



THE GOVERNMENT
OF THE GRAND DUCHY OF LUXEMBOURG

Digital Decade

NATIONAL STRATEGIC ROADMAP FOR LUXEMBOURG 2.0

OCTOBER 2024



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Preface: Luxembourg's role in the Digital Decade

In a decade defined by rapid technological advancements, Luxembourg is ready to take a leading role as a proactive and committed contributor to Europe's sustainable and digital transformation ambitions through 2030. As a founding member of the D9+ ("Digital Nine +"), Luxembourg fully understands that its future is intertwined with a strong European Union, and it wholeheartedly supports the ambitious goals of the Digital Decade Policy Programme.

The commitment of the current Luxembourg government as defined in the 5-year programme "Strengthening Luxembourg for the Future" demonstrates that our small size belies our ambition, as we continuously leverage our strengths to foster a thriving digital ecosystem where no one is left behind. We are dedicated to creating an inclusive, sustainable, and secure digital environment that empowers businesses, citizens, and public institutions alike.

Luxembourg stands out for the security of its data centers and its reliable, state-of-the-art connectivity infrastructure, positioning it as a leader in the data economy. Investing in digital infrastructure and further strengthening Luxembourg's data sovereignty are critical to remaining attractive to companies that are constantly innovating. The disruption caused by generative AI will further accelerate the pace of transformation in the digital practices of both companies and citizens. The Luxembourg Government prioritizes the ethical and responsible use of digital technologies, such as AI, to enhance the quality of life and improve services for its citizens. This is aligned with the Government's efforts to advance the digitalisation and simplification of public services. To help its citizens adapt to the rapidly changing demands brought about by technological progress, Luxembourg will also continue to promote digital competencies with the goal of leaving no one behind.

The Digital Decade National Strategic Roadmap for Luxembourg reflects the country's commitment to its digital journey and, through Luxembourg's involvement in several multi-country projects, underscores the importance of a collaborative European effort.

The effective governance and oversight of Luxembourg's Digital Decade National Strategic Roadmap is ensured by the Interministerial Committee on Digital Policies (Comité interministériel des politiques numériques - CIPN), which was established in early 2024. The committee facilitates interministerial collaboration on cross-cutting digital policy issues through a whole-of-government approach. Comprising representatives from every governmental department, the CIPN operates under the Prime Minister's portfolio and is chaired by the Minister Delegate to the Prime Minister for Media and Connectivity. Additionally, the High-Level Committee for Digital Transformation, established by the Government Council in 2020, plays a central role in digital governance, ensuring regular dialogue with civil society and the private sector. This body, chaired by the Minister for Digitalisation, includes representatives from various ministries, civil society, and digital experts from diverse backgrounds. Hence, this strategy is the result of an intense multi-stakeholder dialogue and the shared ambition for our country.



A European context: The Digital Decade Policy Programme

The Digital Decade National Strategic Roadmap for Luxembourg comes within the scope of the European Digital Decade Policy Programme, established through the decision “Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030¹”.

The Digital Decade Policy Programme entered into force on 9 January 2023. It is a monitoring and cooperation mechanism of the European Commission and set up to achieve Europe's human-centered, sustainable, and inclusive digital transformation by 2030. The European Parliament, the Member States and the Commission have thus jointly set concrete objectives and targets in the four key areas of digital skills, digital infrastructure including connectivity, the digital transition of businesses, especially SMEs, and online public services, in accordance with the European Declaration on Digital Rights and Principles.

From 2023, the Commission annually publishes its Report on the state of the Digital Decade, to take stock and provide an assessment of the progress made towards the targets and goals as well as to guide Member States through recommendations in their digital transformation journey.

In the context of this European monitoring exercise, the Digital Decade National Strategic Roadmap for Luxembourg details the policies, measures, and actions that Luxembourg implements to achieve the common European objectives and targets of the Digital Decade Policy Programme.

A first version of Luxembourg's roadmap was submitted to the European Commission in November 2023. This document presents an update of the latter roadmap, to be submitted to the European Commission in December 2024. Additional revisions of the roadmap occur every two years from 2024 until 2030.

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022D2481&qid=1728376781911>



Section 1: Analysis of the state of play of digital transformation in Luxembourg

Luxembourg fully subscribes to the EU's 2030 objectives and targets for a digital transition, which places human beings at the centre of the digitalisation of our European society.

The implementation of the human-centric approach based on European values is translated into concrete actions and measures, as described in this roadmap.

Using the indicators of the Digital Economy and Society Index (DESI) of 2024 and highlighting the main national specificities, this section looks at Luxembourg's digital skills, digital infrastructure, digital transformation of businesses, and digitalisation of public services.

Over the past few years, Luxembourg has seen an increased focus on digital issues and their growing political importance. The country has implemented several strategies and initiatives to improve its digital performance.

Luxembourg performs well in terms of digital skills with 60.14% (2023) of the population having at least basic digital skills, which is above the EU average of 55.56% (2023). Nevertheless, Luxembourg has to continue its efforts to reach the European 2030 target, which states that at least 80% of individuals should have at least basic digital skills. When it comes to ICT specialists, Luxembourg has with 8% (2023) a higher percentage in its workforce as the EU average of 4.80% (2023). The substantial number of ICT specialists is driven by its banking sector, its digital infrastructure including data centers and the public sector. By 2030, the aim is to have at least 20 million ICT specialists in the European Union, which represents roughly 10% of individuals in employment in the Union. To reach the ambitious EU target by 2030, Luxembourg must continue addressing challenges related to skills shortages, a significant non-resident workforce, housing issues and language barriers that affect the attraction and retention of skilled labour.

In terms of digital infrastructure, and more precisely connectivity, Luxembourg is well above the EU average for the targets "Very high-capacity networks" (VHCN) and "5G coverage". Luxembourg's high-speed VHCN coverage has steadily increased in the last years, which is a crucial step towards achieving the "Gigabit for All" (100%) target at EU level for 2030. 5G coverage (of populated areas) and fixed VHCN coverage reached 99.60% respectively 94.70% by 2023, above the EU average of 89.30% (2023) respectively 78.81% (2023), putting the country on track to meet the EU's 2030 targets (100%). Besides the ambition to quickly embrace new technologies, Luxembourg's good results are the consequence of its ultra-high-speed broadband and 5G strategies that were launched in 2020 and 2018 respectively. Both strategies had the overall objective to drive the nationwide deployment of next-generation telecommunications networks. Luxembourg's geography also makes it relatively easy to upgrade its digital infrastructure. However, even if the coverage is very high, Luxembourg still faces the challenges of geographical whitespots and the uptake rate of 9.86% (2023) of household's subscription to fixed broadband of at least 1 Gbps.

The other targets related to digital infrastructure are "semiconductors", "edge-nodes" and "quantum computing". Following Luxembourg's territorial limitations, the country is unlikely, as many other EU countries, to build up a semiconductor industry on its territory. Nevertheless, Luxembourg's ecosystem hosts innovative companies that provide key value-chain elements in this industry. Furthermore, Luxembourg is setting the scene for its contribution to the achievement of the EU target on quantum computing. Indeed, with the MeluXina supercomputer and the Luxembourg Quantum Communication Infrastructure Laboratory, Luxembourg further strengthens its digital capacities.



Even if challenges related to cryptography, cybersecurity, standardisation, and data portability persist, Luxembourg has an outstanding national communication infrastructure linking and securing the autonomous systems in Luxembourg. The fostering of local routing lowers latencies and increases resilience and security of all Internet based communication. On an international level, Luxembourg is well connected with high-speed, very low latency connections to the main capitals and internet exchanges in Europe.

When it comes to the digital transformation of businesses in Luxembourg, digital technologies also become increasingly important. With a score of 57.80% (2023), the country is slightly above the EU average of 57.70% (2023) in terms of the basic digital intensity of SMEs and still quite far from the EU 2030 target, which is that more than 90% of the Union's SMEs should have at least a basic level of digital intensity. When it comes to the take-up of digital technologies, Luxembourg is with 32.60% (2023) vs. 38.90% (2023) respectively 32.40% (2023) vs. 33.20% (2023) below the EU average for the “cloud” respectively “big data” indicator. For “AI”, Luxembourg is above EU average with 14.40% (2023) vs. 8.00% (2023). All three indicators follow the EU tendency and are still far from the EU target value for 2030, which is set at 75%. However, already 52% (2023) of Luxembourgish enterprises use either AI technologies, buy sophisticated or intermediate cloud computing services or perform data analytics.

For companies of smaller size, the usage of cloud, big data and AI is often very costly and complex. Indeed, the onboarding of SMEs into cloud-based solutions is time-consuming and thus expensive. Furthermore, the usage of cloud by SMEs is often limited to e-mail and eventually storage and manipulation of documents. Accounting software, affordable ERP, e-invoicing, or e-archiving services are less often used. For big data and AI, the main challenge is the missing data portability. Most SMEs use on-site solutions that are managed by local software producers and vendors. These applications mostly have no interfaces to export data sets to engage data driven innovation or participate to the data economy.

In the rollout of digital public services for citizens and businesses, Luxembourg is a frontrunner and well above the EU average with 94.78% (2023) and 96.67% (2023) respectively. The grand duchy is close to the Digital Decade target of 100% online delivery of key public services. In fact, eGovernment has been a priority long before the emergence of the COVID-19 pandemic. Since 2013, MyGuichet.lu has been part of Guichet.lu, which was launched in 2008, and provides a comprehensive national digital platform for citizens, businesses, and the Government to access administrative information. With online procedures, easy form filling, electronic communication, and mobile access, MyGuichet.lu has simplified administrative tasks. The creation of a Ministry for Digitalisation after the elections in 2018 also underlines the political will to speed up the digital transformation process. Besides, Luxembourg has a Government IT Centre, which is the administration of the Ministry of Digitalisation responsible for the development and provision of IT services for the Luxembourg Government, ministries, and public administrations.

The country's strengths and assets include a centralised Government ICT structure, efficient and interoperable back offices, effective infrastructures (such as GovCloud) for administrations and efficient project management. However, even though Luxembourg has good results when it comes to the digitalisation of public services, the overwhelming amount of data and potential interoperability issues are challenging.

Luxembourg scores 76,10/100 (2023) on the eHealth indicator, which is slightly under the EU average of 79,12/100 (2023). Luxembourg scores 100/100 (2023) on the implementation of electronic access to eHealth records for citizens meaning that the national architecture to allow citizens access to eHealth services is in place and functional. This testifies the continuous efforts Luxembourg puts in the digitalisation of medical records. Additional efforts are foreseen from national stakeholders to improve the upload of health data into the electronic health records and the technical interoperability of information systems.



Section 2: National trajectories and target values to contribute to the EU's digital targets

The present section describes the national target values and projected trajectories that Luxembourg has set in 2023, with the entry into force of the decision “Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030”², in order to contribute to achieving each of the EU digital targets.

For the construction of the Digital Decade trajectories, the functional forms recommended in the document “Communication from the Commission establishing Union-level projected trajectories for the digital targets”³ have been used for the different KPIs (linear vs. s-shaped functional forms). The construction method for S-shaped curves is explained in Annex 1 of this document.

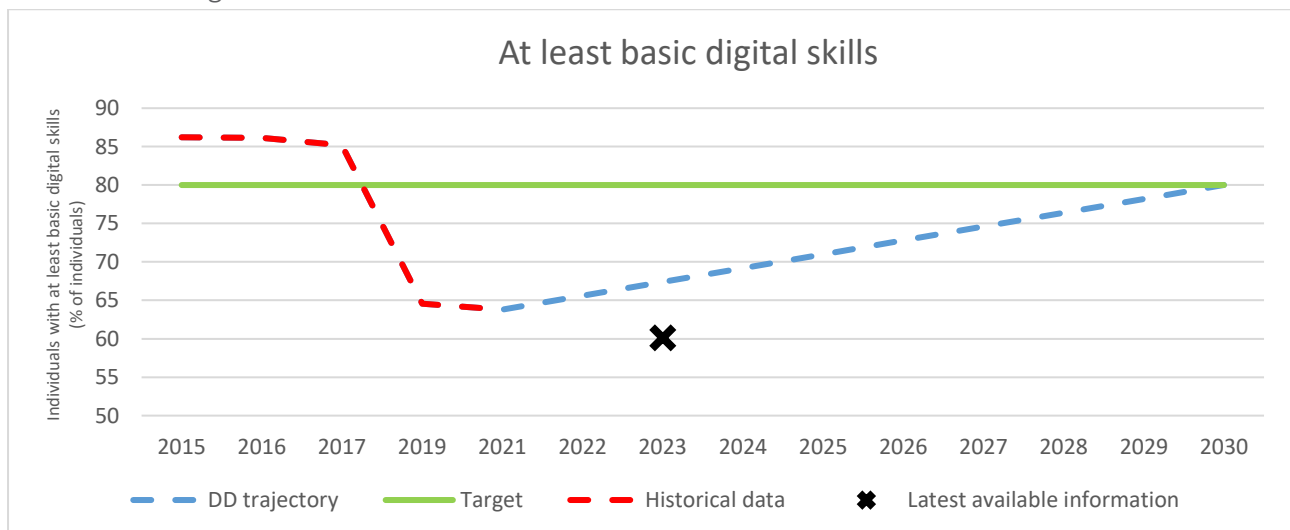
The tables with the numerical values used for the graphs below can be found in Annex 2.

Digital Skills

EU Digital targets: a digitally skilled population and highly skilled digital professionals, with the aim of achieving gender balance, where:

- at least 80 % of those aged 16-74 have at least basic digital skills;
- at least 20 million ICT specialists (approximately 10% of total employment) are employed within the Union, while promoting the access of women to this field and increasing the number of ICT graduates.

At least basic digital skills



For the construction of the Digital Decade trajectory for “At least basic digital skills”, a linear functional form has been used. The EU target for 2030 is that at least 80% of the individuals have at least basic digital skills.

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022D2481&qid=1727251993273>

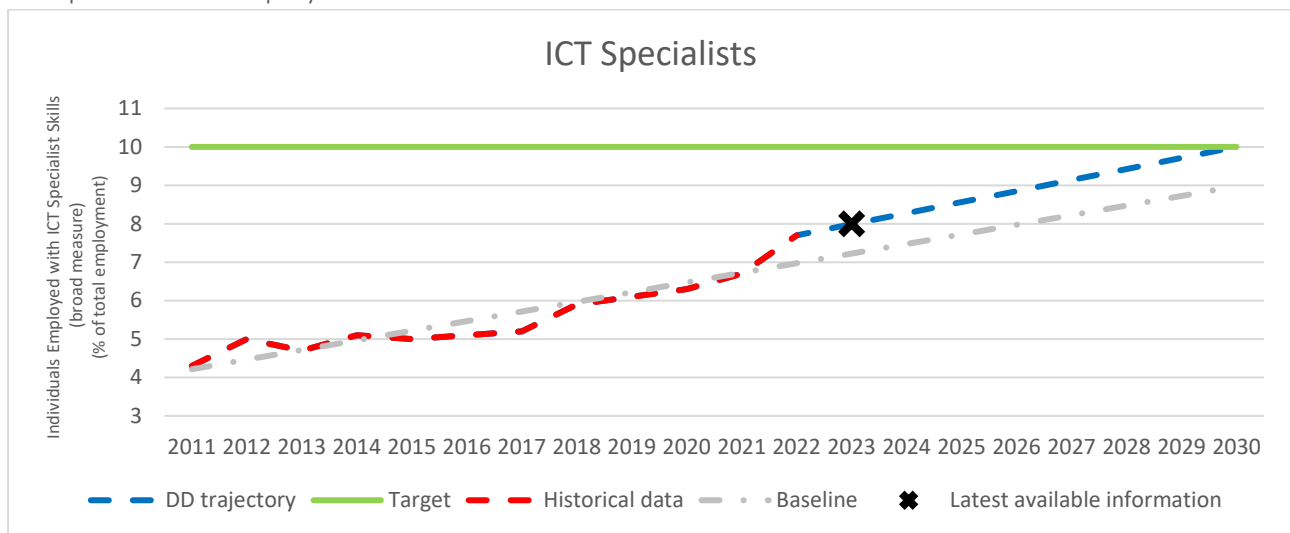
³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023XC0929%2803%29>

Due to a significant change in the methodology of the Luxembourgish ICT survey in 2018, an important drop in the percentage of individuals with at least basic digital skills can be observed after 2018.

The ongoing efforts of the major public and private education providers as well as vocational education and training providers in digital skills testify from Luxembourg’s adaptiveness to changing skills needs in digital work and societal environments. The latter efforts and the financing of digital skills policy actions with corresponding budgets over the next years are planned to lead us to target the provision of at least basic digital skills of 80% of the individuals.

Overall, 63.60% (2023) of men and 56.56% (2023) of women aged 16 to 74 possess at least basic digital skills. This creates a gender gap of 7.04%. The gap is particularly significant among the 65 to 74 years old demographic, reaching 26.26%. However, this disparity decreases among younger generations. This suggests a positive trend in the evolution of basic digital skills among women over time.

ICT specialists in employment



For the construction of the Digital Decade trajectory for “ICT Specialists”, a linear functional form has been used. The EU target for 2030 is that there are at least 20 million ICT Specialists employed within the Union, which represents roughly 10% of individuals in employment age. The national target aligns to the EU target.

The Digital Decade trajectory is ambitious, but realistic since investment in advanced digital education and training programmes is growing significantly. Online and blended training solutions improved considerably due to the COVID-19 pandemic and jobseekers taking part in advanced IT trainings have strongly increased in the last years and are expected to continue increasing.

Luxembourg employs approximately 5 900 female ICT specialists, representing 22.50% of the total ICT workforce in the country in 2023. The percentage of women in these roles has seen notable growth in recent years. In 2017, only 11.60% of ICT specialists in Luxembourg were women. By 2023, this figure has thus nearly doubled. While the proportion of women in ICT roles in Luxembourg is still below parity, this consistent rise reflects significant progress and underscores ongoing efforts to foster a more inclusive workforce in the technology sector.

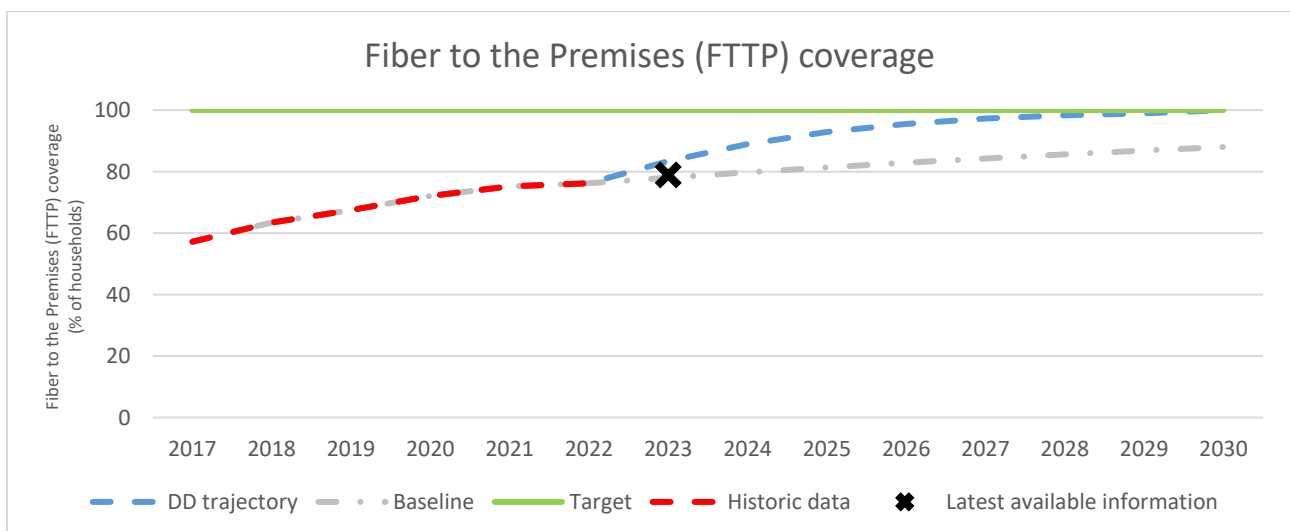
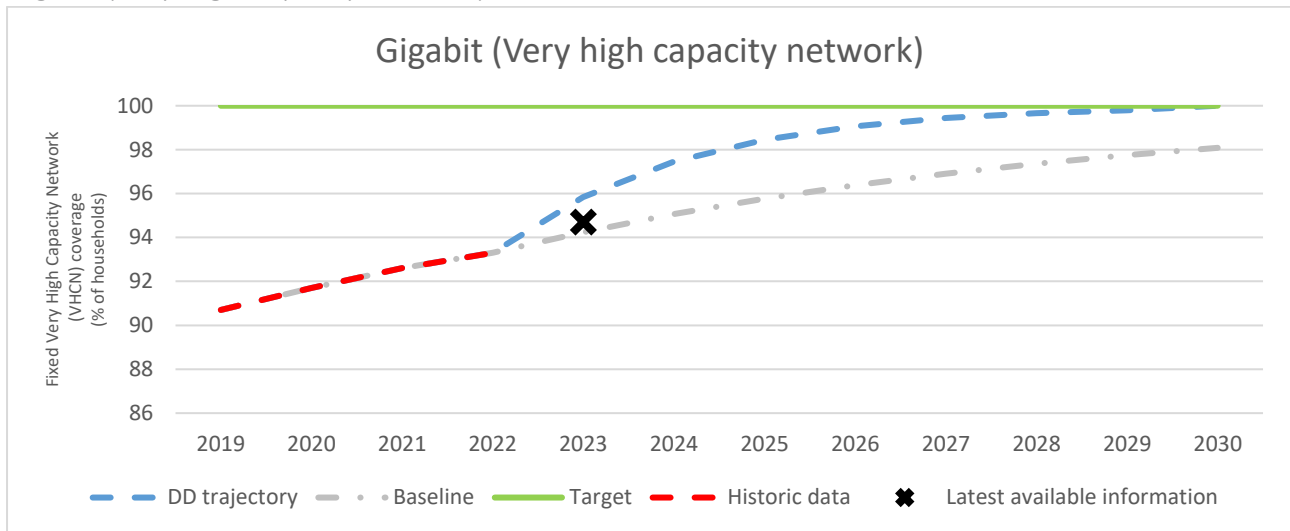


Digital Infrastructure

EU Digital targets: secure, performant and sustainable digital infrastructures:

- all end users at a fixed location are covered by a gigabit network up to the network termination point, and all populated areas are covered by next-generation wireless high speed networks with performance at least equivalent to that of 5G, in accordance with the principle of technology neutrality;
- the production, in accordance with Union law on environmental sustainability, of cutting edge semiconductors in the Union is at least 20 % of world production in value;
- at least 10 000 climate neutral highly secure “edge nodes” are deployed in the Union, distributed in a way that guarantees access to data services with low latency (few milliseconds) wherever businesses are located;
- by 2025, the Union has its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030.

Gigabit (Very High-Capacity Network)

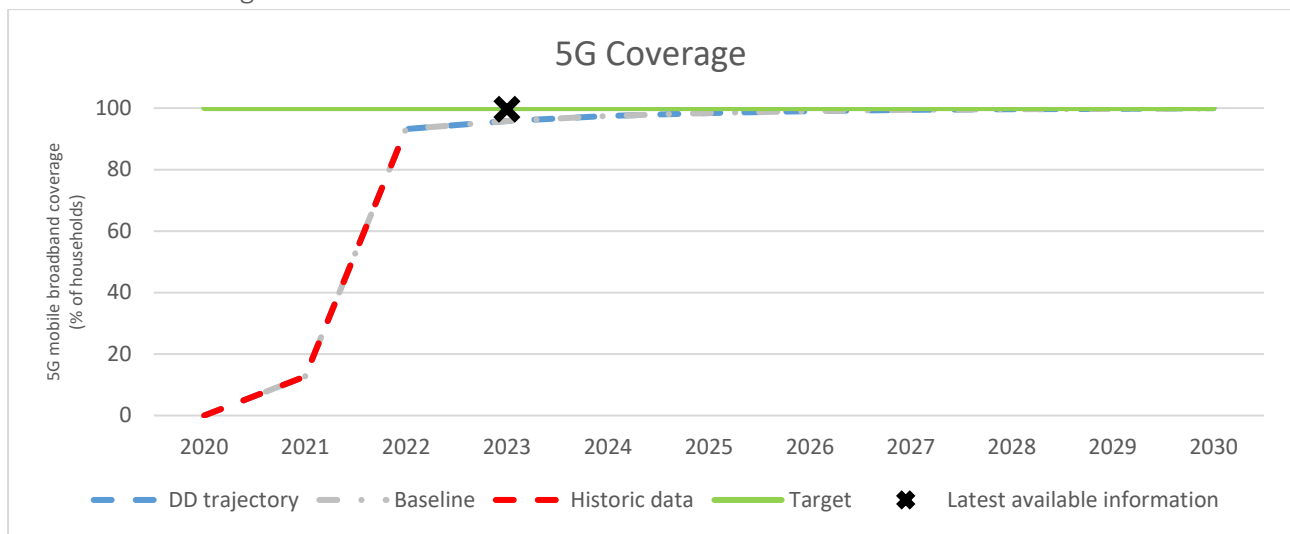




For the construction of the Digital Decade trajectory for “Gigabit” and “Fiber to the Premises”, an s-shaped functional form has been used. The national target value has been set close to 100%, which is in line with the EU Target that “all end users at a fixed location are covered by a gigabit network up to the network termination point”. The baseline trajectory is slightly more cautious with a projected 2030 value of between 98% and 99%.

As of 2022, Luxembourg’s VHCN coverage ratio is already very high at almost 95%. The remaining uncovered areas are often in harder to reach locations, which makes additional progress more costly. Nevertheless, covering these remaining white spots as a priority is a key objective of the Government’s ultra-high speed broadband strategy 2021-2025, including using public funds if necessary.

Overall 5G Coverage



For the construction of the Digital Decade trajectory for “5G Coverage”, an s-shaped functional form has been used. The national target value has been set close to 100%, which is in line with the EU Target that “all populated areas are covered by next-generation wireless high-speed networks with performance at least equivalent to that of 5G”. The baseline trajectory is the same as the Digital Decade trajectory.

As of 2022, Luxembourg already reached a very high coverage rate. The installation of additional antennas has progressed since then. However, the last few percentages being eventually quite cost extensive to perform, there is a certain slow-down in the actual progress rate to expect. Therefore, it is more cautious to target an almost perfect coverage only by 2030.

The feedback from mobile network operators (MNOs) indicates that a national coverage of close to 100% of populated areas (all operators combined) could be achieved even before 2030.

