

THE TECHNOLOGY,
MEDIA AND
TELECOMMUNICATIONS
REVIEW

THIRTEENTH EDITION

Editor
Matthew T Murchison

THE LAWREVIEWS

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MEDIA AND
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PREFACE

This 13th edition of *The Technology, Media and Telecommunications Review* provides updated overviews of legal and policy constructs and developments in the TMT arena across 18 jurisdictions around the world. As in years past, our goal with this publication is to provide a practical, business-focused survey of these issues, along with insights into how regulatory activity in this arena continues to evolve.

Policymakers in 2022 have continued to grapple with the impact of the covid-19 pandemic, which has focussed greater attention on the need for ubiquitous broadband internet connectivity and has hastened efforts to make broadband services more widely available. The height of the pandemic saw a significant rise in remote working, distance learning, tele-health visits, and similar broadband-enabled activities. And while more businesses and schools are now returning to an in-person environment, it remains the case that work, education, and other aspects of our daily lives are more reliant on broadband connectivity today than before the pandemic.

These developments have spurred numerous initiatives around the world to improve and expand broadband connectivity for consumers going forward. Governments in various jurisdictions are in the midst of implementing subsidy programmes and other efforts to speed the deployment of advanced networks in unserved and underserved areas. Regulators have also taken steps to preserve internet access where it already exists, including by exploring mandates requiring certain rates for low-income consumers. Such initiatives have sparked notable legal challenges and policy debates over whether government intervention, market-based solutions, or some combination of the two can be most effective at ensuring widespread broadband availability.

Regulators also are wrestling with how best to fund these ever-growing programmes to promote broadband deployment and availability. Recent years have seen the use of various paradigms, including direct appropriations from the government and funds fed by mandatory contributions from telecommunications service providers and their customers. At the same time, some jurisdictions are looking to other funding mechanisms, such as potentially requiring large online platform providers and streaming video services, whose content makes up a significant portion of internet traffic, to bear some responsibility for contributing to the deployment of networks that carry that traffic.

The relationship between these online content providers and the broadband providers delivering their content also remains the subject of wider policy debates. There continue to be long-simmering questions about ‘net neutrality,’ including whether ‘zero-rating’ and other kinds of network management practices by broadband providers benefit or harm consumers and online content providers, and whether efforts to promote a healthy internet ecosystem are best served by light-touch, market-based regimes or by more intrusive government regulations.

In the past year, Europe has been at the forefront of developments on these issues, while policymakers in the United States have faced obstacles to their anticipated re-evaluation of the light-touch approach reinstated in 2018. Debates about ‘neutrality’ have also carried over to the content side, where social media companies are facing ongoing scrutiny over claims of discriminatory practices in moderating third-party content on their platforms. Indeed, some jurisdictions are considering measures that not only would rescind immunities these platforms have traditionally enjoyed for their content moderation practices, but also would require increased transparency and potentially even impose anti-discrimination mandates or other consumer protections.

In addition, governments around the world continue to take steps to harness new communications technologies. The era of 5G wireless services is now in full swing, and regulators are exploring ways to facilitate further deployment of these services. These efforts include actions to free up more radiofrequency spectrum for these services, by reallocating spectrum from one use to another, auctioning off wireless licences in bands newly designated for 5G, and adopting new spectrum sharing rules. Deployments of new satellite broadband systems, including large systems in low Earth orbit, also are underway, raising fresh questions about how best to ensure space safety and mitigate new sources of radiofrequency interference.

This edition’s chapters for each country describe these and other developments, including updates on media ownership, privacy and data security, and efforts to combat fraudulent robocalling and the ‘spoofing’ of caller identification information. Our contributing authors have done tremendous work in preparing these updated overviews of TMT issues in their respective jurisdictions, and I hope this latest edition of *The Technology, Media and Telecommunications Review* will be a helpful resource to readers interested in the legal and policy developments in this sector.

Matthew T Murchison

Latham & Watkins LLP

Washington, DC

November 2022

LUXEMBOURG

*Linda Funck*¹

I OVERVIEW

The Luxembourg TMT sector has evolved from being predominantly a provider of voice services into a diverse, competitive and interconnected industry using terrestrial, satellite and wireless transmission systems. Today, Luxembourg has first class infrastructures and telecommunication networks and counts among the top locations for electronic communication services and infrastructures. The current challenge for Luxembourg is to become one of the first countries in the EU with a global 5G network covering the entire Luxembourg territory. As a pioneer in telecommunication networks, Luxembourg pursues efforts to remain within the top players in electronic communication services. As a result of the efforts undertaken by the government and various players in the market, Luxembourg figures among those Member States that have already assigned spectrum in the 5G bands. In terms of connectivity dimension overall, Luxembourg is at the 11th position because of the low uptake of at least 1Gbps, the low 5G coverage and the comparatively low affordability of broadband connectivity.² In the 2019 edition of the Global Competitiveness Report (GCR), published by the World Economic Forum, Luxembourg ranks overall 18th out of 140 countries. From a legal perspective, Luxembourg is also very well placed when it comes to a digital framework: pursuant to a GCR 2020 special edition, Luxembourg ranked second after the United States regarding its digital legal framework. According to the Digital Economy and Society Index (DESI), Luxembourg is ranked sixth with regard to its human capital.³ Luxembourg ranked eighth (up two places) out of 28 EU Member States in the last edition of the DESI 2022. The International Telecommunication Union (ITU) has ranked Luxembourg in 13th position in the world.⁴

Traditionally, the sector was limited to very few players. For several decades, telecommunication and postal services were operated as a public monopoly of the state-owned *Entreprise des Postes et Télécommunications* (EPT).⁵ Not surprisingly, POST (formerly EPT) was the first operator to offer 5G services in Luxembourg, which started on 16 October 2020. In 2021, POST planned to extend 5G coverage to the whole territory with 50 per cent coverage by end of 2022 and at 90 per cent by the end of 2024.⁶ Over the past few years, other operators have increased their presence in the telecommunication

1 Linda Funck is a partner at Elvinger Hoss Prussen.

2 DESI 2022, p. 8, <https://digital-strategy.ec.europa.eu/en/policies/desi-luxembourg>.

3 DESI 2022, p. 6.

4 <https://www.itu.int/en/ITU-D/Cybersecurity/Pages/global-cybersecurity-index.aspx>.

5 The new commercial name is Post Luxembourg.

6 <https://business.post.lu>.

sector, increasing competitiveness among players on the Luxembourg market. The radio and television sector is traditionally controlled and developed from its early years by a privately owned company. Indeed, the first radio broadcasting in Luxembourg was initiated by the founders of the current broadcaster, CLT-UFA. Today, RTL Group ranks as the top television and radio broadcaster in Europe and has become a leading European media company in digital video. Luxembourg is also a pioneer in non-terrestrial communication technology. SES-Astra, a Luxembourg-based company created in 1985, was Europe's first private satellite operator and has global standing today.

The presence of important market players in the technology, media and telecom (TMT) and TMT-related sectors in Luxembourg, and the related know-how and experience, have led the government to make efforts to maintain, create and further develop its electronic telecommunication technologies. The aim is to be among the best places in Europe and abroad to do business within the sector and to be a hub for e-services in Europe. This is an aim that has been constantly pursued and publicly reaffirmed by the government since 2010. The government, together with a group of private investors, set up a fund dedicated to information and communications technology (ICT) startups called the digital tech fund, which pursues investments in companies active in cybersecurity, fintech, big data, digital health, media and next-generation communication networks, digital learning, the internet of things, and telecommunications and satellite services.⁷ The Luxembourg support to the TMT sector is also strengthened through the set-up of a €150 million fund by the European Investment Bank (BEI and the Société Nationale de Crédit et d'Investissement (SNCI)) which invests directly or indirectly in venture capital funds and small and medium-sized enterprises (SMEs) to foster the sustainable development of the Luxembourg strategic sector (i.e., companies active in ICT, clean tech and other technology sectors).⁸

The Ministry of Economy has prioritised boosting the digital transformation of the national economy. It has laid out its vision of digitalisation for priority economic development sectors and a data-driven innovation strategy for the development of a trusted and sustainable economy. The development plans have been made in synergy with the artificial intelligence vision of the Ministry of Digitalisation.

Luxembourg combines many features that are beneficial to the development of an ICT sector, including the diversity and multilingual skills of its population and workforce, a geographical location in the centre of Europe and an important financial industry in need of high-performance communication technologies. In addition, Luxembourg has gradually developed a state-of-the-art digital infrastructure, international telecommunication connections (offering fast and reliable connectivity to other European cities at very low latency rates), efficient national communication networks, performant data centres, a comprehensive, evolving and innovative legal framework, as well as cutting-edge research, safety and security. All these elements contribute to Luxembourg's increasing attractiveness to technology organisations and electronic communication services, but also to financial institutions, and companies active in biotechnology, health, space, ecotech, automotive, logistics and media and other businesses. Luxembourg figures among the top locations for ICT infrastructures (data centres, high-speed connectivity and internet traffic, low latency internet) and offers specialised expertise to keep data safe.

7 <https://digital-luxembourg.public.lu/initiatives/digital-tech-fund>.

8 <https://www.eif.org>.

The presence of regulated ICT support professionals of the financial sector (PSF), who are subject to the same confidentiality obligation as banks, provides considerable comfort and security to clients in the financial sector in areas such as the outsourcing of IT functions.

In the past few years, Luxembourg has been focusing strongly on the development of the fintech industry, being an attractive country as it combines a huge range and variety of financial services and performant and innovative technology, with open-minded regulators, public authorities, private players and associations, all of whom have ambitions to follow and develop a sector that is evolving rapidly and that is omnipresent in the overall global economy. Luxembourg, as a hub for financial services, offers an ideal environment for fintech companies to develop their services and expand their business. In fact, many startups have chosen Luxembourg to develop fintech activities, ranging from compliance and risk-management, regulatory reporting, through blockchain and cryptocurrency, security and authentication, automated investment services and big data analytics, to mobile and e-payments.

