.5*
(1.1.3) Others (taxes and property incomes)					*0.1*	*0.1*	*0.2*	*0.3*	*0.4*	*0.4*	*0.5*	*0.6*	*0.6*
(1.2) Cyclical component	***0.7***	***0.7***	***0.6***	***0.6***	***0.4***	***0.2***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
(1.3) One-off and other temporary measures	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
(2) Snowball effect (2.1+2.2+2.3)	**-0.9**	**-0.7**	**-0.6**	**-0.6**	**-0.5**	**-0.5**	**-0.4**	**-0.4**	**-0.3**	**-0.3**	**-0.3**	**-0.2**	**-0.2**
(2.1) Interest expenditure	*0.3*	*0.3*	*0.3*	*0.3*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*
(2.2) Growth effect	*-0.7*	*-0.5*	*-0.5*	*-0.5*	*-0.4*	*-0.4*	*-0.3*	*-0.3*	*-0.3*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
(2.3) Inflation effect	*-0.5*	*-0.4*	*-0.4*	*-0.4*	*-0.4*	*-0.3*	*-0.3*	*-0.3*	*-0.2*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
(3) Stock-flow adjustments	**2.5**	**1.9**	**1.8**	**1.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**









Short term	Medium term	S1	Debt sustainability analysis (detail)	Baseline	Historical SPB	Lower GDP growth	Higher interest rate	Negative shock on SPB	Stochastic projections	DSA	S2	Long term
LOW (S0 = 0.2)	LOW	LOW (S1 = -5.7)	Risk category	LOW	LOW	LOW	LOW	LOW	LOW	LOW	HIGH (S2 = 8.6)	HIGH
			Debt level (2030)	7.3	-1.0	7.9	7.6	10.5				
			Debt peak year	2019	2019	2019	2019	2019				
			Percentile rank	36.0%	24.0%							
			Probability debt higher						14.0%			
			Dif. between percentiles						12.7			

Note: For further information, see the European Commission Debt Sustainability Monitor (DSM) 2019.

[1] The first table presents the baseline no-fiscal policy change scenario projections. It shows the projected government debt dynamics and its decomposition between the primary balance, snowball effects and stock-flow adjustments. Snowball effects measure the net impact of the counteracting effects of interest rates, inflation, real GDP growth (and exchange rates in some countries). Stock-flow adjustments include differences in cash and accrual accounting, net accumulation of assets, as well as valuation and other residual effects.

[2] The charts present a series of sensitivity tests around the baseline scenario, as well as alternative policy scenarios, in particular: the historical structural primary balance (SPB) scenario (where the SPB is set at its historical average), the Stability and Growth Pact (SGP) scenario (where fiscal policy is assumed to evolve in line with the main provisions of the SGP), a higher interest rate scenario (+1 pp. compared to the baseline), a lower GDP growth scenario (-0.5 pp. compared to the baseline) and a negative shock on the SPB (calibrated on the basis of the forecasted change). An adverse combined scenario and enhanced sensitivity tests (on the interest rate and growth) are also included, as well as stochastic projections. Detailed information on the design of these projections can be found in the FSR 2018 and the DSM 2019.

[3] The second table presents the overall fiscal risk classification over the short, medium and long-term.

a. For the short-term, the risk category (low/high) is based on the S0 indicator. S0 is an early-detection indicator of fiscal stress in the upcoming year, based on 25 fiscal and financial-competitiveness variables that have proven in the past to be leading indicators of fiscal stress. The critical threshold beyond which fiscal distress is signalled is 0.46.

b. For the medium-term, the risk category (low/medium/high) is based on the joint use of the S1 indicator and of the DSA results. The S1 indicator measures the fiscal adjustment required (cumulated over the 5 years following the forecast horizon and sustained thereafter) to bring the debt-to-GDP ratio to 60 % by 2034. The critical values used are 0 and 2.5 pps. of GDP. The DSA classification is based on the results of 5 deterministic scenarios (baseline, historical SPB, higher interest rate, lower GDP growth and negative shock on the SPB scenarios) and the stochastic projections. Different criteria are used such as the projected debt level, the debt path, the realism of fiscal assumptions, the probability of debt stabilisation, and the size of uncertainties.

c. For the long-term, the risk category (low/medium/high) is based on the joint use of the S2 indicator and the DSA results. The S2 indicator measures the upfront and permanent fiscal adjustment required to stabilise the debt-to-GDP ratio over the infinite horizon, including the costs of ageing. The critical values used are 2 and 6 pps. of GDP. The DSA results are used to further qualify the long-term risk classification, in particular in cases when debt vulnerabilities are identified (a medium / high DSA risk category).

ANNEX C: STANDARD TABLES

Table C.1: **Financial market indicators**

	2014	2015	2016	2017	2018	2019
Total assets of the banking sector (% of GDP)(1)	1932.5	1925.5	1925.6	1827.0	1793.9	1871.8
Share of assets of the five largest banks (% of total assets)	32.0	31.3	27.6	26.2	26.3	-
Foreign ownership of banking system (% of total assets)(2)	88.4	87.9	87.8	86.8	87.0	87.1
Financial soundness indicators:(2)						
- non-performing loans (% of total loans)	1.4	1.1	0.8	0.7	0.8	0.7
- capital adequacy ratio (%)	19.6	20.9	24.3	22.5	21.4	20.2
- return on equity (%)(3)	7.2	7.2	7.5	5.7	5.5	5.7
Bank loans to the private sector (year-on-year % change)(1)	3.2	5.4	8.0	6.6	4.2	4.8
Lending for house purchase (year-on-year % change)(1)	7.0	6.2	6.5	8.3	7.8	7.7
Loan-to-deposit ratio(2)	91.5	88.0	83.3	76.6	75.6	77.8
Central bank liquidity as % of liabilities(1)	0.5	0.6	0.7	0.9	0.8	0.6
Private debt (% of GDP)	324.9	335.8	309.0	322.9	306.5	-
Gross external debt (% of GDP)(2) - public	10.2	9.0	8.2	10.3	9.3	8.9
- private	5074.3	5647.3	5912.8	5464.1	5184.4	5036.2
Long-term interest rate spread versus Bund (basis points)*	17.3	-12.7	16.5	22.6	16.9	13.7
Credit default swap spreads for sovereign securities (5-year)*	-	-	-	-	-	-

(1) Latest data Q3 2019. Includes not only banks but all monetary financial institutions excluding central banks.
(2) Latest data Q2 2019.
(3) Quarterly values are annualized.
* Measured in basis points.