Semiconductors

For this digital target, no quantitative target is set. However, Luxembourg will contribute to achieving the EU target “Secure, resilient, performant and sustainable digital infrastructures where the production, in accordance with Union law on environmental sustainability, of cutting-edge semiconductors in the Union is at least 20 % of world production in value”.



As of 2023 Luxembourg has some first suppliers for the semiconductor industry. Due to the excellence of Luxembourg's industry and research in materials and coating technologies, Luxembourg would like to increase the number of companies, including start-ups until 2030.

Edge-nodes

For this digital target, no quantitative target is set. However, Luxembourg will contribute to achieving the EU target "Secure, resilient, performant and sustainable digital infrastructures where at least 10 000 climate-neutral highly secure edge nodes are deployed in the Union, distributed in a way that guarantees access to data services with low latency (i.e., a few milliseconds) wherever businesses are located".

Edge-nodes grow in importance for the European industry as they can act like decentralized cloud services granting low latencies. These low latencies are very important for multiple applications such as time critical services. Since the Luxembourg territory is small, and high-speed Internet coverage of Luxembourg is close to 100%, all cloud-like IT services in Luxembourg can be reached within a few milliseconds substantially reducing the need of edge-nodes.

In the context of the IPCEI on Next-Generation Cloud Infrastructure and Services, Luxembourg is currently developing edge-nodes for a cybersecurity data space. As these nodes are fully based on open-source technology, they can be replicated in any European region and further strengthen cross-border collaboration in operative cybersecurity and governance. Luxembourg, in collaboration with other Member States, will thus contribute to the usage of edge-nodes in Europe by providing open-source technology.

Quantum computing

For this digital target, no quantitative target is set. However, Luxembourg will contribute to achieving the EU target "Secure, resilient, performant and sustainable digital infrastructures where the Union has, by 2025, its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030".

In 2024, Luxembourg will finalize its quantum strategy and has been selected as a result of a call for expression of interest for the hosting and operation of European quantum computers integrated in HPC supercomputers, launched in December 2023.

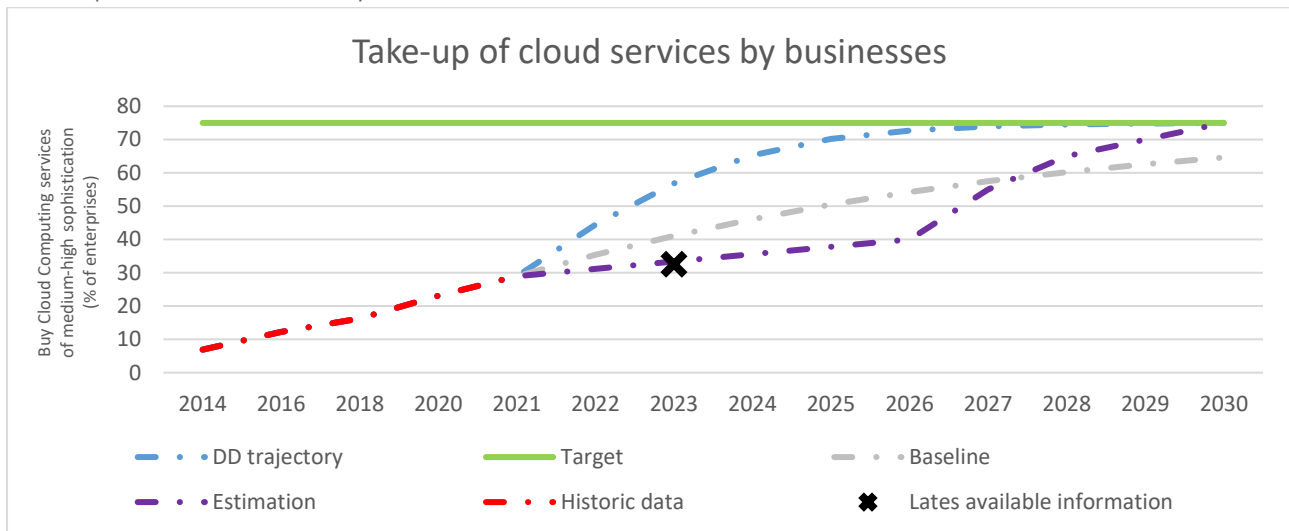


Digital Transformation of Businesses

EU digital targets: digital transformation of businesses:

- a) at least 75% of Union enterprises have taken up:
 1. cloud computing services;
 2. big data;
 3. artificial intelligence;
- b) more than 90% of Union Small and Medium Enterprises ('SMEs') reach at least a basic level of digital intensity;
- c) the Union grows the pipeline of its innovative scale ups and improves their access to finance, leading to at least doubling the number of unicorns.

Take-up of cloud services by businesses



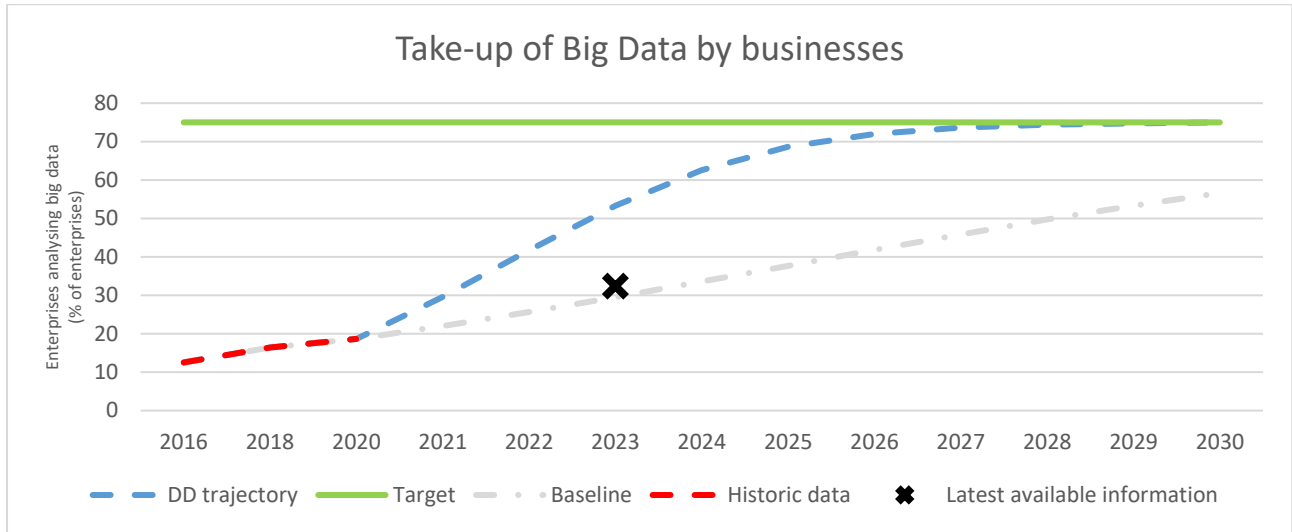
For the construction of the Digital Decade trajectory for the “Take-up of cloud services by businesses”, an s-shaped functional form has been used. The national target value is the same as the EU target value. The baseline trajectory is based on historical data and the 2030 value is below the national target value. In opposition to the gradual growth of the baseline and Digital Decade trajectories, it is however estimated that the trajectory to the target value is rather flat in the coming years and will only increase strongly later.

The first measures will be implemented in 2024, but their impact on the cloud onboarding of businesses will only become effective in the following years (strong increase between 2026 and 2030). By 2025, the first cloud-based services adapted to the Luxembourg context will go online on the Luxembourg cloud providers and the take-up of cloud services by businesses is estimated to start.

Businesses, especially SMEs, will only adopt cloud services if the prices are accessible and if they find the applications that they need. For this reason, the Government will promote the creation of cloud applications assuring interoperability with Government API (Application Programming Interface) and granting data portability rights.

Additionally, the Government has decided that end of 2024, an SME package will be extended in a way that will additionally allow expenditure for OPEX costs such as cloud and cybersecurity services. This package could speed-up, especially due to cloud security services, the take-up of cloud-services by businesses.

Take-up of Big Data by businesses



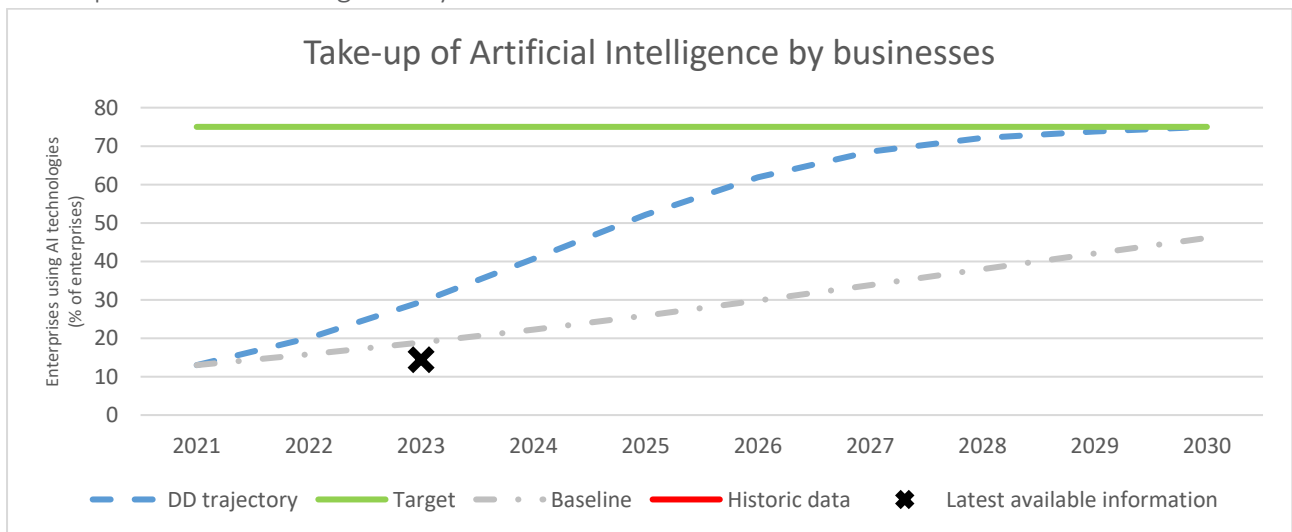
For the construction of the trajectories for the “Take-up of Big Data by businesses”, an s-shaped functional form has been used. The national target value is the same as the EU target value. The baseline trajectory is based on historical data and the 2030 value is far below the national target value.

The take-up of Big Data usage is estimated to be a bit slower in the beginning of the decade. However, as soon as applications, adapted to the Luxembourg context, are available in the cloud, businesses will use them, and data will be available for additional services like for instance accounting, tax, and ERP services as well as fraud detection in big data applications. This explains a possible acceleration of the big data usage take-up from 2024 to 2027.

The percentage of companies using big data is likely to be similar to the percentage of companies buying cloud services as both indicators are largely connected.

In specific sectors, where abundant data is available respectively can be made available, Luxembourg will make this data accessible within SME and start-up friendly sectorial ecosystems and thus positively influence the usage of big data by companies in Luxembourg.

Take-up of Artificial Intelligence by businesses





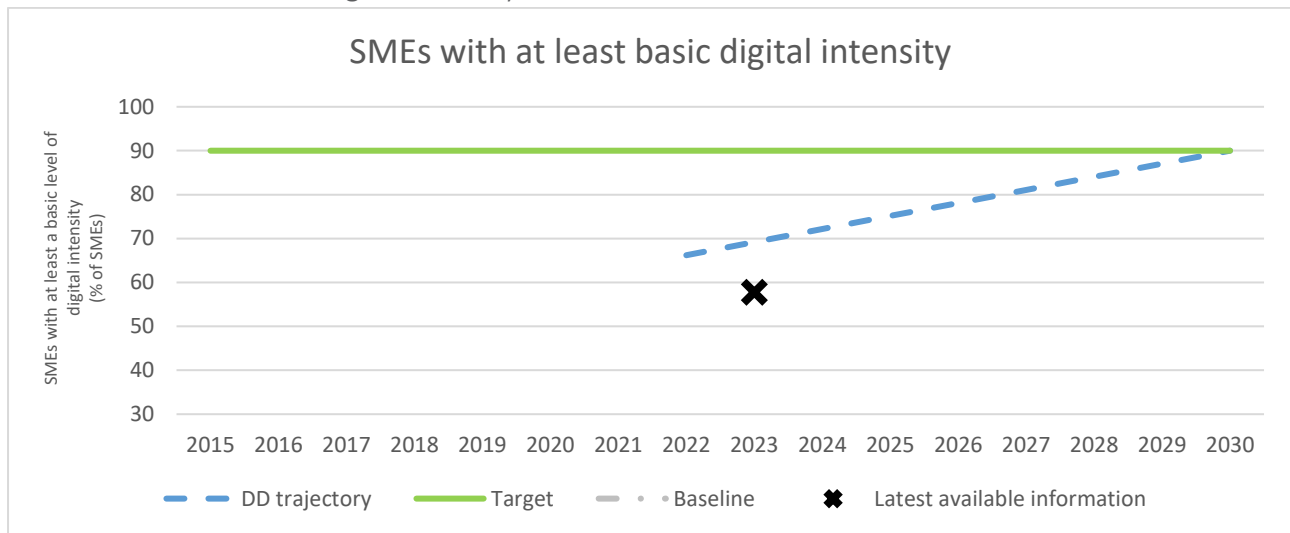
As for the two previous indicators, an s-shaped functional form is used for the construction of the Digital Decade trajectory for the “Take-up of Artificial Intelligence by businesses”. The national target is set at 75%, just like the EU target. There is no historical data for this indicator.

The uptake of AI in companies is expected to be quick due to the usage of Large Language Models (such as OpenAI). The creation of AI applications based on own data however will be slower.

Luxembourg fosters, via ecosystem activities, the creation of AI applications based on individual company data with the usage of multi-agent AI systems running on premise respectively in sovereign cloud tenants that prevent leakage of these critical data. Luxembourg is currently testing the usage of multi-agent AI systems as they have a huge potential of synergies.

As Luxembourg will make large data sets accessible within SME and start-up friendly sectorial ecosystems, Luxembourg will foster the development of AI solutions in these sectors.

SMEs with at least basic digital intensity



For the construction of the Digital Decade trajectory for “SMEs with at least basic digital intensity”, a linear functional form has been used. The national target value has been set at 90% and is in line with the EU target value.

No historical data has been taken for this indicator, as the data from 2022 is not comparable with the previous Digital Intensity Indexes (DIIs). In fact, there has been a change in the composition of the indicator to include technologies that are more recent.

As the pandemic caused an important uptake in digital use and several programmes to support the digitalisation of SMEs, the importance of SMEs with at least basic digital intensity will steadily increase over the next years. Due to the digital uptake in the last years, more and more companies will automatically move towards digital tools. Therefore, a target value of 90% seems realistic with the current definition of the target.



Number of Unicorns

There is no specific target that Luxembourg will set when it comes to the number of Unicorns. The small size of the country as well as its natural propensity to be a "test bed" for innovative companies that will subsequently grow operations in other larger EU countries points to potentially few Unicorns in number and renders very complex carrying out such a forecasting exercise.

Luxembourg's commitment to support national and European start-ups and scale-ups is a priority for the country. Since 2013, the Luxembourg Government initiated incorporating the support of its start-up ecosystem in a determined manner within its economic diversification policy. The combination of these active public policies and engaged private players has helped to build an attractive ecosystem. The ecosystem is growing steadily for the past ten years and the real-time mapping of the ecosystem, available on Startup Luxembourg, identifies more than 500 active start-ups in Luxembourg (September 2024)⁴. Most of these are active in priority areas for the country's economic diversification, such as cleantech, healthtech, fintech, space, industry 4.0 and cybersecurity. Luxembourg published in June 2023 a startup and scaleup roadmap called "From Seed to Scale"⁵ which aims at enhancing Luxembourg ecosystem to provide a better environment for start-ups and scale-ups to thrive and contribute to the Digital Decade goals to increase the number of European Unicorns.

⁴ <https://directory.startupluxembourg.com>

⁵ <https://gouvernement.lu/en/publications/rapport-etude-analyse/minist-economie/13-roadmap-seed-to-scale.html>

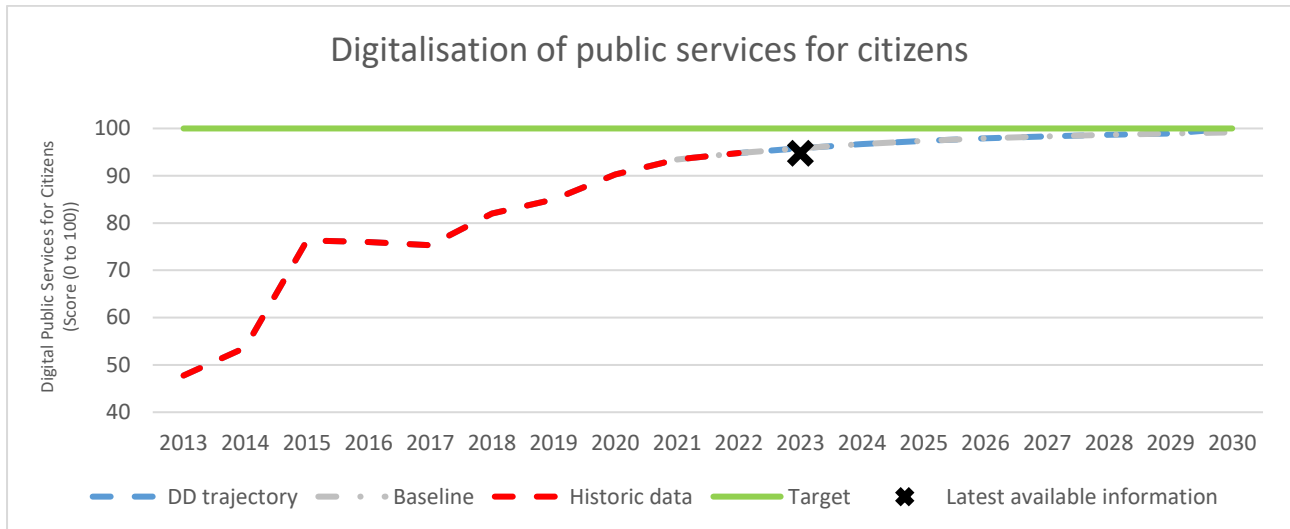


Digitalisation of Public Services

EU Targets: digitalisation of public services:

- a) 100% online accessible provision of key public services for Union citizens and businesses;
- b) 100% of Union citizens have access to their medical records (electronic health records (EHR));
- c) 100% of Union citizens have access to secure electronic identification (eID) means that are recognised throughout the Union, enabling them to have full control over identity transactions and shared personal data.

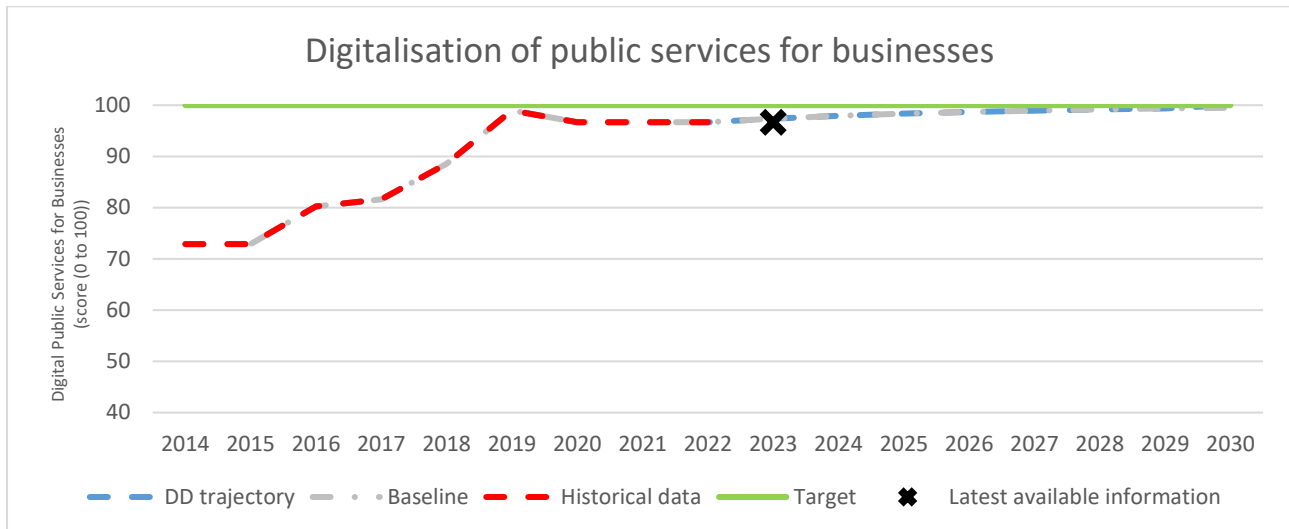
Digitalisation of public services for citizens



An s-shaped functional form has been used to construct the Digital Decade trajectory for “Digitisation of public services for citizens”. The national target is the same as the EU target (100%). The baseline trajectory is expected to be the same as the Digital Decade trajectory.

Luxembourg is a front-runner because eGovernment has been a priority for a few years already. With the continuous improvements made to the single digital point of contact platform “Guichet.lu” and the transactional platform “myGuichet.lu”, along with the activities of the Ministry for Digitalisation and the increased willingness of ministries and administrations to offer more digital public services, it is expected that Luxembourg will reach the Digital Decade target by 2030.

Digitalisation of public services for businesses



For the construction of the Digital Decade trajectory for “Digitalisation of public services for businesses”, an s-shaped functional form has been used. The national target value has been set at 100% and is the same as the EU target value. The baseline trajectory and the Digital Decade trajectory are expected to be the same.

For methodological reasons and for reasons of data availability, DESI 2020 presents structural changes compared to DESI 2019, which explains the minor score drop between the years 2019 and 2020.

Luxembourg prioritises eGovernment and the development of digital public services for citizens and businesses alike. Given the ongoing projects and strategic priorities, it is expected that Luxembourg will reach the Digital Decade target by 2030.

Electronic identification (eWallet and eID)

The EU Target, as described in the Communication from the Commission establishing Union-level projected trajectories for the digital targets, is that “100% of Union citizens have access to secure electronic identification means that are recognised throughout the Union, enabling them to have full control over identity transactions and shared personal data”.

To achieve the target, Member States need to notify at least one national eID scheme. This needs to be in accordance with the regulation “Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC”⁶.

As of 2023, Luxembourg already has a national eID scheme in place to which citizens have access. With the GouvID app, the Luxembourg government is giving citizens the opportunity to use their Luxembourg electronic identity card (eID) in conjunction with their smartphone to identify themselves on any device to certain online public services such as MyGuichet.lu. The GouvID app can also be used to electronically sign for various administrative procedures available on MyGuichet.lu.

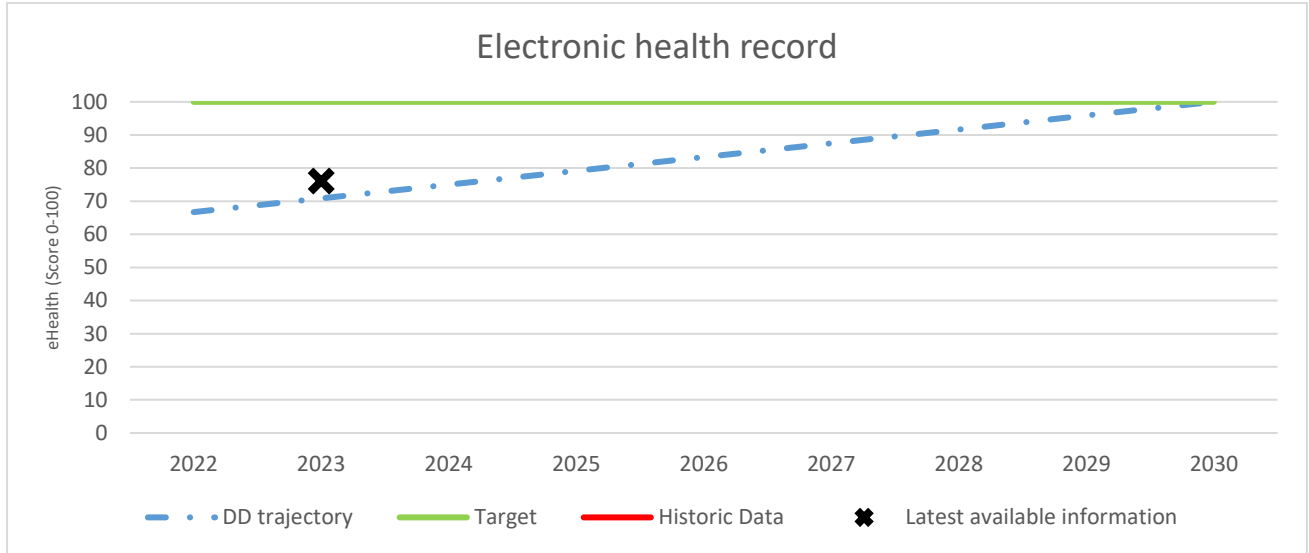
In 2024, the development of a national eWallet was cancelled. Luxembourg will continue its efforts by working on the implementation of the European Digital Identity Wallet called for in the eIDAS2 Regulation, the deadline for the rollout being November 2026. To prepare this implementation, Luxembourg takes an active role in the

⁶ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0073.01.ENG



“POTENTIAL” project, which aims to pilot as soon as 2024 and 2025 prototypes of the national solutions of the European Digital Identity Wallet.

eHealth composite indicator on the availability of electronic medical data



A linear functional form has been used for the construction of the “eHealth” Digital Decade trajectory. No business-as-usual scenario could be defined as there is no historical data available.

Theoretically and technically speaking, the target of technical connectivity and uploading of medical data should be reachable, under the condition that all involved actors and stakeholders, such as health care providers (HCP), software vendors, patients etc. actively contribute.

A joint commitment of all parties involved in rendering electronic health data accessible is required to make this overall objective a complete success. Including further actions regarding regulatory framework and indispensable components (referential national medication database, use of common semantic terminology, etc.) to enhance the exchange of structured and codified medical data.



Section 3: Policies, measures, and actions to achieve the digital targets

This section provides an overview of the policies, measures, and actions that Luxembourg is planning to implement to achieve the digital targets for 2030.

For each digital target, a general overview of the measures is given, together with their overall timing. Each measure that contributes to the achievement of the digital targets is described in the present section.

Digital Skills

EU Digital targets: a digitally skilled population and highly skilled digital professionals, with the aim of achieving gender balance, where:

- a) at least 80 % of those aged 16-74 have at least basic digital skills;
- b) at least 20 million ICT specialists (around 10% of total employment) are employed within the Union, while promoting the access of women to this field and increasing the number of ICT graduates.