The quality of the communication infrastructure continues to lead numerous actors in the gaming sector (online video games) and gambling sector to set up their headquarters in Luxembourg.⁹ Global brands in the media and internet world, such as Amazon, eBay, PayPal, Vodafone Procurement, Intelsat, RTL Group, SES, Milicom, Fanuc (Robotics and CNC), Skype, Fujitsu, Sogeti, NTT, Devoteam, Talkwalker and Oracle all have European headquarters or major operations in Luxembourg.

The presence of Centurylink Communication recently acquired by Brightspeed¹⁰ in Luxembourg (one of the most important operators of telecommunication services at the level of the backbone internet) stated that Luxembourg is a centre of excellence in the internet sector. Luxembourg is also attractive to a number of e-payment and e-money services institutions and can be considered as Europe's e-payment hub with brands including Payconiq International (formerly Digicash), Amazon Payments, Six Payment Services, Rakuten, Airbnb Payments (for all EU payments), eBay, Ping Pong Europe and Mangopay all based on its territory. Several software giants, including Microsoft and Open Text, also have places of business in Luxembourg.

Luxembourg also has a strong reputation for service availability, security and data protection and responsive and open-minded authorities.

The Luxembourg Commission de Surveillance du Secteur Financier has granted Bitstamp a payment institution licence and has made this company the first nationally licensed bitcoin exchange. More licences have been granted since then. There are many other companies, active in the virtual currencies sector, that want to establish themselves in Luxembourg and obtain their licence. This is yet another example confirming the attractiveness of Luxembourg for ICT businesses and the country's open-mindedness.

Luxembourg has a longstanding official policy of welcoming pan-European companies in addition to creating the appropriate framework for the development of local businesses and offers multiple opportunities to startups by creating an environment that allows existing market players to come into contact with young entrepreneurs. For example, the House of Start-Ups hosts the Luxembourg-City Incubator, a project conducted by the Luxembourg Chamber of Commerce, and currently accompanies a large number of innovative startups in a variety of industry sectors. Further, the House of Start-Ups has hosted the Luxembourg

9 'Big Fish Games, Bigpoint, Innova, Valve, Zynga, Onlive', *Luxembourg Times*, 14 March 2021.

10 <https://www.centurylink.com/home/help/brightspeed-faq.html>.

House of Financial Technology (Lhoft), the Luxembourg-City Incubator (LCI), the Hub @ Luxembourg and the International Climate Finance Accelerator Luxembourg (ICFA).¹¹

According to the DESI, the proportion of ICT specialists in the context of total employment is 6.3 per cent (up 0.7 per cent from last year), which is higher than the average of 4.3 per cent in the European Union.¹²

Efforts are also being made in ICT research with a focus on the security, reliability and trustworthiness of ICT systems and services.¹³ In the context of increasing the influence of digital technologies in every aspect of our lives and throughout all business areas and with the further and constantly evolving development in cloud computing and e-archiving, digital security is a key element for the success of the digital economy. Important improvements are being made to the legislation to adapt the national legal framework with the aim of overcoming barriers related to the use of new technologies.

Luxembourg joined forces with other European countries in cooperation with the European Commission, as it is 'aiming to deploy in Europe a world-class supercomputing infrastructure and a competitive innovation ecosystem in supercomputing technologies, applications and skills'.¹⁴ The declaration of European Cooperation in the context of high performance computing (HPC) was signed by the Luxembourg Minister of Economy on 23 March 2017, which marked the official start of the collaboration between the signatory countries (Luxembourg, Germany, Spain, Italy, Portugal, France and the Netherlands). These countries joined forces to implement the strategy of a European HPC network, of which the Grand Duchy is the initiator. The European HPC European high-performance computing joint undertaking is a public-private partnership in HPC and has its headquarters in Luxembourg. In the context of HPC, Luxembourg has been given a leading role in the 'Driveless cars: The Future Smart Mobility made possible by High Performance Computers' project.¹⁵ In September 2020, Luxembourg acquired MeluXina, a petascale supercomputer capable of executing more than 10 petaflops and 10 million billion calculations per second and powered by green energy from a cogeneration plant powered by waste wood. This new supercomputing system was launched on 7 June 2021 and ranks among the world's top 50 supercomputers according to the European High Performance Computing Joint Undertaking.¹⁶ MeluXina is funded via a joint investment of about €30 million of the European Union and Luxembourg.¹⁷

Luxembourg is very present at European-level discussions and negotiations, and it is stout in its defence of its position in the global process of harmonisation and liberalisation, while supporting the direction of European regulation. At a national level, research and development in the ICT sector are conducted by a number of government-promoted

11 <https://www.host.lu/meet-the-players/>.

12 DESI 2022, p. 3.

13 Interdisciplinary Centre for Security, Reliability and Trust (SnT), Computer Science and Communication.

14 <https://hpc.uni.lu/blog/2019/luxembourg-meluxina-supercomputer-part-of-eurohpc/>.

15 Activity Report 2017, Ministry of the Economy, p. 51 (<https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-economie/2017-rapport-activite-economie/rapport-activite-eco-2017.pdf>).

16 <https://eurohpc-ju.europa.eu/news/meluxina-live-eurohpc-ju-supercomputer-luxembourg-operational>.

17 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2020/09-septembre/29-bettel-fayot-meluxina.html and https://eurohpc-ju.europa.eu/about/our-supercomputers_en.

institutions.¹⁸ In developing its communication networks in the context of the investment realities and opportunities in the telecoms and media sector, the challenge is to direct investment in a way that ensures that the right type of network is built and that public investment works in cooperation with the private sector to promote a more competitive telecoms environment.

The ongoing efforts to further develop the information society remains one of the key priorities of the government. In addition to the aforementioned policies, Luxembourg pursues the e-Luxembourg action plan with the ultimate goals that its administrations, corporations, education personnel and individuals may efficiently use and have access to electronic communication means and to help improve their quality of life. A Digital Ministry was created in 2018 to specifically follow and drive the development of the digitalisation in all sectors (both public and private). At present, an increasing number of filings, registrations and requests to public administrations (such as those of the tax, social security, public and energy sectors) can be and are made online. The last novelty is the possibility to apply for a direct road-building permit.¹⁹ Between 1 January and 31 September 2021, more than 2.6 (from 1.3 in 2020) million requests were filed via a new mobile application,²⁰ MyGuichet.lu, which is double the number of requests filed during the same period in 2019.²¹ MyGuichet.lu was launched on 5 July 2021.²² This application represents a major achievement in terms of the commitment set out in the e-Governance 2021–2025 strategy to provide citizens with cross-media accessibility to digital public services accessible on smartphones and tablets.²³ It is notably thanks to MyGuichet.lu that Luxembourg ranked third at the eGovernment Benchmark 2022.²⁴ Other authorities such as the supervisory authority of the financial sector (CSSF) have launched eRISS (electronic Reporting for Information concerning Issuer of Securities) in 2022, which replaces email-based filings.²⁵

The covid-19 crisis has evidenced the importance of digitalisation and efficient means of electronic communication. Administrative online platforms such as eHealth, which facilitate the possibility of carrying out administrative procedures electronically via online applications, have proven to be efficient, specifically during the covid-19 crisis. The government has adopted a GED system (for electronic document management) and has banned the use of paper with the aim of streamlining internal government structures to become more cost effective. Luxembourg has also introduced electronic identity cards. The government encourages and is very keen on actively assisting Luxembourg small and middle-sized companies to familiarise themselves with, and develop and enhance the digitalisation of, their businesses and operations to increase productivity and competitiveness for the long-term sustainability of their enterprises.²⁶ In that context, a Digital Skill Bridge programme has been created,

18 For instance, the Luxembourg Institute of Science and Technology.

19 <https://guichet.public.lu/en/actualites/2022/juillet/27-permission-voirie-myguichet.html>.

20 Activity Report 2021, Ministry of Digitalisation (<https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-digital/2021-rapport-activite-mindigital.pdf>).

21 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2020/10-octobre/05-myguichet.html.

22 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2021/07-juillet/05-hansen-myguichetapp.html.

23 <https://ctie.gouvernement.lu/dam-assets/documents/Strategie-gouvernance-electronique-2021-2025-vfin.pdf>.

24 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2022/08-aout/11-digitalisation-benchmark.html.

25 <https://www.cssf.lu/en/eriss/>.

26 Fit 4 Innovation, financed by the Ministry of Economy, is one of the initiatives.

allowing businesses and their employees to be aware of the possibilities that digitalisation may offer.²⁷ In its efforts to promote itself as a European logistics hub, Luxembourg has introduced the Single Window Logistic programme, which will simplify and digitalise relations between all actors in the logistic chain and thus increase efficiency and competitiveness.

In 2014, the Council of Government launched the Digital Luxembourg strategy, which actively focuses on developing high-level ICT infrastructures, facilitates the regulation and flow of data, promotes digital competences, modernises online administration and creates an innovative ecosystem. The Digital Luxembourg platform assembles private players and public institutions federating inter-sectoral and cross-sectoral interaction. Taking into account the constant need for a workforce with strong IT skills, Luxembourg implemented the Digital (4) Education strategy. The first 'WebForce3' school was created in 2015 and aims to train people in a very short time, to allow them to become qualified for a developer or junior integrator job.²⁸ This school is part of the Fit4coding initiative launched by the government and co-financed by the European Social Fund. Other initiatives such as Start to Code, Open Class Room, Coding for Kids, Kniwellino and Code Start, as well as the launch of the AI Academy and the House of Training, assist in education and in providing digital skills in technology (including artificial intelligence). Since September 2020, primary schools have included coding knowledge in their mathematics classes for Cycle 4 children.²⁹ From September 2021, these coding competences have to be included in the lower cycles of primary school as well as in secondary school.³⁰ Luxembourg has also launched training courses for adults who wish to develop their digital skills through courses that will be given in German, French, English and Portuguese.³¹ Starting from school term 2022/2023, first-year college students will have a new school subject: Digital Sciences.

In the context of the Digital (4) Education strategy and the effort to raise awareness of the importance of technologies at a very early stage, high schools innovating in ICT have been able to use the label 'Future Hub' since 2017. For this purpose, in 2019, college students participated in the International Computer and Information Literacy Study to assess their IT skills, the aim being to make students become aware that technologies will be an integral part of their future, whatever sector they might be working in, and to raise interest in those subjects. The Ministry for Education is currently updating the infrastructure of all high schools to provide high-speed internet through fibre. Luxembourg ranked sixth (up two places from the previous year) out of the 27 EU Member States in the Women in Digital Scoreboard 2021, attesting to the effectiveness of government (through Digital Luxembourg)

27 <https://adem.public.lu/en/employeurs/futureskills/projet-pilote.html>.