Source: European Commission (long-term interest rates); World Bank (gross external debt); Eurostat (private debt); ECB (all other indicators).

Table C.2: **Headline Social Scoreboard indicators**

	2014	2015	2016	2017	2018	2019 [5]
Equal opportunities and access to the labour market						
Early leavers from education and training (% of population aged 18-24)	6.1	9.3	5.5	7.3	6.3	:
Gender employment gap (pps)	12.9	11.7	11.0	7.9	8.0	9.1
Income inequality, measured as quintile share ratio (S80/S20)	4.4	4.3	5.0	5.0	5.7	:
At-risk-of-poverty or social exclusion rate[(1)] (AROPE)	19.0	18.5	19.8	21.5	21.9	:
Young people neither in employment nor in education and training (% of population aged 15-24)	6.3	6.2	5.4	5.9	5.3	:
Dynamic labour markets and fair working conditions						
Employment rate (20-64 years)	72.1	70.9	70.7	71.5	72.1	72.7
Unemployment rate[(2)] (15-74 years)	6.0	6.5	6.3	5.6	5.5	5.5
Long-term unemployment rate (as % of active population)	1.6	1.9	2.2	2.1	1.4	1.4
Gross disposable income of households in real terms per capita[(3)] (Index 2008=100)	103.1	102.5	101.8	104.8	106.5	:
Annual net earnings of a full-time single worker without children earning an average wage (levels in PPS, three-year average)	31367	31922	32320	:	:	:
Annual net earnings of a full-time single worker without children earning an average wage (percentage change, real terms, three-year average)	0.19	0.41	0.72	:	:	:
Public support / Social protection and inclusion						
Impact of social transfers (excluding pensions) on poverty reduction[(4)]	40.6	43.8	39.1	35.5	33.5	:
Children aged less than 3 years in formal childcare	49.0	51.8	50.9	60.8	60.5	:
Self-reported unmet need for medical care	0.8	0.9	0.4	0.3	0.3	:
Individuals who have basic or above basic overall digital skills (% of population aged 16-74)	:	86.0	86.0	85.0	:	:

(1) People at risk of poverty or social exclusion (AROPE): individuals who are at risk of poverty (AROP) and/or suffering from severe material deprivation (SMD) and/or living in households with zero or very low work intensity (LWI).
(2) Unemployed persons are all those who were not employed but had actively sought work and were ready to begin working immediately or within two weeks.
(3) Gross disposable household income is defined in unadjusted terms, according to the draft Joint Employment Report 2019.
(4) Reduction in percentage of the risk of poverty rate, due to social transfers (calculated comparing at-risk-of poverty rates before social transfers with those after transfers; pensions are not considered as social transfers in the calculation).
(5) Average of first three quarters of 2019 for the employment rate, unemployment rate and gender employment gap.
Source: Eurostat

Table C.3: **Labour market and education indicators**

Labour market indicators	2014	2015	2016	2017	2018	2019 [5]
Activity rate (15-64)	70.8	70.9	70.0	70.2	71.1	71.9
Employment in current job by duration						
From 0 to 11 months	12.2	13.3	11.3	12.4	13.5	:
From 12 to 23 months	8.6	9.0	10.1	10.6	11.1	:
From 24 to 59 months	17.2	18.3	17.6	17.6	16.8	:
60 months or over	60.6	56.9	58.0	56.6	54.6	:
Employment growth* (% change from previous year)	2.6	2.6	3.0	3.4	3.7	3.7
Employment rate of women (% of female population aged 20-64)	65.5	65.0	65.1	67.5	68.0	68.1
Employment rate of men (% of male population aged 20-64)	78.4	76.7	76.1	75.4	76.0	77.2
Employment rate of older workers* (% of population aged 55-64)	42.5	38.4	39.6	39.8	40.5	42.8
Part-time employment* (% of total employment, aged 15-64)	18.4	18.4	19.2	19.5	17.7	16.8
Fixed-term employment* (% of employees with a fixed term contract, aged 15-64)	8.1	10.2	9.0	9.1	9.8	9.3
Transition rate from temporary to permanent employment (3-year average)	34.5	34.3	34.2	33.1	34.2	:
Youth unemployment rate (% active population aged 15-24)	22.3	16.6	19.1	15.5	14.1	13.8
Gender gap in part-time employment	30.9	28.1	28.7	29.4	26.1	24.6
Gender pay gap(2) (in undadjusted form)	5.4	5.5	5.5	5.0	:	:
Education and training indicators	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Adult participation in learning (% of people aged 25-64 participating in education and training)	14.5	18.0	16.8	17.2	18.0	:
Underachievement in education(3)	:	25.8	:	:	:	:
Tertiary educational attainment (% of population aged 30-34 having successfully completed tertiary education)	52.7	52.3	54.6	52.7	56.2	:
Variation in performance explained by students' socio-economic status(4)	:	20.8	:	:	:	:

* Non-scoreboard indicator
(1) Long-term unemployed are people who have been unemployed for at least 12 months.
(2) Difference between the average gross hourly earnings of male paid employees and of female paid employees as a percentage of average gross hourly earnings of male paid employees. It is defined as "unadjusted", as it does not correct for the distribution of individual characteristics (and thus gives an overall picture of gender inequalities in terms of pay). All employees working in firms with ten or more employees, without restrictions for age and hours worked, are included.
(3) PISA (OECD) results for low achievement in mathematics for 15 year-olds.
(4) Impact of socio-economic and cultural status on PISA (OECD) scores.
(5) Average of first three quarters of 2019. Data for youth unemployment rate is seasonally adjusted.
Source: Eurostat, OECD