At least basic digital skills

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 60.14 % (2023), 56.56% for women
- EU baseline value: 55.56 % (2023), 54.46% for women

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Prepare students for evolving digital work environments	■	■	■	■	■	■	■	■
Measure 2: Safety for children in an online environment	■	■	■	■	■	■	■	■
Measure 3: Digital Skills Partnerships	■	■	■	■	■	■	■	■
Measure 4: Programmes for jobseekers	■	■	■	■	■	■	■	■
Measure 5: Agreement with the non-profit organization Digital inclusion	■	■	■	■	■	■	■	■
Measure 6: Agreement with the non-profit organisation GoldenMe	■	■	■	■	■	■	■	■
Measure 7: Big Data Life: Privacy awareness tool for children and young adults	■	■	■	■	■	■	■	■
Measure 8: Skillsbridges programmes	■	■	■	■	■	■	■	■
Measure 9: Digital game for secondary school pupils to raise awareness of responsible consumption: the changemaker games	■	■	■	■	■	■	■	■
Measure 10: Online trainer platform and monthly IT trainer meetups	■	■	■	■	■	■	■	■

Luxembourg-specific challenges addressed by the measures:

Luxembourg has a multilingual education system with instruction in Luxembourgish, German, and French. Integrating digital literacy into a trilingual curriculum can be complex, requiring resources and digital content in multiple languages.



Despite a comparably high technological standard equipment of schools and households, there can still be disparities in access to digital tools and especially digital skills and support among students. Ensuring equitable access to digital education is crucial.

Developing and effectively implementing national policies and strategies for digital education requires coordination among various stakeholders, including government, schools, and private sector partners. Ensuring that these policies are coherent and sustainable is key.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

Measure 1: Prepare students for evolving digital work environments

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Luxembourg’s Ministry of Education, Children and Youth continuously introduces new study tracks to offer secondary schools’ students the opportunity to enter in these study fields. ⁷ Since the school year 2018-2019, the study track CI (“informatique et communication”) has been offered in secondary schools. This track provides access to higher education, particularly in the fields of IT and communication. Course-specific subjects include programming classes, an introduction to modern technologies and a media communication class. In addition to the existing study track CI (“informatique et communication”), a new track P (“sciences cognitives et humaines”) was introduced for the school year 2023-2024 focusing on the role of people in a rapidly developing society. Among other disciplines, this new track will offer classes in data science and communication.
Budget allocated or planned, other resources	EUR 500 000 for a duration from 2017 to 2025.
Expected impact and related timing	By introducing media literacy competencies on a transversal and curricular approach, the Luxembourgish school system takes a holistic approach in assuring basic digital skills. This is an ongoing measure that is planned to be continued over the next years.

Measure 2: Safety for children in an online environment

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	BEE SECURE ⁸ , the Luxembourg Safer Internet Centre, is a governmental initiative involving the Ministry of Education, Children and Youth, the Ministry of the Economy and the Ministry of Family Affairs, Solidarity, Living Together and Reception of Refugees. BEE SECURE is coordinated by the National Youth Service (SNJ) and it is operated by SNJ in cooperation with the counselling service Kanner-Jugendtelefon (KJT), in partnership with the Luxembourg House of

⁷ <https://men.public.lu/en/actualites/communiqués-conference-presse/2023/03/17-section-p.html>

⁸ <https://www.bee-secure.lu> - Access the annual reports at <https://www.bee-secure.lu/fr/publication/rapport-dactivite-2023> and the latest trend monitoring report at <https://www.bee-secure.lu/de/publikation/bee-secure-radar>



	<p>Cybersecurity, the Luxembourg Police and the Public Prosecutor's Office of the Grand Duchy of Luxembourg. BEE SECURE is part of the European networks Insafe (awareness-raising centres and helplines) and INHOPE (the International Association of Internet Hotlines - leads the fight against child sexual abuse material (CSAM) online.)</p> <p>BEE SECURE aims to raise awareness for a safety-oriented and responsible use of digital technology to the general public, and to particularly empower children, young people and their entourage (parents, teachers, educators and others) through targeted offers and information.</p> <p>BEE SECURE acts in the following four areas:</p> <ol style="list-style-type: none"> 1. Awareness and information 2. Orientation and advice (BEE SECURE Helpline) 3. Anonymous reporting platform (BEE SECURE Stoptline) 4. Trend-Monitoring <p>Furthermore, BEE SECURE coordinates activities like the Safer Internet Day (SID) in Luxembourg, urging stakeholders to promote safe digital use and responsible behaviour for children and young people in Europe.</p>
Budget allocated or planned, other resources	The allocated and planned budget of BEE SECURE for all areas of action from 1.1.2022 to 31.12.2030 is EUR 22 285 343, consisting of EUR 14 368 469,84 national funding and EUR 7 916 873,43 EU funding.
Expected impact and related timing	<p>BEE SECURE plans to continue and further develop its actions and offers, while orienting on needs and developments in the domain of a safer internet for children.</p> <p>This is an ongoing measure that is planned to be continued over the next years.</p>

Measure 3: Digital Skills Partnerships

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Innovative Initiatives, former Digital Luxembourg, of the Department of Media, Connectivity and Digital Policy (SMC) of the Ministry of State launched the “Digital Skills Matchmaking” (DSMM). DSMM is an initiative with the goal of encouraging companies to form partnerships with digital skills project owners to accelerate innovation and support digital skills development.</p> <p>These partnerships come in many forms, and facilitate our digital target by generating mentorship programmes, IT assistance for NGOs, augment volunteering for coding workshops in schools and digital skills information events and digital immersion days in enterprises for students.</p> <p>During a side-event with national and international keynotes, IMS Luxembourg guides companies and digital skills project owners to exchange (speed dating format) and to create win-win digital partnerships. Project owners can be NGOs, public actors, schools, training providers, research organisations, and grassroots initiatives.</p>
Budget allocated or planned, other resources	DSMM 2023 and 2024 benefited from a European Social Fund co-financing where a budget of EUR 270 000 (EUR 81 000 from the SMC) allowed to targeted preparation workshops for both CSR decision



	makers and digital skills project owners as well as ex-post workshops to guide formed partnerships in the implementation of their new positive impact initiatives.
Expected impact and related timing	The latest DSMM edition (2024) resulted in 32 partnerships. This matchmaking activity is to be continued in 2025 and 2026 but will change in nature (see measure 9: ICT specialists and gender convergence: motivate girls for STEM under ICT Specialist Skills).

Measure 4: Programmes for jobseekers

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The National Employment Agency (ADEM) offers training courses to help jobseekers develop basic digital skills⁹. Using a computer has become an essential part of jobs. Courses proposed by ADEM enable jobseekers to get familiarised with a computer, learn about the most used software and prepare their immersion in computer essentials, which can also help in their digital job search:</p> <ul style="list-style-type: none"> • “Basic Digital Skills” is a project run by ADEM in collaboration with the House of Training and the Luxembourg Lifelong Learning Centre with the support of the European Social Fund Plus (ESF+). The programme is delivered in English, French and German and is aimed at jobseekers over 30 years with little or no IT skills seeking to improve their skills in Computer and IT essentials. • “Digital Fundamentals” is a project run by ADEM in partnership with the Centre National de la Formation Professionnelle Continue (CNFPC). It is aimed at jobseekers under 30 years with little or no IT skills and has the same objectives as the above mentioned “Basic Digital Skills” programme.
Budget allocated or planned, other resources	The total cost of “Basic Digital Skills” is EUR 264 400 co-financed by the ESF+ (40%) and by the Luxembourg Employment Fund of the Ministry of Labour (60%). The total cost of “Digital Fundamentals” per participant is EUR 320 of national public budget. The project is estimated to have around 140 participants per year.
Expected impact and related timing	<p>“Basic Digital Skills” targets 144 jobseekers over the period 1.1.2024 - 31.12.2025. 51 jobseekers participated in “Digital Fundamentals” in 2023 and 37 jobseekers have already completed the programme since early 2024. Each session can welcome up to 20 jobseekers. A total of 5 sessions are planned for 2024.</p> <p>The programme will continue throughout 2025.</p>

Measure 5: Agreement with the non-profit organisation Digital inclusion

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>The Ministry of Family Affairs, Solidarity, Living Together and Reception of Refugees (MFSVA) and the National Social Inclusion Office (ONIS) signed an agreement with the non-profit organisation Digital Inclusion in 2022.</p> <p>Training component that is offered free of charge in 10 languages - ONIS:</p>

⁹ <https://adem.public.lu/fr/demandeurs-demploi/se-former/formations-ADEM/numerique.html>



	<ol style="list-style-type: none"> 1. “Digital literacy”: This training targets individuals without any digital skills. Participants learn how to use Windows, set up and use an email account, and browse the internet. Minimum 27 computer and 12 smartphone trainings per year. 2. “Digital autonomy”: This course is for individuals with basic digital skills. It covers using file servers, handling documents and emails, utilizing video conferencing tools, and messaging services. Minimum 18 trainings per year. 3. “Digital citizenship”: Participants are taught how to use myGuichet and other common online services in Luxembourg, such as banking, mobilitéit.lu, and the Electronic Healthcare Record (Dossier de Soins Partagé – DSP). Minimum 18 trainings per year. <p>Distribution of material – MFSVA: Digital Inclusion also collects old laptops and smartphones through donations, repairs and resets them, and then distributes them to those in need. Eligible recipients include applicants and beneficiaries of international protection, as well as residents receiving the cost-of-living benefit or selected by social welfare offices.</p>
Budget allocated or planned, other resources	<p>ONIS: 6.25 Full-Term-Equivalent (FTE) and operating costs with a total (national public) budget of EUR 571 563,50.</p> <p>MFSVA: 5.75 Full-Term-Equivalent (FTE) and operating costs with a total (national public) budget of EUR 693 429,22.</p>
Expected impact and related timing	<p>Making information technology accessible to everyone through training and the distribution of refurbished laptops and smartphones. This is an ongoing initiative that is planned to continue over the coming years.</p>

Measure 6: Agreement with the non-profit organisation GoldenMe

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>Since January 2023, the Ministry of Family Affairs, Solidarity, Living Together and Reception of Refugees (MFSVA) has signed an agreement with the GoldenMe association. GoldenMe's primary mission is to prevent social isolation and give seniors access to the digital world through learning offers tailored to their needs.</p> <p>The promotion of access to and use of information and communication technologies for seniors takes place at 4 levels: (1) Individual assistance, (2) Workshops and courses, (3) Information and awareness-raising and (4) Training.</p> <p>Furthermore, GoldenMe develops and organizes specific training courses for senior volunteers, more specifically “train the trainer” courses in the field of “seniors and digitalisation”. This is the “Silver Surfer” group. Volunteers are supported and supervised by GoldenMe.</p>
Budget allocated or planned, other resources	<p>GoldenMe is 100% funded by the Ministry of Family Affairs, Solidarity, Living Together and Reception of Refugees. The total annual national public budget for 2024 is EUR 431 741 including 3 Full-Term-Equivalent (FTE), operating costs and rent.</p>



Expected impact and related timing	<p>The expected impacts are to reduce the digital divide, to improve the digital skills of the elderly, to encourage and support volunteering by seniors, to promote intergenerational contacts and exchanges, to support and facilitate the transition from working life to retirement, to prevent social isolation and encourage active participation by seniors, and to promote a positive image of age and aging.</p> <p>This is an ongoing initiative that is planned to continue over the coming years.</p>
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Measure 7: “Big Data Life”: Privacy awareness tool for children and young adults

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>The National Data Protection Commission (CNPD) is developing an awareness raising tool for teenagers and young adults (15-22 years) to increase awareness on data protection matters and on why, where, and how their personal data is processed when they play online games, chat on social media or simply when they start working life.</p> <p>The tool will be a webtoon (cartoon in digital format) and will challenge the target group in different ways to help them doing the right choice in their daily real life. This will be achieved based on a gamified story telling approach developed on a UX experience analysis by including the specific expertise of BEE SECURE as a project cooperation partner.</p> <p>The Webtoon will inform young people about their data subject rights (transparency, access, rectification, to be forgotten, portability, remedies, etc.) and about the key public actors supporting them on data protection matter (CNPD, BEE SECURE, etc.). For a wider usage within and outside of Luxembourg, the tool will be offered in several languages (English, French, German, Luxembourgish and probably Portuguese).</p>
Budget allocated or planned, other resources	The allocated budget for this project spreading from 2025 until 2026 is EUR 212 865 (with 90% co-financed by the EU Commission DG Just / CERV programme) of which EUR 45 000 are subcontracted to external contractors.
Expected impact and related timing	<p>Create augmented awareness on personal data protection within the teenager population, including teachers and parents.</p> <p>Project is expected to start by end of 2024 and, with a duration of 24 months, will end in 2026.</p>

Measure 8: Skillsbridges programmes

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>The Skillsbridges programmes¹⁰ are innovative professional training initiatives launched by the Ministry of Education, Childhood, and Youth (VET Department – Service de la formation professionnelle). These short-term courses are designed to help adults adapt to new technologies and the constantly evolving job market, focusing on both upskilling and reskilling. A significant emphasis is placed on digital and IT skills, with courses covering areas such as artificial</p>

¹⁰ <https://men.public.lu/de/publications/dossiers-presse/2023-2024/20240722-skillsbridges.html>



	intelligence, data analysis, cloud computing, and e-marketing. These programs aim to address the shortage of qualified labour and support professional transitions, contributing to a sustainable and innovative economy.
Budget allocated or planned, other resources	The first three Skillsbridges are part of Luxembourg’s recovery and resilience plan and are thus co-financed by the European Union. Future Skillsbridges will be financed through regular ministerial lifelong training budgets.
Expected impact and related timing	The first three Skillsbridges will start in September 2024 with around 20 additional training programmes starting over the course of 2025 and 2026.

Measure 9: Digital game for secondary school pupils to raise awareness of responsible consumption: the changemaker games

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	“The changemaker games” is a playful 2-3 h experience, launched by the Directorate for Consumer Protection, in which high school pupils are confronted with riddles and challenges in a digital environment that raise their awareness of responsible consumption issues. After facing the different challenges pupils should be able to identify concrete measures that will enable them to have a positive impact on climate change through responsible consumption choices. Through interactive scenarios, young people will be encouraged to reflect on their consumption habits, including the digital ones.
Budget allocated or planned, other resources	EUR 100 000 of national public budget spread over 2024 and 2025.
Expected impact and related timing	This measure, which is based on the voluntary participation of secondary school pupils supervised by their teachers, aims to raise awareness of responsible consumption while stimulating basic digital skills, namely the ability to locate and retrieve digital data, information, and content as well as the ability to resolve problem situations in a digital environment. The game also aims at raising awareness about the environmental impact of digital technologies. The go live of this initiative is planned for September 2025.

Measure 10: Online trainer platform and monthly IT trainer meetups

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	Since 2021, the Ministry for Digitalisation and the non-profit organisation ErwuesseBildung are collaborating to develop basic digital skills training programs, which are available in 3 different languages (DE, FR, and EN) and are adapted to accommodate special learning needs. The trainings are available free of charge to organisations working in the social field and municipal actors, thereby expanding the network of people authorised to provide these courses. In order to further expand the network, the Ministry and the organisation have developed an online trainer platform ¹¹ which

¹¹ <https://trainer.ewb.lu/en>



	offers a wide array of instructional videos and teaching materials and offer monthly "train the trainers" sessions throughout the country targeting different organisations, associations, and municipalities.
Budget allocated or planned, other resources	An annual national public budget of EUR 30 000 is foreseen for trainer meet-ups starting in 2024 and platform maintenance.
Expected impact and related timing	<p>The project aims to equip IT trainers with the necessary tools and knowledge to effectively teach basic digital skills to individuals who face challenges navigating the digital world. The initiative is designed to have a lasting impact on the associative sector by expanding the network of trained individuals capable of providing digital skills education. The monthly "train the trainers" sessions aim to foster a sustainable community of educators, ensuring continuous growth and adaptation of digital skills training.</p> <p>By providing these resources and networking opportunities, the initiative seeks to bridge the digital divide, enhance digital literacy, and empower more individuals and organisations within the social sector.</p> <p>Ongoing measure until at least 2025, with the platform remaining accessible beyond this period.</p>

ICT specialists in employment

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 8.00% of total employment (2023) of which 22.50% are women
- EU baseline value: 4.80% of total employment (2023) of which 19.40% are women

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Digital Learning Hub								
Measure 2: University of Luxembourg as a prime provider of digital skills programmes								
Measure 3: Short cycle higher education programmes (BTS)								
Measure 4: ICT START								
Measure 5: Luxembourg Tech School								
Measure 6: ElementsofAI.LU” (EoAI): MOOC with online study accompaniment and extensive targeted in-person support								
Measure 7: “Google certificates” personalised and accompanied upskilling offers for jobseekers								
Measure 8: ICT mentoring programmes for women								
Measure 9: ICT specialists and gender convergence: motivate girls for STEM								
Measure 10: List of professions facing significant shortages.								

Luxembourg-specific challenges addressed by the measures:

No Luxembourg-specific challenges identified.



Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

Measure 1: Digital Learning Hub

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The Digital Learning Hub¹² is an initiative of the Ministry of Education, Children and Youth and was created to contribute to the Government’s mission to reduce the digital skills gap in Luxembourg. The DLH aims to further expedite the digital transformation of Luxembourg by way of continuous professional education and to help fill the severe need for skilled IT-trained professionals on the job market.</p> <p>The DLH is able to continuously adapt its training offerings in an agile and responsive manner.</p> <p>The DLH targets the following audiences:</p> <ol style="list-style-type: none"> 1. Professionals wanting to improve their IT-skills, 2. Job seekers considering a professional reorientation into IT, 3. Young people who are looking for an alternative teaching to acquire digital competences. <p>The DLH offers three training formats:</p> <ol style="list-style-type: none"> 1. Tailored individual courses to impart a precise skill in a short period of time. 2. A learning track is a set of different courses forming a comprehensive and well-rounded program, culminating into a specific skillset. 3. The 42 coding school has currently 54 campuses worldwide. 42 Luxembourg¹³ is operated by the DLH. 42 has no teachers, no classes, and no courses. It works on a peer-learning and project-based approach. The school is open 24/7 and allows every student to progress at his/her own pace. The training programme starts with the common core where learners acquire the fundamentals in programming. Then, students can choose to continue with the specialisation, where they will progress into the field of their choice, such as web development, cybersecurity, or AI. <p>None of the three training formats requires any administrative or academic prerequisites, thereby allowing everyone to reskill in IT or upskill within the context of their professional career.</p>
Budget allocated or planned, other resources	<p>The yearly budget of the Digital Learning Hub is EUR 1 000 000 of national budget.</p>
Expected impact and related timing	<p>Between June 2022 and June 2024, the DLH has offered 800 courses and welcomed 6000 learners.</p>

¹² <https://dlh.lu>

¹³ <https://42luxembourg.lu>



	This is an ongoing measure that is planned to be continued over the next years.
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Measure 2: University of Luxembourg (Uni.lu) as a prime provider of digital skills programmes

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The University integrates digital skills and transformation initiatives across its programmes, in line with its Strategy Framework 2020-2039 that promotes Digital Transformation as a key area. In the field of ICT, most programmes¹⁴ are situated at the Faculty of Science, Technology, and Medicine (FSTM); these programmes enroll 328 bachelor, 305 master, and 262 doctoral students (as of academic year 2023-2024, see Annex 4), and are strongly oriented towards the job market in line with the University's overall approach which has led to 50% of its graduates¹⁵ remaining in Luxembourg for their first job. As of the academic year 2024-2025, a new master programme in cybersecurity will be launched with a planned intake of up to 40 students per academic year. Furthermore, the University is exploring lifelong learning programmes in AI.</p> <p>The University of Luxembourg promotes female ICT mentoring via its Scienceteens lab in computer science¹⁶ which targets female students, its Girls Exploring Math programme¹⁷ which encourages girls to study STEM, and its Advance Mentoring Program¹⁸ for early career researchers including those in ICT.</p>
Budget allocated or planned, other resources	During the academic year 2022-2023, around 12 000 teaching units were delivered at the FSTM in ICT programmes, which will further increase with the opening of the new programmes. Based on previous years, a minimum annual spend of approximately EUR 3 000 000 can be expected until the end of the decade (excluding inflation adjustments).
Expected impact and related timing	Until 2030, the University expects at least 150 graduates per year in ICT across the different academic educational levels with an increase to around 200 graduates per year due to newly established programmes.

Measure 3: Short cycle higher education programmes (BTS)

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Higher education programmes at short cycle level (BTS - Brevet de technicien supérieur) ¹⁹ are professionally oriented courses at higher education level (Level 5 NQF/EQF), which comprise on average between 120 and 135 ECTS credits and take four semesters to finish. They are offered in secondary schools. BTS programmes primarily prepare for the job market but graduates also can pursue further studies. Depending on the study field and upon decision of the given

¹⁴ <https://www.uni.lu/fstm-en/studies>

¹⁵ <https://www.uni.lu/en/about/profile/facts-figures>

¹⁶ <https://www.uni.lu/life-en/scienceteens-lab/workshops/computer-science>

¹⁷ <https://www.uni.lu/fstm-en/research-departments/departement-of-mathematics/outreach/girls-exploring-math>

¹⁸ <https://www.uni.lu/en/about/gender-equality/advance-mentoring-programme>

¹⁹ <https://mengstudien.public.lu/en/etudier-luxembourg/brevets-de-technicien-superieur.html>



	<p>higher education institution/university, they can receive a partial or full recognition of their short cycle programme.</p> <p>There are no rules or limits set at national level as to the creation of new programmes. The assessment of their relevance and opportunity, as well as feasibility, is an integral part of the programme accreditation procedure.</p> <p>The 11 BTS programmes that are currently offered in the ICT areas of study are listed in Annex 5. In 2024-2025 two new BTS programmes will be offered, called “Applied Artificial Intelligence” and “Automated Industrial Production”.</p>
Budget allocated or planned, other resources	EUR 3 000 000 of national public budget in 2023. The yearly budget is estimated to remain in the same order of magnitude in the upcoming years.
Expected impact and related timing	<p>In the academic year 2022-2023, 835 students were registered for a BTS winter semester.²⁰</p> <p>This is an ongoing measure that is planned to be continued over the next years.</p>

Measure 4: ICT START

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>ICT Start²¹ is a training measure that was launched by Luxembourg’s National Employment Agency (ADEM) and the professional training department of the Ministry of Education (SFP - Service de la Formation Professionnelle) in December 2022 and ended in January 2024.</p> <p>ICT Start targets jobseekers in Luxembourg registered with ADEM who wish to direct their careers towards the new professions in web and mobile technologies. It is a 10-day (40h per week) introduction training to get in touch with the IT sector and gives the possibility to discover the different IT jobs as well as to acquire basic IT skills, especially in coding and web development. After completion, the learners can decide whether they would like to reskill for an IT job and enrol in one of the more complete trainings as a follow up.</p>
Budget allocated or planned, other resources	No specific budget is foreseen for this measure. In 2023, about EUR 132 000 of national public budget was invested in the ICT Start project.
Expected impact and related timing	<p>ICT Start trained 233 jobseekers in total.</p> <p>The programme was concluded in 2024 and ADEM is analysing new trainings with similar objectives with its partners, both public and private, which will be launched end of 2024 or early 2025.</p>

Measure 5: Luxembourg Tech School

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Luxembourg Tech School ²² (LTS) is an extra-curricular educational program co-financed by the Luxembourg Government and the private sector to drive the development of future digital leaders.

²⁰ <https://chiffres-cles.mesr.gouvernement.lu/dashboard>

²¹ <https://adem.public.lu/content/dam/adem/fr/publications/demandeurs-emploi/formations/2022-12-14-ict-start.pdf>

²² <https://www.techschool.lu>



	<p>Motivated 12-19 years old students learn and apply technology in a real business context. Starting with coding, big data and management lessons, students are later taught to link technologies to business and society purposes within three modules: Space Ressources, AI and Finance (FinTech) and AI Creativity and Arts. The technology purpose of the LTS program is adapted on a biannual basis, to reflect digital transformation in business and society.</p> <p>The public-private objective-oriented partnership has the goal to increase tech and science employability by enlarging the number of students, promoting student job and mentorship opportunities, and increasing participation in recognized competitions and hackathons.</p>
Budget allocated or planned, other resources	LTS' annual budget is EUR 600 000 where the Government comes in for 40% and the private sector for 60%.
Expected impact and related timing	LTS is offered within nine secondary schools throughout the country, 24 neighbouring schools also have access to the nine premises. 825 students graduated from LTS so far (2017-July 2023). The LTS program covers the period 2017-2026.

Measure 6: "ElementsofAI.LU" (EoAI): MOOC with online study accompaniment and extensive targeted in-person support

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>In 2021 and 2023, the Government initiative Innovative Initiatives, former Digital Luxembourg, joined forces with the University of Luxembourg Competence Centre (ULCC), the Ministry of Education, Children and Youth, the University of Luxembourg, the National Institute of Public Administration (INAP), to implement a free and hybrid version of the online MOOC "Elements of AI"²³ with virtual and in-person options.</p> <p>Launched in 2019 and co-financed by the European Commission, "Elements of AI" is a free online course created by MinnaLearn and the University of Helsinki. Luxembourg uses this famous MOOC to equip at least 1% of its working-age population, and strongly encourages individuals outside of the tech industry, with the knowledge of how AI can be applied to real-life applications, LLM, and what the implications of this technology are. On top of that, it also serves as a refresher to experts in the field.</p> <p>The "embedded" Luxembourg version of Elementsofai.lu features additional targeted study accompaniments to drive its success: seven webinars throughout the accompanied course duration of the course, and three study group formats dedicated to teaching professionals, women-only and all other participants.</p> <p>During the 2023 edition of elementsofAI.LU the provision of a multitude of additional targeted study accompaniments were deployed to drive its success. There are also three targeted support groups (professionals, women-only study groups and study groups for all other interested). The aim of the support group is to continuously exchange, to review the content of the MOOC, discuss use cases and hold Q&A sessions.</p>

²³ <https://www.elementsofai.lu>



Budget allocated or planned, other resources	EoAI Licence, operational costs and a half PhD come at a yearly national budget of EUR 85 000.
Expected impact and related timing	The expected impact of this measure is to provide 1% of the population with AI literacy. The free EoAI MOOC with blended accompaniment shall additionally motivate participants to go further and deepen training in AI or other ICT technologies. An EoAI 2024 and 2025 edition is planned.

