



5G COUNTRY PROFILE



PRINCIPALITY OF LIECHTENSTEIN

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Version 1.1

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Note: Version 1.1 of this document is an advanced draft for possible additional inputs, comments, feedback. The final version of the document is planned to be released after the ITU Regional Forum for Europe.

1. ICT background and current status of broadband

The Principality of Liechtenstein has a well-developed telecommunication infrastructure with high penetration rates above the regional average both for fixed and mobile services. Focusing on the investments of state-owned companies, Liechtenstein has been expanding its fibre-optic network since the mid-1990s. According to the Office for Communications, by the end of 2022 all premises will be connected by fibre optic and the legacy infrastructure, i.e. copper and coax, will be switched off. The various policy and regulatory initiatives undertaken by the Government and the regulator over the past years have fostered competition and supported infrastructure investment, which influenced the country's early development and high growth rates recorded in the mobile-broadband market.¹ As of September 2020, no official strategy has been laid down by the Government for 5G roll out in Liechtenstein, although frequencies are being allocated to operators.

As a member of the European Economic Area (EEA), the EU telecommunication *acquis* is applied in Liechtenstein. The latest revision to the Communications Act was in 2020 and the country is undergoing its revisions to transpose the latest EU telecommunication directives (the "Code") in the area of electronic communications. With the aim of promoting investment in a small market while fostering competition, two key policies have been implemented: the obligation to share mobile towers imposed to all mobile network operators (MNOs) and the vertical separation of the fixed-line incumbent.² The latter was a decision of the Government of Liechtenstein that came into effect in 2007, thus separating the network infrastructure operations and the retail businesses of the fixed incumbent.³ Liechtenstein's telecommunication market benefits from a competitive environment in the fixed and mobile segments based on the non-discriminatory access for all telecommunication service providers to the network infrastructure. More recently, many of the Government's digital strategies have focused on legislation, governance, infrastructure, and business,⁴ thereby playing a crucial role in expanding broadband access and connectivity speed throughout the country.⁵

As part of the Government Program for 2017-2021, the Digital Agenda is a central field of action for the new legislature concerning ICTs in the country. The main objective of Digital Agenda for Liechtenstein is to optimize the process efficiency of the National Administration with a focus on electronic means of communication, thus strengthening the digital service and the expansion of digital infrastructures—which also includes the development of 5G networks.⁶

The Digital Agenda is oriented by the following overarching principles:⁷

- That the country shall actively use the opportunities of digitization actively and address the associated challenges;

¹ See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf

² See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf

³ See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf

⁴ See: https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Liechtenstein_2019.pdf

⁵ See: <https://www.ico.li/liechtenstein-has-the-fastest-internet-in-the-world/>

⁶ See: https://www.regierung.li/media/attachments/Regierungsprogramm_2017%E2%80%932021_www.pdf?t=636895549583835664

⁷ See: <https://www.regierung.li/media/attachments/ikr-DigitaleAgendaFL-A4-Einzelseiten-200dpi.pdf?t=636924885232021692>

- That the country shall seek opportunities and deal with challenges of digital in cooperation in regard to the society, economy, science, education and administration;
- That the country shall work toward achieving the population's trust in digital services in a way that is driven by reliable information, transparency, security and a strong and clear legal foundation;
- That the companies based in Liechtenstein companies shall offer digitization the chance of penetrating into existing markets further establishing new segments as well as new niches areas for growth. In so doing, they will help foster existing skills and create new ones able to generate added value;
- That Liechtenstein shall seize the opportunity for better, cheaper and innovative products, as well as technologies, service performances and business models;
- That the country shall boost its investment attractiveness as a location that is enhanced by digitization. As such, the country shall create novel kinds of workspaces and job-related opportunities domestically;
- That the country shall promote access to knowledge for all relevant sectors in a simplified way for the population.

The areas for which these principles are designed for, as well as the goals and measures articulated in the Digital Agenda, are structured in the following topics of relevance: State and Administration; Education; Economy; Blockchain and Fintech; Infrastructure; Transportation; Health; Family affairs; and Culture. The strategy also informs that its main goal shall influence the ICT development beyond the legislation, and its core concepts shall be seen as an overarching and cross-institutional that is resourceful for all kinds of stakeholders in the country.