Table C.4: **Social inclusion and health indicators**

	2013	2014	2015	2016	2017	2018
Expenditure on social protection benefits* (% of GDP)						
Sickness/healthcare	5.8	5.6	5.4	5.1	5.4	:
Disability	2.5	2.5	2.4	2.2	2.3	:
Old age and survivors	8.5	8.3	8.4	8.2	8.5	:
Family/children	3.6	3.5	3.4	3.2	3.3	:
Unemployment	1.5	1.4	1.4	1.2	1.2	:
Housing	0.3	0.3	0.3	0.3	0.4	:
Social exclusion n.e.c.	0.5	0.5	0.5	0.5	0.5	:
Total	22.7	22.1	21.8	20.9	21.5	:
of which: means-tested benefits	0.8	0.8	0.8	0.8	0.9	:
General government expenditure by function (% of GDP)						
Social protection	18.6	18.1	18.3	18.0	18.4	:
Health	5.2	5.0	4.8	4.7	4.9	:
Education	5.1	4.7	4.7	4.6	4.7	:
Out-of-pocket expenditure on healthcare	11.1	11.0	10.6	10.5	10.7	:
Children at risk of poverty or social exclusion (% of people aged 0-17)*	26.0	26.4	23.0	22.7	23.6	23.5
At-risk-of-poverty rate(1) (% of total population)	15.9	16.4	15.3	16.5	18.7	18.3
In-work at-risk-of-poverty rate (% of persons employed)	11.2	11.1	11.6	12.0	13.7	13.5
Severe material deprivation rate(2) (% of total population)	1.8	1.4	2.0	1.6	1.2	:
Severe housing deprivation rate(3), by tenure status						
Owner, with mortgage or loan	0.6	0.6	0.4	0.9	1.8	0.9
Tenant, rent at market price	5.9	5.7	6.0	6.6	5.8	5.8
Proportion of people living in low work intensity households(4) (% of people aged 0-59)	6.6	6.1	5.7	6.6	6.9	8.3
Poverty thresholds, expressed in national currency at constant prices*	17043	17270	17626	16890	18010	19689
Healthy life years						
Females	10.6	10.8	8.7	8.0	8.5	:
Males	10.9	11.3	10.7	9.5	9.0	:
Aggregate replacement ratio for pensions(5)	0.8	0.9	0.8	0.9	0.9	0.9
Connectivity dimension of the Digital Economy and Society Index (DESI)(6)	:	62.6	71.0	74.4	78.8	:
GINI coefficient before taxes and transfers*	50.3	48.5	48.1	47.3	49.2	:
GINI coefficient after taxes and transfers*	30.4	28.7	28.5	31.0	30.9	:

* Non-scoreboard indicator
(1) At-risk-of-poverty rate (AROP): proportion of people with an equivalised disposable income below 60 % of the national equivalised median income.
(2) Proportion of people who experience at least four of the following forms of deprivation: not being able to afford to i) pay their rent or utility bills, ii) keep their home adequately warm, iii) face unexpected expenses, iv) eat meat, fish or a protein equivalent every second day, v) enjoy a week of holiday away from home once a year, vi) have a car, vii) have a washing machine, viii) have a colour TV, or ix) have a telephone.
(3) Percentage of total population living in overcrowded dwellings and exhibiting housing deprivation.
(4) People living in households with very low work intensity: proportion of people aged 0-59 living in households where the adults (excluding dependent children) worked less than 20 % of their total work-time potential in the previous 12 months.
(5) Ratio of the median individual gross pensions of people aged 65-74 relative to the median individual gross earnings of people aged 50-59.
(6) Fixed broadband take up (33%), mobile broadband take up (22%), speed (33%) and affordability (11%), from the Digital Scoreboard.
Source: Eurostat, OECD

Table C.5: **Product market performance and policy indicators**

Performance indicators	2013	2014	2015	2016	2017	2018
Labour productivity per person[1] growth (t/t-1) in %						
Labour productivity growth in industry	16.34	-5.68	10.08	10.78	-1.02	0.35
Labour productivity growth in construction	0.71	10.59	-1.57	0.60	-0.58	7.40
Labour productivity growth in market services	0.49	2.06	2.65	1.44	-2.61	-1.86
Unit labour cost (ULC) index[2] growth (t/t-1) in %						
ULC growth in industry	-11.49	7.13	-7.07	-10.02	4.66	0.76
ULC growth in construction	0.65	-3.05	2.22	-0.02	3.17	-3.85
ULC growth in market services	2.11	1.84	-0.60	-0.28	5.31	4.88
Business environment	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Time needed to enforce contracts[3] (days)	321	321	321	321	321	321
Time needed to start a business[3] (days)	16.5	16.5	16.5	16.5	16.5	16.5
Outcome of applications by SMEs for bank loans[4]	0.29	0.00	0.32	0.56	0.36	0.16
Research and innovation	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
R&D intensity	1.30	1.26	1.27	1.26	1.27	1.21
General government expenditure on education as % of GDP	5.10	4.70	4.70	4.60	4.70	:
Employed people with tertiary education and/or people employed in science & technology as % of total employment	38	40	37	37	36	38
Population having completed tertiary education[5]	35	40	35	36	34	38
Young people with upper secondary education[6]	77	74	69	77	75	77
Trade balance of high technology products as % of GDP	-1.32	-1.40	-3.22	-1.95	-2.42	-1.48
Product and service markets and competition	**2003**	**2008**	**2013**			**2018**
OECD product market regulation (PMR)[7], overall	1.60	1.44	1.46			1.72
OECD PMR[7], retail	4.17	4.47	4.54			1.71
OECD PMR[7], professional services[8]	3.52	3.55	3.47			2.50
OECD PMR[7], network industries[9]	2.96	2.72	2.73			1.91

Notes:
1 Value added in constant prices divided by the number of persons employed.
2 Compensation of employees in current prices divided by value added in constant prices.
3 The methodologies, including the assumptions, for this indicator are shown in detail here: http://www.doingbusiness.org/methodology.
4 Average of the answer to question Q7B_a. "[Bank loan]: If you applied and tried to negotiate for this type of financing over the past six months, what was the outcome?". Answers were codified as follows: zero if received everything, one if received 75% and above, two if received below 75%, three if refused or rejected and treated as missing values if the application is still pending or don't know.
5 Percentage population aged 15-64 having completed tertiary education.
6 Percentage population aged 20-24 having attained at least upper secondary education.
7 Index: 0 = not regulated; 6 = most regulated. The methodologies of the OECD product market regulation indicators are shown in detail here: http://www.oecd.org/competition/reform/indicatorsofproductmarketregulationhomepage.htm
Please be aware that the indicator values from 2003 to 2013 are comparable, however the methodology has considerably changed in 2018 and therefore past vintages cannot be compared with the 2018 PMR indicators!
8 Simple average of the indicators of regulation for lawyers, accountants, architects and engineers.
9 Aggregate OECD indicators of regulation in energy, transport and communications (ETCR).