28 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2015/12-decembre/08-ecole-webforce.html.

29 Children of Cycle 4 are children attending years 5 and 6 of primary school and are normally aged between 10 and 12.

30 https://gouvernement.lu/fr/actualites/toutes_actualites/Articles/2020/10-octobre/12-coding-ecole.html;
<https://gouvernement.lu/dam-assets/documents/actualites/2020/10-octobre/12-coding-ecole/Dossier-de-presse.pdf>.

31 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2021/07-juillet/26-digitalisation-hansen.html.

Women in Digital Empowerment initiatives, which actively support girls and women in the acquisition of digital skills.³² In 2019, Luxembourg was the European champion in terms of woman's participation, at a rate of 56 per cent.³³

BEEcreative is another initiative of the Ministry for Education, constituting a place of discovery and creation intended to stimulate the creativity of the next generation.

Luxembourg is very aware of the need of skills coming in from across its borders and, with a view to recruiting IT skills abroad, the government has adapted its legislative framework to facilitate the obtaining of residence permits for highly skilled individuals.

Luxembourg strongly encourages the development of a digital single market, as this will strengthen its position within the European area.

In addition, the government is fully aware that the continuance of the success and the competitiveness of Luxembourg's financial sector will depend, *inter alia*, on the availability of cutting-edge services based on fintech.³⁴

The Luxembourg Creative Industries Cluster aims to support the economic development of a sector that includes activities such as architecture, crafts, visual arts, design, styling, the games industry, marketing and communication, literature, publishing, the performing arts and new media.³⁵

Convergence has been achieved by creating rules and regulations, and regulatory authorities and consulting entities, at the national, European and international levels, all of which embrace the diversity, interconnectivity and interrelatedness of the various industries and players. The increasing convergence between telecommunications, information technology and media had led to the adoption of a first regulatory framework that was introduced into Luxembourg law by the laws of 27 February 2011. The adoption of Directive EU 2018/1972 replaced the existing four directives in that sector³⁶ and introduced the electronic communication code. The new Law of 17 December 2021 introducing the Electronic Communication Code has replaced the previous telecoms package. One of the main novelties that this Law introduced is the application of the electronic communication legislation to over-the-top (OTT) operators providing number independent interpersonal communication services. The continuing development of the ICT sector constantly calls for adjustment of the current legislation and regulations at the national and European levels (see Section II.i).

As a result of such convergence, it is extremely important that interconnectivity and free access to all operators and service providers within the TMT sector is ensured in an equal manner. The use of one infrastructure for different types of services is of particular importance, and it is crucial that the operators and owners of infrastructure or networks make these available to other participants in the TMT sector. This is particularly true in Luxembourg because of the small size of the market. The New Electronic Communication Law (as required by the Electronic Communication Code Directive) provides for a specific standardised declaration process facilitating the exercise of rights of interconnection. Ensuring Luxembourg's international connectivity remains at the top of the agenda, the aim being to ensure the lowest latency rates with major capitals, the lowest prices and the presence of the

32 <https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021>.

33 DESI Report 2020.

34 Financial sector-related technology.

35 <https://www.luxinnovation.lu/cluster/luxembourg-creative-industries-cluster/>.

36 Directives EU 2002/19, 2002/20, 2002/21 and 2002/22.

most important carriers. The New Electronic Communication Law shall enhance investments in new high-speed networks; it covers spectrum availability and prohibits redundant restrictions to the interconnexion of radio local area network (RLAN) access points, and the universal service has been extended to access to high-speed internet.

The government supports the principles of network neutrality (i.e., keeping a free architecture, open and non-discriminatory terms, guaranteed access without unjustified conditions onto electronic communication networks), and pushed for the adoption of Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and of Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the European Union, adopted on 25 November 2015, during Luxembourg's presidency of the European Union Council.

Finally, competition among incumbent operators and alternative operators remains an important element for e-industry players.

II REGULATION

TMT services cover an extremely wide scope of technology and services, with different laws and regulations applicable that entail various regulatory authorities to supervise different services and related technology. Currently, the competent ministry in Luxembourg for the telecommunication and media industry is the Ministry for Communications and Media.

i The regulators and regulated activities

The Law of 1997 created the Luxembourg Institute of Telecommunications (ILT), whose duty was to supervise and regulate the telecommunications sector. In 2000, the tasks of the ILT were widened to encompass the Luxembourg energy sector and postal services. As a consequence of the Law of 30 May 2005, the ILT was renamed the Luxembourg Institute of Regulation (ILR).³⁷ That Law was abrogated by the Law of 27 February 2011, which governs the ILR today. The scope of the ILR's tasks has been modified on several occasions, and for the last time by the New Electronic Communication Law. The ILR is an independent regulator, receiving no financial support from public state funds paid for by taxpayers; it is rather financed by the operators of the sector it supervises and regulates.

The New Electronic Communication Law and the Spectrum Law clarify the allocation of competences between the Minister for Communications and Media and the ILR in different sectors. The ILR is entitled to set rules in accordance with European directives and national law. Additionally, it controls the efficient use of infrastructure for the benefit of consumers. It is entitled to determine the fees and conditions under which communication networks are operated and services rendered to allow the formation of a competitive market. It also has the authority to draw up reports and proposals, which it must submit to its board and the government. It gives advice and prepares statistics and regulations.

The ILR is competent to receive notifications and to grant authorisations or licences in relation to the provision or operation of electronic communication network services and

³⁷ www.ilr.lu.

assists the competent minister in the allocation of licences for radio spectrum. It is also in charge of establishing the plan for frequencies and updating the public registers required by law for the various TMT sectors.

It has the power to issue administrative sanctions against operators that breach laws or regulations. It may also act as a dispute settler between competing operators and acts as mediator between customers and operators.³⁸ Over the last three years, the number of mediation requests has been around 120–130, with an average of 85 per cent of these concerning the field of electronic communication services.

The Law of 27 June 2018 created a database at the ILR containing information that certain enterprises have to transmit to the Institute. This database may be accessed by the prosecutor, the investigating judge, the State Intelligence Service and, under some circumstances, the officers of the judicial police.

The ILR is not empowered to monitor and regulate abuses of dominance. It is, however, responsible for ensuring that dominant players do not exclude other competitors from the sector, by introducing certain requirements for the access and interconnection, and it may take measures and issue rules to make sure that the market is competitive if it believes that proper competition is no longer possible (for instance, it can evaluate the existence of unjustified fees with respect to the universal services).

Regarding media, one of several amendments of the Media Law that is worth mentioning is the Law of 27 August 2013, which replaced the governmental commissions existing under the former law (i.e., the Communication Media Service (CMS), the Independent Radio Broadcasting Commission (CIR) and the National Programming Council (CNP)) with one single authority: the Luxembourg Independent Audiovisual Authority (ALIA). Its main responsibilities are to:

- a* ensure service providers' compliance with the law;
- b* grant or withdraw broadcast permits;
- c* ensure access to audiovisual programmes for persons with a visual or hearing disability;
- d* stimulate on-demand audiovisual media service providers to promote and distribute European works;
- e* encourage audiovisual media service providers to elaborate codes of conduct concerning the broadcast of inappropriate content; and
- f* impose sanctions on non-compliant service providers such as fines, withdrawal of permits, warnings and suspension of transmission.

The National Commission for Data Protection (CNPD) is the authority in charge of the supervision of the electronic communication market as far as data protection issues are concerned. It was created by the Law of 2 August 2002 on the protection of individuals with regard to the processing of personal data (repealed following the entering into force of the General Data Protection Regulation (GDPR)) and now exists under and is governed by the Law of 1 August 2018 (Luxembourg Data Protection Law).

The CNPD controls the processing of personal data in Luxembourg and ensures compliance with the data protection regulations, in particular those relating to the confidentiality and security of processing operations. In addition, it has an advisory competence towards the government. The CNPD participates in numerous conferences and

38 ILR Regulation 11/151/ILR of 4 April 2011. See ILR Activity Report 2013 (<https://assets.ilr.lu/Documents/ILRLU-1797567310-62.pdf>).

contributes to the activities undertaken by the European Data Protection Board (EDPB), such as the European Commission's assessment adequacy decision regarding Japan related to international transfers of personal data.³⁹ Although the CNPD is a public institution, it enjoys independence in carrying out its mission.

It has investigative competence that allows it direct access to data of processing operations. As an investigative and disciplinary body, the CNPD can issue administrative sanctions. Since the entry into force of the GDPR in 2018, the CNPD is responsible for monitoring the application of the GDPR to protect the fundamental rights and freedoms of natural persons in relation to processing, and to facilitate the free flow of personal data within the Union.⁴⁰ The authority has seen its powers enhanced, as after the adoption of the GDPR, *inter alia*, it is able to impose fines of up to €20 million, or in case of an undertaking, up to 4 per cent of the total worldwide annual turnover of the preceding financial year for some infringements.⁴¹

The TMT sector is extremely broad and diversified. Due to the specifics of the various industries on the one hand and their interrelatedness on the other, it appears that laws and regulations apply to more than one specific service within the TMT sector, thus resulting in a large amount of applicable legislation and regulations.

ii Main sources of law

The main legal texts are as follows:

- a* the Law of 27 July 1991 as amended by the Law of 17 December 2010, and the Law of 8 April 2011 on electronic media (Media Law) as amended for the last time by a law of 22 July 2022;
- b* the Law of 11 April 2010 on freedom of expression in electronic media, amending the Law of 8 June 2004 (as amended) on the freedom of expression in the media sector;
- c* the Law of 17 December 2021 implementing Directive EU 2018/1972 introducing the Electronic Communication Code (the New Electronic Communication of Law) and abrogating the Law of 27 February 2011 on electronic communication services and networks (the Repealed Electronic Communication Law);
- d* the Law of 30 May 2005, organising the management of radio spectrum (Spectrum Law);
- e* the Law of 30 May 2005 regarding the organisation of the ILR as amended (most recently by the Electronic Communication Law);
- f* the Law of 30 May 2005 on the specific provisions regarding the protection of individuals as to the processing of personal data in the electronic communication sector and amending Articles 88-2 and 88-4 of the Criminal Instruction Code, as amended for the last time by a law of 19 December 2020 (Electronic Data Protection Law);
- g* the Law of 14 August 2000 on electronic commerce (the Electronic Commerce Law) as amended for the last time by the Law of 19 November 2021;

39 EDPB, opinion 28/2018 regarding the European Commission Draft Implementing Decision on the adequate protection of personal data in Japan, 5 December 2018 (https://edpb.europa.eu/sites/edpb/files/files/file1/2018-12-05-opinion_2018-28_art.70_japan_adequacy_en.pdf).