In addition to this Government-led agenda, the Digital Roadmap for Liechtenstein⁸ was launched at the end of 2017 in coordination between the Government and other stakeholders in order to support the business development of the country, which included over 50 companies and organizations and networks with relevance in business, science, and politics. Complementarily to the Digital Agenda (2017-2021), the Digital Roadmap for Liechtenstein focuses primarily on eight areas of focus, especially from the point of view of the economy, so that Liechtenstein can reach a high status of digitalization by 2025⁹:

- Education: the focus is placed on educating and sensitizing the population, encouraging businesses to train workers as well as fostering cooperation between educational institutions and business;
- Workforce: shortage of skilled workers is a central topic of the digital roadmap. Flexible residence permits and a smart job platform for foreign specialists are among the measures to attract foreign talent;

⁸ See: <https://digital-liechtenstein.li/>

⁹ See: https://digital-liechtenstein.li/application/files/7515/5680/8200/PM_digital_roadmap.pdf

- Digital infrastructure: this includes expanding the fiber optic network and the introduction of the new generation of mobile communications 5G in high quality and as inexpensive as possible. The economy should expand its range of broadband and smart services accordingly;
- Cybersecurity: sensibilization about security risks on the Internet is an important part of the roadmap and this should be incorporated in the national strategy;
- Research and innovation: continuing the work of platforms for research and innovations to support knowledge and technology transfer is of primary importance. This includes the “Innovation Day”, the annual Congress Digital Summit Liechtenstein for decision makers from home and abroad as well as the regular workshop events at companies. The initialization of a DigiLab focused on SMEs is also planned as well as programs for start-up funding fund and the expansion of endowed professorships at educational institutions;
- Healthcare: e-Health offers new and modern solutions for insured persons as well as service providers. An electronic health service provision can create significantly more security and efficiency in data handling, unnecessarily reduce duplication and increase the quality of care;
- Mobility and energy: according to the strategy paper, all actors should be given high priority in the areas of mobility and energy to develop innovative mobility concepts;
- e-Government: E-government is the focus of politics, administration and the legal framework. The population and companies should be able to use the services of the state administration in a digital way.

Moreover, extra attention is paid to emerging technologies such as artificial intelligence (AI), robotics, Internet of Things (IoT), big data, cloud computing, and so forth. The digital roadmap is now to be implemented step-by-step in dialogue with politicians and the population and continuously developed.¹⁰ In other words, Liechtenstein now has a strategy paper from the perspective of the economy and from the perspective of the state.¹¹

2. Broadband and mobile telecommunication sectors data

ITU data shows that 98.10% of individuals had access to the Internet in 2017 in Liechtenstein.¹² In 2010, the ITU data for the country was 80% and, in 2000, 36.52%. In 2019, the number of fixed-broadband subscriptions per 100 inhabitants was 45.37.¹³ Since 2014, xDSL has been reducing while coaxial cable internet access has been increasing steadily, and especially after 2017 with a rapid increase in glass fibre access for private customers.¹⁴ By the end of 2019, fibre-optics network represented a quarter of all internet connections in Liechtenstein (about 4,000 subscriptions).¹⁵ As part of a 48.3 million EUR expansion plan, the regulator’s vision is that operators will provide fibre-optic connectivity to the entire country by 2023,¹⁶ which is part of the country’s vision in deploying and ensuring a further data traffic

¹⁰ See: <https://digital-liechtenstein.li/beitraege/digitale-roadmap-die-regierung-ueberreicht>

¹¹ See: <https://www.volksblatt.li/nachrichten/Liechtenstein/Wirtschaft/vb/230270/digitale-roadmap-an-erbprinz-und-regierung-uberreicht>

¹² See: https://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2019/Individuals_Internet_2000-2018_Dec2019.xls

¹³ See: ITU World Telecommunication/ICT Indicators Database online: <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator “i992b”)

¹⁴ See: <https://www.vaterland.li/liechtenstein/vermischtes/glasfaser-als-basis-fuer-5g;art171,400951>

¹⁵ See: <https://www.llv.li/inhalt/118050/amtstellen/marktstatistik>

¹⁶ See: <https://www.llv.li/inhalt/118043/amtstellen/glasfaserausbau-ftth>

capacity development toward a “gigabit society.”¹⁷ While the 2019 ITU Measuring Digital Development ICT Price Trends report does not provide basket cost for the fixed-broadband indicators because the GNI per capita data on Liechtenstein are not available, an unlimited monthly data cap of data traffic costs about 42.82¹⁸ USD (36.25 million EUR) in 2020, a decrease from 61.36 USD (51.94 million EUR) in 2019.¹⁹