Measure 7: “Google certificates” personalised and accompanied upskilling offers for jobseekers

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	The Google Certificates programme ²⁴ is a collaboration between the University of Luxembourg Competence Centre (ULCC) and Luxembourg’s National Employment Agency (ADEM). The Google Certificates training partnership started in 2021 and was readapted in 2023. The training project’s goal is to provide important IT-related skills to facilitate the professional integration and/or reintegration of jobseekers and to facilitate recruitment for employers in Luxembourg. Google Certificates learning packages are available online on the Coursera website. Designed for beginner learners, they are based on online learning principles, with a maximum duration of six months. This allows learners to progress at their own pace, with guidance from the ADEM counsellor. The different areas in which the Google Certificates are offered are listed in Annex 3.
Budget allocated or planned, other resources	No specific budget allocation.
Expected impact and related timing	From 1.1.2023 to 1.9.2024, 278 participants took advantage of the offer. The initiative covers the period from 2021 to 2024.

Measure 8: ICT mentoring programmes for women

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Together with the National Research Fund and Luxembourg Tech School, the Luxembourg Government is actively promoting and co-financing IT Mentoring Programmes for female ²⁵ . The Women Cyber Force Mentoring Programme ²⁶ provides the opportunity to connect with experienced mentors who can offer valuable career guidance and share their insights. The objective is to enhance women’s involvement in the cybersecurity sector by promoting competences and facilitating access to professions in this field. WeSTEM+ Luxembourg is a local community of women in tech who can support and encourage each other. The goal is to build a diverse and inclusive tech workforce. WeSTEM+ Luxembourg organises conferences, bootcamps, workshops and job boards, just to name a

²⁴ <https://adem.public.lu/fr/demandeurs-demploi/se-former/formations-ADEM/informatique-ict.html>

²⁵ <https://www.techschool.lu/2023/11/14/female-talent.html>

²⁶ <https://www.womencyberforce.lu/mentoring-program>



	few. In the frame of WeSTEM+'s Academy, the government's Innovative Initiative platform finances a yearly tech training for non-tech women.
Budget allocated or planned, other resources	The government's part of this budget, except for the yearly tech training, is comprised in the Lux Tech School funding. The national public budget for the tech training is EUR 10 000.
Expected impact and related timing	These measures will help to reduce the gender gap in ICT. The initiative is planned to be continued until 2026 included.

Measure 9: ICT specialists and gender convergence: motivate girls for STEM

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>This measure aims to allow 15- and 16-year-old girls to shed a new light on STEM disciplines and overcome the gender stereotypes associated with them, through building partnerships between schools and businesses. In this initiative, a mentor in a business or public administration guides a small group of girls (2-3) through a key working process, where STEM or IT knowledge is an important knowledge factor. The girls are given a challenge to resolve and to present to a jury.</p> <p>The matchmaking process to find motivated organisations and schools to participate in Girls4STEM partnerships (name of the project to be confirmed) is managed by a CSR specialized association IMS Luxembourg, under the direction and the co-financing of the Innovative Initiatives platform from the Department of Media, Connectivity, and Digital Policy (SMC). Note that the initiative is labelled for girls, but boys are allowed to participate.</p> <p>During an event with national and international keynotes to promote STEM for girls, a selection of Girls4STEM groups present their challenge and the solution they provided.</p>
Budget allocated or planned, other resources	The Girls4STEM project is planned to be partly co-financed by FSE (September 2024 Call for Projects) and the Ministry of Education, Children and Youth, the "Maison de l'Orientation" (Youth Guidance Centre) and the SMC's "Innovative Initiatives" platform. With the FSE grant, the project may be budgeted for EUR 430 000, without the FSE grant, the project will be executed at a lower scale for an estimated EUR 250 000 for two years.
Expected impact and related timing	The project aims to orient girls for STEM and IT studying fields. The initiative covers the period 2025 to 2026.

Measure 10: List of professions facing significant shortages.

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	The shortage of skilled workers has become a serious issue for Luxembourg's economic development and the IT sector is particularly affected. To address this issue and assist companies in hiring foreign skilled workers, the law of 7 August 2023, that came into force on 1 September 2023 ²⁷ , introduced significant changes to the employment of third-country nationals. The new law aims to

²⁷ <https://adem.public.lu/en/actualites/adem/2023/09/metiers-penurie.html>



	<p>significantly simplify the employment of third-country nationals already residing in Luxembourg.</p> <p>In this respect, ADEM annually publishes a list of professions facing significant shortages of skilled workers based on objective data (the number of job vacancies reported to ADEM, the number of jobseekers available by profession, the number of job vacancies for which no suitable candidate could be found). For professions listed as shortage professions, ADEM is no longer required to conduct a job market test. In such cases, the certificate is issued within five days of receiving the application</p>
Budget allocated or planned, other resources	No specific budget allocation.
Expected impact and related timing	This measure is helping to facilitate the recruitment of ICT specialists in Luxembourg, given that IT professions are on the list of professions facing significant shortages.



Digital Infrastructure

EU Digital targets: secure, performant and sustainable digital infrastructures:

- all end users at a fixed location are covered by a gigabit network up to the network termination point, and all populated areas are covered by next-generation wireless high speed networks with performance at least equivalent to that of 5G, in accordance with the principle of technology neutrality;
- the production, in accordance with Union law on environmental sustainability, of cutting edge semiconductors in the Union is at least 20 % of world production in value;
- at least 10 000 climate neutral highly secure “edge nodes” are deployed in the Union, distributed in a way that guarantees access to data services with low latency (few milliseconds) wherever businesses are located;
- by 2025, the Union has its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030.

Gigabit (Very High-Capacity Network)

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 94.70% (2023)
- EU baseline value: 78.81% (2023)

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Ultra-high-speed broadband strategy								

Luxembourg-specific challenges addressed by the measures:

In 2023, the Luxembourg Regulatory Institute launched an information campaign on the ongoing copper switch-off by the network operators. The copper switch-off is expected to be definitive by around 2030. The copper-switch off is very likely to lead to an increase in the uptake of very high-capacity networks in the coming years. The to be covered areas can be considered as “white spots”, as opposed to larger “white areas”, as they are widely scattered and of a very small scale. Filling those white spots requires many small but resource intensive projects, leading to high costs per household.

Estimated investment gap and possible actions to reach the national target values:

There is currently no reliable estimate available of the funding gap. Based on initial pilot projects, data that are more reliable should be available by 2025.

Description of the measures

Measure 1: Ultra-high-speed broadband strategy

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	In 2021, the Government published its new ultra-high-speed broadband strategy ²⁸ for the time horizon 2021-2025. One of the objectives of this strategy is to cover the remaining whitespots in the

²⁸ <https://gouvernement.lu/dam-assets/documents/actualites/2021/10-octobre/05-connecting-tomorrow/Broadband-EN-.pdf>



	<p>country with at least one VHCN capable infrastructure. To assist in the implementation of the strategy, “MyConnectivity” was created. This is a Government backed entity whose mission it is among others to facilitate the deployment of VHCN cabling. One of its main objectives is to establish roadmaps for each municipality that has a significant number of whitespots to accelerate the necessary infrastructure works.</p> <p>The current strategy targets that every household of the country should have access to a network delivering at least 100 Mbps by 2025. In addition, the strategy defines targeted measures to accelerate the build-out of VHCN networks by 2025, by identifying white spots and defining specific solutions in pilot areas.</p> <p>The measures will improve the coordination between the concerned municipalities and the different infrastructure providers to prioritise the remaining whitespots areas. This may be complemented by state-aid measures in the future.</p>
<p>Budget allocated or planned, other resources</p>	<p>The total national budget of the Ultra-high-speed broadband strategy is about EUR 9 100 000.</p> <p>The “MyConnectivity” entity has an allocated national yearly budget of about EUR 1 200 000. EUR 1 000 000 have already been allocated in 2022.</p> <p>The national budget law also contains an additional total amount of EUR 4 500 000 in funds that may be used within a state aid scheme to rollout VHCN networks. Using this budget would require an implementation law that was introduced to parliament in 2023. Nothing has been allocated yet.</p>
<p>Expected impact and related timing</p>	<p>This measure is running until 2025 with the aim to accelerate national VHCN coverage. The main impact is achieved by establishing a strategy for each municipality with significant whitespots and if necessary, design a state aid scheme to cover the households where commercial deployment is too onerous.</p>

Overall 5G Coverage

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 99.60% (2023)
- EU baseline value: 89.30% (2023)

Luxembourg-specific challenges addressed by the measures:

The national 5G coverage is not driven by the demand-side, but by the offering parties: mobile network operators (MNO). The network relies on the interest of the MNOs and the feasibility to cover all populated areas. Based on the feedback received from the MNOs, specific national measures to support the roll-out of the 5G network seem not appropriate in the context of the Digital Decade.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.



Semiconductors

Overview of the measures and timing

National and EU baseline values:

- National baseline value: not available (2023)
- EU baseline value: not available (2023)

Luxembourg-specific challenges addressed by the measures:

Following Luxembourg’s territorial limitations, the country is unlikely, as many other EU countries, to build up a semiconductor industry on its territory. Luxembourg has thus no specific measures in place, apart from keeping a watchful eye on company innovation projects (suppliers for the semiconductor industry). This falls under the RDI state aid regime (European Regulation General Block Exemption Regulation – GBER).

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Edge-nodes

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 8 (2023)
- EU baseline value: 1 186 (2023)

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Creation and large publication of the necessary open-source technology and governance models								
Measure 2: Edge-cloud calls reusing published open-source technologies and governance models								
Measure 3: GAIA-X								

Luxembourg-specific challenges addressed by the measures:

The main challenge is to lower the technical knowledge and financial entry barriers for any entity wanting to join a data economy, promoting multi-AI-agent systems, promoting open-source technologies, data space governance models and GAIA-X standards for technical and semantical interoperability.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

Measure 1: Creation and large publication of the necessary open-source technology and governance model

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	The open-source technology for the creation of the first highly secure edge-nodes will be published between 2025 and 2026. This includes the technical stack, the API (Application Programming Interface), user



	<p>management, contracts, and the governance model. The publication of these information will greatly lower the individual invest necessary to create private, semi-public, and public nodes. The technology is designed to foster cross-border collaboration within the European cloud-edge continuum ramped-up with the help of the IPCEI-CIS²⁹ (see Section 5 for more information about IPCEI-CIS).</p> <p>The measure intends to create an affordable and easily manageable technology granting the necessary rights (for instance data portability) and necessary security features needed for the deployment of a data economy in Europe.</p> <p>Especially in cybersecurity, this open technology is necessary to overcome the manifest market failures in cloud and cybersecurity addressed by the IPCEI-CIS.</p>
Budget allocated or planned, other resources	The budget from 2023 to 2027 is EUR 6 000 000 of national budget (GBER and research budgets).
Expected impact and related timing	<p>Luxembourg will create two nodes hosting the first open cybersecurity data space. This dataspace will be fed with the existing two PB of cybersecurity data made available by the Luxembourg national Cyber Emergency Response Community and will be continuously fed by sensor-data deployed in cloud networks. The access to the data space is limited to any entity having a legitimate interest and will lead to further innovation and development of unattended AI based cybersecurity solutions for SMEs (Planned “joint action” at the European Cybersecurity Competence Centre³⁰). The availability of these tools will further increase the sovereignty and resilience of the European economy and increase trust of SMEs in digital technologies in general and cloud technologies specifically.</p> <p>The expected overall timing for this new measure is from 2024 to 2027.</p>

Measure 2: Edge-cloud calls reusing published open-source technologies and governance models

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Luxembourg fosters the deployment of edge nodes to provide low latencies and specialised services to entities with a high level of digitization and a great need for safe AI and/or collaboration based on technical interoperability. The Luxembourg data driven innovation strategy fosters the participation of all entities in a data economy. The open-source edge-cloud technology and open-source data space governance models will make the necessary and most of all trusted infrastructures and governance models accessible.</p> <p>Luxembourg will publish research, development and innovation calls in the different segments of the economy it wishes to develop. These calls will include references to the open cybersecurity node technologies and governance models to lower the individual investments and efforts and increase interoperability. The calls will refer to GAIA-X compatible standards and data spaces to enhance operative collaboration.</p>

²⁹ <https://www.bmwk.de/Redaktion/EN/Artikel/Industry/ipcei-cis.html>

³⁰ <https://eur-lex.europa.eu/EN/legal-content/summary/european-cybersecurity-network-and-competence-centre.html>



Budget allocated or planned, other resources	The yearly budget is estimated at EUR 3 000 000 – EUR 5 000 000 of national budget (GBER).
Expected impact and related timing	This measure will substantially reduce the individual effort in terms of costs (open-source, co-financing scheme) and in terms of skills (ready-to-use governance models) for the establishment of cloud-edge-nodes. This is an ongoing measure that will be launched in September 2024 and to be continued over the next years

Measure 3: GAIA-X

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	The GAIA-X initiative, which encourages and coordinates the creation, validation and publication of sectoral and cross-border data interoperability frameworks is a powerful catalyst for boosting the data economy. Yet with the complex regulation that is being put in place to strengthen the trust of all data economy stakeholders necessitates guidance for the implementation of interoperable data spaces and the ramping up of trustworthy data intermediaries and data processing infrastructures. For this reason, the Luxembourg Government foresees to increase the number of experts working in this area. They should on the one side encourage companies to get involved in the data economy and on the other side identify potential cross-sector synergies and publish guidance for stakeholders. Luxembourg will create the cybersecurity GAIA-X stream to further enhance interoperability of cybersecurity threat information (based on MISP ³¹ technology – Malware Information Sharing Platform) and operative cybersecurity telemetry.
Budget allocated or planned, other resources	The yearly national budget of the measure is approximately EUR 670 000.
Expected impact and related timing	This measure will significantly reduce the complexity and increase the pertinence for creating cloud-edge nodes for data spaces. GAIA-X is an existing measure that is expected to be extended from 2025 to 2030.

³¹ <https://www.misp-project.org>



Quantum computing

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 0 (2023)
- EU baseline value: 0 (2023)

The measures that directly or indirectly impact the “Quantum Computing” digital target are described in Sections 4 and 5. The measure planned in the context of the Multi-Country Project (MCP) “EuroHPC” has a direct impact on the “Quantum Computing” digital target. This measure is described in Section 5. The “Luxembourg Quantum Communication Infrastructure” (LuxQCI) has an indirect impact on the digital target but helps achieve the general objectives. It will therefore be described in Section 4 of the national roadmap.

Luxembourg-specific challenges addressed by the measures:

No Luxembourg-specific challenges identified.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.



Digital Transformation of Businesses

EU digital targets: digital transformation of businesses:

- d) at least 75% of Union enterprises have taken up:
 1. cloud computing services;
 2. big data;
 3. artificial intelligence;
- e) more than 90% of Union Small and Medium Enterprises ('SMEs') reach at least a basic level of digital intensity;
- f) the Union grows the pipeline of its innovative scale ups and improves their access to finance, leading to at least doubling the number of unicorns.

Take-up of Cloud, Big Data and Artificial Intelligence by businesses

Overview of the measures and timing

National and EU baseline values:

- National baseline value:
32.60% (2023) for Cloud – 32.40% (2023) for Big Data – 14.40% (2023) for Artificial Intelligence
- EU baseline value:
38.90% (2023) for Cloud – 33.20% (2023) for Big Data – 8% (2023) for Artificial Intelligence

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Development of Luxembourg cloud application and services for SMEs								
Measure 2: Financial security services								
Measure 3: OSPO – Open Source Programme Office								
Measure 4: "SME Packages" for Cybersecurity and AI								
Measure 5: Fit 4 Digital - AI								

Luxembourg-specific challenges addressed by the measures:

Due to the limits of full European harmonisation of rules for companies, Luxembourg companies might still rely in some sectors (e.g. accounting) on local services. These services might not yet be provided as cloud services. Luxembourg will try to motivate typical company service providers to modernize their applications by moving them to sovereign cloud and granting data portability to foster the development of additional services such as fraud detection. For companies using legacy technology services, it is furthermore often difficult to extract data from their applications in a standardized format and make this data accessible to big data operations. Finally, some services are provided based on expensive proprietary solutions, by fostering open-source solutions, Luxembourg might be able to create a less discriminatory market in terms of costs.

Estimated investment gap and possible actions to reach the national target values:

In Luxembourg and other European countries, huge budgets are needed to co-finance SMEs developing AI-based unattended and autonomous cybersecurity products and services for SMEs currently unavailable on large scale on the European market. As countries cannot cover the expected budgetary needs, it is planned to propose a "joint action" to the European Cybersecurity Competence Centre to cover up to 50% of the overall budget needs. In general, high initial investments are often cited as hurdles to the uptake of new technologies by most companies.



Description of the measures

Measure 1: Development of Luxembourg cloud application and services for SMEs

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>In 2024, the Government published GBER (General Block Exemption Regulation) – experimental development financed calls for the creation of cloud enabled accounting, tax and ERP services for SMEs that foster interoperability, data portability, data export capabilities and fraud detection and prevention technologies that can be used by multi-tenant service providers specialised in SME needs.</p> <p>By 2025, the first cloud-based services adapted to the Luxembourg context (social security, taxing, e-invoicing, banking, eIDAS services such as digital signatures, digital wallet, and e-archiving) will go online on the Luxembourg cloud providers.</p> <p>Luxembourg is preparing the implementation of a national Health Information System which aims to connect all hospitals to a unique system, and which foresees connection with medical cabinets and long-term care establishments. The roll-out of the first phase of this system is foreseen for 2026. This system will respond to the requirements of the European Health Data Space and will provide a high level of security and especially confidentiality. By 2027, the Government will have put in place API for services used by SMEs for taxation, social security. These API will further enhance the uptake cloud services by SMEs. The majority of private medical cabinets will be connected to their virtual highly secure and collaborative workspace.</p> <p>The developments will have to respect data interoperability criteria (GAIA-X), data portability rights and provide the possibility to export anonymised data to create additional services in the data economy.</p>
Budget allocated or planned, other resources	As the state aid intensity will not be above 40%, the estimate private budget will be around EUR 1 800 000, the public budget around EUR 1 200 000.
Expected impact and related timing	<p>As a lot of SMEs already use accounting and ERP solutions, the migration of these services into cloud solutions, allowing data portability, will contribute substantially to the uptake of cloud-services by SMEs.</p> <p>This measure exists since 2024 and is planned to be extended until 2027.</p>

Measure 2: Financial security services

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The further developments of open banking and instant payment, fraud detection and fraud prevention will be of utmost importance. Luxembourg will in a collective effort create a GAIA-X compliant data space that makes available timely information about fraudsters.</p> <p>Accounting and ERP software will be linked to this data space to consume data on malicious account numbers, domain names and wallet-ids used by mules or fraudsters.</p> <p>This measure directly targets the challenges of insecure platforms.</p>
Budget allocated or planned, other resources	The yearly budget is EUR 500 000, approximately EUR 200 000 of public budget and EUR 300 000 of private budget.



Expected impact and related timing	The impact will substantially reduce invoice fraud ³² and CEO fraud ³³ for companies using this service exchanging information about fraudsters via a GAIA-X compliant cloud data space. Further developments are planned between 2025 and 2027.
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Measure 3: OSPO - Open-Source Programme Office

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	The Service eHandwierk ³⁴ of the Chamber of Skilled Trades and Crafts is counselling small companies in their digitization process and has gathered a great knowledge about the recurrent problems and pitfalls. Together with the Chamber, an Open-Source Programme Office (in the spirit of the EC OSPO ³⁵) will be created to test and recommend the usage of open-source software within small companies. The ecosystem of service providers will be coached in the usage and maintenance of this software.
Budget allocated or planned, other resources	The yearly budget is EUR 150 000 of public budget.
Expected impact and related timing	This measure directly affects the take-up of cloud services by businesses and addresses the challenges of skills improvement as well as discriminatory pricing. This measure started in 2018 and is thus ongoing. It is planned to have the OSPO operational in 2025. The allocated time is expected to cover the period 2023-2030.

Measure 4: “SME Packages” for Cybersecurity and AI

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	Similarly, to the “SME Packages – Digital” (see below), a new program is being developed to support SMEs in their digitalisation process, specifically in the domains of cybersecurity and AI.
Budget allocated or planned, other resources	As this is a State Aid, the budget depends on the number of requests received. The estimated budget for this measure and the below measure, “Fit 4 Digital – AI”, is together EUR 1 000 000.
Expected impact and related timing	This measure directly affects SMEs in their digital transformation. This will be an ongoing measure that will continue over the years.

Measure 5: Fit 4 Digital - AI

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	From autumn 2024, Fit 4 Digital – AI ³⁶ will offer SMEs the opportunity to collaborate with an experienced consultant who will define the challenges the company faces, its objectives and its priority development action(s). The SMEs will also carry out a feasibility

³² https://www.europol.europa.eu/cms/sites/default/files/documents/6_invoice_fraud.pdf

³³ https://www.europol.europa.eu/cms/sites/default/files/documents/ceo_fraud_wm.pdf

³⁴ <https://services.cdm.lu/gestion-entreprise/digitalisation>

³⁵ <https://joinup.ec.europa.eu/collection/ec-ospo>

³⁶ <https://luxinnovation.lu/digitalise-activities/digital-cyber-maturity/fit-4-digital-ai>



	<p>analysis of pre-selected use cases, in particular through the qualitative and quantitative analysis of available internal data.</p> <p>The consultant will draw up a roadmap including a detailed action plan including cost estimates for material investments, the choice of an AI solution (generic or tailor-made) and an estimate of the return on investment.</p> <p>The investments made in furtherance of this plan may be eligible for investment aid. In addition, the fees charged by the consultant accompanying the business through the implementation phase may be eligible for aid for consultancy services.</p>
Budget allocated or planned, other resources	As this is a State Aid, the budget depends on the number of requests received. The estimated budget for this measure and measure 4, "SME Packages" for Cybersecurity and AI, is together EUR 1 000 000.
Expected impact and related timing	<p>This measure allows SMEs to implement an AI strategy within their organisations.</p> <p>This will be an ongoing measure that will continue over the years.</p>

SMEs with at least basic digital intensity

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 57.80% (2023)
- EU baseline value: 57.70% (2023)

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Letzshop.lu								
Measure 2: SME Packages - Digital								
Measure 3: Fit 4 Digital								
Measure 4: E-Invoicing								
Measure 5: Dedicated workshops and practical guidelines								

Luxembourg-specific challenges addressed by the measures:

As Luxembourg is a small country and thus its local market is limited in size, it is important for SMEs to digitalise their services and have an omnichannel offer to attract more customers.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

Measure 1: Letzshop.lu

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Letzshop.lu ³⁷ is an online marketplace supported by the Government and a number of partners who co-finance the project. It is aimed at

³⁷ <https://letzshop.lu>



	<p>all local businesses, regardless of their size, that wish to offer their customers a quick and easy way to order products. Retailers can present their complete range of products in this showcase. For retailers, it is also a way to sell online and digitise their business, be placed among the first search results in search engines, acquire new customers and benefit from personalised assistance.</p> <p>Investments in helping SMEs on the road to digitalisation will be maintained. To increase “online selling”, SMEs active in the retail sector can benefit from support from the national online platform Letzshop.</p>								
Budget allocated or planned, other resources	<p>The budget of Letzshop includes an annual membership fee from the members of the Economic Interest Group, its partners (e.g., the municipalities) and a contribution per participating company depending on their license level. The municipalities pay EUR 1,5 per resident.</p> <p>The planned contribution from the Ministry of the Economy from 2023 to 2026 in thousands of euros is:</p> <table border="1"> <thead> <tr> <th>2023</th> <th>2024</th> <th>2025</th> <th>2026</th> </tr> </thead> <tbody> <tr> <td>500€</td> <td>400€</td> <td>400€</td> <td>400€</td> </tr> </tbody> </table> <p>The budget for the period after 2026 is estimated to remain at EUR 400 000 per year. The overall budget for the Economic Interest Group for 2023 is EUR 1 700 000.</p>	2023	2024	2025	2026	500€	400€	400€	400€
2023	2024	2025	2026						
500€	400€	400€	400€						
Expected impact and related timing	<p>SMEs can have an easy access to an online shop and don’t need to develop specific tools on their own.</p> <p>This is an ongoing measure, and efforts will be maintained to attract as many businesses as possible by offering them personalised assistance.</p>								

Measure 2: SME Packages – Digital

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The SME Packages - Digital³⁸, previously known as “Fit 4 Digital Packages”, aim to implement a digital tool to boost performance in areas such as digital marketing, management systems and electronic invoicing. If the company is eligible and interested, it can apply and ultimately benefit from a financial aid by the Government of up to EUR 5 000 and invest in a digital project with an approved service provider.</p> <p>As part of the “SME Packages – Digital” support programme, companies receive assistance for implementing a digital tool that allows them to establish better online communication with customers and to achieve better business management. Companies can deploy a digital solution with the assistance of a professional and receive guidance from an adviser as they implement their digital strategy.</p> <p>The House of Entrepreneurship from the Chamber of Commerce and the service “e-Handwierk” from the Chamber of Skilled Trades and Crafts and offer companies an initial digital checkup to identify their</p>

³⁸ <https://guichet.public.lu/en/entreprises/financement-aides/regime-sme-packages/soutien-pme/sme-packages-digital.html>



	digital maturity and identify priority actions. They will then guide the companies through the implementation process and conduct a final meeting to evaluate the work that has been achieved.
Budget allocated or planned, other resources	The planned total budget for “SME Packages – Digital” and “Fit 4 Digital” (described below) for 2023 is EUR 3 000 000 and for 2024 – 2028 is EUR 3 500 000. For 2029 and 2030, the estimated budget is EUR 4 000 000. This is a State Aid and the budget depends on the number of requests by companies. Companies are guided to the most suitable of both programs.
Expected impact and related timing	In 2023, EUR 1 310 000 were granted for 262 requests. This is an ongoing measure that is planned to be continued over the next years.

Measure 3: Fit 4 Digital

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The "Fit 4 Digital" programme³⁹ enables SMEs to diagnose their state of digital maturity and draw up a digital transformation roadmap using experts accredited by Luxinnovation – the national innovation agency of Luxembourg.</p> <p>“Fit 4 Digital” is a programme offering guidance and co-funding to businesses. It is spearheaded by Luxinnovation and supported by the Ministry of the Economy and comprises two phases:</p> <ul style="list-style-type: none"> • Phase 1: businesses have the option of having a consultant provide an assessment of their level of digital maturity, in terms of IT infrastructure, cybersecurity and software. The assessment is accompanied by a detailed plan listing various costed actions that could be implemented to improve the business’s digital readiness. State aid is provided, in the form of a capital grant, to cover the cost of the assessment. • Phase 2: the company then chooses whether or not to implement all or some of the recommendations listed in the detailed plan. The investments made in furtherance of the digital readiness plan may be eligible for investment aid. In addition, the fees charged by the consultant accompanying the business through the implementation phase may be eligible for aid for consultancy services
Budget allocated or planned, other resources	The planned total budget for “SME Packages – Digital” and “Fit 4 Digital” for 2023 is EUR 3 000 000 and EUR 3 500 000 for 2024 – 2028. For 2029 and 2030, the estimated budget is EUR 4 000 000. This is a State Aid and the budget depends on the number of requests by companies. Companies are guided to the most suitable of both programs.
Expected impact and related timing	In 2023, EUR 115 000 were granted for 23 requests. This is an ongoing measure that is planned to be continued over the next years.