40 CNPD, GDPR – Certified Assurance Report Based Processing Activities (CARPA), 29 May 2018, p. 1 (<https://cnpd.public.lu/content/dam/cnpd/fr/actualites/national/2018/gdpr-carpa-criteria-v0-1.pdf>).

41 GDPR, Article 83-5.

- h* the Law of 18 April 2001 on copyrights (Copyright Law) as amended for the last time by the Law of 1 April 2022;
- i* the Law of 1 August 2018 on the organisation of the CNPD and the implementation of the GDPR (Luxembourg Data Protection Law);⁴²
- j* the Luxembourg Constitution;
- k* the Law of 11 August 1982 on privacy (Privacy Law);
- l* Article L222-2 to L222-10 of the Consumer Code regarding distance contracts on transactions not covered by the provisions relating to financial services;
- m* Article L222-12 to L222-23 of the Consumer Code regarding distance contracts on financial services, abrogating the Law of 18 December 2006 on distance selling of financial services;
- n* general laws that are applicable to all aspects not specifically regulated by specific laws or regulations, and in particular the provisions of the Luxembourg Criminal Code (LCC) (e.g., in relation to pornography, discrimination, racism, violence, theft and piracy) and the commercial code with an amended Article 567;⁴³
- o* the Law of 2 April 2014 amending, inter alia, the Consumer Code, the Electronic Data Protection Law and the Electronic Commerce Law (2014 Law);
- p* the Law of 18 July 2014 on cybercrime;⁴⁴
- q* the Law of 25 July 2015 on electronic archiving as amended by Grand-Ducal regulations, the last one being of 21 September 2017 on the execution of Article 4 Section 1 of the Law (Electronic Archiving Law);
- r* the Law of 22 March 2017 on measures to reduce the cost of deploying high-speed electronic communications networks, as amended by Grand-Ducal regulations, the last one being of 17 August 2018;
- s* the Law of 27 June 2018, amending, inter alia, the Criminal Procedure Code, the Law of 30 May 2005 and the Electronic Media Law;
- t* the Law of 22 February 2018 on the exchange of personal data and information in policy matters, as amended by the Law of 1 August 2018;
- u* Bill of Law No. 6763 modifying the Criminal Procedure Code and Electronic Data Protection Law;
- v* the Law of 1 August 2018 relating to the protection of individuals as to the processing of personal data in criminal and national security matters;
- w* the Law of 28 May 2019 relating to the implementation of the Directive on security of network and information systems (NIS Directive);⁴⁵
- x* the Law of 28 May 2019 on public websites and mobile applications accessibility of public sector entities, transposing the Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies;

42 The GDPR harmonises the applicable data protection law and the Luxembourg legislator has adopted relevant legislative texts to cover matters in which Member States retain a certain autonomy.

43 See Section III.iv.

44 See Section III.iv.

45 Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (NIS Directive).

- y the Law of 27 July 1991 on electronic media (as amended for the last time on 26th February 2021;
- z the Law of 15 December 2020 on space activities; and
- aa in addition, a large number of Grand-Ducal regulations and other regulations (particularly from the ILR) have been adopted in relation to the implementation of the various laws.

iii Ownership and market access restrictions

Luxembourg rules and regulations do not, in principle, impose ownership restrictions within the TMT sector, except in certain specific sectors. Regarding telecommunications services, the New Electronic Communication Law provides for a general authorisation regime but which is implemented through a notification regime.

There are specific ownership conditions for being granted a concession to operate Luxembourg satellite systems or other space activities or to broadcast a Luxembourg programme via satellite or cable.

Because spectrum is considered a rare resource, its management and use is reserved to the state. Licences to use spectrum may, however, be granted to third parties subject to the conditions of national legislation, related regulations or international or European agreements and treaties.

There is no specific national regulation on cross-ownership of media companies. However, general laws on competition still apply.

iv Transfers of control and assignments

Mergers and acquisitions

There is no specific Luxembourg authority regulating mergers and acquisitions in the TMT sector. The ILR's competences are to guarantee competitiveness on the Luxembourg TMT market and, as such, it will monitor acquisitions and mergers in the sector to evaluate their position on the market *ex post*.

The Law of 23 October 2011 on competition, which prohibits restrictive agreements and abuses of dominant position, provides for an independent authority, the Council for Competition Matters (CCM), which is in charge of investigating cases, consultative missions and sectoral inquiries (or inquiries by types of agreement). The Investigation Division for Competition Affairs was abolished. The CCM is also the decision-making body and exercises various powers for the execution of its mission (i.e., finding and sanctioning legal violations, drafting opinions, undertaking market studies, gaining information about companies and executing missions allotted to the national CCM). Decisions by the ILR in relation to regulation of competition must be taken in agreement with the CCM. None of the relevant authorities has *ex ante* powers; nor may they prevent mergers or acquisitions.

III TELECOMMUNICATIONS AND INTERNET ACCESS

i Internet and internet protocol regulation

Internet services were regulated, prior to the New Electronic Communication Law, by the Law of 21 March 1997 relating to telecommunication services and the operation of telecommunications networks (Law of 1997) and the Repealed Electronic Communication Law.

The Law of 1997 did not provide for specific internet protocol regulations, but covered telecommunications services and networks generally. The New Electronic Communication Law regulates the electronic communication networks and services in the broadest way and has been extended to cover OTT players and services that are not based on numbering.

The New Electronic Communication Law has introduced a certain number of changes, widened the scope of existing regulation to a larger range of communication technologies and introduced definitions of electronic communication network and electronic communication service, as opposed to the previously used generic term telecommunication services. The new terminology reflects the increased scope of the regulated services and networks, making an express reference to internet services. The New Electronic Communication Law takes a more global approach with respect to networks and electronic communication services as a result of the convergence between the telecommunication, media and information technology sectors.

Neither the Law of 1997 nor the Repealed Electronic Communication Law provided for any specific rules applicable to internet services or IP-based services as opposed to traditional telephony services, except that certain additional rules apply to the provision of telecommunication services that are offered to the public because of the specific nature of the telephony services. The Repealed Electronic Communication Law provided for certain specific obligations applying to publicly available telephony services and public telephone networks. The aim of these specific regulations was to ensure a universal service to the resident population and they applied only to traditional telephony. The New Electronic Communication Law, among other things, has introduced the access to high-speed internet as a universal service at an acceptable price.⁴⁶

As previously noted, the ILR is the competent regulator in charge of the supervision of the services rendered both in relation to internet services. The operation or provision of electronic communication services or networks (other than the number-independent interpersonal communication services) is subject to notification to the ILR.⁴⁷ No distinction as regards the notification requirement is made between the variety of the electronic communication networks and services, other than details regarding the differences in the various services notified. Although no licence is required, notified entities are subject to a certain number of obligations, formalities and filings largely derived from the Directive 2018/1972 and have to pay an administrative fee calculated on the generated turnover by the relevant entity with respect to the notified service.

The New Electronic Communication Law has profoundly changed the landscape of electronic communication legal and regulatory framework focusing on interconnectivity, competition, consumer protection, security of networks and equal access to services and network.

ii Universal service

The development of communication infrastructure in Luxembourg is among the top priorities of the governmental programmes in the field of information and communication technology. The government has been developing broadband infrastructure services for approximately 10 years.

⁴⁶ New Electronic Communication Law, Article 95 and following

⁴⁷ New Electronic Communication Law, Chapter II, Section 1 and 2.

Since the end of 2011, Luxembourg has a 100 per cent standard (fixed) broadband coverage ((DSL) up to 25Mbps) available to all Luxembourg households.⁴⁸ By 2024, the main operator, Post Luxembourg aims to have the standard fixed lines totally replaced by fixed lines provided via IP. According to the DESI, next generation access (NGA) coverage⁴⁹ reached 99 per cent (compared to a European Union average of only 90 per cent of the households).⁵⁰ 4G broadband availability in Luxembourg reached around 99.8 per cent in urban and rural areas.⁵¹ Luxembourg residents are very connected: 93 per cent are internet users compared to 85 per cent in the EU.⁵²

The installation of the optical fibre has been in constant progress since 1997 and LuxConnect,⁵³ the city of Luxembourg and POST are joining forces to cover the whole territory with optical fibre under the 'national ultra-high speed network strategy – ultra-high speed network for everyone'. Fibre to the home (FTTH), using fibre optic cable, is further progressing, and 85 per cent⁵⁴ of all Luxembourg households are connected to FTTH according to the latest activity report of the Ministry of State. In 2021, this percentage increased to reach 75.2 per cent⁵⁵ and 90.2 of DOCSIS 3.1.⁵⁶ Since the end of 2020, optical fibre became the most used technology for fixed internet access in Luxembourg and represents 55.3 per cent of all access.⁵⁷

In addition to work being carried out on the deployment of optical fibre throughout the country, efforts are also being made on the existing networks to increase the broadband speed. The Grand Duchy is connected through 28 different fibre routes to the main internet exchange hubs in Europe – Frankfurt, London, Paris, Brussels, Amsterdam and Strasbourg – with particularly low-latency rates of around five milliseconds.⁵⁸

The most recent ILR statistical report (ILR report) confirms that more than half of all internet connection subscriptions (72.3 per cent) are those with a speed equal or superior to 100Mbps.⁵⁹ The uptake of 1 Gbps is low and below average as offers introduced only in 2019.⁶⁰ Luxembourg ranks third in the European Union in terms of internet access (a bit less than 90 per cent of households).⁶¹

48 Luxembourg 2011 Telecommunication Market and Regulatory Developments.

49 NGA (very high-speed digital subscriber line, data over cable services interface specification 3 cable and fibre to the premises).