Source: European Commission; World Bank — Doing Business (for enforcing contracts and time to start a business); OECD (for the product market regulation indicators); SAFE (for outcome of SMEs' applications for bank loans).

Table C.6: **Green growth**

Green growth performance		2013	2014	2015	2016	2017	2018
Macroeconomic							
Energy intensity	kgoe / €	0.10	0.10	0.09	0.09	0.09	0.09
Carbon intensity	kg / €	0.26	0.24	0.22	0.21	0.21	-
Resource intensity (reciprocal of resource productivity)	kg / €	0.27	0.27	0.29	0.29	0.28	0.29
Waste intensity	kg / €	-	0.16	-	0.21	-	-
Energy balance of trade	% GDP	-5.4	-4.4	-3.1	-2.4	-2.8	-3.3
Weighting of energy in HICP	%	14.85	14.48	12.32	10.93	11.65	11.55
Difference between energy price change and inflation	p.p.	-3.5	-6.3	-8.0	-8.2	0.6	6.8
Real unit of energy cost	% of value added	11.2	10.1	10.7	11.5	-	-
Ratio of environmental taxes to labour taxes	ratio	0.10	0.10	0.11	0.11	0.11	-
Environmental taxes	% GDP	2.2	2.0	1.8	1.7	1.7	1.7
Sectoral							
Industry energy intensity	kgoe / €	0.14	0.14	0.13	0.12	0.11	0.11
Real unit energy cost for manufacturing industry excl. refining	% of value added	46.3	39.6	41.8	44.2	-	-
Share of energy-intensive industries in the economy	% GDP	3.20	3.79	3.60	3.36	3.10	3.45
Electricity prices for medium-sized industrial users	€ / kWh	0.10	0.10	0.09	0.09	0.08	0.08
Gas prices for medium-sized industrial users	€ / kWh	0.05	0.04	0.04	0.03	0.03	0.03
Public R&D for energy	% GDP	0.00	0.00	0.00	0.00	0.00	0.00
Public R&D for environmental protection	% GDP	0.02	0.02	0.02	0.02	0.02	0.02
Municipal waste recycling rate	%	46.6	47.7	47.4	48.2	50.4	50.1
Share of GHG emissions covered by ETS*	%	16.5	17.9	16.2	15.0	14.6	13.9
Transport energy intensity	kgoe / €	1.50	1.32	1.16	1.05	1.01	1.09
Transport carbon intensity	kg / €	2.10	1.99	2.26	2.04	1.88	1.91
Security of energy supply							
Energy import dependency	%	97.1	96.5	95.9	96.1	95.4	-
Aggregated supplier concentration index	HHI	2.7	2.9	2.7	2.7	2.6	-
Diversification of energy mix	HHI	45.6	44.6	43.4	42.6	43.5	44.6

All macro intensity indicators are expressed as a ratio of a physical quantity to GDP (in 2010 prices)
Energy intensity: gross inland energy consumption (in kgoe) divided by GDP (in EUR)
Carbon intensity: greenhouse gas emissions (in kg CO2 equivalents) divided by GDP (in EUR)
Resource intensity: domestic material consumption (in kg) divided by GDP (in EUR)
Waste intensity: waste (in kg) divided by GDP (in EUR)
Energy balance of trade: the balance of energy exports and imports, expressed as % of GDP.
Weighting of energy in HICP: the proportion of 'energy' items in the consumption basket used for the construction of the HICP.
Difference between energy price change and inflation: energy component of HICP, and total HICP inflation (annual % change).
Real unit energy cost: real energy costs as % of total value added for the economy.
Industry energy intensity: final energy consumption of industry (in kgoe) divided by gross value added of industry (in 2010 EUR).
Real unit energy costs for manufacturing industry excluding refining: real costs as % of value added for manufacturing sectors.
Share of energy-intensive industries in the economy: share of gross value added of the energy-intensive industries in GDP.
Electricity and gas prices for medium-sized industrial users: consumption band 500–20 00MWh and 10 000 -100 000 GJ; figures excl. VAT.
Recycling rate of municipal waste: ratio of recycled and composted municipal waste to total municipal waste.
Public R&D for energy or for the environment: government spending on R&D for these categories as % of GDP.
Proportion of GHG emissions covered by EU emissions trading system (ETS) (excluding aviation): based on GHG emissions. (excl. land use, land use change and forestry) as reported by Member States to the European Environment Agency.
Transport energy intensity: final energy consumption of transport activity including international aviation (kgoe) divided by gross value added in transportation and storage sector (in 2010 EUR).
Transport carbon intensity: GHG emissions in transportation and storage sector divided by gross value added in transportation and storage sector (in 2010 EUR).
Energy import dependency: net energy imports divided by gross inland energy consumption incl. consumption of international bunker fuels.
Aggregated supplier concentration index: Herfindahl index covering oil, gas and coal. Smaller values indicate larger diversification and hence lower risk.
Diversification of the energy mix: Herfindahl index covering natural gas, total petrol products, nuclear heat, renewable energies and solid fuels. Smaller values indicate larger diversification.
* European Commission and European Environment Agency - 2018 provisional data.

Source: European Commission and European Environment Agency (Share of GHG emissions covered by ETS); European Commission (Environmental taxes over labour taxes and GDP); Eurostat (all other indicators).