³⁹ <https://guichet.public.lu/en/entreprises/financement-aides/regime-fit-4/aide-digitalisation.html>



Measure 4: E-invoicing

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Since March 2023, it is mandatory for all economic operators to issue and transmit electronic invoices compliant to the legal obligations in public procurement and concession contracts. Economic operators can transmit their electronic invoices either in an automated way via the international eDelivery network Peppol (peppol.org) or via two alternative non-automated technical solutions on MyGuichet.lu:</p> <ul style="list-style-type: none"> • Online form allowing to manually fill in the data of an invoice and to submit the invoice⁴⁰ • Online form allowing to upload an already compliant electronic invoice⁴¹ <p>Furthermore, SMEs can benefit from the “SME Packages – Digital” to implement an e-invoicing system within their companies (see above). All public sector bodies (all contracting authorities and entities) must be able to receive compliant electronic invoices via the international eDelivery network Peppol.</p>
Budget allocated or planned, other resources	The yearly governmental budget for running, maintaining, and supporting the governmental E-invoicing platform, for continuous evolution and further extension of the solutions linked to eInvoicing and for assistance, coaching and training of the public sector and private sector users of eInvoicing is around EUR 350 000.
Expected impact and related timing	<p>The growth in use of electronic invoices in Luxembourg has been quite considerable following the introduction of this new obligation for economic operators and has gone up from a few dozen invoices in 2021 to around one million electronic invoices in 2023. Electronic invoicing is already significantly, and will even more in the future, contribute to the automatisisation and digitalisation of the business processes linked to invoicing, procurement, and accounting in general in the private sector.</p> <p>This is an ongoing measure that is planned to be continued over the next years.</p>

Measure 5: Dedicated workshops and practical guidelines

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Since 2018, the Luxembourg Chamber of Commerce and the Chamber of Skilled Trades and Crafts offer SMEs support in their digitalisation process to identify the right tools to implement within their companies. They also offer, usually free of charge, awareness-raising workshops, and conferences for business to highlight opportunities linked to digital transformation.</p> <p>In 2023, they were actively involved in preparing companies and especially SMEs for the new legal framework on electronic invoicing (see above). In the context of the new legislative framework on electronic invoicing in Luxembourg, the</p>

⁴⁰ <https://guichet.public.lu/en/entreprises/commerce/marches-publics/facturation/emission-facture-electronique-marche-public-contrat-concession.html>

⁴¹ <https://guichet.public.lu/en/entreprises/commerce/marches-publics/facturation/transmission-facture-electronique-marche-public-contrat-concession.html>



	<p>digitalisation service of the House of Entrepreneurship put in place a helpline for all questions relating to this new legal framework.</p> <p>In addition to these workshops, numerous practical guidelines have been elaborated by the Luxembourg Chamber of Commerce on digital transformation (electronic invoicing, e-commerce, cybersecurity, etc.).</p>
Budget allocated or planned, other resources	The budgetary impact cannot be assessed.
Expected impact and related timing	<p>In 2023, more than 2000 entrepreneurs participated in the workshops from the House of Entrepreneurship regarding topics of digitalisation, development, and business transfer.</p> <p>This is an ongoing measure that is planned to be continued over the next years.</p>

Number of Unicorns

In June 2023, building on the success and on the foundation of prior policy programmes for start-ups, the Government announced a new roadmap for start-ups and for scale-ups called “From Seed to Scale”. This roadmap continues to provide much-appreciated support for the creation of start-ups, which has demonstrated its usefulness and quality, and encourages their development into scale-ups.

Relative to its size Luxembourg will actively contribute to the development of unicorns in Europe by consolidating the elements of support for the Luxembourg start-up ecosystem and putting in place specific measures for scale-ups.

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 2 (2023)
- EU baseline value: 263 (2023)

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: “Seed to Scale” Roadmap								
Measure 2: Fit4Start Accelerator								
Measure 3: Luxembourg Future Fund 2 (LFF 2)								

Luxembourg-specific challenges addressed by the measures:

The measures target both the expansion of the support provided for early-stage start-up development and the development of the scale-up segment. The overall impact of these measures relates to strengthening its resilience and to bringing socio-economic benefits to our population.

Estimated investment gap and possible actions to reach the national target values:

One of the identified gaps to grow the European ecosystem of start-ups and scale-up is the need for larger investors and funds that can invest tickets larger than EUR 50 000 000. As the ecosystem grows in Luxembourg, larger investment tickets will also become an issue to tackle in the future.



Description of the measures

Measure 1: “Seed to Scale” Roadmap

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>In June 2023, the Luxembourg Government presented the roadmap for the future development of Luxembourg's start-up ecosystem⁴². The aim for Luxembourg’s Ecosystem is to reach a new stage of maturity, with a particular focus on the transition of young start-ups to the scale-up level. The roadmap proposes a series of measures specifically adapted to the Luxembourg ecosystem and structured around five main axes:</p> <ol style="list-style-type: none"> 1. Continuing early-stage start-up support 2. A national ecosystem that is better connected, stronger and more visible 3. Improving access to talent for start-ups and scale-ups 4. Creating the right environment for scale-ups 5. A start-up ecosystem anchored at the heart of the European Union
Budget allocated or planned, other resources	A specific budget is not allocated directly to the Seed to Scale Roadmap as it is a roadmap composed of a series of transversal and collaborative initiatives to be developed. Specific budgets will be determined and allocated closer to the start of the different initiatives as it has been done for “Fit4Start” and the Luxembourg Future Fund 2.
Expected impact and related timing	This roadmap will guide Luxembourg’s future action in favour of the start-up ecosystem. It aims at further strengthening the economic environment in Luxembourg by building on the dynamism of start-ups and scale-ups and diversifying Luxembourg’s economy. This roadmap’s implementation will span over the next years.

Measure 2: Fit4Start Accelerator

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Fit4Start⁴³ is the flagship acceleration programme in Luxembourg supported by the Ministry of the Economy and managed by Luxinnovation. Launched in 2015, the national acceleration programme Fit4Start has reached its 14th edition in 2024. The programme, that is organized around three verticals, digital technologies, Space and Health Technologies, provides coaching and grant funding (up to EUR 150 000) to start-ups.</p>
Budget allocated or planned, other resources	Up to EUR 3 000 000 per year of national public budget.
Expected impact and related timing	In 2024, some 429 projects from all over the world were submitted to the programme. This accelerator contributes to identifying, financing, and supporting high potential start-ups contributing therefore to build the pipeline of future European grown scale-ups. This is an ongoing measure that is planned to be continued over the next years.

⁴² <https://gouvernement.lu/en/publications/rapport-etude-analyse/minist-economie/13-roadmap-seed-to-scale.html>

⁴³ <https://luxinnovation.lu/start-and-scale-your-business/develop-your-startup/fit4start>



Measure 3: Luxembourg Future Fund 2 (LFF 2)

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The LFF 2⁴⁴ was created in March 2023 as the successor initiative to the existing Luxembourg Future Fund (LFF 1). The LFF 2 targets risk-adjusted financial returns whilst simultaneously stimulating the diversification and sustainable development of the Luxembourgish economy with investments across different sectors including climate technologies, Fintech, cybersecurity, energy resilience, life science, medical technologies, and new space technologies.</p> <p>Investments under LFF 2 continue to take place in the form of fund commitments and/or co-investments. Compared to LFF 1 the investment scope has been broadened and will now:</p> <ul style="list-style-type: none"> • Include investment funds and businesses already established in Luxembourg, thereby allowing these entities to expand local operations further; • Target more mature innovative businesses by providing hybrid debt-equity investments; • Investments will also be considered for more mature companies, facing complex and uncertain market environments, including businesses exposed to changes in digitalisation, supply chain disruptions or companies transitioning to a low-carbon business model.
Budget allocated or planned, other resources	<p>With EUR 200 000 000 in total financing commitments split between Société Nationale de Crédit et d'Investissement (SNCI) and the European Investment Fund, the LFF 2 provides additional firepower in support of innovative projects in Luxembourg.</p> <p>National SNCI provides EUR 160 000 000 and the EIF EUR 40 000 000.</p>
Expected impact and related timing	<p>The LFF 2 stimulates the diversification and sustainable development of the Luxembourgish economy by making available financial resources to venture capital and private equity funds and early to later stage innovative businesses.</p> <p>This is an ongoing measure that is planned to be continued over the next years.</p>

⁴⁴ https://www.eif.org/what_we_do/resources/lff2/index.htm



Digitalisation of Public Services

EU Targets: digitalisation of public services:

- a) 100% online accessible provision of key public services for Union citizens and businesses;
- b) 100% of Union citizens have access to their medical records (electronic health records (EHR));
- c) at least 80% of Union citizens use a digital identification (ID) solution.

The reaching of these targets pre-supposes a robust internal system that is interoperable and efficient. Some of the actions below reflect these pre-conditions and building blocks to achieve end-to-end digitalisation. It is also important to note that the Government IT Centre focuses on the implementation of standardised platforms according to the "as a service" model.

Luxembourg's digitalisation policy is based on its Electronic Governance strategy 2021-2025 which has been agreed by all the members of the government. A new digitalisation strategy will be prepared and developed by the end of 2024 together with all members of the Interministerial Committee for Digitalisation through creative workshops. The new strategy should be a Digital Government Strategy 2026-2030.

Since 2023, the Ministry for Digitalisation offers a service to all ministries and administrations of the central administration where they can ask for support in the elaboration of an individualised digital roadmap regarding their specific projects which support the implementation of the central digitalisation strategy.

Digitalisation of public services for citizens and for businesses

The targets "Digitalisation of public services for citizens" and "Digitalisation of public services for businesses" have been combined as the measures described below target both, citizens and businesses, at the same time.

N.B.: The internal costs mentioned throughout this section are always estimations.

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 94.78/100 (2023) for citizens – 96.67/100 (2023) for businesses
- EU baseline value: 79.44/100 (2023) for citizens – 85.42/100 (2023) for businesses

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: National strategy on electronic governance 2021-2025 (eGovernment Strategy) and preparation of a new strategy, Digital Government Strategy 2026-2030								
Measure 2: Draft law on the electronic signature of administrative documents and secure platform for public documents								
Measure 3: Electronic signature verification and validation platform								
Measure 4: MyGuichet.lu interface: omni-channel delivery of public services (improvements)								
Measure 5: GovTech Lab Innovation partnerships								
Measure 6: Conseil à la Digitalisation – Digital Advisory Service								
Measure 7: MyGuichet.lu Virtual Meeting Room								
Measure 8: Draft law on the use of data in a trusted environment								
Measure 9: Digital Mandate								



Luxembourg-specific challenges addressed by the measures:

No Luxembourg-specific challenges identified.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

Measure 1: National strategy on electronic governance 2021-2025 (eGovernment Strategy) and preparation of a new strategy, Digital Government Strategy 2026-2030

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The “Electronic Governance 2021-2025” strategy, drawn up jointly by the Ministry for Digitalisation and the Government IT Centre, was adopted by the Government Council in 2021 and is thus an ongoing measure.</p> <p>One of the key areas of focus of the Ministry for Digitalisation aims at reinforcing eGovernment and enabling the transition to digital government, a concept that covers the use of technologies as part of the strategies to modernise the State, the purpose being to create genuine added value for citizens, businesses, and public authorities. The eGovernance strategy is part of this approach, determining the essential elements of the State's successful digital transition to provide the citizens with access to high quality digital services and ensure the gradual transition to digital governance and a data-driven public sector, as advocated by international bodies.</p> <p>In order to update the strategy, it is foreseen to present in October 2024 to the members of the Interministerial Committee for Digitalisation an overview of the current state of progress in the field of implementation of the national strategy on electronic governance and to kickstart the preparations for the elaboration of a new strategy for the digitisation of the central administration, called the "Digital Government Strategy", a new strategy for the next 5 years, i.e. for the period 2026-2030.</p>
Budget allocated or planned, other resources	The budget to elaborate the strategy 2021-2025 - has been 3 full-time people.
Expected impact and related timing	<p>This measure addresses the challenges with interoperability of administrations and the use of data.</p> <p>Efforts to analyse the progress on the goals set out in this strategy are ongoing, and concrete actions to propose an updated plan for the years 2026-2030 will start in 2024. It is foreseen to continue to align this strategy with the Digital Decade targets and goals where possible.</p>

Measure 2: Draft law on the electronic signature of administrative documents and secure platform for public documents

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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Short description of the measure	<p>To facilitate and accelerate the transmission of documents in administrative matters, between the Government and the various administrations, and between administrations and citizens, it has been proposed to introduce the possibility of affixing the electronic signature and the electronic seal in administrative matters.</p> <p>The (draft) law and the accompanying platform will further contribute to the digitalisation of administrative processes, as they will enable administrative acts to be concluded in digital format. This means that many of the processes that are based on a signed document can be carried out in their entirety in digital form which will lead to faster processing and less waiting time for citizens and businesses.</p> <p>In addition, digital inclusion will also be enhanced by the functionality of affixing a digital identifier on public documents, which will allow any citizen to access the original acts stored on a new secure platform simply by knowing the corresponding identifier, thereby enhancing trust.</p>
Budget allocated or planned, other resources	<p>The costs (national public budget only) for the secure platform for public documents amount to</p> <ul style="list-style-type: none"> • external development costs: EUR 326 000 EUR VAT excluded (budgeted for the entire project) • internal resources: EUR 35 670 EUR VAT excluded (expended as of 30.6.2024)
Expected impact and related timing	<p>The draft law and the accompanying platform will further contribute to the digitalisation of administrative processes.</p> <p>The draft law has been submitted to the Parliament and is undergoing the official procedure. It is estimated that the law will come into effect in 2025.</p>

Measure 3: Electronic signature verification and validation platform

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>This platform allows state agents to verify and validate electronic signatures in accordance with the requirements of the eIDAS regulation. The user uploads the document to the platform that validates the signatures, stamps and electronic timestamps present on the document on the basis of the European trusted lists and presents the results of the validation to the user in a simplified way. The platform further allows to download a detailed report and print the validation summary in a print-friendly format. The document is destroyed automatically on the platform after the validation report is issued.</p>
Budget allocated or planned, other resources	<p>The costs (national public budget only.) for the platform amount to</p> <ul style="list-style-type: none"> • external development costs: EUR 59 000 EUR VAT excluded (budgeted for the entire project) • internal resources: EUR 47 013 EUR VAT excluded (expended as of 30.6.2024)
Expected impact and related timing	<p>The platform will allow state agents to receive electronically signed documents from citizens and companies and validate the electronic signature on the document. Citizens and businesses will be able to submit more electronic documents to administrations and more</p>



	<p>administrative procedures can be redesigned to be end-to-end digital.</p> <p>The platform is operational since April 2024.</p>
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Measure 4: MyGuichet.lu: omni-channel delivery of public services

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>MyGuichet.lu the interactive single point of contact for accomplishing administrative procedures online for citizen and companies, integrating various administrative formalities on a single internet portal that gathers all relevant procedures, forms and information made available by the State.</p> <p>The portal's primary objective is to provide an omni-channel, secured access to eServices (accomplish procedures, appointment booking, delivery of official documents and access to authentic sources), improving their value and quality through innovative, digital functionalities.</p> <p>MyGuichet.lu evolves constantly with new functionalities and new digitalised public services.</p>
Budget allocated or planned, other resources	<p>It is challenging to budget this measure because the portfolio of eServices offered on MyGuichet.lu are in constant evolution. Every year the roadmap of functionalities and eServices to be developed is revised.</p> <p>The total budget for MyGuichet.lu developments foreseen for</p> <ul style="list-style-type: none"> • 2024: EUR 5 600 000 + costs for 21 internal people • 2025: EUR 6 300 000 + costs for 25 internal people. <p>A few development projects for MyGuichet.lu (not mentioned in detail here), approximately EUR 250 000, are part of Luxembourg's Recovery and Resilience Plan and financed by the European Commission.</p>
Expected impact and related timing	<p>Since MyGuichet.lu is the single point of contact for public eServices, it is important to invest resources in the ongoing development of this platform. New functionalities allow to bring new public services online that could not be digitalised before and to enhance the usability and accessibility of existing eServices, making the switch from paper to online services more attractive for citizen and businesses.</p> <p>The continuous improvements of the MyGuichetApp are a permanent initiative.</p>

Measure 5: GovTech Lab innovation partnerships

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>The GovTech Lab⁴⁵ is a technological innovation accelerator for the Luxembourg State. It uses open innovation to work with internal and external actors on the development of the digitalisation of public services and integration of new technologies. It organises events around GovTech and aims to create a real GovTech community in Luxembourg. The GovTech Lab is a joint initiative of the Ministry for Digitalisation and the Government IT Centre. On top through the</p>

⁴⁵ <https://govtechlab.public.lu/en.html>



	<p>implementation of its innovation partnerships, the GovTech Lab has initiated an innovative approach regarding procurement in the Luxembourg State.</p> <p>This measure is about creating and implementing innovative, technological solutions that contribute directly to providing online public services to citizens.</p>
Budget allocated or planned, other resources	The total annual budget of approximately EUR 350 000 EUR is covered by the Ministry for Digitalisation. In addition, an annual budget is allocated by the CTIE for the implementation of the technological solutions.
Expected impact and related timing	The GovTech Lab is a permanent initiative created in November 2021 that launches a minimum of two innovation partnerships per year.

Measure 6: Conseil à la Digitalisation – Digital Advisory Service

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	In 2023, the Ministry for Digitalisation officially launched the Digitalisation Advisory Service (“Conseil à la Digitalisation” ⁴⁶). This unit is responsible for analysing and assessing the maturity of public administrations in terms of their digital transition, which is measured using a "Digital Maturity Assessment". This unit also provides support to ministries and public authorities in implementing personalised digital roadmaps, taking into account the objectives and principles set out in the eGovernance Strategy and the technological standards applied by the Government IT Centre.
Budget allocated or planned, other resources	Currently, the department consists of two fulltime employees and is expected to grow in the coming years.
Expected impact and related timing	The aim in creating this advisory service is to support and assist public administrations in the digital transition of their administrative procedures and internal processes to improve online public services for citizens and businesses.

Measure 7: MyGuichet.lu Virtual Meeting Room

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>One of the axes regarding digitalisation of public services is to enable citizens to carry out as many procedures as possible using IT tools. However, it may be essential that a live exchange can take place between an agent in charge of a case and the citizen.</p> <p>The aim of this Virtual Meeting Room⁴⁷ is to enable public administrations to offer virtual appointments by video conference in a secure and confidential environment. Citizens and businesses will be able to have an appointment with an administration virtually by video conference without travelling to a physical counter.</p>
Budget allocated or planned, other resources	The costs for the platform amount to external development costs of EUR 217 260 VAT excluded (budgeted for the entire project).

⁴⁶ <https://mindigital.gouvernement.lu/fr/dossiers/2023/conseil-a-la-digitalisation.html>

⁴⁷ <https://govtechlab.public.lu/en/call-solution/2022/virtualroom.html>



	The MyGuichet.lu Virtual Meeting Room is part of the Luxembourg's Recovery and Resilience Plan and financed by the European Commission.
Expected impact and related timing	This measure allows to bring processes online that need a direct and human interaction between a citizen and a civil servant. This videoconferencing solution, enabling a citizen to interact remotely and in real time with the administration is in place since September 2024.

Measure 8: Draft law on the use of data in a trusted environment

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	<p>The main purpose of this bill is to introduce the "once only" principle. A secondary purpose is to supplement the implementation of the Data Governance Act with the necessary national provisions. This draft law will imply a project programme for the valorisation of data in a trusted environment and bring together all the projects required to meet the obligations set out in national and European legislation. Among others, projects will include a harmonised approach for the public data inventory, a semantic repository with shared standards, a single point of information on public sector data containing among others a data catalogue and data access requests, a data science platform for furthering data driven policy and decision making, new training courses in relation to public sector data, or the establishment of a real and tangible data culture in the Luxembourg public sector. This draft law will as well support the implementation of the National Interoperability Framework, and the work of the National Committee for Interoperability ("Comité national pour l'interopérabilité" - CNI) on the Once only principle ("Groupe de travail thématique transversal - Once only principle" - G3T - OOP) to systematise and accelerate Luxembourg's Once only approach. There are 3 concrete projects:</p> <ol style="list-style-type: none"> 1. The systemisation of the Once only approach on the Luxembourg's single digital gateway for administrative procedures. 2. The automatisisation and proactive implementation of the administrative procedures around the birth of a child. 3. The automatisisation and proactive implementation of the administrative procedures around the death of a person.
Budget allocated or planned, other resources	Three full-time people for the draft law and the budget of the programme has to be defined later.
Expected impact and related timing	<p>The legislative measures introduced by the bill are expected to increase expediency and efficiency of procedures for citizens, businesses, and public bodies, and to generate a significant administrative burden reduction for the further processing of public sector data and to boost the valorisation of data within the public administration and with the private sector.</p> <p>All necessary financial, human, and technical resources have been engaged to ensure a fully operational system by the end of 2025, when the bill is foreseen to be adopted.</p>



Measure 9: Digital mandate

New measure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Short description of the measure	As a wider range of public sector procedures become more and more accessible in digital form, one can observe that these digital procedures are often faster, more efficient, and more user-friendly than their conventional counterparts. However, a good number of able adults do not have access to these procedures due to a lack of means, skills, or knowledge in the digital domain or simply because they do not want. Giving these people the opportunity to mandate another trusted person to carry out these digital procedures on MyGuichet.lu on their behalf allows them to benefit from the advantages of digital technology directly and fully.
Budget allocated or planned, other resources	The budget figures are not yet available.
Expected impact and related timing	The digital mandate project closes the gap between capable people who are digitally savvy and those who have limited abilities by creating access to digital procedures via a proxy. Through a trusted person, these people can therefore benefit from user-friendly, fast, and efficient online procedures without having to travel. The first iteration of the digital mandate via the MyGuichet.lu platform limited to able adults will go live at the end of 2025. After this first iteration, further aspects of the digital proxy will be developed with the respective audiences such as for example people under guardianship or curatorship, the surviving relatives of a deceased person and more.

Electronic identification (eWallet and eID)

Overview of the measures and timing

National and EU baseline values:

- National baseline value: e ID scheme notified (2023)
- EU baseline value: not available (2023)

Luxembourg-specific challenges addressed by the measures:

As of 2023, Luxembourg already has a national eID scheme in place to which citizens have access. In 2024, the development of a national eWallet was cancelled. Luxembourg will continue its efforts by working on the implementation of the European Digital Identity Wallet.

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.



eHealth composite indicator on the availability of electronic medical data

Overview of the measures and timing

National and EU baseline values:

- National baseline value: 76.10/100 (2023)
- EU baseline value: 79.12/100 (2023)

Overall timeline:

	2023	2024	2025	2026	2027	2028	2029	2030
Measure 1: Organise meetings with and for software vendors and healthcare institutions' chief information officers								
Measure 2: Organise (in)formation meetings for healthcare providers and invite them to work groups								
Measure 3: Continuous assessment of need for functional evolutions								
Measure 4: Roll out medical ePrescription/eDispensation service on national level								
Measure 5: Offer information sessions on the Electronic healthcare record for different patient target groups								
Measure 6: Implement further accessibility improvements to eSanté portal								

Luxembourg-specific challenges addressed by the measures:

Following the Luxembourg 2023 results for the eHealth composite indicator, four major issues have been identified:

- **Observation 1:** Timely and automatic update of available healthcare data is needed. Some healthcare data (e.g., hospital discharge letter, essential healthcare data sets) are not timely and automatically updated by healthcare providers (HCP). Although technical specifications and possibilities are available, they are not always implemented by the software vendors or IT departments of HCP institutions.
- **Observation 2:** Due to the unavailability of specific services (e.g., ePrescription/eDispensation of medicinal products), some healthcare data cannot be uploaded by healthcare professionals (HCP).
- **Observation 3:** Connectivity to the national eHealth platform of the following HCP institutions can be improved: public/private rehabilitation centres, public/private geriatric nursing homes, and private mental health facilities.
- **Observation 4:** absence of legal basis and/or provision of additional measures to support equal access opportunities for disadvantaged groups (citizens with low digital and health literacy, disabled citizens, elderly).

Estimated investment gap and possible actions to reach the national target values:

No investment gap identified.

Description of the measures

The following measures are proposed to overcome the hurdles related to the four major issues:

In response to **observation 1 and 4:**



Measure 1: Organise meetings with and for software vendors and healthcare institutions' chief information officers

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>This measure intends to incite software editors/IT departments to implement the technical specifications and foster action from both parties involved, meaning software vendor/IT department and HCP respectively.</p> <p>To keep software editors / CIOs informed about ongoing and new projects, Agence eSanté will continue to hold at least two "group" information sessions per year and have individual meetings on an ad hoc basis.</p>
Budget allocated or planned, other resources	<p>The measure is part of Agence eSanté's missions and budgeted as follows:</p> <ul style="list-style-type: none"> • Budget per year: EUR 25 600 • Total budget (8 years): EUR 204 800
Expected impact and related timing	<p>This measure will help incite software editors/IT departments to implement the technical requirements allowing the data exchange. It is an ongoing measure with continuous effort from 2023 to 2030.</p>

In response to observation 1:

Measure 2: Organise (in)formation meetings for healthcare providers and invite them to work groups

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Keeping HCP informed about the eSanté services, here particularly the DSP (Dossier de Soins Partagé) and inviting them to work groups is a way to raise their awareness about the service, reinforce/underline the importance of their role as producer of data that must be uploaded into the DSP, and will foster their uptake.</p>
Budget allocated or planned, other resources	<p>The measure is part of Agence eSanté's missions and budgeted as follows:</p> <ul style="list-style-type: none"> • Budget per year: EUR 15 525 • Total budget (8 years): EUR 124 200
Expected impact and related timing	<p>This measure intends to incite healthcare professionals to adhere to upload/update data in the DSP. It is an ongoing measure with continuous effort from 2023 to 2030.</p>

Measure 3: Continuous assessment of need for functional evolutions (to reply to HCP needs)

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	<p>Through group and individual meetings with HCPs, Agence eSanté will continue to assess whether additional new functionalities are to be put in place to make the DSP responsive to the HCP's needs in their daily practice and evaluate the additional investment required for the respective functional evolutions.</p>
Budget allocated or planned, other resources	<p>The budget is inherent to Agence eSanté's missions and included in Agence eSanté's budget as follows:</p> <ul style="list-style-type: none"> • Budget per year: EUR 15 525 • Total budget (8 years): EUR 124 200
Expected impact and related timing	<p>It is an ongoing measure with continuous effort from 2023-2030.</p>



In response to **observation 2**:

Measure 4: Roll out medical ePrescription/eDispensation service on national level

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	The national multimodal ePrescription service is foreseen to be deployed for the following use cases (in chronological order of expected timing of roll out): for laboratory tests (starting 2024), medication (starting 2024), nursing care (starting S2 2024), medical imaging (starting 2025). Since ePrescription is the basis of the majority of healthcare acts, this will have an important positive impact on the uptake of the DSP.
Budget allocated or planned, other resources	Foreseen in Agence eSanté's budget as follows: <ul style="list-style-type: none"> • Total budget 2022-2024: EUR 2 748 000, which represents an annual budget of EUR 916 000 • Total budget 2025-2027: EUR 1 668 141, with annual distribution of EUR 546 862 for 2025, EUR 555 666 for 2026 and EUR 565 613 for 2027
Expected impact and related timing	It is an existing measure as it is foreseen in Agence eSanté's roadmap. The roll-out of the ePrescription/eDispensation service is estimated for 2025/2026.