50 DESI 2022, <https://digital-strategy.ec.europa.eu/en/policies/desi-luxembourg>, p. 8.

51 DESI 2021, p. 9.

52 DESI 2020.

53 Luxconnect was created at the initiative of the government.

54 Activity Report 2020 Ministry of State, p. 21 (<https://gouvernement.lu/en/publications/rapport-activite/minist-etat/me/2020-rapport-activite-me.html>).

55 IRL Telecommunication Statistical Report 2021 (<https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-916.pdf>), p. 8.

56 DESI Report 2022 Luxembourg.

57 id., p. 8.

58 <https://www.consilium.europa.eu/media/21796/luxembourg-eba-natural-choice-official-en.pdf>; <https://maec.gouvernement.lu/dam-assets/directions/sg/euopen-cybersecurity-competence-centre/Brochure.pdf>.

59 IRL Telecommunication Statistical Report 2021 (<https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-916.pdf>), p. 8.

60 DESI Report 2022 Luxembourg.

61 [file:///ehp-fs02.ehp.local/W10-FolderRedirection\\$/annlist/Downloads/desi_2020_thematic_chapters_-_full_european_analysis_22E60892-D319-9F6D-3E247D4BE7030772_67086.pdf](file:///ehp-fs02.ehp.local/W10-FolderRedirection$/annlist/Downloads/desi_2020_thematic_chapters_-_full_european_analysis_22E60892-D319-9F6D-3E247D4BE7030772_67086.pdf), p. 18.

In Luxembourg, a notable market trend towards bundled offers (broadband mobile or fixed telephony and TV) continues. By the end of 2016, 84 per cent of all internet access was commercialised with at least one other service.⁶² The ILR report for 2020 confirms this trend, as 85.8 per cent of internet subscriptions are coupled with at least one other service.⁶³ The most subscribed offer is that of fixed internet and fixed telephone services.⁶⁴ Luxembourg benefits from an extremely well-developed FTTH architecture.

Since the end of 2021, Luxembourg has provided a very high capacity network (VHCN) with downstream speeds ranging up to 1GB/s to almost 96 per cent of all households and businesses.⁶⁵ POST and other alternative operators offer ultra-high speed internet access. Luxembourg is ranked within the three leaders on VHCN with 96 per cent coverage.⁶⁶

iii Restrictions on the provision of service

Pursuant to the Electronic Data Protection Law and the GDPR, internet service providers (ISPs) and operators of electronic communication services and networks are compelled to ensure the confidentiality of communications exchanged by way of electronic communication means. The general rule is that no person other than the user is allowed to listen to, intercept or store communications and data relating to traffic and location without the agreement of the user.

This prohibition does not apply to:

- a* communications relating to emergency calls;
- b* commercial transactions to the extent that they constitute proof of transactions; and
- c* authorities investigating and acting in relation to a *flagrante delicto* act or within the scope of criminal offences to ensure national and public security.

An ILR regulation, adopted on 14 December 2017, provides for the conditions and limitations of any permitted interceptions.⁶⁷

In relation to data resulting from commercial transactions and cookies, the user or parties to the transaction must be informed that their data may be processed and of the conditions (in particular the duration) and aim of the storage, as well as of the possibility to oppose such data processing. Cookies may only be used with the express consent of the user. The user must have a real choice and there cannot be any risk of deception or negative consequences if the user chooses not to give his or her consent. For the purpose of criminal law enforcement, specific conditions must be met to have recourse to intercepted communications data. In addition, for the purpose of research, monitoring and pursuit of criminal offences, and with the sole aim of providing relevant information to the judicial authorities, each ISP or operator must store traffic information and locational data for a period of six months. The Law of 24 July 2010 has amended the scope of criminal offences by

62 ILR Telecommunications Statistical Report 2016, p. 40 (<https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-620.pdf>).

63 IRL Telecommunication Statistical Report 2021 (<https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-916.pdf>), p. 33.

64 *ibid.*

65 IRL Telecommunication Statistical Report 2021 (<https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-916.pdf>), p. 8.

66 DESI Report 2022, p. 8.

67 Regulation ILR/T17/11 of 14 December 2017 related to technical specifications for the interception of electronic communications in Luxembourg – Electronic communications sector.

limiting the possibility of only consulting the data that relates to criminal offences resulting in penal sanctions of more than one year's imprisonment. The Grand-Ducal Regulation of 24 July 2010 relating to traffic data and localisation data determines the category of traffic data that may be useful for the research, observation and prosecution of criminal offences, as well as the manner pursuant to which such information is made available to the authorities. The Law of 28 May 2019 implementing the NIS Directive provides legal measures to further enhance and strengthen the level of cybersecurity.

Intellectual property theft and piracy are regulated by:

- a* the Copyright Law;
- b* the LCC;⁶⁸
- c* the Privacy Law;
- d* the Electronic Data Protection Law; and
- e* the GDPR.

There is currently no public authority in Luxembourg that exercises global supervisory or monitoring power over the content and traffic data of network operators, ISPs and users, as this would violate the essential privacy principles.

Similarly, and for the same reasons, network operators may not control the content, application and services accessed by their network users.

The practice of deep packet inspection is prohibited in Luxembourg, as it infringes confidentiality rules and constitutes an invasion of privacy in complete violation of the above-mentioned legislation. The same analysis would apply to the filtering of data processed by means of electronic communication.

However, to comply with the secrecy or confidentiality requirements and to avoid invasion of privacy, piracy or intellectual property theft, network operators, data centre operators and PSF are obliged to take appropriate technical and organisation measures, and to have systems and procedures (firewalls, encryption, secured and restricted access, etc.) in place that render the network and the data processing via their network secure.

iv Privacy and data security

National security

The New Electronic Communication Law, the Electronic Communication Data Protection Law and the Data Protection Law provide for specific applicable measures to ensure national interests.

In certain circumstances, where national security (including public health and public order) is endangered, the government may requisition the entire electronic communication network established in Luxembourg, as well as the connected equipment, or prohibit the provision of some or all electronic communication services.

To maintain access to the emergency services, the government may also dictate special conditions for the use of electronic communication services and networks. Although storage of personal data is generally prohibited, the New Electronic Communication Law provides for an exception in relation to the storage of traffic data relating to emergency calls or inspection of false alerts, attacks or abusive calls.⁶⁹

68 Criminal Code, Articles 309, 460, 488, 505, 509-1 and following.

69 New Electronic Communication Law, Article 124.

The Law of 23 July 2016, as amended by the Law of 28 May 2019, created a High Commission for national protection with special powers, allowing it to prevent, anticipate and manage a crisis and its effects in order to return to a normal state. For example, according to Article 4 of the Law of 23 July 2016, '[t]he protection of critical infrastructure includes all activities aiming to prevent, attenuate or neutralise the risk of a reduction or discontinuity . . . of services essential to the protection of vital interests or essential needs for all or part of the country or its population'.

Furthermore, following terrorist attacks, a law on the exchange of personal data and information in police matters was adopted on 1 August 2018.

Finally, the Law of 7 June 2017 abolished anonymous prepaid SIM cards for mobile phones. Mobile operators have to deactivate prepaid SIM cards with a Luxembourg number whose holders have not yet been identified. In return, they have to collect certain data in relation to the identification of their clients before activating the purchased prepaid cards.

The Law of 28 May 2019 relating to the implementation of the Directive on security of network and information systems (NIS Directive) creates a computer security incident response team network to contribute to the development of trust and confidence between Member States and to promote swift and effective operational cooperation.

Consumer protection

Consumer protection in the electronic communication domain is guaranteed by both the Consumer Code and the Media Law, as well as other general applicable laws in Luxembourg. They set guidelines and restrictions in relation to commercial advertisements and specific provisions for the protection of children.

Information about consumers must be treated confidentially and may not be made accessible to third parties, and the processing of consumer data is allowed only if it falls within the criteria defined by the relevant laws. Processing of data is subject to the principle of legitimacy of processing.

Luxembourg law prohibits in principle the addressing of advertisements or other unrequested communications to persons by electronic means without their consent. In any event, the consumer shall be able to object. If the supplier of a product received the email addresses during a previous sale, he or she can use those email addresses to promote analogous products and services unless the concerned person requests that such actions be stopped.⁷⁰

Specific Luxembourg provisions related to specific sectors (e-payment, financial services concluded or offered via electronic means) apply when the contractor or prospective client agrees to enter into contracts or receives services over the internet or other mobile means that do not necessitate direct human contact.

The New Electronic Communication Law has introduced an additional level of consumer protection and the proposal for an e-Privacy regulation that is currently being negotiated at EU level will further enhance consumer protection.

Protection of children

In Luxembourg, no specific legislation or regulations that ensure the online protection of children exist.

70 Electronic Data Protection Law, Article 11.

In 2011, Luxembourg ratified the United Nations Convention on the Rights of the Child and the Council of Europe Convention on Protection of Children against Sexual Exploitation and Sexual Abuse. It is also involved in the implementation of their provisions.

Moreover, the government is issuing a number of recommendations and is supporting various projects to make children and their parents aware of the risks related to use of the internet. The BEE Secure project was drawn up in the context of the EU Safer Internet Programme, which gives directions for the use of the internet to children, parents and educational staff. In this context, it provides ‘trainings, which are mandatory for all 7th-grade classes in Luxembourg’s secondary schools’.⁷¹ Plus, ‘Luxembourg is the only country in Europe that has introduced mandatory trainings for safe internet use within the education system’.⁷² Furthermore, at the start of the 2021–2022 school year, a new subject called Digital Sciences was introduced in a pilot project with 18 secondary schools as part of the ‘Easy Digital’ initiative of the Ministry of Education, Children and Youth. This new course takes place in the first-year secondary school curriculum.⁷³

Generally, the policy aims to familiarise children with new technology rather than filtering or blocking access to various types of information (these two techniques might, however, be alternatives); the intention is to teach children how to use the internet safely and to always be aware of the risks related to such use.