ANNEX D: INVESTMENT GUIDANCE ON JUST TRANSITION FUND 2021-2027 FOR LUXEMBOURG

Building on the Commission proposal, this Annex ([116]) preliminary Commission services' views on priority investment areas and framework conditions for effective delivery for the 2021-2027 Just Transition Fund investments in Luxembourg. These priority investment areas are derived from the broader analysis of territories facing serious socio-economic challenges deriving from the transition process towards a climate-neutral economy of the Union by 2050 in Luxembourg, assessed in the report. This Annex provides the basis for a dialogue between Luxembourg and the Commission services as well as the relevant guidance for the Member States in preparing their territorial just transition plans, which will form the basis for programming the Just Transition Fund. The Just Transition Fund investments complement those under Cohesion Policy funding for which guidance in the form of Annex D was given in the 2019 Country Report for Luxembourg ([117]).

The two main industrial emitters in Luxembourg are the cement industry in Rumelange (42 % of the total industrial GHG emissions) and the steel industry in Esch-sur-Alzette (27 % of the total industrial GHG emissions). Overall, these two sectors employ some 4,000 people, mainly in the south of the country ([118]).

Given their highest emission intensities and the likely socioeconomic impact of the transition, it appears warranted that the Just Transition Fund concentrates its intervention on these areas. The smart specialisation strategies ([119]) provide an important framework to set priorities for innovation in support of economic transformation. The Just Transition Fund could contribute to promoting economic diversification, reskilling and multi-specialisation, building-up on the smart specialisation strategy of Luxembourg, which identifies the sectors with most potential: clean & eco-technologies, health technologies, ICT and digitalisation of industry ([120]).

In order to tackle these transition challenges, investment needs for alleviating the socio-economic costs of the transition have been identified. Key actions of the Just Transition Fund could target in particular:

- productive investments in SMEs, including start-ups, leading to economic diversification and reconversion;
- investments in research and innovation activities and fostering the transfer of advanced technologies;
- investments in the deployment of technology and infrastructures for affordable clean energy, in greenhouse gas emission reduction, energy efficiency and renewable energy;
- upskilling and reskilling of workers.

Some industrial sites in these areas, performing activities listed in Annex I to Directive 2003/87/EC, employ a substantial number of workers and their activity is at risk due to their high greenhouse gas emissions. Support to investments to reduce the emissions could be considered, provided that they achieve a substantial reduction of emissions (going substantially below the relevant benchmarks used for free allocation under Directive 2003/87/EC) and on the condition that the investments are compatible with the European Green Deal.

([116]) This Annex is to be considered in conjunction with the EC proposal for a Regulation of the European Parliament and of the Council on the Just Transition Fund 2021-2027 (COM(2020)22) and the EC proposal for a Regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, and the European Maritime and Fisheries Fund and financial rules for those and for the Asylum and Migration Fund, the Internal Security Fund and the Border Management and Visa Instrument (COM(2020)23).
([117]) SWD(2019) 1015 final.
([118]) Statec 2019. https://statistiques.public.lu/catalogue-publications/principales-employeurs/2019/PDF-princip-entreprises-taille.pdf
([119]) As defined in Article 2(3) of Regulation No 1303/2013 (CPR)
([120]) https://s3platform.jrc.ec.europa.eu/regions/lu/tags/lu

ANNEX E: PROGRESS TOWARDS THE SUSTAINABLE DEVELOPMENT GOALS (SDGS)

Assessment of Luxembourg's short-term progress towards the SDGs ([121])

Table E.1 shows the data for Luxembourg and the EU-28 for the indicators included in the EU SDG indicator set used by Eurostat for monitoring progress towards the SDGs in an EU context ([122]). As the short-term trend at EU-level is assessed over a 5-year period, both the value at the beginning of the period and the latest available value is presented. The indicators are regularly updated on the SDI dedicated section of the Eurostat website.

([121]) Data extracted on 9 February 2020 from the Eurostat database (official EU SDG indicator set; see https://ec.europa.eu/eurostat/web/sdi/main-tables).

Table E.1: Indicators measuring Luxembourg's progress towards the SDGs

SDG / Sub-theme	Indicator	Unit	Luxembourg Starting year	Luxembourg Starting value	Luxembourg Latest year	Luxembourg Latest value	EU-28 Starting year	EU-28 Starting value	EU-28 Latest year	EU-28 Latest value
SDG 1 – No poverty										
Multidimensional poverty	People at risk of poverty or social exclusion	% of population	2013	19.0	2018	21.9	2013	24.6	2018	21.9
	People at risk of income poverty after social transfers	% of population	2013	15.9	2018	18.3	2013	16.7	2018	17.1
	Severely materially deprived people	% of population	2013	1.8	2018	1.3	2013	9.6	2018	5.8
	People living in households with very low work intensity	% of population aged 0 to 59	2013	6.6	2018	8.3	2013	11.0	2018	8.8
	In-work at-risk-of-poverty rate	% of population aged 18 or over	2013	11.2	2018	13.5	2013	9.0	2018	9.5
Basic needs	Population living in a dwelling with a leaking roof, damp walls, floors or foundation or rot in window frames or floor	% of population	2013	15.3	2018	18.3	2013	15.6	2018	13.9
	Self-reported unmet need for medical care	% of population aged 16 or over	2013	0.9	2018	0.3	2013	3.7	2018	2.0
	Population having neither a bath, nor a shower, nor indoor flushing toilet in their household	% of population	2013	0.0	2018	0.0	2013	2.2	2018	1.7
	Population unable to keep home adequately warm	% of population	2013	1.6	2018	2.1	2013	10.7	2018	7.3
	Overcrowding rate	% of population	2013	6.2	2018	8.4	2013	17.0	2018	15.5
SDG 2 – Zero hunger										
Malnutrition	Obesity rate	% of population aged 18 or over	2014	15.6	2017	16.0	2014	15.9	2017	15.2
Sustainable agricultural production	Agricultural factor income per annual work unit (AWU)	EUR, chain linked volumes (2010)	2012	20 840	2017	23 082	2012	14 865	2017	17 304
	Government support to agricultural research and development	million EUR	2013	0.3	2018	0.1	2013	3 048.6	2018	3 242.5
	Area under organic farming	% of utilised agricultural area	2013	3.4	2018	4.4	2013	5.7	2018	7.5
	Gross nitrogen balance on agricultural land	kg per hectare	2010	127	2015	129	2010	49	2015	51
Environmental impacts of agricultural production	Ammonia emissions from agriculture	kg per ha of utilised agricultural area	2012	38	2017	41.5	2011	19.7	2016	20.3
	Nitrate in groundwater	mg NO_3 per litre	N/A	:	N/A	:	2012	19.2	2017	19.1
	Estimated soil erosion by water	km^2	2010	62.1	2016	61.4	2010	207 232.2	2016	205 294.5
	Common farmland bird index	index 2000 = 100	N/A	:	N/A	:	2013	83.9	2018	80.7
SDG 3 – Good health and well-being										
Healthy lives	Life expectancy at birth	years	2012	81.5	2017	82.1	2012	80.3	2017	80.9
	Share of people with good or very good perceived health	% of population aged 16 or over	2013	71.9	2018	68.6	2013	67.3	2018	69.2
Health determinants	Smoking prevalence	% of population aged 15 or over	2012	27	2017	21	2014	26	2017	26
	Obesity rate	% of population aged 18 or over	2014	15.6	2017	16.0	2014	15.9	2017	15.2
	Population living in households considering that they suffer from noise	% of population	2013	18.5	2018	19.3	2013	18.8	2018	18.3
	Exposure to air pollution by particulate matter ($PM_{2.5}$)	µg/m^3	2012	12.2	2017	11.2	2012	16.8	2017	14.1
Causes of death	Death rate due to chronic diseases	number per 100 000 persons aged less than 65	2011	113.9	2016	94.7	2011	132.5	2016	119.0
	Death rate due to tuberculosis, HIV and hepatitis	number per 100 000 persons	2011	2.1	2016	1.1	2011	3.4	2016	2.6
	People killed in accidents at work	number per 100 000 employed persons	2012	3.38	2017	2.74	2012	1.91	2017	1.65
	People killed in road accidents	number of killed people	2012	34	2017	25	2012	28 231	2017	25 257
Access to health care	Self-reported unmet need for medical care	% of population aged 16 or over	2013	0.9	2018	0.3	2013	3.7	2018	2.0