In response to **observation 4**:

Measure 5: Offer information sessions on the Electronic healthcare record for different patient target groups

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	Agence eSanté will continue to hold information sessions on the DSP at its own initiative and at the initiative of and in collaboration with relevant stakeholders and associations, for example at the occasion of congresses, exhibitions, at associations' assemblies, etc.
Budget allocated or planned, other resources	The measure is foreseen in Agence eSanté's budget as follows: <ul style="list-style-type: none"> • Budget per year: EUR 23 050 • Total budget: EUR 184 400
Expected impact and related timing	It is an ongoing measure with continuous effort from 2023-2030.

Measure 6: Implement further accessibility improvements to eSanté portal

New measure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Short description of the measure	In June 2023, Agence eSanté implemented in the national eSanté portal a first series of measures to facilitate health data access for disabled citizens, mainly for people with vision impairment. In order to further enhance accessibility for disabled persons (e.g., with hearing problems) and compliance with the law " <i>Loi du 28 mai 2019 relative à l'accessibilité des sites internet et des applications mobiles des organismes du secteur public</i> " additional actions will be undertaken to put in place functions that facilitate accessibility for all citizens.
Budget allocated or planned, other resources	EUR 40 000 one-off budget for implementations in 2025.
Expected impact and related timing	This is an ongoing measure initiated in 2024 that is planned to be continued over the next years.



Section 4: Main policies, measures and actions to contribute to the general objectives

This section describes the main policies, measures, and actions that Luxembourg is planning on a national level and that will help to achieve the general objectives listed in Article 3 of the Decision establishing the Digital Decade Policy Programme 2030.

This chapter refers only to measures that are complementary to the targets and are considered to also contribute to the achievement of the objectives listed in Article 3. Measures from Section 3 will therefore not be repeated.

Actions, policies, and measures related to the general objectives

Digital citizenship

(a) Promoting a human-centred, fundamental-rights-based, inclusive, transparent, and open digital environment where secure and interoperable digital technologies and services observe and enhance Union principles, rights and values and are accessible to all, everywhere in the Union.

(b) Reinforcing Member States' collective resilience and bridging the digital divide, achieving gender and geographic balance by promoting continuous opportunities for all individuals, developing basic and advanced digital skills and competencies, including through vocational and professional training, and lifelong learning, and fostering the development of high-performing digital capacities within horizontal education and training systems.

(g) Ensuring that online participation in democratic life is possible for everyone, and that public services, health and care services are also accessible in a trusted and secure online environment for everyone, in particular for disadvantaged groups including persons with disabilities, and in rural and remote areas, offering inclusive, efficient, interoperable and personalised services and tools with high security and privacy standards.

These objectives are in line with chapters 1, 2, 4, and 5 of the European Declaration on Digital Rights and Principles for the Digital Decade: Putting people at the centre of the digital transformation, Solidarity, Participation in the digital public space, and inclusion and Safety, security, and empowerment.

Aid scheme for low-income households to reduce monthly broadband costs

Households that are eligible for the means tested cost of living benefit also get a voucher which gives them the right to a EUR 10 discount on their fixed broadband subscription.

- Budget: Approximately EUR 1 200 000 of national public budget.
- Timing and expected impact: Yearly issuance of vouchers that aims to increase the take up of flat rate (no traffic cap) fixed broadband services among poorer households.

New approach for awareness raising activities on protection of personal data.

Almost 6 years after entering into application of the GDPR it has been recognised by EU regulators (DPAs) that the general maturity level of many public and private actors regarding the protection of personal data and how to achieve compliance is still quite low. This is critical in times of an accelerated digitalisation of the society and with the democratisation of artificial intelligence to maximise the uptake of opportunities offered by these technologies while safeguarding fundamental rights and enhancing trust into operators of digital services. Therefore, the CNPD started in 2022 initiatives to adapt its pedagogical approach including



presentation formats and communication channels to increase the impact of awareness raising and training tools on SMEs, independents, and the general public. This is best reflected by the following initiatives: Introductory training sessions to GDPR for non-experts (Data Protection Basics⁴⁸), DaProLab workshops on AI⁴⁹, Communication campaign including videoclips “Your data? Your rights!”⁵⁰, series of media articles and information reports (Protection des données⁵¹, numérisation et innovation au Luxembourg⁴⁶, Cyberattack resilience⁵², GDPR Certification⁵³, etc.), CNPD booth at NEXUS2050 conference⁵⁴, DAAZ eLearning platform for GDPR compliance⁵⁵).

- **Budget:** The national budget for the different initiatives (training sessions, workshops and campaigns) is approximatively EUR 24 000 each year.
- **Timing and expected impact:** End 2025 a new strategic plan of the CNPD will be elaborated and the achievements of the running period (2022-2025) will be evaluated and adapted if necessary.

National strategy on public sector’s digital data preservation (2024-2030)

The Ministry of Culture is aware that huge progress has been made to digitize public sector procedures or tools. However, digital preservation is rarely addressed and not often taken into consideration. Some data is no longer collected nor preserved. Other data is not archived anymore, because of the technical aspects guarantying their authenticity or validity.

The National archives decided, after helping all the public sector entities to define how to deal with their documents and data (conventions de tableaux de tri), to help them to prioritize digital preservation operations on the data they produce.

- **Budget:** Approx. EUR 500 000 of national public budget yearly.
- **Timing and expected impact:** This measure addresses the challenges with interoperability of administrations and the long-term preservation of data. All public sector entities will be able to adopt their digital preservation plans until 2030, to find solutions to preserve the data that has to be kept.

Digitalskills.lu: the platform dedicated to developing digital skills and talent

Luxembourg uses the Digital Skills and Jobs Coalition platform⁵⁶ initiated by the European Commission as an important tool for digital skills promotion. In 2024, the Department of Media, Connectivity and Digital Policy gave the digitalskills.lu platform in the hands of a wider governing board comprising: the Ministry of Labour, the Ministry of Education, the National Employment Agency, the Chamber of Employees, the Chamber of Commerce and the Chamber of Skilled Crafts. The Department of Media, Connectivity and Digital Policy keeps an observing and counselling role.

After 2024 the mission will remain the same: promote and develop digital skills for everyone - from primary school students to ICT professionals. DigitalSkills.lu serves as a “matchmaking” platform for digital skills and jobs stakeholders. The platform informs people of training opportunities and the latest news and events relating to digital themes. Moreover, this tool is directly linked to initiatives in EU Member States thanks to an interoperability system with the European Digital Skills and Jobs Platform.

The new Board plans to continue thematic meetings and webinars for its members, but will organize major events pertaining to digital, data and AI Skills under the Digital Skills and Jobs Coalition label.

- **Budget:** The Women in Digital Empowerment - WIDE coordination task is co-financed via a mutually national shared yearly budget of EUR 70 000.

⁴⁸ <https://cnpd.public.lu/fr/actualites/national/2024/07/dpbasics-q32024.html>

⁴⁹ <https://cnpd.public.lu/fr/actualites/national/2024/05/daprolab-ia-mai-2024.html>

⁵⁰ <https://cnpd.public.lu/fr/actualites/national/2024/01/droit-information.html>

⁵¹ <https://cnpd.public.lu/fr/actualites/national/2024/07/pdd-lux-premier-retour-experience.html>

⁵² <https://cnpd.public.lu/fr/dossiers-thematiques/securite-informatique/attaques-informatiques.html>

⁵³ <https://cnpd.public.lu/fr/dossiers-thematiques/securite-informatique/attaques-informatiques.html>

⁵⁴ <https://cnpd.public.lu/fr/actualites/national/2024/06/nexus2050-2024.html>

⁵⁵ <https://cnpd.public.lu/fr/actualites/national/2024/06/lancement-daaz.html>

⁵⁶ <https://digitalskills.lu>



- Timing and expected impact: The medium-term objective of the Digital Skills Platform is to accompany newer digital skills trends.

Interactive dashboard JobInsights

As sectoral studies represent a huge amount of work in terms of analysis and then updating, ADEM has made another form of tool available to the general public. In February 2024, ADEM presented a new interactive dashboard available on its website and on www.jobinsights.lu. This tool aims to inform a broad panel of citizens (general public, journalists, experts, employers, jobseekers, training institutes...) on employment opportunities and trends in terms of professions and skills. This includes the possibility to focus on trends regarding ICT jobs and digital skills. The dashboard is based on job offers declared to ADEM.

- Budget: No specific budget is dedicated to this measure, as it is part of the regular activities of ADEM's statistics team.
- Timing and expected impact: The objective is to provide all interested people with easy and up-to-date access to key information on professions, trends and skills required by employers, to help with career and training guidance. Another objective is also to further strengthen transparency on the job market.

Draft bill "Skills-Plang"

In response to the rapid and significant changes in the job market driven by technological, regulatory, environmental, and societal shifts, ADEM introduced a draft bill "Skills-Plang" in June 2023. As industries evolve, new jobs emerge, some become obsolete, and many existing roles are substantially transformed. With 14% of jobs at high risk of automation according to the OECD, and a pressing need for upskilling and reskilling, the Skills-Plang aims to secure employability and prevent unemployment. This initiative builds on the insights from the pilot project "Luxembourg Digital Skills Bridge" and focuses on providing intensive training for employees at risk of job automation. Although the bill has not yet been voted on, it addresses the gap in current training support, offering more substantial financial and methodological assistance to employers for targeted employee development. The proposed bill reflects collaborative efforts, aiming to make a significant impact in preparing the workforce for future challenges.

- Budget: The budget for this measure is EUR 1 000 000 coming exclusively from the national budget. Companies can ask for reimbursements once their employees have participated in specific training courses.
- Timing and expected impact: The law has not been voted yet. The measure aims to support and accompany companies that are confronted to technological change linked to digitalisation, ecological changes, or societal developments. Employees shall be encouraged to acquire the necessary skills to be able to fulfil their tasks in a professional environment that is undergoing a constant evolution. This will lead to a stronger resilience of the economy in general and the labour market in particular.

LevelUp

In 2023, the Service de Coordination de la Recherche et de l'Innovation Pédagogiques et Technologiques (SCRIPT) of the Ministry of Education, Children and Youth created the project LevelUp to facilitate the access for schools to national and international competitions in different categories, such as the field of coding and computer sciences.

One of the examples is the "Lëtzebuerger Informatikolympiad (LIO)", a national high school programming competition that is organized annually by the non-profit association of the same name, with the public support of the SCRIPT and the Centre de Gestion Informatique de l'Éducation (CGIE).

In 2023, the competition is already organized for the 33rd time. The competition aims to identify young students with special skills in solving problems on computers, designing algorithms, and implementing programs using a programming language.

- Budget: Unfortunately, a specific budget for the LevelUP project cannot be provided, as the budget comes out of the regular budget of the SCRIPT.



- Timing and expected impact: The project started in 2023 and it is foreseen that it will run over the next years. The project is expected to interest children at a young age to approve their digital skills in a playful way and facilitate the developments of these skills.

Development of a new version of Guichet.lu for better accessibility

Guichet.lu is the informational counterpart of MyGuichet.lu and gathers the necessary information needed by citizen and businesses to carry out administrative formalities, no matter if they can be carried out online, on paper or in person. The sections dedicated to simple language and to inclusion ensure that people with disabilities can play an active part in society. It thus is a key measure regarding to digital citizenship and providing access to public services to everyone. The development of new functionalities is ongoing.

- Budget: The approximate national budget (internal and external costs) is of EUR 900 000, VAT excluded.
- Timing and expected impact: The new version of Guichet.lu has been launched officially in January 2024. The goal is to make the content of Guichet.lu as accessible as possible for everyone. Guichet.lu is a key platform of eGovernment and is an ongoing project that will run until 2030. A new feature called “life events” has been presented by the Minister for Digitalisation and this feature will be further developed.

Decentralisation of Guichet.lu Service Point

The Guichet.lu Service Point, located in the country's capital, welcomes citizens to help them with administrative procedures. The decentralized service point project aims to bring administrative services closer to citizens by establishing mobile or fixed service points in strategic locations. These service points will allow users to easily access a full range of administrative services, as well as assistance. Beginning of October 2024, a public consultation takes place to gather input from citizens on what a decentralized service point should look like. This consultation targets specifically people who are potentially digitally excluded to ensure their needs and preferences are considered in the implementation of the project. The consultation employs various methods, including online surveys, community meetings, and focus groups, to reach a diverse audience.

- Budget: No budget available.
- Timing and expected impact: Following the public consultation in October 2024, the first mobile service point is expected to be operational by July 2025. The decentralized service point project is expected to significantly improve access to public services, especially for residents in remote areas. By providing convenient and efficient access to administrative services, the project aims to reduce travel time and costs for citizens, enhancing overall satisfaction and engagement with public services in a more accessible way.

Digital skills initiatives to foster digital inclusion of all citizens

The current National Action Plan for Digital Inclusion (2021-2024)⁵⁷ brings together 40 concrete initiatives to foster the digital inclusion of all citizens. One of the action plan's three priorities is the development of basic digital skills and 18 of the plan's initiatives aim to improve the basic digital skills of Luxembourg's citizens.

This action plan is budgeting a yearly call for projects to promote digital inclusion in Luxembourg. The projects shall allow the development of basic digital skills in general and address people with difficulties to apprehend digital Government applications, in particular. Twelve of the twelve projects funded since 2023 have focused specifically on developing basic digital skills and digital citizenship.

Since 2021, the Ministry for Digitalisation has developed 13 specifically tailored vocational training modules in basic digital skills in collaboration with a continuous vocational training establishment (ErwuesseBildung ASBL – Adult Education). The various training courses are made available free of charge to actors operating in the social sector to make them accessible to as many people as possible throughout the Grand Duchy.

⁵⁷ <https://mindigital.gouvernement.lu/en/publications/document-de-reference/panin-2021.html>



- **Budget:** The total budget depends on the individual initiatives. The national annual budget for the yearly call for projects to promote digital inclusion is EUR 250 000. The national annual budget for vocational training modules in basic digital skills is EUR 60 000.
- **Timing and expected impact:** In 2024, the current national action plan is being evaluated. In 2025, a new national action plan will be elaborated within an inter-ministerial working group where experiences from various non-state actors close to populations isolated from the digital world also flow in. This action plan will set out new concrete initiatives to promote digital inclusion in Luxembourg.

Organisation of Digital Inclusion events

Every year, the Ministry for Digitalisation organises a National Digital Inclusion Day on 17 May, coinciding with the World Telecommunication and Information Society Day. The event includes participatory workshops for associations with an inclusion focus and an interdisciplinary forum on digital inclusion. The forums foster collaboration, knowledge sharing and the development of solutions to digital inclusion challenges.

In addition to the national day dedicated to digital inclusion, the Ministry for Digitalisation organises an interdisciplinary forum on digital inclusion every six months. The first forum was organised in 2023 and featured a round table discussion on digital accessibility and inclusive design with more than 120 representatives. This forum brings together representatives of ministerial departments, actors active in digital inclusion and stakeholders supporting people that are isolated from the digital world.

- **Budget:** The national public budget varies depending on the nature and scope/size of event and is approximatively of EUR 60 000 each year.
- **Timing and expected impact:** The digital inclusion day takes place annually and the digital inclusion forum biannually. The expected impact is increased awareness and engagement, strengthening of networks and partnerships, enhanced collaboration and knowledge sharing, development of solutions to digital inclusion challenges, capacity building and skill development, promotion of inclusive design and accessibility, influence on policy and strategy.

Digital strategy for cultural heritage and the arts

Since 2016, the mission of the Ministry of Culture's digital strategy service is to define, coordinate and implement the national digital strategy for the cultural heritage and the arts sector⁵⁸.

The ecosystem of digital cultural heritage has a visible part, that of publication platforms, mobile applications, 3D representations, virtual exhibitions or even scientific or educational projects. However, cultural institutions are faced with a growing demand from different audiences and users for digital objects and cultural heritage data and are thus particularly affected by the digitalisation of society.

For digitalisation to become an integral part of work processes, teams must expand, new skills must be integrated, management, publication and preservation systems must be put into place or evolve. The main achievement would be capacity building, as it is one of the major concerns in the sector. Digital transformation is not only a technological upheaval, but also involves a profound change in cultural institutions.

- **Budget:** Budget allocation varies every year. Between 2023 and 2030, EUR 7 000 000 of national public budget could be allocated to this measure in total.
- **Timing and expected impact:** Building on the previous period, the next phase, between 2023 and 2030, focuses on creating the necessary foundations within cultural institutions to ensure the development of a sustainable and evolving digital ecosystem, to be able to respond to societal changes efficiently and to continue to offer a relevant and up to date public service.

⁵⁸ <https://kep.public.lu/fr/mises-en-oeuvre-du-kep/industries-culturelles/strategie-numerique-patrimoine-culturel-national.html>



Fostering leadership and sovereignty

(c) Ensuring the Union's digital sovereignty in an open manner, in particular by secure and accessible digital and data infrastructures capable of efficiently storing, transmitting and processing vast volumes of data that enable other technological developments, supporting the competitiveness and sustainability of the Union's industry and economy, in particular of SMEs, and the resilience of the Union's value chains, as well as fostering the start-up ecosystem and the smooth functioning of the European digital innovation hubs.

(d) Promoting the deployment and the use of digital capabilities with a view to reducing the geographical digital divide and granting access to digital technologies and data on open, accessible, and fair terms, in order to achieve a high level of digital intensity and innovation in Union enterprises, in particular start-ups and SMEs.

(e) Developing a comprehensive and sustainable ecosystem of interoperable digital infrastructures, where high performance, edge, cloud, quantum computing, artificial intelligence, data management and network connectivity work in convergence, to promote their uptake by businesses in the Union, and to create opportunities for growth and jobs through research, development and innovation, and ensuring that the Union has a competitive, secure and sustainable data cloud infrastructure in place, with high security and privacy standards and complying with the Union data protection rules.

(f) Promoting a Union digital regulatory environment to support the ability of Union undertakings, especially that of SMEs, to compete fairly along global value chains.

These objectives are in line with chapters 2,3, and 5 of the European Declaration on Digital Rights and Principles for the Digital Decade: Solidarity and inclusion, Freedom of choice, and Safety, security, and empowerment.

Luxembourg National Data Service (LNDS)

At the end of 2022, on the initiative of the Ministry of Higher Education and Research (MESR), the national platform for data exchange (PNED: Plateforme Nationale d'Échange de Données), now called Luxembourg National Data Service (LNDS)⁵⁹, was founded with the following missions:

- to support the entire data value chain in a federated manner, with a central structure for the provision of enabling services;
- to enable stakeholders in the public and research sector to use multiple, combined data sources, while respecting data protection regulations;
- to be able to offer strong data partnerships to corporate partners in the context of public-private partnerships, with a view to developing new and innovative data-driven services and products.

In 2024, LNDS has more than 60 employees.

- Budget: The planned budget from the Luxembourg Government is EUR 5 000 000 for 2023, EUR 6 000 000 for 2024, EUR 7 000 000 for 2025 and EUR 10 000 000 for 2026, next to supplementary funding from other sources. By 2024, LNDS has secured EUR 4 900 000 in external funding via subsidy projects, primarily from the European Commission.
- Timing and expected impact: LNDS started in 2023 to deliver services to both public and private organisations to facilitate research, innovation, and technological developments via the secondary use of public sector data. By 2025, LNDS aims to support more than 50 data projects via the developed services.

⁵⁹ <https://www.lnds.lu>



Luxembourg Digital Innovation Hub

The Luxembourg Digital Innovation Hub (L-DIH)⁶⁰ is implemented by a Luxembourgish consortium and is co-funded by the European Commission. It is part of the network of European Digital Innovation Hubs. Luxembourg has one hub, which supports the digital transformation of the manufacturing sector. The L-DIH deploys its effort to inform, inspire and engage all manufacturing companies. One-to-many activities include webinars on digital technologies, skills and successful transformations, company visits and providers/industries exchange fora. One-to-one services enable digital maturity assessments, cybersecurity, and skills maturity assessments. More advanced services cover “test before invest” activities, implementing training programmes and supporting the companies to reach out to national or European funding programmes.

- **Budget:** The L-DIH is supported through the Digital Europe Programme with an annual contribution of EUR 695 000 that is matched on national level.
- **Timing and expected impact:** For the moment the L-DIH is planned to run until December 2025. The L-DIH is a consortium supporting national industrial companies, especially SMEs to respond to digital challenges and become more competitive. The L-DIH supports companies to improve business/production processes, products, or services using digital technologies, especially focusing on technologies like HPC, Cybersecurity and AI.

“Sandkëscht”: the regulatory sandbox for AI driven applications

The CNPD started developing in 2023 the concept of a regulatory sandbox (RSB) to allow actors of the Luxembourg innovation ecosystem to test their AI systems in an isolated and secured environment for a limited time before they are putting these on the market.

The Sandkëscht programme is dedicated to support SMEs, industry, startups, and public organisations in the development of new technologies that are respectful of privacy, make responsible use of personal data and are in compliance with the GDPR. The CNPD initiative focusses on data governance and organisational and technical measures regarding data protection with the aim to help the technology developing organisation to understand the legal implications of these technologies while encouraging innovation. The initial concept set up in the context of AI and the GDPR will be extended in the coming years to the context of the AI Act and other new EU regulations.

- **Budget:** Approximately EUR 250 000 yearly based on HR costs for 2.2 FTE from 2024 to 2030.
- **Timing and expected impact:** First call for projects opened in 2024 and are running until the end of 2025. Additional calls will be launched on an annual basis.

Creation of a public API Portal to accelerate the automation of data exchanges between companies and public authorities

The IT Government Centre is developing a centralised portal to present, document and publish to the general public the API interfaces made available by public authorities. It is thus creating the essential environment for further automation of data exchanges between the public and private sectors, under secure and standardised manners. The development of the API Portal is part of a wider project to implement a central API Gateway on the IT infrastructure provided by the Government IT Center. The API Gateway is a cornerstone of proactive eGovernment, providing an automated, fast, and secured means of exchanging data between IT systems, hence promoting the principles of interoperability and once only.

- **Budget:** For the development of the Portal API in 2024, approximately EUR 83 000 EUR of external costs and 30-45 internal man-days have been budgeted.
- **Timing and expected impact:** End of 2024. The exchange of data between companies and public authorities can be further automatised. This results in be faster and more time saving processes for companies that need to transmit data to public authorities.

⁶⁰ <https://www.dih.lu>



Fostering the development of the startup ecosystem

The Luxembourg startup and scaleup roadmap called “From seed to scale” will enhance Luxembourg and Europe’s leadership and sovereignty by empowering startups and scaleups to contribute to reaching the Digital Decade goals.

Luxembourg will continue to cultivate diversity within its start-up ecosystem while improving connectedness and the exchange of best practices between its various players, to increase the effectiveness of the entrepreneurial environment as a whole. The Government is seeking to make the start-up ecosystem even more sustainable and inclusive, to give as many people as possible the same desire and the same opportunities to become entrepreneurs. Luxembourg wants to continue to enrich its community of innovative entrepreneurs, while enabling them to put together multidisciplinary and multilingual teams to deploy their start-up or scale-up solutions on the European market.

- **Budget:** A specific budget is not allocated directly to the Seed to Scale Roadmap as it is a roadmap composed of a series of transversal and collaborative initiatives to be developed. Specific budgets will be determined and allocated closer to the start of the different initiatives.
- **Timing and expected impact:** The roadmap for the start-up and scale-up ecosystem should be implemented by the end of the Digital Decade reference period. It aims at further strengthening the economic environment in Luxembourg by building on the dynamism of start-ups and scale-ups and diversifying Luxembourg’s economy.

Luxembourg Quantum Communication Infrastructure (LuxQCI)

Luxembourg has started the national initiative (LuxQCI), with the aim to develop and build a quantum communication infrastructure in Luxembourg that will then be interconnected with the European initiative, EuroQCI.

The Government and the University of Luxembourg have signed a convention in March 2022 aiming at setting up a national experimental testbed (project LUQCIA). In September 2023, the connection of two geographically distant points on the ground with an end-to-end encryption by using Quantum Key Distribution (QKD) was achieved. This connection between Luxembourg-Kirchberg and Belval has been achieved by using a dark fiber spanning a distance of 33 km. The next step will be the realization of terrestrial cross-border connections.

Another project is Lux4QCI, co-funded under the Digital Europe Programme (DEP), allowing Luxembourg to extend the research and development activities for the terrestrial segment.

The next objective is the establishment of the link between the terrestrial segment and the first European quantum satellite Eagle-1 for bridging long distance QKD.

- **Budget:** The total budget planned to be attributed to this measure, including the RRF (EUR 10 000 000), the DEP Call (EUR 7 500 000) and private investment, amounts to EUR 37 000 000.
- **Timing and expected impact:** The national project implementation started in 2022, and is expected to run until the end of 2026, and even beyond. The measure shall develop capabilities and experience to strengthen the security of the communications of the public sector and of critical infrastructures as well as private sector in a later stage.

Data Accountability from A to Zen (DAAZ)

The National Data Protection Commission (CNPD) launched in 2024 DAAZ (“Data Accountability from A to Zen”) an innovative eLearning and story learning tool making GDPR compliance easier for SMEs and start-ups. It was developed in collaboration with the Luxembourg House of Cybersecurity as the main deliverable in the ALTO (‘dAta Protection compLiance supporT tOolkit’) project co-financed by the European Commission from 2022 until 2024. DAAZ provides small companies and entrepreneurs with a simple, intuitive, anonymized, and free online tool enabling them to understand and integrate their GDPR obligations into their business activities. It is based on a gamified learning-by-doing approach in non-legal language. They are supported in assessing, strengthening, and maintaining their GDPR compliance thus improving transparency and trust which is getting even more important at the age of accelerated digitization



and use of AI. The launch of DAAZ comes in response to the personal data protection challenges faced especially by SMEs which are often at a disadvantage compared with large organisations in terms of legal resources and expertise.