Children’s rights are protected by provisions of the LCC. After the adoption of the Law of 21 February 2013 amending Articles 372 and 377 of the LLC, the LLC provides for enhanced sanctions in relation to sexual child abuse matters. The BEE Secure Stopline is a project operated by a national consortium that provides a structure to report illegal information transmitted over the internet anonymously. The E-commerce Law requires information service providers to withdraw or render inaccessible any illegal content that they become aware of. The Media Law includes specific child protection provisions.

The University of Luxembourg is an active member of the EU Kids Online project, which is a multinational research network seeking to enhance European children’s opportunities and safety and reduce risks.⁷⁴ A Safer Internet Day is organised every year.

In relation to the adoption of the 2014 Law, the CNP has lobbied to introduce an appropriate visual warning obligation. A Grand-Ducal Regulation was adopted on 8 January 2015 (as amended by Grand-Ducal Regulation of 31 May 2017) for the protection of minors regarding audiovisual media services.

The GDPR establishes enhanced protection for children when it comes to the processing of their data and to their consent in relation to information society services. The processing of the personal data of a child shall be lawful where the child is at least 16 years old. If the child is younger, ‘such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child’.⁷⁵

71 BEE Secure Annual Report 2020, p. 6, https://www.bee-secure.lu/wp-content/uploads/2021/02/145_jahresbericht-2020.pdf.

72 *ibid.*

73 BEE Secure Annual Report 2021, p. 30, https://www.bee-secure.lu/wp-content/uploads/2022/02/150_annual-report-2021-web-ua.pdf.

74 <http://www.eukidsonline.net/>.

75 GDPR, Article 8.

Cybersecurity

Cybersecurity is a government priority.

Individuals and companies are encouraged to take appropriate technical measures to defend themselves against cyberattacks.

Similar to the internet project for children, the government created CASES Luxembourg, a project that is accessible by all internet users and the purpose of which is to make the public aware of potential cyberattacks that are inherent in internet use, and to advise on how to identify them. In this context, it is worth mentioning the certification authority, Luxtrust, which manages electronic certificates with the highest level of security.

Network operators and ISPs are required by applicable law to comply with stringent security measures.

As a response to the increasing number of cyberattacks, the LCC has been amended to include offences in the electronic communication sector.

The government pursues efforts to prevent and fight cybercrime and, in 2011, created two dedicated structures:

- a* the Luxembourgish Cybersecurity Board (CSB), whose mission is to work on a strategic plan against attacks via the internet; and
- b* GOVCERT, the governmental computer emergency response team, which is linked to the national agency for the security of information systems.

The ANSSI is the body authorised to deal with incidents of cybercrime in the information systems of the public sector and of operators of critical infrastructure. In addition, the Interministerial Coordination Committee for Cyber Prevention and Security, established in 2017, supports the CSB in its initiatives.

In continuation of existing cybersecurity strategies and plans adopted and followed over the past 10 years, Luxembourg, through a multidisciplinary working group, has drawn up the new national cybersecurity strategy⁷⁶ for 2021–2024, whose main objectives are to build trust in the digital world and protect human rights, strengthen the security and resilience of digital infrastructures in Luxembourg, and develop a reliable, sustainable and secure digital economy. LU-CIX's⁷⁷ infrastructure has been strengthened to create a national centre for filtering distributed denial of services (DDoS). Since its implementation, some entities have already been included and are protected, and further entities shall be included in 2021.⁷⁸ POST published with full transparency its figures starting from January 2019 concerning DDoS volumetric attacks recorded on its Backbone in Luxembourg. In 2021 they ranged between 95 and 155 attacks per month with alerts ranging between 170 and 330 per month.⁷⁹

The CSB acts as a central point of information and contact for users to report cybersecurity incidents, which should allow the CSB to supply businesses with this information and put them in a position to take appropriate action to fight risks against security.

The Computer Incident Response Centre Luxembourg (CIRCL), the official computer emergency response team (CERT) for 'Security made in Lëtzebuerg' (SMILE), is competent

76 National Cybersecurity Strategy IV, <https://hcupn.gouvernement.lu/dam-assets/fr/publications/brochure-livre/strategie-nationale-cybersecurite-4/National-Cybersecurity-Strategy-IV.pdf>.

77 The Luxembourg internet exchange.

78 Annual Report 2020, Ministry of State, p. 66.

79 <https://ictexpertsluxembourg.lu/ddos-attacks/>.

for the private sector, municipalities and non-governmental entities in Luxembourg. SMILE is an initiative that has the objectives of coordinating governmental initiatives, as well as supporting and making the public more aware of cybersecurity issues. In addition, SECURITYMADEIN.LU aims to develop an ecosystem for cybersecurity.

After the delay in the implementation of the European Council Convention on Cybersecurity (CCC)⁸⁰ and Directive 2013/40/EU relating to attacks against information systems, a law relating to cybercrime was adopted on 18 July 2014. This law adapted the national substantive and procedural criminal law to the specific needs of fighting cybercrime. The law introduced new criminal offences into the LCC, in particular the misuse of identity, phishing and illegal interception of computer data supplementing the legal instrument of computer-related crimes, which includes the illegal access, hacking and deletion of computer data. The law also amends the Criminal Procedure Code to achieve the requirements of the CCC regarding the prompt preservation of stored computer data and traffic data.

In May 2016, the government announced a collaboration between the ANSSI and SMILE through their respective CERTs⁸¹ in relation to all activities in connection with the detection, management and notification of incidents.

Given the importance of international cooperation on cybersecurity at an EU level, the NIS Directive establishes that computer security incident teams should be able to participate in international cooperation networks in conjunction with national authorities.

In October 2017, a national centre of expertise concerning cybersecurity was created in Luxembourg, which helps to strengthen the positioning and the economic attractiveness of the country for undertakings in the ICT sector.⁸²

Cybersecurity Week – Luxembourg takes place every year in October within the framework of the European Cybersecurity Month, an annual advocacy campaign organised by the European Union Agency for Network and Information Security and the European Commission.⁸³

Luxembourg is fully aware that security in the increasingly highly technological environment continues to be an important pillar and continues to be successful in a data-driven economy. It participates in initiatives and programmes that aim to share information on cybersecurity-related subjects, for instance through MONARC and MISP (malware information-sharing platform and threat sharing).

The ITU ranked Luxembourg seventh in Europe and 13th in the world in its latest edition of the global cybersecurity index 2020 (GCI). These rankings highlight the commitment of Luxembourg to cybersecurity and its growing position in the leader rankings.⁸⁴ Luxembourg ranks 39th out of 160 in the national cybersecurity index.⁸⁵

The launch by the ILR and the Luxembourg Institute of Science and Technology of SERIMA, a cybersecurity platform for security risk management, evidences Luxembourg

80 The treaty entered into force on 1 July 2004. The Grand-Duchy of Luxembourg signed the treaty in 2003 and ratified it on 16 October 2014. The entry into force in Luxembourg was 1 February 2015.

81 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2016/05-mai/30-cybersecurite-anssi.html.

82 <https://www.wort.lu/en/business/security-luxembourg-to-launch-cybersecurity-centre-in-2017-580725845061e01abe83a969>.

83 <https://www.cybersecurity.lu/cybersecurityweek>.

84 Global Security Index (CGI) 2020, <https://www.itu.int/en/ITU-D/Cybersecurity/Pages/GCI/GCIv4-Report-Launch.aspx>.

85 NCSI e-Governance Academy 2022.

players' awareness of the necessity and competence for developing new tools in the field of information security. While at first it will be used by operators of the electronic communications sector, it will soon be used in other sectors such as energy, transport, health, water distribution and IT infrastructure.⁸⁶

Emergency response networks

Traditionally, Luxembourg first responders and other emergency responders (such as the police, customs and civil protection) benefit from a dedicated network (RIFO), which was analogue in the beginning. With the adoption of the Law of 20 May 2014, as amended by the Law of 1 March 2019, for the financing of a national integrated radio communication network for Luxembourg, RIFO was replaced by RENITA. RENITA is based on the terrestrial trunked radio digital technology and, in the case of a congestion of mobile networks, the RENITA network is less exposed to inherent risks. RENITA has been operational since July 2015. A second mobile base was acquired in 2020.

On an international scale, the government has actively cooperated regarding the strengthening of emergency telecommunications and a rapid response in the event of disasters. It has developed a nomadic satellite-based telecommunication system, emergency.lu, which aims to assist 'humanitarian agencies respond to communities affected by natural disasters, conflicts or protracted crisis'.⁸⁷ As of 2012, this platform has been available as a public global service. The government decided to join the European Commission's European Response Coordination Centre, and thus Luxembourg will be the first state to bring in a common module to the voluntary pool.

At an EU level, harmonisation of the digital frequency relating to these services has been achieved, permitting interoperability.

IV SPECTRUM POLICY

i Development

The increasing development of wireless communication, media and information technology also affects spectrum policy in Luxembourg.

The need for radio spectrum has increased significantly over the past few years, and Luxembourg actively participates in the elaboration of a pan-European spectrum policy and favours a more flexible and efficient use of spectrum.

In a contribution paper to the European Commission of 2010, Luxembourg indicated that it is in favour of a more flexible use of spectrum; however, emphasising that it is crucial that the more flexible use will not negatively impair the current quality of services or entail harmful interferences. Luxembourg has expressed its concern that a more flexible use would need to take into consideration the characteristics of more specific and sensitive technology, which would be more prone to harmful interference than others.

During the negotiations that led to the adoption of the European regulatory framework, Luxembourg explained that one of its top priorities was to maintain national competence in relation to the management of the spectrum and a full subsidiarity in this area.

86 <http://assets.ilr.lu/Documents/ILRLU-1797567310-239.pdf>.

87 <https://luxembourg.public.lu/en/society-and-culture/international-openness/humanitarian-aid.html>.

ii Flexible spectrum use

As a result of the Law of 27 February 2011 amending the Spectrum Law, allocated licences are no longer personal.⁸⁸ On that account, it is currently possible to sell, transfer or sublease allocated spectrum, thus enhancing the flexibility of spectrum use. The Spectrum Law also provides for the possibility of spectrum sharing. The New Electronic Communication Law has introduced new provisions for the management and the allocation of individual right of use for radio spectrum for electronic communication services and networks.