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Table (continued)

SDG / Sub-theme	Indicator	Unit	Luxembourg				EU-28			
			Starting		Latest		Starting		Latest	
			year	value	year	value	year	value	year	value
SDG 4 – Quality education										
Basic education	Early leavers from education and training	% of the population aged 18 to 24	2013	6.1	2018	6.3	2013	11.9	2018	10.6
	Participation in early childhood education	% of the age group between 4-years-old and the starting age of compulsory education	2012	97.9	2017	96.6	2012	94.0	2017	95.4
	Underachievement in reading	% of 15-year-old students	2015	25.6	2018	29.3	2015	19.7	2018	21.7
	Young people neither in employment nor in education and training	% of population aged 15 to 29	2013	7.2	2018	7.5	2013	15.9	2018	12.9
Tertiary education	Tertiary educational attainment	% of the population aged 30 to 34	2013	52.5	2018	56.2	2013	37.1	2018	40.7
	Employment rate of recent graduates	% of population aged 20 to 34	2013	79.1	2018	87.9	2013	75.4	2018	81.7
Adult education	Adult participation in learning	% of population aged 25 to 64	2013	14.6	2018	18.0	2013	10.7	2018	11.1
SDG 5 – Gender equality										
Gender-based violence	Physical and sexual violence to women experienced within 12 months prior to the interview	% of women	N/A	:	2012	7	N/A	:	2012	8
Education	Gender gap for early leavers from education and training	percentage points, persons aged 18–24	2013	4.7	2018	0.9	2013	3.4	2018	3.3
	Gender gap for tertiary educational attainment	percentage points, persons aged 30–34	2013	6.4	2018	7.3	2013	8.5	2018	10.1
	Gender gap for employment rate of recent graduates	percentage points, persons aged 20–34	2013	1.3	2018	2.9	2013	4.4	2018	3.4
Employment	Gender pay gap in unadjusted form	% of average gross hourly earnings of men	2012	7.0	2017	5.0	2012	17.4	2017	16.0
	Gender employment gap	percentage points, persons aged 20–64	2013	14.1	2018	8.0	2013	11.7	2018	11.6
	Gender gap in inactive population due to caring responsibilities	percentage points, persons aged 20–64	2013	33.4	2018	22.2	2013	25.5	2018	27.1
Leadership positions	Seats held by women in national parliaments and governments	% of seats	2014	28.3	2019	25.0	2014	27.2	2019	31.5
	Positions held by women in senior management	% of board members	2014	11.7	2019	13.6	2014	20.2	2019	27.8
SDG 6 – Clean water and sanitation										
Sanitation	Population having neither a bath, nor a shower, nor indoor flushing toilet in their household	% of population	2013	0.0	2018	0.0	2013	2.2	2018	1.7
	Population connected to at least secondary wastewater treatment	% of population	2012	96.1	2017	97.0	N/A	:	N/A	:
Water quality	Biochemical oxygen demand in rivers	mg O_2 per litre	N/A	:	N/A	:	2012	2.06	2017	2.00
	Nitrate in groundwater	mg NO_3 per litre	N/A	:	N/A	:	2012	19.2	2017	19.1
	Phosphate in rivers	mg PO_4 per litre	N/A	:	N/A	:	2012	0.096	2017	0.093
	Inland water bathing sites with excellent water quality	% of bathing sites with excellent water quality	2013	100.0	2018	73.3	2013	76.5	2018	80.8
Water use efficiency	Water exploitation index	% of long term average available water (LTAA)	2011	2.8	2016	2.7	N/A	:	N/A	:
SDG 7 – Affordable and clean energy										
Energy consumption	Primary energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.3	2018	4.5	2013	1 577.4	2018	1 551.9
	Final energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.1	2018	4.4	2013	1 115.5	2018	1 124.1
	Final energy consumption in households per capita	kgoe	2013	919	2018	828	2013	605	2018	552
	Energy productivity	EUR per kgoe	2013	9.8	2018	11.3	2013	7.6	2018	8.5
	Greenhouse gas emissions intensity of energy consumption	index 2000 = 100	2012	105.5	2017	91.6	2012	91.5	2017	86.5
Energy supply	Share of renewable energy in gross final energy consumption	%	2013	3.5	2018	9.1	2013	15.4	2018	18.0
	Energy import dependency	% of imports in gross available energy	2013	97.1	2018	95.1	2013	53.2	2018	55.7
Access to affordable energy	Population unable to keep home adequately warm	% of population	2013	1.6	2018	2.1	2013	10.7	2018	7.3