In the coming years, sector specific, thematic, and linguistic evolutions of the tool will be implemented.

- **Budget:** Approximately EUR 200 000 from 2022 to 2024 with 90% EU Commission co-funding (CERV programme). Maintenance, continuous improvement, and specific development will account for EUR 12 000 per year from 2025 to 2030, based on 0.1 FTE.
- **Timing and expected impact:** Increased maturity level on data protection compliance principles of SMEs and better preparedness to imminent digitalisation challenges driven by AI technologies.

Situational awareness

Resilience to cyberattacks is achieved when all stakeholders have at least a basic understanding of the threat landscape and implement cybersecurity measures, accordingly, following the principle of proportionality and necessity. To help all stakeholders to achieve this goal, the Luxembourg Government will publish three times a year a situational awareness based on incidents and threats intel gathered in MISP (Open-Source Threat Intelligence and Sharing Platform). This situational awareness should help all stakeholders to assess their risks in a more objective way.

- **Budget:** EUR 60 000 of national budget per year.
- **Timing and expected impact:** The National Cybersecurity Competence Centre (NC3.lu) is publishing on a recurrent basis information about threats, access points, necessary prevention, targets, and impacts⁶¹ observed in Luxembourg and contributing to the situational awareness. This information should help all types of companies to create more accurate risk management decisions. For sure this service is only reaching those companies that perform a formal risk management process. For smaller companies, that have no formal risk management process, this information is published in bulleting like form. Impact will be quite low for companies that have no formal risk management process and quite high for those companies that are directly or indirectly regulated under NIS2 or DORA.

Risk management for SMEs

SMEs are part of most supply chains. To increase resilience of operators of critical infrastructures and operators of essential services, the members of the supply chains have to be secured as well. Luxembourg will continue to provide risk management tools⁶² and diagnostic tools⁶³ for SMEs to help them identify and implement the correct cybersecurity measures and to help them demonstrate their compliance. Luxembourg will interface these tools with the Luxembourg risk management platform and the risk governance platform MONARC⁶⁴ as well as the tools DIAGNOSTIC and Fit4Cybersecurity.

- **Budget:** EUR 150 000 of national budget per year.
- **Timing and expected impact:** The measure starts in Q4 2024 and most probably ends in Q4 2027. Operators of essential or important services as well as critical infrastructure operators heavily rely on SMEs (sub-contractors) in their value chains. Luxembourg provides easy-to-use services for SMEs to perform risk assessments to identify and invest in the necessary technologies. In this context, Luxembourg helps SMEs with the service “test before invest” from L-DIH to test services and provides them financial assistance through the “SME package”. The impact of this measure is to raise the maturity of all the sub-contractors of essential and important service providers identified under NIS2 and DORA (probably between 200 and 600 companies). The measure will prevent that these small service providers are exchanged by large companies that can demonstrate their compliance to NIS2 and DORA

⁶¹ <https://observatory.nc3.lu/observatory-bulletin>

⁶² <https://nc3.lu/pages/services/fit4.html>

⁶³ <https://nc3.lu/pages/services/diagnostic.html>

⁶⁴ <https://www.monarc.lu/community>



Rescue Chains

NIS2 and DORA expects also sub-contractors of essential and important service providers to implement incident response capabilities. The maturity of these SME sub-contractors will not suffice to work with CERT, they will have to rely on smaller regional entities that are capable of handling small incidents. Luxembourg will implement the German model of “Rettungsketten” rescue chains) deployed in Saarland. The creation of these rescue chains foresees the training of the first, second and third level of support concerning cybersecurity incidents of SMEs. Luxembourg will set-up a training program for the first and second level of support at the Digital Learning Hub. The third level of support will be handled by already established public or private CSIRT. It is also foreseen to exchange operational knowledge about this approach with Saarland.

- Budget: EUR 200 000 of national budget per year.
- Timing and expected impact: The measure will start in Q1 2025, and the end-date is not yet foreseen. The impact of this measure is the stepwise increase of the resilience of SMEs by increasing the maturity of their IT service providers. This measure will strongly reduce the response times and costs for handling incidents within small entities. It is a kind of democratisation of incident response and will have a beneficial effect on the resilience of SMEs in Luxembourg.

Cascading Funding

The Ministry of the Economy, in close cooperation with the National Cybersecurity Competence Centre (NC3) - in its capacity as the National Coordination Centre (NCC-LU) - and with the support of Luxinnovation, has launched in May 2024 the first call for projects under the new funding scheme known as the Cybersecurity Innovation & Development Funding Programme (LU-CID-FP). This call for funding is co-financed by the European Union under the Digital Europe Programme. This initiative aims to bolster the development and adoption of cybersecurity innovations by supporting SMEs and start-ups within Luxembourg. Successful applications to this call will be funded through the Research and Development funding scheme managed by the Ministry of Economy.

- Budget: EUR 720 000 of national funding and EUR 720 000 of European funding for the years 2024 and 2025.
- Timing and expected impact: The first call was launched in May 2024, the second call in November 2024. The expected impact is to help at least 15 SMEs to take advantage of a simplified call and foster innovation from SMEs for SMEs in cybersecurity.

Competence Hub for Cybersecurity and Cyber Defense

The Luxembourg Directorate of Defence announced on 15 November 2023 the launch of a Competence Hub in Research in Cybersecurity and Cyber Defence (CyberHub), in partnership with the University of Luxembourg. The CyberHub is intended to strengthen and increase Luxembourg's ability to meet national and international challenges such as increasingly serious and elaborate cyber threats. As activities ramp up in 2024, the Cyberhub will support the Government's Cybersecurity Strategy IV and Cyber Defence Strategy through research, technology transfer, and education. Cutting-edge research projects will be executed in collaboration with public and private actors transferring state-of-the-art knowledge on cybersecurity and thus improving the overall resilience to cyberattacks. The PhD and Master student education supported through the Cyberhub will increase the available cybersecurity talent pool in Luxembourg.

- Budget: The initial Government support covers the years 2023 to 2027 with a budget of EUR 9 700 000.
- Timing and expected impact: With the current financial support, the CyberHub will continue until 2027. It will improve cyber-resilience through knowledge transfer to public and private actors via research projects, and cybersecurity education.

National Chat System

End of 2022, Luxembourg has announced the deployment of a national Chat System (LuxCHAT⁶⁵, tested during early 2022), based on the French open-source application MATRIX. This application, based on



Luxembourg servers using French open-source applications will dramatically increase resilience and sovereignty of mobile communication in Luxembourg. It was first deployed within government and then be made available to business and finally to citizens in November 2023.

- Budget: The State has earmarked a total multiannual budget of EUR 4 340 789 excluding VAT for the years 2022 to 2028.
- Timing and expected impact: In place since November 2023, this national Chat System will dramatically increase resilience and sovereignty of mobile communication in Luxembourg.

Contributing to the green transition

(h) Ensuring that digital infrastructure and technologies, including their supply chains, become more sustainable, resilient, and energy- and resource-efficient, with a view to minimising their negative environmental and social impact, and contributing to a sustainable circular and climate-neutral economy and society in line with the European Green Deal, including by promoting research and innovation which contribute to that end and by developing methodologies for measuring the energy and resource efficiency of the digital space.

(j) Ensuring that all policies and programmes which are relevant to achieving the digital targets set out in Article 4 are taken into account in a coordinated and coherent way to fully contribute to the European green and digital transition, while avoiding overlaps and minimising administrative burdens.

These objectives are in line with chapters 6 of the European Declaration on Digital Rights and Principles for the Digital Decade: Sustainability.

Tax measures

In the context of the digital transformation and the ecological and energy transition, the new article 152bis of the Luxembourg income tax law has abolished the tax bonus⁶⁵ for additional investment and introduced the possibility for companies to benefit from an income tax bonus with specific rates for investments and operating expenses made as part of the digital transformation or the ecological and energy transition. Investments in tangible depreciable assets made as part of a digital transformation or an ecological and energy transition will be entitled to a total tax credit of 18% (12% + additional tax credit of 6%).

Operating expenses (e.g., employee training costs, diagnostic or audit costs, cloud computing, software licences, etc.) incurred as part of such a digital transformation or ecological and energy transition will also be eligible for the 18% investment tax credit.

Article 152bis of the Luxembourg income tax law lists specific objectives that investments and operating expenses must meet to fall within the scope of this new 18% tax bonus. Digital transformation must, for example, redefine a company's entire production process to substantially improve productivity, or implement an innovative business model within the company to create new value for the company's stakeholders.

- Budget: The budgetary impact cannot be assessed until the 2025 financial year.
- Timing and expected impact: The measure came into action on 1 January 2024. It is currently not limited in time. It is not possible at this stage to quantify the expected impact of this measure. However, it can be said with confidence that this measure is an additional incentive for companies to invest in their digitalisation.

⁶⁵ <https://www.luxchat.lu>

⁶⁶ <https://guichet.public.lu/en/entreprises/fiscalite/bonification-impot-investissement/modernisation.html>



SME Packages – Sustainability

The "SME Packages - Sustainability", aim to reduce SMEs' environmental impact by reducing their energy or water consumption, improving their waste management, or reducing their carbon footprint. By using "SME Packages – Sustainability", SME can combine economy and ecology by undertaking a first project that has a positive impact on the following areas:

- energy: implementation of energy reduction tools;
- water: implementation of water reduction tools;
- waste: implementation of waste management or reduction tools, and tools of circularity;
- carbon footprint: carbon assessment and action plan, potential for decarbonisation.

If the company is eligible and interested, it can apply and ultimately benefit from a financial aid by the Government of up to EUR 5 000 and invest in a sustainable project with an approved service provider.

As part of the "SME Packages – Sustainability" support programme, companies receive assistance for implementing a sustainable solution that allows them to establish better online communication with customers and to achieve better business management. Companies can deploy a digital solution with the assistance of a professional and receive guidance from an adviser as they implement their digital strategy. The House of Sustainability from the Chamber of Commerce and the service "e-Handwierk" from the Chamber of Skilled Trades and Crafts offer companies an initial sustainable checkup to identify priority actions. They will then guide the companies through the implementation process and conduct a final meeting to evaluate the work that has been achieved.

- Budget: The budget depends on the number of requests received.
- Timing and expected impact: This is an ongoing measure that has been introduced in 2022. SMEs receive support in their sustainable development and will improve their environmental impact.

Fit 4 Sustainability

The "Fit 4 Sustainability" programme offers SMEs the possibility of having an environmental impact assessment carried out on their activities, followed by various recommendations for reducing the environmental impact.

Phase 1- This phase lasts a maximum of 6 months and gives an overview of the situation of the applicant business, in particular on decarbonisation (carbon footprint, energy audit), water (consumption, wastewater pollution), circularity (product life cycle assessment) and based on applicable standards and regulations.

The assessment will be completed by a list of the different measures that could be implemented, in accordance with their ease of implementation, to reduce the company's environmental impact, not only in terms of investment but also in terms of processes and organisation.

Phase 2- During the implementation phase, the applicant can choose to implement the recommendations from the diagnostic phase. If necessary, this phase may be the subject of a new application for investment aid depending on the conclusions of the diagnostic phase.

- Budget: The budget depends on the number of requests received.
- Timing and expected impact: This is an ongoing measure since 2022. SMEs receive support in their sustainable development and will improve their environmental impact.

Product Circularity Data Sheet - Terra Matters G.I.E.

TerraMatters is an economic interest group set-up by the Ministry of the Economy and the Chamber of Commerce in 2022 to set-up and maintain the ecosystem around the idea of the Product Circularity Data Sheet (PCDS). As the idea has received enough validation and support, both partners decided to launch a company which will be the first supplier of a technical solution allowing for the creation, exchange, and handling of PCDS and their proofs of statement. This will enable third party audit and provide the necessary trust within the system itself.

- Budget: EUR 800 000 of national public money per year between 2023 and 2026.



- Timing and expected impact: The G.I.E. should be self-sustained by the end of 2026 and continue its work towards its goals. The expected impact lies in the global adoption and success of the PCDS solution as presented technically by TerraMatters.

Energy data platform

In 2021, an obligation for the Transmission System Operator, CREOS, was introduced in the electricity market law to develop and deploy a National Energy Data Platform (NEDP)⁶⁷ for the electricity and gas markets. The long-term objective of the platform is to provide a central point for storage and exchange of energy market data between distribution system operators, suppliers, customers, generators, aggregators, energy communities and authorities.

- Budget: The project is part of the network costs and is funded by end-consumers through grid utilisation tariffs.
- Timing and expected impact: The first phase of the project, planned to go live in the second half of 2024, will provide access to the platform to all large customers and producers. The second phase is expected to be in operation as of early 2027, including all electricity and natural gas customers and a full-fledged integration of all market communication processes.

The national energy data platform will make energy data more easily accessible for customers and market actors alike and will increase the efficiency of market processes. This is expected to bring a wide range of benefits to stakeholders and participants in the Luxembourg energy sector, such as:

- A high degree of competition with low barriers to entry
- Easy customer access to their own data for consumption and self-generation
- considerable improved data quality, in particular for customer master data
- Efficient collection and distribution of metering values
- Enhanced security of data access and management
- Streamlined market communication processes through hub-based communication
- Efficient reporting to regulatory authorities

Smart energy system

Smart energy systems will allow to address the challenges and to reap the benefits related to the energy transition. Specifically, an increasing number of market participants will need to be integrated and coordinated, such as small-scale electricity producers, electric vehicles, or electrolyzers, closely aligned with grid infrastructures and markets. Several activities have been initiated to facilitate and enable these developments:

- The rollout of smart meters providing 15-minute data about electricity and gas consumption.
- Grid operators are developing their networks into a smart grid, with digitalized and controllable transformer stations, predictive maintenance programs, or enhanced operational planning procedures.
- Energy suppliers and other energy service providers are developing products and services to allow inter alia for energy sharing between prosumers, energy efficiency and dynamic pricing models.
- Several research and innovation projects in the field of smart energy systems are underway.
- Budget: The smart meter rollout as well as grid upgrades are part of the grid investments done by grid operators and are recovered through grid utilisation tariffs. There is no direct contribution through national or EU budgets for these projects.
- Timing and expected impact: The smart meter rollout has been completed. Grid upgrades are ongoing, as are the introduction of new products offered by suppliers. The availability of smart meter data, new grid utilisation tariffs incentivising system friendly behaviour and new supplier products are expected to

⁶⁷ <https://energieaueur.lu>



increase active consumer behaviour in the coming years, and thus to contribute to a more efficient and secure energy supply.

Infrastructure and platforms on an as-a-service basis

A centralised as-a-service-offer fits perfectly into a policy of cost rationalisation as well as energy savings since administrations do not operate their own infrastructures. The Government IT Centre's strategy focuses on the implementation of as-a-service offers for infrastructure, platforms, and software.

Example: GovCloud, the private sovereign cloud hosted and operated by the Government IT Centre provides infrastructure as a service to the public administrations. GovCloud is hosted in data centres that are highly efficient in terms of energy use and cooling. Another key benefit of operating a cloud is the flexible provisioning of resources based on current needs, which means that only the necessary resources are utilised at any given moment.

- **Budget:** This is a generalised best practice according to which the Government IT Centre develops his entire offer proposed to the public authorities.
- **Timing and expected impact:** Cost rationalisation, energy savings, standardised products resulting in interoperability and standardised security.

Reduction of energy costs related to the workplace

The Government IT Centre is responsible for the centralised acquisition of office equipment for all ministries and administrations.

The Government IT Centre has implemented three key measures to reduce energy costs and improve the efficiency of office equipment management. Firstly, they have replaced small office printers with large, centralised multifunction printers in administrative offices, incorporating secure printing systems to prevent unnecessary document printing. Secondly, through the introduction of the Digital Workplace concept, agents are provided with standardised equipment, including laptops and telephony software, which promotes flexible working while reducing the energy consumption associated with desktop computers. Finally, they encourage equipment donations in line with circular economy principles, ensuring that surplus equipment benefits people in need.

- **Budget:** Approximately EUR 600 000 annually
- **Timing and expected impact:** These ongoing measures are in line with the broader eGovernance strategy, creating a more sustainable and cost-effective IT environment for administrations.

MA-eFaST: Database interfacing in view to create added value for agriculture, environment and sustainability

Nutrient management is an important part of climate-smart agriculture. Excess nutrients on the land can lead to nitrogen losses to the atmosphere. Nutrient management maximizes crop-nitrogen uptake and minimize the use of chemical fertilizers. It has a compelling and cost-effective role to play in mitigating greenhouse gas emissions from agriculture and reducing the carbon footprint. The project involves setting up a platform for exchanging data from various government databases with a view to minimizing the use of chemical fertilizers.

- **Budget:** EUR 345 358 for the years 2023 and 2024 allocated by the CTIE
- **Timing and expected impact:** The project is scheduled for completion by the end of 2024. The MA-eFaST project aims to make agricultural, environmental, and sustainable crop management data available in a simple, and standardized way to farmers and advisory bodies.



ADAPT (FNR-MAVDR) Smart Cropping to Adapt Luxembourg Agriculture to Climate Change

In ADAPT⁶⁸, smart crop management is tested with farmers to reduce emissions and protect soil carbon through cover crops, intercropping, reduced tillage, and less synthetic nitrogen. The project will compare smart and conventional farming, simulate droughts, and analyze soil and microorganisms. The data will be used to calibrate and validate models predicting emissions. The best of three models will be extended with national soil and climate data to predict emissions across Luxembourg. Regional climate projections will help model future emissions which will be provided to the advisors.

- Budget: EUR 598 000 of national public money for the years 2022 to 2026. The costs are borne jointly between the Ministry of Agriculture and the National research funding agency (50/50).
- Timing and expected impact: At the end of the project the modelling of the future emissions will give advice on how to reduce emissions in agriculture via giving direct advise on the crop management.

⁶⁸ <https://agriculture.public.lu/de/innovation-und-forschung-projekte/adapt.html>



Section 5: EU level cooperation

5.1 Multi-Country Projects and Joint Commitments

This section describes the multi-country projects (MCP) and joint commitments in which Luxembourg is implicated. It provides an overview of existing and potential future projects between Member States that contribute to the achievement of the digital targets and general objectives.

Seamless cross border mobility 5G DeLux

In the domain of connectivity, Luxembourg is currently active in the multi-country project “Seamless cross border mobility 5G DeLux”. In this project, Telekom Deutschland, POST Luxembourg, and BMW are pairing up in form of a consortium, aiming to go beyond existing LTE/4G roaming services between Germany and Luxembourg. The objective is to enable 5G on an identified roaming corridor of a highway connecting both countries. Enabled by a Proof-of-Concept, this will progressively ensure seamless cross-border handover and service continuity. The corridor has a length of 98 km, between Saarbrücken (Germany) and Frisange (Luxembourg), covered by both MNOs. The supported high-level use-cases encompass high bandwidth content services, automotive use cases, as well as voice and video calls.

This measure contributes to achieving the digital target “Secure and sustainable digital infrastructures - Overall 5G Coverage” (with a focus on Transport Corridors) and helps reach the general objectives on “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: The project started on 1.1.2023 and has a timeframe of 36 months.

Source of funding & budget: The total project cost is EUR 12 676 651. The project is co-financed under Connecting Europe Facility Digital by the European Commission (50%) and the consortium (50%). The LU incurred costs (private) are EUR 5 560 000 of which EUR 2 780 000 are co-funded by the European Commission.

5G Melusina

The second connectivity related multi-country project in which Luxembourg is active is “5G MELUSINA”. The goal is to improve the 5G infrastructure along a rail cross-border section of North Sea Mediterranean between Metz (France) and Luxembourg City (Luxembourg), for the benefits of train passengers’ connectivity and digitalisation of rail operations. The “study” phase of the project was carried out by a consortium of 9 members involving two rail infrastructure managers and seven mobile network operators from both countries. The study phase was conclusive and currently, the consortium partners are considering the submission of a new project under the “works” category for the upcoming deadline.

This measure contributes to achieving the digital target “Secure and sustainable digital infrastructures - Overall 5G Coverage” (with a focus on Transport Corridors) and helps reach the general objectives on “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: The “study” phase of the project took place in 2023, and a “works” phase would go from 2026 to 2029.

Source of funding & budget: The “study” phase of the project cost was EUR 270 406,45. The project was co-financed under Connecting Europe Facility Digital by the European Commission (50%) and the consortium (50%). The LU incurred costs (private) were EUR 57 692,10 of which EUR 28 846,05 were co-funded by the European Commission.



EuroHPC

Luxembourg is one of the Member States that is actively participating in acquiring supercomputers and quantum computers. With MeluXina, Luxembourg already has one of the six most powerful supercomputers in Europe. Starting in 2024, Luxembourg will invest in a quantum computer simulator for its High Performance Computer (HPC) and a small European Quantum Computer connected to the HPC. The Luxembourg quantum computer will be part of a network of several quantum computers across Europe that will build a EuroHPC quantum computing infrastructure to support the development of a wide range of applications with industrial, scientific, and societal relevance for Europe by adding new capacity to the European supercomputing infrastructure. The EuroHPC quantum computer initiative started in 2022 with six selected sites across the EU and with a new tender for the installation of two more EuroHPC quantum computers in early 2024, in which Luxembourg participated.

This measure contributes to achieving the digital target “Secure and sustainable digital infrastructures” and helps reach the general objective “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: MeluXina HPC as part of the EuroHPC supercomputer infrastructure has been operational since 2021. The Luxembourg quantum computer as part of the EuroHPC quantum computing infrastructure is expected to be operational from 2027. The end date will be after 2030.

Source of funding & budget: This initiative is co-funded by the European Commission. The remaining budget comes from public funds and contributions from private users. The total cost of the quantum computer is estimated at approximately EUR 17 000 000, with half of this amount being co-funded by the EuroHPC JU through the Digital Europe Programme (DEP).

EUROCC

EUROCC (European Competence Centre for High-Performance Computing) is a collaborative initiative funded by the EU to enhance and coordinate national and regional efforts in HPC across Europe. The main goal is to establish a network of national competence centers (NCCs) in HPC, ensuring that each Member State has the expertise, resources, and infrastructure needed for advanced computational research and development. These centers provide services like training, consulting, and access to HPC resources, enabling academia, industry, and public administrations to leverage HPC technologies for innovation and competitiveness.

The initial establishment and operational phase of these centers took place from 2020 to 2022 (EUROCC-1). Building on this success, the further development and expansion of the NCCs started in 2023 onward (EUROCC-2). EUROCC-2 continues the mission of supporting HPC, High-Performance Data Analytics (HPDA), and Artificial Intelligence (AI) across Europe. The project has a total funding of EUR 61 918 783,97, supporting the coordination of the NCCs in 32 participating countries.

This measure contributes to achieving the digital targets “Secure and sustainable digital infrastructures” as well as “Digital transformation of businesses” and helps reach the general objective “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: From 2020 to 2025, where EUROCC-2 began on 1 January 2023 and will run until 31 December 2025.

Source of funding & budget: EUROCC-1: EUR 1 000 000 of EU funding in Luxembourg (EUR 28 000 000 total EU funding), plus EUR 1 500 000 of national funding. EUROCC-2: EUR 1 500 000 EU funding in Luxembourg (EUR 31 000 000 total EU funding), plus EUR 1 500 000 of national funding.



IPCEI-CIS

Luxembourg is one of the twelve Member States participating in the Important Project of Common European Interest for Next Generation Cloud Infrastructure and Services (IPCEI-CIS⁶⁹) in the field of cloud computing, which is part of the multi-country Common Data Infrastructure and Services project. The IPCEI-CIS aims to create a cloud-edge-continuum and grant the right for applications and data to freely “roam” from one cloud-provider to another cloud provider (data portability right granted by GDPR) with a special focus on edge-cloud computing. The aim of the IPCEI-CIS is to equip the European Union with the next generation of advanced, distributed, secure, sustainable, and innovative cloud-to-edge capabilities that citizens and businesses need. Luxembourg contributes to this IPCEI with a special focus on open-source cybersecurity tools like SOC (Security Operations Centre) and CSIRT (Cyber Security Incident Response Teams) tools for Cloud and edge cloud generating important positive externalities in terms of synergies. Luxembourg will also provide privacy and trade secrets preserving technologies for cloud that are capable of running on edge nodes. Luxembourg has put a special focus on cross-company and cross-border collaboration and the capitalisation of synergies. To achieve this, all documentation, API, products, and services will be published in open-source via a resource centre becoming the first Luxembourg Open-Source Promotion Office (OSPO). The OSPO measure is described in Section 3 of this document.

This measure contributes to achieving the digital target “Secure and sustainable digital infrastructures – Edge-nodes” as well as the target “Digital transformation of businesses – Take-up of Cloud, Big Data and Artificial Intelligence” and helps reach the general objective “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: Starting in Q4 2024 and ending in Q4 2027.

Source of funding & budget: EUR 6 000 000 of national funding.

POTENTIAL

The Ministry for Digitalisation and the Government IT Centre (CTIE) participate in the Consortium “Pilots for European digital identity wallet” (POTENTIAL⁷⁰). This Consortium submitted a project that was selected in December 2022 by the European Commission to pilot new European prototypes around the “European Digital Identity Wallet”. 148 participants from 19 European Union Member States and Ukraine joined forces in the Consortium to pilot their wallets through six use cases, four of which involve entities from Luxembourg (e-Government services, bank account opening, mobile driving license, remote qualified electronic signature). This multi-country project aims at improving citizens' access to reliable electronic identification means and to services such as electronic signatures or provision of digital attestations. This allows citizens to store their identity data in a secure digital wallet that shall be recognised across borders. The mission of POTENTIAL is to shape scenarios to test the European digital identity wallet. Thus, Luxembourg is testing between 2023 and 2025 both national and cross-border scenarios including the use of a mobile driving licence, authentication/identification for private and public services, bank account opening and qualified electronic signature.

This measure contributes to achieving the digital target “Digitalisation of public services - eID” and helps reach the general objective “Digital citizenship” of the Digital Decade Policy Programme 2030.

Timeframe: From 2023 to 2025.

⁶⁹ <https://www.bmwk.de/Redaktion/EN/Artikel/Industry/ipcei-cis.html>

⁷⁰ <https://www.digital-identity-wallet.eu>



Source of funding & budget: This project is co-financed by the European Commission via the call DIGITAL-2022-DEPLOY-02 (Topic: DIGITAL-2022-DEPLOY-02-ELECTRONIC-ID). The total budget over two years is EUR 1 200 000, which also includes about EUR 550 000 in in-kind costs (personnel costs). EU-provided co-financing will be 50% of the eligible project costs, amounting to approximately EUR 600 000.