The mobile use of spectrum dedicated to fixed use is possible as a matter of applicable law and regulations and is in line with the principle of technological neutrality.

iii Broadband and next-generation mobile spectrum use

According to the DESI 2022, fixed broadband internet is accessible for 91 per cent of the population of Luxembourg, compared to 78 per cent for the rest of the European Union.⁸⁹ For the new generation high speed internet, 99 per cent of the Luxembourg population is covered compared to only 90 per cent for other EU Member States.⁹⁰

In Luxembourg, the increasing need for spectrum for use in the offer of increasing broadband services is partly solved by opening additional frequencies or the release of spectrum for the use of broadband and next generation mobile services.

Luxembourg completed the switch-off of analogue television broadcasting in 2006, replacing it with digital terrestrial TV. The released spectrum (referred to generally as the first digital dividend) is used for next-generation mobile services.

The ILR adopted a new frequency plan on 10 September 2020, which does not yet include the Commission Implementing Decision (EU) 2021/1067 of 17 June 2021 on the harmonised use of radio spectrum in the 5945–6425MHz frequency band for the implementation of wireless access systems, including (wireless access systems (WAS)/RLANs)⁹¹ as well as the subsequent Implementing Decisions.⁹²

In October 2011, Luxembourg concluded an agreement with its neighbouring countries regarding the reduction of risks of interference as a result of overlapping coverage in the frequency band 790–862MHz. Additional agreements were reached in May 2017 with the administrations of Belgium, France, Germany, Switzerland and the Netherlands on frequency usage and frequency coordination in border areas. Another multilateral agreement between France, Germany, Switzerland and Luxembourg was concluded in 2014 concerning the allotment of preferential frequency blocks in the 406.100–410.000MHz band to ensure equal spectrum access in the respective border areas. A bilateral agreement was signed with Germany regarding Luxembourg and Germany's common approach on dealing with the 470–694MHz and the 694–790MHz frequency bands. A similar bilateral agreement has existed with France since 2016.

The licences within the 900MHz have been renewed to the existing operators and one new operator and the use thereof has been expanded to different technologies. These licences

⁸⁸ Article 2 of the Law of 27 February 2011 amending Law of 30 May 2005 organising the management of radio spectrum.

⁸⁹ DESI 2022, p. 8.

⁹⁰ *ibid.*

⁹¹ https://web.ilr.lu/FR/Professionnels/Frequences-radioelectriques/_layouts/15/ILR.Internet/Nouveaute.aspx.

⁹² ILR European Union Decisions, https://web.ilr.lu/fr/professionnels/frequences-radioelectriques/legislation/reglementation-europeenne/decisions/_layouts/15/ilr.internet/publications.aspx.

have allowed the introduction of 4G technology in Luxembourg specifically (Long Term Evolution). In addition, the three operators have spectrum in the 1,800MHz band allowing flexibility for the introduction of innovative new technologies.

At a European level, the European Commission adopted a decision to make more spectrum available for mobile services in the 700MHz band (694–790MHz) by 2020, allowing the provision of high-quality internet to users, whereas ‘frequencies in the sub-700MHz area (470–694MHz) will remain available, as a priority, for audiovisual services’.⁹³ This development is in line with the ongoing deployment of 5G.

In August 2017, the ILR launched a public consultation to establish the level of interest in the 700MHz band and the possible use thereof, and the quantity needed to cover mobile services, security and emergency services. Three interested parties responded (of which RENITA is in charge of the emergency call network) and expressed their interest in obtaining broadband in that frequency, in particular with a view to the upcoming introduction of the 5G network. The European telecommunication ministers have signed the common declaration ‘Making 5G a success for Europe’, and the ministers envisage a deployment of the 5G network between 2018 and 2025 with the aim to cover major cities and major transportation routes by 2025.⁹⁴ On 12 September 2018, Prime Minister Xavier Bettel presented the 5G strategy for Luxembourg, whereby Luxembourg’s vision is to be among the leaders in 5G. Indeed, the government wants to launch several pilot zones in Luxembourg to enable a timely deployment of 5G.⁹⁵ In April 2020, the competent ministry set the conditions and the modalities of the frequency auction procedure.⁹⁶ The candidates that participated in the public auction were Eltrona Interdiffusion SA, Luxembourg Online SA, ORANGE Communications Luxembourg SA, POST Luxembourg and Proximus Luxembourg SA,⁹⁷ with three frequency bands to be allocated to the highest bidder: that is, 30MHz was to be allocated twice in the 700MHz band, and 330MHz in the 3600MHz band.⁹⁸ On 22 July 2020, the results of the auction were made public.⁹⁹

The licences were attributed to four of the five candidates and contain obligations relating to the offering of 5G coverage in the City of Luxembourg and a deadline to have the entire national territory covered by 5G being 2025. POST started its first launch in October 2020.

iv Spectrum auctions and fees

Given the small size of the market and the limited number of operators, the experience of the authorities shows that allocations of spectrum through auctions or ‘beauty contests’ do not produce satisfactory results. Hence, although they are theoretically possible as a matter of law, auctions are not currently practiced.

93 http://europa.eu/rapid/press-release_IP-16-207_en.htm.

94 Activity Report 2017, Ministry of State, p. 9 (<https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-etat/2017-rapport-activite-etat/rapport-annuel-me-2017.pdf>).

95 <https://www.luxinnovation.lu/event/luxembourg-5g-conference-2/>.

96 https://smc.gouvernement.lu/fr/actualites.gouv_smc%2Ben%2Bactualites%2BArticles%2Bfrequencyauction.html; <http://www.legilux.lu/eli/etat/adm/dmin/2020/04/27/b1437/jo>.

97 <http://legilux.public.lu/eli/etat/adm/amin/2020/06/11/b1959/jo>.

98 <http://assets.ilr.lu/Documents/ILRLU-1797567310-235.pdf>.

99 https://smc.gouvernement.lu/fr/actualites.gouvernement%2Bfr%2Bactualites%2Btroutes_actualites%2Bcommuniques%2B2020%2B07-juillet%2B22-resultats-5g.html.

The Spectrum Law provides for various procedures for the allocation of spectrum licences such as competitive selection, comparative selection or by a public bidding procedure for the best offeror. The competent minister will determine the applicable procedure on a case-by-case basis after having undertaken a public consultation and will publish this decision in the Luxembourg Official Gazette and in the EU Official Journal at least one month prior to the launch of the procedure.¹⁰⁰

The fees payable to the state (as owner of the national spectrum) for the allocated spectrum are determined by a Grand-Ducal Regulation of 21 February 2013 on royalties for radio frequencies,¹⁰¹ and by the Grand-Ducal regulations amending it.¹⁰² The Spectrum Law has modified the allocation and recovery of the fees payable in relation to spectrum licences in favour of the ILR. Public services and authorities are not subject to the payment duty to the extent that spectrum is used for the provision of services within the scope of national defence, public security or emergency services.

V MEDIA

i Restrictions on the provision of service

The Media Law¹⁰³ has been amended several times, with the most recent amendment being implemented from January 2018. The Law aims to cover all types of audiovisual and sonorous media. High importance is attributed to content regulation, protection of children, non-discriminatory content, and the form and content of commercial advertising.

ii Internet-delivered video content

It is difficult to measure the importance of internet video distribution in Luxembourg, given the absence of surveys or statistics on this phenomenon. The only indicator is the fact that, as in most other Western countries, people watch less traditional TV, since internet video or linear streaming via platforms is becoming more popular. However, given the general availability of cable and satellite TV, the impact has so far been minimal.

VI THE YEAR IN REVIEW

Key legislation

The adoption of the New Electronic Communication Law is certainly a major step towards harmonisation at the European level of electronic communication services and will provide wider transparency and enhanced availability of electronic communication services and networks to consumers.

¹⁰⁰ Article 6 of the Spectrum Law.

¹⁰¹ Grand-Ducal Regulation of 21 February 2013 on royalties for radio frequencies.

¹⁰² Grand-Ducal Regulation of 8 November 2016 and Grand-Ducal Regulation of 5 December 2018.

¹⁰³ Information in this section is largely drawn from the Ministry of State's Annual Report from 2011 (and 2012).

VII CONCLUSIONS AND OUTLOOK

The digital economy has further developed and remains a top priority of the government. Continuing efforts are being made to favour the development of new communication and information technologies that allow Luxembourg to continue to play a key role in the digital domain. The development of international connectivity, and access of its industries to high performance computer and security in the current context remain key priorities and Luxembourg participates in numerous initiatives and projects both with human capital and economic means.

Digital Letzebuerg's ongoing actions and initiatives show the government's commitment to and awareness of the importance of the ICT sector and ICT-related services. The development of FinTech services and the satellite sector is strongly supported by many market players and the government and will further attract players in that sector.

Luxembourg pursues its efforts in assisting and helping companies to enhance and consolidate their digitalisation. The government's and relevant players' efforts show promising results. The DESI 2022 indicates that

the degree of integration of digital technology by businesses, Luxembourg has managed to pull back and gain five ranks in one year, coming in 14th place. Luxembourg has made major progress in the uptake of digital innovation. In particular, it performs well on the share of companies that analyse big data, a throwback from the country's engagement in the Euro High Performance Computing (EuroHPC) initiative.

Luxembourg is constantly building tools to enhance its digital and data-driven economy.

Luxembourg has launched a Digital Innovation Hub (L-DIH) whose mission is to actively contribute to digital transformation by supporting companies in their strategic and concrete actions. The L-DIH is the European Commission national contact point in the context of the establishment of national and regional digital innovation hubs across Europe. The level of digitalisation in SMEs is still a moving target but the Luxembourg government is supporting SMEs continuously to continue or to further embrace the digital transformation.

The Fit 4 Digital programme involving very small companies (those having fewer than 50 employees) has multiplied by six the number of participants utilising Fit 4 Digital packages.¹⁰⁴ In the same vein, the Luxembourg Digital Innovation Hub is becoming more successful every year.¹⁰⁵ By contrast, Luxembourg continues to perform well below the EU average on the share of SMEs selling online, with only 9 per cent compared to the EU average of 17 per cent. Efforts are being deployed to increase that result.