(Continued on the next page)

Table (continued)

SDG / Sub-theme	Indicator	Unit	Luxembourg Starting year	Luxembourg Starting value	Luxembourg Latest year	Luxembourg Latest value	EU-28 Starting year	EU-28 Starting value	EU-28 Latest year	EU-28 Latest value
SDG 8 – Decent work and economic growth										
Sustainable economic growth	Real GDP per capita	EUR per capita, chain-linked volumes (2010)	2013	78 030	2018	83 470	2013	25 750	2018	28 280
	Investment share of GDP	% of GDP	2013	19.5	2018	16.8	2013	19.5	2018	20.9
	Resource productivity	EUR per kg, chain-linked volumes (2010)	2013	3.76	2018	3.39	2013	1.98	2018	2.04
Employment	Young people neither in employment nor in education and training	% of population aged 15 to 29	2013	7.2	2018	7.5	2013	15.9	2018	12.9
	Employment rate	% of population aged 20 to 64	2013	71.1	2018	72.1	2013	68.4	2018	73.2
	Long-term unemployment rate	% of active population	2013	1.8	2018	1.4	2013	5.1	2018	2.9
	Gender gap in inactive population due to caring responsibilities	percentage points, persons aged 20–64	2013	33.4	2018	22.2	2013	25.5	2018	27.1
Decent work	People killed in accidents at work	number per 100 000 employed persons	2012	3.38	2017	2.74	2012	1.91	2017	1.65
	In-work at-risk-of-poverty rate	% of population	2013	11.2	2018	13.5	2013	9	2018	9.5
SDG 9 – Industry, innovation and infrastructure										
R&D and innovation	Gross domestic expenditure on R&D	% of GDP	2013	1.30	2018	1.21	2013	2.01	2018	2.12
	Employment in high- and medium-high technology manufacturing and knowledge-intensive services	% of total employment	2013	58.1	2018	53.0	2013	45.0	2018	46.1
	R&D personnel	% of active population	2013	1.98	2018	1.91	2013	1.15	2018	1.36
	Patent applications to the European Patent Office (EPO)	number	2012	67	2017	55	2012	56 772	2017	54 649
Sustainable transport	Share of buses and trains in total passenger transport	% of total inland passenger-km	2012	17.0	2017	17.1	2012	17.2	2017	16.7
	Share of rail and inland waterways in total freight transport	% of total inland freight tonne-km	2012	16.0	2017	12.1	2012	25.4	2017	23.3
	Average CO2 emissions per km from new passenger cars	g CO_2 per km	2013	133.4	2018	131.4	2014	123.4	2018	120.4
SDG 10 – Reduced inequalities										
Inequalities within countries	Relative median at-risk-of-poverty gap	% distance to poverty threshold	N/A	:	2018	24.4	2013	23.8	2018	24.6
	Income distribution	income quintile share ratio	2013	4.6	2018	5.7	2013	5.0	2018	5.2
	Income share of the bottom 40 % of the population	% of income	2013	21.4	2018	19.5	2013	21.1	2018	21.0
	People at risk of income poverty after social transfers	% of population	2013	15.9	2018	18.3	2013	16.7	2018	17.1
Inequalities between countries	Purchasing power adjusted GDP per capita	Real expenditure per capita (in PPS)	2013	70 000	2018	80 900	2013	26 800	2018	31 000
	Adjusted gross disposable income of households per capita	Purchasing power standard (PPS) per inhabitant	2013	31 449	2018	33 332	2013	20 392	2018	22 824
	Financing to developing countries	million EUR, current prices	2012	311	2017	376	2012	147 962	2017	155 224
	Imports from developing countries	million EUR, current prices	2013	2 022	2018	909	2013	817 475	2018	1 013 981
Migration and social inclusion	Asylum applications	Positive first instance decisions, per million inhabitants	2013	239	2018	1 661	2013	213	2018	424
SDG 11 – Sustainable cities and communities										
Quality of life in cities and communities	Overcrowding rate	% of population	2013	6.2	2018	8.4	2013	17.0	2018	15.5
	Population living in households considering that they suffer from noise	% of population	2013	18.5	2018	19.3	2013	18.8	2018	18.3
	Exposure to air pollution by particulate matter ($PM_{2.5}$)	µg/m³	2012	12.2	2017	11.2	2012	16.8	2017	14.1
	Population living in a dwelling with a leaking roof, damp walls, floors or foundation or rot in window frames or floor	% of population	2013	15.3	2018	18.3	2013	15.6	2018	13.9
	Population reporting occurrence of crime, violence or vandalism in their area	% of population	2013	12.9	2018	11.3	2013	14.5	2018	12.7
Sustainable mobility	People killed in road accidents	number of killed people	2012	34	2017	25	2012	28 231	2017	25 257
	Share of buses and trains in total passenger transport	% of total inland passenger-km	2012	17.0	2017	17.1	2012	17.2	2017	16.7
Adverse environmental impacts	Settlement area per capita	m²	2009	542.9	2015	511.7	2012	625.0	2015	653.7
	Recycling rate of municipal waste	% of total waste generated	2013	46.6	2018	50.1	2013	41.7	2018	47.0
	Population connected to at least secondary wastewater treatment	% of population	2012	96.1	2017	97.0	N/A	:	N/A	:

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Table (continued)