In 2019, the number of mobile-cellular subscriptions per 100 inhabitants was of 127.06,²⁰ while the active mobile broadband subscriptions per 100 inhabitants were 132.43.²¹ There are three major MNOs that dominate the market in Liechtenstein: Telecom Liechtenstein (FL1), Swisscom (Switzerland), and Salt (Liechtenstein) (formerly Orange Liechtenstein). Since the introduction of roam-like-at-home tariffs in the European Economic Area (EEA) from mid-2017, mobile subscriptions with Liechtenstein +423 numbers increased again significantly in 2019 and reached a share of 31% at the end of the reporting year. The total number rose by 2% to 48,000 subscriptions.²² Despite that, a significant number of mobile subscriptions are from Swiss mobile phone providers with the number +417, which means that these mobile phone subscriptions are subject to Swiss legislation.²³ Although the basket cost for mobile data remain unavailable due to the lack of data on GNI per capita in Liechtenstein, a monthly package of 20 GB Internet data traffic cap was reported to cost about 24.54 USD (20.77 EUR) in 2019.²⁴ Overall, according to ITU elaborations, 98% of the population enjoys 4G/LTE services while 99% of the population is covered by 3G.²⁵

3. Current progress on 5G: consultations and national strategies

The government regards the introduction of 5G as an important building block for the country’s digital future, and as the logical continuation of previous strategies and Government-led plans in the field of electronic communication. Therefore, no dedicated national strategy on 5G is necessary. The Government states that it is largely through a modern and optical communication infrastructure the country will be able to make its territory a highly attractive location for telecom investments and consequently improvement of the economy in the future.²⁶

The initial strategy for Liechtenstein was to award 5G frequencies to operators at the end of 2019. However, the Ministry of Economy informed that the Office for Communications decided to wait for the frequency allocation to take place in neighbouring countries. In parallel to the proceedings in Austria, the Office prepared the allocation of 5G frequencies in Liechtenstein,²⁷ taking into consideration the

¹⁷ See: <https://www.llv.li/inhalt/118044/amtstellen/warum-ist-der-glasfaserausbau-so-wichtig>

¹⁸ See: <https://www.supra.net/glasfaser.html>, <https://www.li-life.li/DE/Internet/Internet/tblid/187/Default.asp>, <https://www.hoi.li/internet/exchange-rate> on 12 October 2020: 1,09782 available on <https://www1.oanda.com/lang/de/currency/converter/>

¹⁹ See: https://www.itu.int/en/mediacentre/Documents/Documents/ITU-Measuring_Digital_Development_ICT_Price_Trends_2019.pdf

²⁰ See: ITU World Telecommunication/ICT Indicators Database online: <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator “i911”)

²¹ See: ITU World Telecommunication/ICT Indicators Database online: <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator “i911mw”)

²² See: <https://www.llv.li/inhalt/118050/amtstellen/marktstatistik>

²³ See: <https://www.llv.li/inhalt/12117/amtstellen/mobilfunk>

²⁴ See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2019/ITU_ICTpriceTrends_2019.pdf

²⁵ See: ITU World Telecommunication/ICT Indicators Database online: <http://handle.itu.int/11.1002/pub/81550f97-en> (indicators “i271G” e “i271GA”)

²⁶ See: https://www.llv.li/files/srk/bua_051_2020_interpellation-einfuehrung-5g-mobilfunkstandards-in-liechtenstein.pdf

²⁷ See: <https://www.liewo.li/liechtenstein/wirtschaft/5g-kommt-erst-ende-2020;art173,411124>

possibility of coordinating the available frequencies closely with Switzerland and Austria²⁸ and ensuring an optimal frequency allocation and efficient frequency use in the country.²⁹

The MNOs in Liechtenstein can rely on a comprehensive fibre-optic network for connecting all the radio cells required for 5G.³⁰

Additionally, the Office for Communications also states that it is currently not possible to estimate how many new antenna locations in total will be required, although it can be assumed that in a first phase of the 5G roll out in Liechtenstein, the existing transmitter network which consist of 23 so-called “macro locations” will be taken as a basis for building the network.³¹

Based on the current telecommunication rules in the country, the technical design of the networks falls into the responsibility of MNOs, which depends on the frequency band and the respective geographic coverage area. Depending on the technical expansion concept, MNOs in Liechtenstein must handle increased bandwidths, which will require antenna with higher transmission capacities. Different network concepts are also considering the use of microcell in metropolitan areas of the country.

4. Spectrum assignment for 5G & market development

In 2020, Liechtenstein started the process of assigning the 5G frequencies in the ranges of 700 MHz, 1400 MHz and 3.5 GHz bands. The regulator has already informed, that it will not use an auction, but an administrative procedure,³² under which the MNOs propose the optimal distribution of the available frequencies.