In the fast-evolving field of artificial intelligence (AI), Luxembourg follows its Artificial Intelligence strategy published in 2019 and is pursuing its efforts to benefit from artificial tools while remaining aware of the challenges that are linked to the development and use of AI. Governmental initiatives such as AI4GOV and Ready4 AI have been successfully launched.

Luxembourg has improved exceptionally well in digital public services and is keen to pursue that path. Public authorities and institutions have implemented digitalised processes in a large range of public services but also more business-related services, such as, for

¹⁰⁴ <https://www.luxinnovation.lu/news/fit-4-digital-packages-un-nouveau-programme-de-digitalisation-tout-en-un-pour-les-tpe/>.

¹⁰⁵ Annual Report 2020 of Luxinnovation.

instance, the financial supervisory authority by introducing a new digital filing process. The government pursues these efforts, and by no later than early September 2022, the GovTech Lab's fourth call for solutions was launched. The aim is to develop a technological solution to assist the various ministries and administrations in administrative simplification and 'Better Regulation' enabling a more innovative and automated analysis of the legislative and regulatory framework.¹⁰⁶ In the same context, the 13th edition of Fit 4 Start was launched in August 2022. This programme was initiated by the Ministry of Economy and is managed by Luxinnovation and aims to support innovative start-ups focused on technology and data.¹⁰⁷

In February 2022, the Ministry of Digitalisation together with the Interdisciplinary Centre for Security, Reliability and Trust (SnT), signed a four-year framework through which the Ministry of Digitalisation uses the skills of the SnT to promote and strengthen the digital transformation of public administration as well as the digitalisation of administrative procedures in Luxembourg. This is a new approach for the Ministry of Digitalisation through which it benefits from access to working prototypes demonstrating that technology can solve a concrete challenge for the public sector as well as knowledge transfer through access to innovative technologies. Through this agreement, specific topics will be addressed through concrete collaborative research contracts. This cooperation should contribute to and complement the work done to achieve the ministry's objectives in terms of public sector data, interoperability, digital inclusion and GovTech solutions.¹⁰⁸

The result of these efforts are reflected in the DESI 2022, which mentions that

Luxembourg has been improving its score for three consecutive years, jumping from 18th (2018) to 11th (2021), with a score of 79.4. The EU Commission particularly highlights Luxembourg's performances in the provision of digital public services to businesses, scoring 97 out of 100.

The choice for certain European projects or international players to elect Luxembourg to site their headquarters or to establish a presence confirms Luxembourg's attractiveness when it comes to digital, electronic and telecommunication services (ranging from infrastructure, security and interconnectivity to a variety of services), but also forces Luxembourg to continue to strive to be at the top of the sectors' expectations and keep pace in a sophisticated and fast-evolving environment. Luxembourg is keen to be part of European projects and praises its competences and advantages internationally. One big challenge remains attracting and educating skilled persons who are key for the digital world to progress and who bring advantages to not only the world of economy, but also nations and the environment. Luxembourg is committed to the development of research and talent skills in the inspection certification and testing sectors, and widely supports the teaching of coding skills and computational thinking.¹⁰⁹

Luxembourg is thus very much aware that its success in the digitalisation project necessitates digital skills. Luxembourg is continuously launching new initiatives and adapting

106 https://digital.gouvernement.lu/fr/actualites/gouvernement%2Bfr%2Bactualites%2Btoutes_actualites%2Bcommuniqu%C3%A9s%2B2022%2B09-septembre%2B05-govtech-lab-simplify-legi.html.

107 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqu%C3%A9s/2022/08-aout/23-fit4start.html.

108 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqu%C3%A9s/2022/02-fevrier/04-transformation-numerique-etat.html.

109 Activity Report 2019, Ministry for Education, <https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-education-nationale-enfance-jeunesse/2019-rapport-activite-menej/2019-rapport-activite-menej.pdf>.

constantly to ensure that the efforts are tailored to the evolution of the market and skills needed. Luxembourg's players common agreement on the importance of the digitalisation sector and agility in adapting is one of its great strength in its success. In addition to the projects already in place, the Minister of Education, Children and Youth launched the Digital Learning Hub (DLH) in May 2022. In that context a Luxembourg branch of the 42 school, a world-renowned school of coding, was established. The Ministry stressed the importance of a Digital Learning Hub for Luxembourg:

The future is digital. Therefore, we need to develop digital skills from an early age: in a fun way with coding in primary school, with the digital science course in secondary school. It is also important to develop and deepen digital skills in working life. With the Digital Learning Hub, Luxembourg has a modern continuing education centre that promotes creativity, autonomy and working together.

The offer is open to all persons of adult age, regardless of their qualification or diploma, for both residents and non-residents.¹¹⁰

The first National Digital Inclusion Day was held in Luxembourg on 17 May 2022. This is part of the World Telecommunications and Information Society Day and is one of the initiatives of the National Action Plan for Digital Inclusion, developed by the Ministry of Digitalisation in conjunction with a dedicated interdepartmental working group. Two workshops and the presentation of the Digital Inclusion 2022 prize were on the agenda.¹¹¹

The Grand Duchy continues to build its position as a European hub for the exploration and use of space resources as it continues to pursue its path towards innovation and its constant search for new opportunities. It has notably participated in a new project at the European level, Quantum Communication Infrastructure, which, besides its terrestrial features, has a spatial component. In 2020, Luxembourg joined the International Space Exploration Coordination Group, which is 'an international forum for promoting coordinated efforts toward human and robotic space exploration on and around the Moon and Mars'.¹¹² The space activities sector is certainly one of the areas where Luxembourg will focus on specifically given its history in the satellite industry.

Luxembourg is actively pursuing national and European efforts to fight IT and cyber threats.

In the context of the European Quantum Communication Infrastructure, Luxembourg has committed to invest €10 million in a national ultra-secured communication infrastructure based on the quantum cryptology technique, LuxQCI, which shall at some stage be integrated into the quantum communication network of the European Union in the process of being developed via the OpenQKD (open quantum key distribution) pilot project. The Interdisciplinary Centre for Security, Reliability and Trust (SnT) of the University of Luxembourg, in collaboration with the Media, Connectivity and Numerical Policy Service (SMC) of the Ministry of State, announced in early April 2022 the development of the Luxembourg Quantum Communication Infrastructure Laboratory (LUQCIA). The five-year project is funded by the European Union's Recovery and Resilience Facility under the

110 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2022/05-mai/16-meisch-digital-learning-hub.html.

111 https://gouvernement.lu/fr/actualites/toutes_actualites/communiqués/2022/05-mai/05-journee-nationale-inclusion-numerique.html.

112 https://space-agency.public.lu/en/news-media/news/2020/luxembourg_becomes_isecg.html.

NextGenerationEU initiative and will aim to set up a national laboratory in 2023 to enable cutting-edge and applied research on the distribution of quantum keys and the quantum internet an essential step in the future of computing and the internet.¹¹³

The future Luxembourg quantum telecommunication infrastructure shall be based on a terrestrial optical fibre network as well as a space element constituted by a myriad of satellites.^{114,115}

In the context of European blockchain services, Infrastructure Luxembourg launched the EBSILUX project in 2020 to enhance cross-border public services via blockchain systems. The Infrachain project (a common blockchain infrastructure project), launched in 2016, is continuing on its path. This non-profit organisation was incorporated in May 2017 and shows the interest of various actors in that technology. It has been awarded its first European financing in relation to the Horizon Programme 2020.

All these efforts fit into the overall Digital Europe Programme proposed by the European Commission, which focuses on super computers, AI, cybersecurity, trust and digital skills.

Government policy also aims at further promoting ICT-related infrastructure (data centres, etc.) as one of the pillars of the Luxembourg economy. The government is continuing to invest heavily in the security of networks and infrastructures as one of the main elements in the development of electronic communication systems. As of January 2017, Luxembourg had at least eight Tier IV data centres, Tier IV being the highest level possible for a data centre with very high security and availability standards.¹¹⁶ Luxembourg is already hosting the European Commission's data processing centres and, at the end of 2016, a new data centre for the European Commission was inaugurated in Betzdorf, which, according to the former European Commissioner for Digital Economy and Society, is a 'world-class data centre' ensuring a modern, reliable and economic IT infrastructure for the Commission.¹¹⁷

The discussions underway between the government and Google for the creation in Luxembourg of one of the biggest data centres in the world are still ongoing.

The creation of various structures and the regular update of its strategies at a national level evidences the government's priority to prevent and combat cybercrime and other attacks on electronic communication services and infrastructures.

The continuing development of the online video games sector in Luxembourg and the establishment of internationally known companies is encouraging LU-CIX to further develop its services. The government has renewed prior efforts to establish efficient technical infrastructures and a business-friendly legal environment to assure the best development possible for these companies in Luxembourg.

Luxembourg is taking advantage of the growing demand for high-performance infrastructure bandwidth capacity and the connectivity needs of the e-economy. Its geographical location close to the major European cities is a clear advantage. Luxembourg actively participates in the deployment of the 5G bandwidth both on a national and European

113 https://smc.gouvernement.lu/fr/actualites.gouvernement%2Bfr%2Bactualites%2Btroutes_actualites%2Bcommunications%2B2022%2B04-avril%2B06-laboratoire-infrastructure-communication-quantique.html.

114 SES participates in that development and a first Luxembourgish satellite is dedicated to the quantum cryptography communication shall be launched beginning of 2024.

115 Mercure (Sept–Oct 2021) published by Luxembourg Chamber of Commerce, 'When economic resilience rhymes with quantum cryptography'.

116 <http://www.innovation.public.lu/fr/decouvrir/pourquoi/secteurs-innovants/finance/index.html>.

117 <https://digital-luxembourg.public.lu/news/inauguration-european-commissions-new-data-center>.

level. The launch by POST of the first 5G services evidences Luxembourg's determination in this regard. In 2022, the plan is to cover 50 per cent of Luxembourg with 700MHz frequency bands, and up to 90 per cent in 2024.¹¹⁸

118 <https://www.rtl.lu/radio/invite-vun-der-redaktioun/a/1544598.html>.

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