SDG / Sub-theme	Indicator	Unit	Luxembourg				EU-28			
			Starting		Latest		Starting		Latest	
			year	value	year	value	year	value	year	value
SDG 12 – Responsible consumption and production										
Decoupling environmental impacts from economic growth	Consumption of toxic chemicals	million tonnes	N/A	:	N/A	:	2013	300.3	2018	313.9
	Resource productivity	EUR per kg, chain-linked volumes (2010)	2013	3.76	2018	3.39	2013	1.98	2018	2.04
	Average CO2 emissions per km from new passenger cars	g CO_2 per km	2013	133.4	2018	131.4	2014	123.4	2018	120.4
	Energy productivity	EUR per kgoe	2013	9.8	2018	11.3	2013	7.6	2018	8.5
Energy consumption	Primary energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.3	2018	4.5	2013	1 577.4	2018	1 551.9
	Final energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.1	2018	4.4	2013	1 115.5	2018	1 124.1
	Share of renewable energy in gross final energy consumption	%	2013	3.5	2018	9.1	2013	15.4	2018	18.0
Waste generation and management	Circular material use rate	% of material input for domestic use	2012	18.5	2017	8.9	2012	11.5	2017	11.7
	Generation of waste excluding major mineral wastes	kg per capita	2012	2 423	2016	2 697	2012	1 716	2016	1 772
	Recycling rate of waste excluding major mineral wastes	% of total waste treated	2012	77	2016	64	2012	55	2016	57
SDG 13 – Climate action										
Climate mitigation	Greenhouse gas emissions	index 1990 = 100	2012	98.0	2017	90.8	2012	82.1	2017	78.3
	Greenhouse gas emissions intensity of energy consumption	index 2000 = 100	2012	105.5	2017	91.6	2012	91.5	2017	86.5
	Primary energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.3	2018	4.5	2013	1 577.4	2018	1 551.9
	Final energy consumption	million tonnes of oil equivalent (Mtoe)	2013	4.1	2018	4.4	2013	1 115.5	2018	1 124.1
	Share of renewable energy in gross final energy consumption	%	2013	3.5	2018	9.1	2013	15.4	2018	18.0
	Average CO2 emissions per km from new passenger cars	g CO_2 per km	2013	133.4	2018	131.4	2014	123.4	2018	120.4
Climate impacts	European mean near surface temperature deviation	temperature deviation in °C, compared with the 1850–1899 average	N/A	:	N/A	:	2013	1.4	2018	2.1
	Climate-related economic losses	EUR billion, in 2017 values	N/A	:	N/A	:	2012	2 719	2017	2 649
	Mean ocean acidity	pH value	N/A	:	N/A	:	2013	8.06	2018	8.06
Support to climate action	Contribution to the international 100bn USD commitment on climate related expending	EUR million, current prices	N/A	:	2017	40.4	N/A	:	2017	20 388.7
SDG 14 – Life below water										
Ocean health	Coastal water bathing sites with excellent water quality	% of bathing sites with excellent water quality	N/A	:	N/A	:	2013	85.5	2018	87.1
	Mean ocean acidity	pH value	N/A	:	N/A	:	2013	8.06	2018	8.06
Marine conservation	Surface of marine sites designated under NATURA 2000	km^2	N/A	:	N/A	:	2013	251 566	2018	551 899
Sustainable fisheries	Estimated trends in fish stock biomass	index 2003 = 100	N/A	:	N/A	:	2012	110.0	2017	136.0
	Assessed fish stocks exceeding fishing mortality at maximum sustainable yield (Fmsy)	% of stocks exceeding fishing mortality at maximum sustainable yield ($F>F_{MSY}$)	N/A	:	N/A	:	2012	52.9	2017	42.7
SDG 15 – Life on land										
Ecosystems status	Share of forest area	% of total land area	2009	34.4	2015	36.3	2012	40.3	2015	41.6
	Biochemical oxygen demand in rivers	mg O_2 per litre	N/A	:	N/A	:	2012	2.06	2017	2.00
	Nitrate in groundwater	mg NO_3 per litre	N/A	:	N/A	:	2012	19.2	2017	19.1
	Phosphate in rivers	mg PO_4 per litre	N/A	:	N/A	:	2012	0.096	2017	0.093
Land degradation	Soil sealing index	index 2006 = 100	2009	103.1	2015	105.6	2009	101.7	2015	104.2
	Estimated soil erosion by water	km^2	2010	62.1	2016	61.4	2010	207 232.2	2016	205 294.5
	Settlement area per capita	m^2	2009	542.9	2015	511.7	2012	625.0	2015	653.7
Biodiversity	Surface of terrestrial sites designated under NATURA 2000	km^2	2013	469	2018	702	2013	787 766	2018	784 252
	Common bird index	index 2000 = 100	N/A	:	N/A	:	2013	94.7	2018	93.5
	Grassland butterfly index	index 2000 = 100	N/A	:	N/A	:	2012	72.2	2017	74.1

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Table (continued)

SDG / Sub-theme	Indicator	Unit	Luxembourg Starting year	Luxembourg Starting value	Luxembourg Latest year	Luxembourg Latest value	EU-28 Starting year	EU-28 Starting value	EU-28 Latest year	EU-28 Latest value
SDG 16 – Peace, justice and strong institutions										
Peace and personal security	Death rate due to homicide	number per 100 000 persons	2011	0.4	2016	0.5	2011	0.9	2016	0.6
	Population reporting occurrence of crime, violence or vandalism in their area	% of population	2013	12.9	2018	11.3	2013	14.5	2018	12.7
	Physical and sexual violence to women experienced within 12 months prior to the interview	% of women	N/A	:	2012	7	N/A	:	2012	8
Access to justice	General government total expenditure on law courts	million EUR	2012	97	2017	129	2012	48 381	2017	51 027
	Perceived independence of the justice system	% of population	2016	73	2019	70	2016	52	2019	56
Trust in institutions	Corruption Perceptions Index	score scale of 0 (highly corrupt) to 100 (very clean)	2013	80	2018	81	N/A	:	N/A	:
	Population with confidence in the EU Parliament	% of population	2013	59	2018	60	2013	39	2018	48
SDG 17 – Partnerships for the goals										
Global partnership	Official development assistance as share of gross national income	% of GNI	2013	1.00	2018	0.98	2013	0.43	2018	0.48
	EU financing to developing countries	million EUR, current prices	2012	311	2017	376	2012	147 962	2017	155 224
	EU imports from developing countries	million EUR, current prices	2013	2 022	2018	909	2013	817 475	2018	1 013 981
Financial governance within the EU	General government gross debt	% of GDP	2013	23.7	2018	21.0	2013	86.3	2018	80.4
	Shares of environmental and labour taxes in total tax revenues	% of total tax revenues	2013	5.7	2018	4.4	2013	6.4	2018	6.1

Source: Eurostat

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