Cross-border ePrescription exchange

As Luxembourg's National Contact Point for eHealth, Agence eSanté (AeS) participates in the EU4Health programme, which aims to put in place the cross-border electronic exchange of a certain number of health data containing documents with a healthcare professional in another EU country. In the context of this programme, AeS will put in place the cross-border ePrescription exchange in the course of 2026, and of original clinical documents (i.e., hospital discharge report, laboratory results and medical imaging report) starting 2025.

This measure contributes to achieving the digital target "Digitalisation of public services" of the Digital Decade Policy Programme 2030. It furthermore helps strengthening health systems as defined in the EU4Health Programme.

Important note: The below timeframe and budget are those covered by the grant agreement signed with the EC and englobe the roll-out of the additional cross-border exchange services (so not only ePrescription).

Timeframe: From November 2023 to October 2026.

Source of funding & budget: The source of funding is the EU4Health call EU4H-2022-DGA-MS-IBA2, with an EU contribution of EUR 668 634,65 and national resources from AeS of EUR 445 756,44.

Luxembourg's participation in European Digital Infrastructure Consortia :

European Digital Infrastructure Consortium for the Alliance for Language Technologies (ALT-EDIC)
ALT-EDIC is hosted by France. The mission of ALT-EDIC is to develop a common European infrastructure in the field of language technologies, focusing on Large Language Models. It will develop Large Language and Foundation Models that optimize the adoption of European language technologies, including through generative AI. ALT-EDIC will establish a European network of excellence for the development, evaluation, and deployment of language technologies. The network strives for a transparent, sustainable, and ethical use of language technologies and will foster digital competitiveness, preserve linguistic diversity, and promote cultural richness in Europe.

This measure helps reach the general objective on "Fostering leadership and sovereignty" of the Digital Decade Policy Programme 2030.

Timeframe: The ALT-EDIC was officially created on 7 February 2024 through the Commission Implementing Decision (EU) 2024/458⁷¹ and has an indefinite timeframe. Luxembourg, represented by the Luxembourg Institute of Science and Technology, the University of Luxembourg and, the Zenter fir d'Lëtzebuerger Sprooch, officially became a member of the EDIC on 27 May 2024.

Source of funding & budget: The allocated national budget for the years 2024 to 2027 combined is EUR 163 347,69 of public financial contribution.

⁷¹ https://eur-lex.europa.eu/eli/dec_impl/2024/458/oj



Networked Local Digital Twins towards the CitiVERSE» (EDIC LDT CitiVERSE)

The EDIC LDT CitiVERSE is hosted by the City of Valencia in Spain. Its main mission is to implement multi-country Local Digital Twin (LDT) projects across European cities. These LDTs will be interconnected, ensuring interoperability between existing local digital twin initiatives across Europe, forming the basis for the EU CitiVERSE. The EDIC LDT CitiVERSE aims to develop a common joint action by EU Member States for the implementation of a strong digital ecosystem around shared infrastructural components and state-of-the-art technologies for data, AI-based services, and related elements for cloud-based Smart Communities. One of its focuses will be on enabling predictive and generative AI applications in smart cities, including simulations addressing urban development, city mobility, climate change mitigation, energy grid optimization, air pollution mitigation, waste management, and water resource management improvement. Additionally, it will explore AI-based virtual reality applications to improve citizen interaction. The EDIC will identify and aggregate common assets from members, creating greater value through joint delivery and service.

This measure helps achieve the general objectives on “Digital citizenship” and “Fostering leadership and sovereignty” of the Digital Decade Policy Programme 2030.

Timeframe: The EDIC LDT CitiVERSE was officially created on 7 February 2024 through the Commission Implementing Decision (EU) 2024/459⁷² and has an indefinite timeframe. Luxembourg officially became a member of the EDIC as a founding member, represented by the Luxembourg Institute of Science and Technology (LIST).

Source of funding & budget: The currently allocated national budget for the years 2024 to 2025 combined is EUR 30 000 of private in-kind contribution.

EUROPEUM-EDIC

On 21 May 2024, the Commission adopted the decision⁷³ creating the EUROPEUM-EDIC, a new legal entity established by a consortium of 10 Member States, including Luxembourg as a founding member. The Europeum EDIC will further deploy and expand the exploitation of the European Blockchain Services Infrastructure (EBSI) to deliver EU-wide cross-border services, in particular public services. The aim is to reinforce trust and cyber resilience in compliance with EU regulation, including the newly adopted European Digital Identity framework. The EUROPEUM-EDIC will support cross-border cooperation between public authorities on Web3 and decentralised technologies, promoting innovation and interoperability of such solutions with other technologies.

This measure contributes to achieving the digital target “Digitalisation of public services – Digitalisation of public services for citizens and businesses” and helps reach the general objectives on “Digital citizenship”, “Fostering leadership and sovereignty” and “Contributing to the green transition” of the Digital Decade Policy Programme 2030.

The Europeum EDIC (European Digital Infrastructure Consortium for European Blockchain Partnership and European Blockchain Service Infrastructure) contributes to the EU Digital Decade Policy Programme by supporting the following key objectives:

1. Digital Infrastructure: Enhancing Europe's digital infrastructure through blockchain and Web3 technologies.
2. Interoperability and Cybersecurity: Promoting cross-border cooperation, ensuring interoperability, and reinforcing trust and cyber resilience.

⁷² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024D0459&qid=1727856562574>

⁷³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024D1432&qid=1727856661705>



3. Innovation: Driving innovation in digital public services and decentralized technologies.
4. European Digital Identity: Aligning with the European Digital Identity framework for secure and efficient identity verification.

Timeframe: From 2023 to 2025.

Source of funding & budget: The Government has engaged in-kind and financial contributions in the amount of EUR 250 000 (before VAT, in total) to be disbursed over three years (2023, 2024 and 2025).

Genome EDIC

The Genomic Data Infrastructure (GDI) project, launched in November 2022, aims to deploy sustainable genomic data-access infrastructure across multiple countries. Coordinated by ELIXIR and jointly funded by the European Commission's Digital Europe Programme and participating Member States, the EUR 40 000 000 (EUR 20 000 000 is Member State's contributions matched 100% by the Commission) project ensures sustainability through member contributions, EU funding, use-dependent income, a governance model, and a business plan. The GDI involves national agencies, research organisations, and technology providers from 22 of the 26 signatory countries to support the 1+MG initiative.

Luxembourg is set to host the Genome EDIC, as discussed in the Genome EDIC WG meeting on 26 May 2023, with the final decision pending the Genome EDIC application development.

This measure contributes to achieving the digital target "Secure, resilient, performant and sustainable digital infrastructures" and helps reach the general objective "Fostering leadership and sovereignty" of the Digital Decade Policy Programme 2030.

Timeframe (provisional):

- Q1/Q2 2025: Submit application to the EC.
- Q3/Q4 2025: Formally found Genome EDIC.
- 2026: First non-founding members join.
- Q3 2026-2027: Serve first users.

Funding & Budget: Luxembourg's contributions include (public funds):

- EUR 1 405 568 for GDI deployment.
- EUR 500 000 for tools like a citizen information portal and a secure processing environment.
- EUR 500 000 for creating reference genomes for the Genome of Europe project.
- 1 FTE for two years for data curation and characterization for Genome EDIC.

Other MCPs with Luxembourg participation, that were already listed in sections 3 and 4 are not repeated in this section, e.g., the Luxembourg Digital Innovation Hub who is part of the EDIH Network or the Digital Skills and Jobs Platform.



5.2 Facilitating factors at EU level

In this section, stakeholders describe elements and actions that could be supported by the EU in order to help Member States to reach the digital targets and general objectives.

5G seamless handover

Unless a standard solution for a seamless hand-over gets implemented by the MNOs themselves within a reasonable timespan, it would be extremely valuable if additional support or incentives in the harmonisation of this hand-over gets promoted on the EU level. Still, the actual standardisation will be driven by the industry (e.g. within 3GPP).

Open Cybersecurity dataspace

Examples of current market failures in cybersecurity are coordination failure, asymmetry of information, lack of incentives, and absence of supply.

Especially due to the future massive onboarding of cloud technologies and due to the possibility of these actors to freely roam through the cloud-edge continuum (IPCEI-CIS), collaborative cross-border incident response and SOC technologies and services have to be developed for the cloud.

Furthermore, cybersecurity incidents in cloud can quickly scale and effective and efficient collaboration of CSIRT (Computer Security Incident Response Team) and SOC (Security Operation Center) are essential for resilience. To be effective, these private sector entities have to closely collaborate in an operative way, share threat intelligence, forensic evidence and take advantage of the obvious synergies of cybersecurity.

Luxembourg proposes other Member States to join the open cybersecurity dataspace initiative to increase the effectiveness of their SOC or CSIRT activities, as, the data in the open cybersecurity data space can be used to train AI models used for unattended cybersecurity tools and services for SMEs.



Section 6: Stakeholder consultations

From June to July 2024, a public stakeholder consultation was held to gather inputs on the 2023 Digital Decade National Strategic Roadmap for Luxembourg from stakeholders across the national digital ecosystem, including private companies, SMEs, public institutions, social partners, civil society, and research. In accordance with Article 9 of the Digital Decade Policy Programme, the consultation aimed to engage the national digital ecosystem on Luxembourg's 2023 Digital Decade National Strategic Roadmap.

The consultation was open from June to July 2024 on the “Zesumme Vereinfachen” platform⁷⁴, where participants could access and complete the online questionnaire. The inputs received were shared with the Interministerial Committee on Digital Policies in the context of the 2024 update of the national roadmap.

The consultation challenged the participants on the targets and general objectives of the Digital Decade Policy Programme as well as the measures proposed within the national roadmap. The survey indicates a diverse mix of participants, with the majority being from commercial companies. The consultation confirmed the strengths and weaknesses of Luxembourg's digital ecosystem that have already been considered in the commission recommendations. A high number of participants pointed to the challenge to realise the twin transition in conjunction with the digitalisation while being under high economic, administrative, and regulatory pressure.

In addition to the public consultation, regular consultations of the digital ecosystem are organised by the different governmental departments. Those consultations involve a wide range of digital stakeholders, including for example research and educational institutions, regulators, social partners, chambers and industry representatives, telecom and satellite operators, healthcare professionals, or private tech companies. This broad consultation ensures that Luxembourg's digital policies are well-rounded and take into account the perspectives of all key stakeholders, including representatives from civil society and the broader digital ecosystem.

⁷⁴ <https://www.zesumme-vereinfachen.lu/en-GB/projects/stakeholder-consultation-digital-decade>



Section 7: Overall impact and conclusions

Luxembourg's national Digital Decade strategic roadmap illustrates Luxembourg's willingness to help achieve the general objectives and the digital targets and more generally a successful digital transformation by 2030.

A number of Luxembourg's new or existing measures are linked to digital citizenship, especially the ones linked to the digital targets of people having at least basic digital skills, the digitalisation of public services for citizens and businesses, and the access to electronic identification as well as to electronic health records.

In Luxembourg, access to basic digital trainings is easy and the country is taking measures to ensure the development of basic digital skills for different age groups. Concrete measures target children, job seekers and older people. Measures help develop basic digital skills, teach online risks, and contribute to a safer internet for citizens.

When it comes to the access to digital public services, Luxembourg is one of Europe's frontrunners and is very close to the target of 100%. The platforms Guichet.lu and MyGuichet.lu already allow people to take a whole range of procedures online and new measures will strengthen this.

Connectivity related measures are intended to help citizens get access to an ultra-high-speed network, which will provide them with an improved access to the digital economy.

A reliable and secure connectivity forms the backbone of our ecosystem, enabling individuals, businesses, and societies to thrive and adapt in an increasingly interconnected world. Appropriate development and use of infrastructure, data and connectivity are essential to drive progress, efficiency, and success.

With measures contributing to secure and resilient digital infrastructures, and an increased number of ICT specialists, Luxembourg actively contributes to fostering leadership and sovereignty in the EU.

Several measures contribute to Luxembourg becoming a pool of attraction for talents seeking a degree and career in digital skills and digital transformation. Measures aim to increase the offer and improve the overall quality of Luxembourgish study programmes. In fact, Luxembourg is proposing advanced digital skills trainings on different levels, such as university degrees, short cycle higher education programmes or training programmes.

In addition to measures helping to increase the number of ICT specialists in the country, Luxembourg has numerous ongoing and new measures that contribute to tackling the remaining challenges of an open cybersecurity and data economy.

Education and lifelong learning are of crucial importance, as the speed of technological advances requires that citizens are constantly learning new skills to stay competitive and adapt to professional requirements. In addition, recruiting talent is becoming a major challenge due to constantly evolving skill requirements and increased global competition and talent shortages in the emerging fields of digital technology.

On the Business side, there are measures that incentivise companies, and especially SMEs, to invest in digitalisation projects, which improves the companies' competitiveness and thus contributes to fostering leadership and sovereignty.

Luxembourg is, in addition to national initiatives, also actively participating in several large-scale multi-country projects that are crucial to combine efforts as Member States to reach the EU digital transformation by 2030.



The measures that contribute to the green transition concentrate for example on efficient energy use, on supporting SMEs in their sustainable development and on creating a more sustainable and cost-effective IT environment for administrations.

Digital inclusion is essential in today's interconnected world and plays a vital role to bridging the digital divide. By promoting access to technologies, digital inclusion encourages innovation, collaboration, and knowledge sharing, creating thus a more inclusive and equitable society.

We remain convinced that the success of digitalisation in Europe will largely depend on the degree of confidence of European citizens in the development and deployment of new digital technologies and services. To achieve this objective, it is essential to make Europe's citizens more responsible and to create a participatory European enlightened society that is aware of its rights and obligations in the digital space.



ANNEX

Annex 1: Construction method for s-shaped curves (Section 2)

For the creation of S-shaped curves, a Bass model has been used.

The Bass model is a mathematical model used to describe the adoption of a new product or innovation by a population over time. It is often used in marketing and innovation research to create S-shaped curves that represent the cumulative adoption of the product, with some people adopting it early (innovators) and others adopting it later (imitators, because they adopt the product after seeing others using it). The model helps predict how quickly an innovation will be adopted and when it will reach its saturation point in the market.

More information can be found here: <https://www.numberanalytics.com/tutorials/bass-model-new-product-diffusion>



Annex 2: Numerical values used for the graphs of trajectories (Section 2)

Digital Skills

At least basic digital skills

Period	DD trajectory	Baseline	Target
2015	86.21		80
2016	86.15		80
2017	85.18		80
2019	64.58		80
2021	63.79		80
2022	65.59		80
2023	67.39		80
2024	69.19		80
2025	70.99		80
2026	72.80		80
2027	74.60		80
2028	76.40		80
2029	78.20		80
2030	80.00		80

Source: Eurostat - European Union Survey on the use of ICTs in Households and by Individuals

ICT specialist in employment

Period	DD trajectory	Baseline	Target
2011	4.30	4.21	10
2012	5.00	4.46	10
2013	4.70	4.71	10
2014	5.10	4.96	10
2015	5.00	5.22	10
2016	5.10	5.47	10
2017	5.20	5.72	10
2018	5.90	5.97	10
2019	6.10	6.22	10
2020	6.30	6.47	10
2021	6.70	6.72	10
2022	7.70	6.97	10
2023	7.99	7.22	10
2024	8.28	7.47	10
2025	8.56	7.72	10
2026	8.85	7.97	10
2027	9.14	8.22	10
2028	9.43	8.47	10
2029	9.71	8.73	10
2030	10.00	8.98	10

Source: Eurostat - Labour Force Survey



Digital Infrastructure *Gigabit (VHCN)*

Period	DD trajectory	Baseline	Target
2019	90.70	90.70	100
2020	91.70	91.70	100
2021	92.60	92.60	100
2022	93.30	93.30	100
2023	95.85	94.24	100
2024	97.46	95.06	100
2025	98.45	95.77	100
2026	99.07	96.38	100
2027	99.44	96.91	100
2028	99.66	97.36	100
2029	99.80	97.75	100
2030	100.00	98.08	100

Source: Broadband coverage in Europe studies for the European Commission by IHS Markit, Omdia and Point Topic

Fiber to the Premises (FTTP) Coverage

Period	DD trajectory	Baseline	Target
2017	57.18	57.18	100
2018	63.40	63.40	100
2019	67.50	67.50	100
2020	72.10	72.10	100
2021	75.20	75.20	100
2022	76.20	76.20	100
2023	83.45	78.01	100
2024	88.98	79.73	100
2025	92.90	81.34	100
2026	95.54	82.86	100
2027	97.24	84.28	100
2028	98.32	85.61	100
2029	98.98	86.84	100
2030	100.00	87.98	100

Source: Broadband coverage in Europe studies for the European Commission by IHS Markit, Omdia and Point Topic

Overall 5G Coverage

Period	DD trajectory	Baseline	Target
2020	-	-	100
2021	12.69	12.69	100
2022	93.21	93.21	100
2023	95.79	95.79	100
2024	97.42	97.42	100
2025	98.43	98.43	100
2026	99.05	99.05	100
2027	99.43	99.43	100
2028	99.66	99.66	100
2029	99.79	99.79	100
2030	100.00	99.88	100

Source: Broadband coverage in Europe studies for the European Commission by IHS Markit, Omdia and Point Topic



Digitalisation Transformation of Businesses

Take-up of cloud services by businesses

Period	DD trajectory	Baseline	Estimation	Target
2014	6.91	6.91	6.91	75
2016	12.21	12.21	12.21	75
2018	16.27	16.27	16.27	75
2020	23.09	23.09	23.09	75
2021	29.00	29.00	29.00	75
2022	44.43	35.41	31.20	75
2023	56.88	41.09	33.40	75
2024	65.31	46.09	35.60	75
2025	70.20	50.45	37.80	75
2026	72.73	54.22	40.00	75
2027	73.96	57.47	55.00	75
2028	74.53	60.24	65.00	75
2029	74.79	62.61	70.00	75
2030	75.00	64.61	75.00	75

Source: Eurostat - European Union survey on ICT usage and e-commerce in enterprises

Take-up of Big Data by businesses

Period	DD trajectory	Baseline	Target
2016	12.53	12.53	75
2018	16.38	16.38	75
2020	18.66	18.66	75
2021	29.61	22.03	75
2022	41.75	25.67	75
2023	53.33	29.54	75
2024	62.55	33.57	75
2025	68.61	37.70	75
2026	71.98	41.82	75
2027	73.64	45.85	75
2028	74.40	49.71	75
2029	74.74	53.31	75
2030	75.00	56.61	75

Source: Eurostat - European Union survey on ICT usage and e-commerce in enterprises

Take-up of Artificial Intelligence by businesses

Period	DD trajectory	Baseline	Target
2021	13.00	13.00	75
2022	20.07	15.77	75
2023	29.44	18.86	75
2024	40.63	22.24	75
2025	52.14	25.90	75
2026	61.91	29.78	75
2027	68.52	33.82	75
2028	72.14	37.95	75
2029	73.82	42.07	75
2030	75.00	46.09	75

Source: Eurostat - European Union survey on ICT usage and e-commerce in enterprises



SMEs with at least basic digital intensity

Period	DD trajectory	Baseline	Target
2022	66.20		90
2023	69.18		90
2024	72.15		90
2025	75.13		90
2026	78.10		90
2027	81.08		90
2028	84.05		90
2029	87.03		90
2030	90.00		90

Source: Eurostat - European Union survey on ICT usage and e-commerce in enterprises



Digitalisation of Public Services

Digitalisation of public services for citizens

Period	DD trajectory	Baseline	Target
2013	47.76	47.76	100
2014	53.64	53.64	100
2015	76.35	76.35	100
2016	76.00	76.00	100
2017	75.31	75.31	100
2018	81.98	81.98	100
2019	84.99	84.99	100
2020	90.28	90.28	100
2021	93.43	93.43	100
2022	94.80	94.80	100
2023	95.84	95.84	100
2024	96.68	96.68	100
2025	97.35	97.35	100
2026	97.89	97.89	100
2027	98.33	98.33	100
2028	98.67	98.67	100
2029	98.95	98.95	100
2030	100.00	99.17	100

Source: eGovernment Benchmark Reports

Digitalisation of public services for businesses

Period	DD trajectory	Baseline	Target
2014	72.89	72.89	100
2015	72.89	72.89	100
2016	80.25	80.25	100
2017	81.64	81.64	100
2018	88.54	88.54	100
2019	98.96	98.96	100
2020	96.67	96.67	100
2021	96.67	96.67	100
2022	96.70	96.70	100
2023	97.37	97.37	100
2024	97.91	97.91	100
2025	98.34	98.34	100
2026	98.68	98.68	100
2027	98.96	98.96	100
2028	99.17	99.17	100
2029	99.35	99.35	100
2030	100.00	99.48	100

Source: eGovernment Benchmark Reports



eHealth composite indicator on the availability of electronic medical data

Period	DD trajectory	Baseline	Target
2022	66.71		100
2023	70.87		100
2024	75.03		100
2025	79.19		100
2026	83.35		100
2027	87.51		100
2028	91.68		100
2029	95.84		100
2030	100.00		100

Source: Digital decade e-Health indicators development report



Annex 3: Google Certificates (Section 3)

Google Certificates are offered in the following areas:

- Google IT Support Professional Certificate (Online training for people wanting to work as an IT Support/Helpdesk operator)
- Google IT Automation with Python Professional Certificate (Online training for people wanting to work as an IT Support Specialist or a Junior Systems Administrator)
- Google Project Management: Professional Certificate (Online training for people wanting to work as a junior Project Manager or an assistant Project Manager)
- Google Data Analytics Professional Certificate (Online training for people wanting to work as a junior Data Analyst, Database Administrator, Data Scientist or SQL Developer.
- Google UX Design Professional Certificate (Online training for people wanting to work in UX Design or UX Testing.
- Digital Marketing & E-commerce Certificate (Online training for people wanting to work as a Marketing coordinator, Media Planner, or an Email Marketing Specialist)
- Business Intelligence Certificate
- Cyber Security Certificate

The working methodologies, content and training programmes resulting from this cooperation are the property of Google LLC and Coursera Inc.



Annex 4: University programmes (Section 3)

The University has a number of programmes that train specialists in various fields of the broader area of ICT and that have a direct relationship with the job market. These programmes are:

	Programme name	Comment	Available places per academic year	Enrolment AY 2023-2024 (across all semesters)
Bachelor (180 ECTS, except if specified differently)	Bachelor in Computer Science (BICS)		40	170
	Bachelor in Applied Information Technology (BINFO)		75	130
	Bachelor in Applied Information Technology – <i>Continuing Education Programme</i> (BINFO-FC)	Part time: 80 ECTS at UL	25	23
	Bachelor in Engineering – Digital Engineering	6 tracks, overall 150 places available	150/6	5
Master (120 ECTS, except if specified differently)	Master in Information and Computer Sciences (MICS)		60	101
	Master in High Performance Computing		40	27
	Master in Cybersecurity “CYBERUS”	<i>Erasmus Mundus</i> funded double degree programme, one semester (3 rd) of classes at UL.	32	25
	Master in Cybersecurity and Cyber Defence (MCSCD)	Full programme that integrates the 3 rd semester from CYBERUS.	40	<i>Starts as of winter semester 2024</i>
	Master of Data Science (MADS)		20	43
	Master in Mathematics (MAMATH)	Two out of three tracks have a focus on computational methods: <ul style="list-style-type: none"> • Mathematical Modelling and Computational Sciences • Financial Mathematics 	50/3	18
	Master in Space Technologies and Business (MSTB) (<i>formerly “Interdisciplinary Space Master”</i>)		20	28
	Master in Information System Security Management (MISSM)	Part time: ECTS 60 at UL	20	25
	Master in Technopreneurship (MTECH)	Part time: ECTS 60 at UL	20	10
Master in Molecular and Computational Biomedicine (<i>formerly “Master in Integrated Systems Biology”</i>)		18	28	



The University has a number of programmes that have, besides their core discipline, a thematic focus on ICT with a direct relationship with the demand of job market. These programmes are:

	Programme name	Comment	Available places per academic year	Enrolment AY 2023-2024 (across all semesters)
Bachelor	Bachelor in Physics	Data science and machine learning for physics	unlimited	51
	Bachelor in Life Sciences	Data analysis <i>The thematic focus on data sciences will increase as of AY 2025-26.</i>	25	39
Master	Master in Physics	Classical and quantum information theory Physics of Living Matter: Statistical tools and methods for biophysical data analyses; image analyses and pattern recognition- Machine Learning, Data analysis Computational Methods in Physics	20	18
	Master in Secondary Education (Math)	Mathematical Statistics: Data and AI	25	24

Doctorate	<p>The University of Luxembourg hosts more than 1000 doctoral students in its doctoral schools. The biggest doctoral school (DSSE: “Doctoral School in Science and Engineering”) hosts currently (July 2024) over 600 doctoral candidates in 6 doctoral programmes:</p> <ul style="list-style-type: none"> • Doctoral Programme in Systems and Molecular Biomedicine Doctorat en Sciences Exactes et Naturelles (Natural Sciences) • Doctoral Programme in Physics and Material Sciences Doctorat en Sciences Exactes et Naturelles (Natural Sciences) • Doctoral Programme in Mathematics and Applications Doctorat en Sciences Exactes et Naturelles (Natural Sciences) • Doctoral Programme in Complex Systems Science Doctorat en Sciences de l’Ingénieur (Engineering Sciences) Doctorat en Sciences Exactes et Naturelles (Natural Sciences) • Doctoral Programme in Engineering Doctorat en Sciences de l’Ingénieur (Engineering Sciences) • Doctoral Programme in Computer Science and Computer Engineering Doctorat en Informatique (Computer Science and Computer Engineering) <p>Besides the appr. 260 doctoral candidates which are currently pursuing a “Doctorate en Informatique”, it can be presumed that the vast majority of doctoral candidates of the DSSE will apply a substantial share of digital methods in their research.</p>
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Annex 5: BTS programmes (Section 3)

BTS programmes in ICT study areas:

- Communication Technologies
- Connected Building and Cities
- Informatics
- Internet of Things
- Cloud Computing
- Game Programming and Game Design
- Game Art and Game Design
- Cybersecurity
- Digital Content
- Genie technique
- Building Information Modelling

The objective of this programme is to educate BIM modelers regarding the significance of interoperability and provide hands-on experience using BIM software that integrates all advanced construction technologies.

- (New): Automated Industrial Production

This programme trains students to work in the fields of installation, commissioning, and maintenance of complex automated installations. Graduates will have skills in automation (electrical engineering, control, sensor settings and robotics), mechanical engineering (CAD, technology, pneumatics, hydraulics, etc.) and numerical sciences (mathematics and computer science).

- (New): Applied Artificial Intelligence

This hands-on programme focuses on the configuration, automation, maintenance, and interfacing of an artificial intelligence system. It also provides a solid grounding in programming and data processing, through the application of methods for training and learning artificial intelligence models.



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