According to the Liechtenstein frequency allocation plan, the following additional frequency ranges will be available for the provision of public, nationwide mobile communications services for technology-neutral use to be taken by the major MNOs in the country:³³

- 703-733 MHz / 758-788 MHz (2 x 30 MHz) bands;
- 738-753 MHz (15 MHz) band;
- 1427-1517 MHz (90 MHz) band;
- 3410-3800 MHz (390 MHz) band.

The Office for Communications assumes that the award procedure can be completed in 2021. The Office for Communications will report on the result after the award procedure has been completed.

²⁸ See: <https://www.vaterland.li/liechtenstein/wirtschaft/5g-liechtenstein-wartet-ab;art173,371703>

²⁹ See: <https://www.landtag.li/kleinanfragenprint.aspx?id=15518>

³⁰ See: <https://www.llv.li/inhalt/118044/amtstellen/warum-ist-der-glasfaserausbau-so-wichtig>

³¹ See: <https://www.landtag.li/kleinanfragenprint.aspx?id=15518>

³² See: <https://www.vaterland.li/liechtenstein/wirtschaft/5g-liechtenstein-wartet-ab;art173,371703>

³³ See: <https://www.llv.li/files/ak/pdf-llv-ak-frequenzzuweisungsplan.pdf>

5. Electromagnetic fields levels and the implementation dynamics

To ensure protection of the population from electromagnetic radiation, the Government issued the Environmental Protection Act (USG) in 2008³⁴ and the Ordinance on Protection from Non-Ionizing Radiation (NISV) in 2008.³⁵ This act and ordinance limits the non-ionizing radiation emanating from fixed systems (e.g. high-voltage lines, mobile radio or radio transmitters).

In December 2009 the population of Liechtenstein voted in a referendum to maintain the same limit values as pronounced in Switzerland. These are currently the lowest permissible exposure limits in Europe. The Swiss threshold level is set at 4-6 volts per meter (V/m) for the electric field strength.³⁶ In other words, the limits for the electromagnetic fields (EMF) values in Liechtenstein are today 10 times stricter than those proposed limits by the World Health Organization (WHO).³⁷ In February 2019, MPs raised the question on whether a relaxation of radiation protection is also expected to facilitate 5G deployment and uptake as 23 antenna masts are currently in place and current limits would require installation of additional masts.³⁸

Nevertheless, it is still unclear whether the legal regulations regarding the non-ionizing radiation will have to be adapted for the introduction of 5G. Based on the amendment on the Environmental Protection Act from June 30th 2020,³⁹ the responsible Office for the Environment stated, that Liechtenstein is actively monitoring developments related to 5G and EMF in Switzerland, and explained further, that it will respond to any adaptation of the legal framework to examine whether there would be any need for action for Liechtenstein.⁴⁰

6. 5G commercial launches: announcements, trail cities, and digital cross-border corridors

In 2018 FL1 and Swisscom made announcements of their intention of expanding their networks to encompass 5G services but without providing a timeline or specific targeted goals to the public.⁴¹

In August 2019 A1 Telekom Austria Group has announced the sale of its 24.9% stake in Telecom Liechtenstein (FL1) to the state of Liechtenstein. The transaction increases the state's shareholding in the telecom operator from 75.1% to 100%. The companies agreed to a strategic partnership in 2014 that lasted for five years and A1 exercised its termination option last year. Further cooperation, especially on a technical-operational level but without capital interlocking, was agreed between FL1 and the A1 Telekom Austria Group, which may have implications for 5G development in Liechtenstein.⁴²

³⁴ See: <https://www.gesetze.li/chrono/2008199000>

³⁵ See: <http://www.fao.org/faolex/results/details/es/c/LEX-FAOC130736/>

³⁶ See: <http://www.emfrf.com/liechtenstein-reduces-rf-exposure-limits/>

³⁷ See: https://www.llv.li/files/srk/bua_051_2020_interpellation-einfuehrung-5g-mobilfunkstandards-in-liechtenstein.pdf

³⁸ See: <https://www.landtag.li/kleinanfragenprint.aspx?id=15518>

³⁹ See: <https://www.volksblatt.li/nachrichten/Liechtenstein/Politik/vb/253977/regierung-will-gesetzesgrundlage-fur-5g-schaffen>

⁴⁰ See: <https://www.landtag.li/kleinanfragenprint.aspx?id=13556>

⁴¹ See: <https://ligital.li/2018/03/swisscom-kuendigt-5g-auf-ende-jahr-an/>

⁴² See: <https://www.lighreading.com/5g/eurobitex-ericsson-bags-deutsche-telekom-5g-ran-deal/d/d-id/762558>

However, despite the changes in the telecom structures and other 5G developments by Swisscom in Switzerland, there have been no major 5G-related commercial announcements in Liechtenstein as of October 2020.