5G COUNTRY PROFILE

STATE OF ISRAEL

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Version 1.1

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

Israel has one of the highest gross domestic expenditure on high-technology research and development, often referred to as a "start-up" nation characterized by its a vibrant ICT sector.[1] Through many policies and initiatives since the 1990s, the Israeli government laid the foundations for private industry to support innovation and made heavy investments in building a strong human capital.[2] Israel also has a robust telecom market with a significant number of operators,[3] providing high household broadband penetration and covering almost the entire territory with 3G and 4G networks.[4] By 2017, Israel's ICT sector represented about 7.2% of its GDP and 20% of its exports of goods and services.[5] Despite the steady growth in the ICT sector, the fall of profits and revenue by the country's largest operators over the past years remains one of the most pressing challenges as the private sector prepares to invest in new telecommunication infrastructure.[6] In the 2017 ITU ICT development index, Israel ranks 23rd out of 176 countries.[7]

The ICT development in Israel is oriented by the National Digital Program (2017-2022), which outlines the following three primary goals and areas of focus:[8]

Reducing Socio-economic Gaps

- Bring the geographic and social periphery closer by improving digital literacy among weakened populations; providing access to quality public goods and services by digital means; creating jobs and developing business in the geographic and social periphery;
- Reduce the cost of living by advancing the digitization processes in the housing and real state areas; developing the financial area in the digital age; promoting the transition to digital products that produce economic savings; foster informed consumption by digital means;
- Promote legal literacy by increasing access to information about rights through digital means; streamlining rights realization processes through digital means.

Accelerating Economic Growth

- Promote digital industries and businesses by developing digital-based industries; turning business into digital business; increasing digital presence and encouraging the use of e-commerce platforms;
- Develop the employment market in the digital age by adapting digital skills in the education system, academia, and the labour force to the modern employment market; increasing the use of online occupational training; expanding employment options in the digital age by removing distance barriers; qualifying professional workers in digital and ICT fields;

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[1] See: https://www.privacyshield.gov/article?id=Israel-Information-Communication-Technology-ICT
[2] See: http://documents1.worldbank.org/curated/en/526981530526619514/pdf/Best-Practices-and-Lessons-Learned-in-ICT-Sector-Innovation-A-Case-Study-of-Israel.pdf
[3] See: https://www.brodynt.com/business-internet-connectivity-in-israel/
[4] See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf
[5] See: https://www.brookings.edu/wp-content/uploads/2018/12/FP_20181221_israel_developing_world1.pdf
[6] See: https://www.reuters.com/article/bezeq-results/israels-bezeq-telecom-q3-profit-revenue-fall-idUSL8N1NZ545
[7] See: https://www.itu.int/net4/ITU-D/idi/2017/index.html
[8] See:
https://www.gov.il/BlobFolder/news/digital_israel_national_plan/en/The%20National%20Digital%20Program%20of%20the%20Government%20of%20Israel.pdf

- Support infrastructure development by developing physical infrastructures; promoting an enabling a digital activity ecosystem.

Creating a smart and friendly government
- Accessibility of state and local government by improving government services to citizens and reducing the bureaucracy; digitization of local government; advancing "Smart Cities"; promoting Open government; increasing ease of doing business;
- Promote innovative and effective government by increasing digitization in internal government work; promoting information-based policy and cross-governmental sharing; developing the digital competencies of human capital in government; expanding innovation and entrepreneurship in government;
- Improve public goods by focusing on the improvement of education, health, social welfare and other additional goods by digital means.

As the Israeli government seeks to bridge the digital divide between urban and rural areas, the Ministry of Communication notes that a wide geographical competition approach is the best way to improve the network coverage by the domestic operators, including the quality of the service offered, price performance, overall penetration, as well as further commercial competition with other private stakeholders.[9]

While other nations in the European region are operating fibre optic networks, Israel relies on infrastructure rolled out before 2010, which presents consequences for the capacity of data trafficking as more users engage with ICTs and as users require increasingly high data rates. In face of the COVID-19 pandemic, telecom operators in the country are hard-pressed to invest significant resources in infrastructure upgrades. Accordingly, the government has raised concerns over the need for upgrading the domestic telecom infrastructure due to the broadband needs of the Israeli population. The Ministry of Communications is currently working to approve operators to make fibre available across Israel's territory, especially in remote areas.[10]

2. Broadband and mobile telecommunication sectors data

ITU data shows that 86.79% of individuals in Israel had access to the Internet in 2019.[11] In 2010, the ITU data for the country was 67.50% and 20,87% in 2000. In 2019, the number of fixed-broadband subscriptions per 100 inhabitants was 29.12[12] with an averaged fixed-network access speed of 99.7 Mbps.[13]

Israel has a significant household Internet penetration rate with nearly all of them being broadband connections.[14] In terms of technology, DSL represents the largest market share of broadband

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[9] See: https://www.oecd.org/sti/broadband/33871370.pdf

[10] See: https://www.reuters.com/article/us-israel-bezeq-internet/israels-bezeq-to-double-internet-speed-eyes-fibre-network-launch-idUSKCN24D0FV

[11] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i99H")

[12] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i992b")

[13] See: https://en.globes.co.il/en/article-israel-lags-oecd-peers-in-fiber-optic-infrastructure-1001335931

[14] See: https://www.prnewswire.com/news-releases/israel---telecoms-mobile-and-broadband---statistics-and-analyses-300864679.html

subscriptions, while the fibre-network deployment is being deployed under the auspices of Israel Broadband Company (IBC).[15] As of June 2019, the percentage of subscribers in Israel for fibre optics to the premises/home/building (FTTP/FTTH/FTTB) comprised 2% of all broadband network connections.[16] From the regional perspective, Europe's average fixed-broadband basket cost was 1.5 per cent of the GNI per capita in 2019, while Israel's corresponded to 0.8 per cent for an unlimited Internet data cap.[17]

In 2019, the number of active mobile-cellular subscriptions per 100 inhabitants was of 126.77,[18] while the number of mobile-broadband subscriptions per 100 inhabitants were 115.03.[19] There are five mobile network operators after a merger between (MNOs)—Cellcom, Partner, Pelephone, Partner HOT Mobile, Marathon 018—that currently have licenses for the use of radiofrequency.[20] Given the highly competitive nature of the Israeli mobile market with 6 MNOs, the average revenue per user has dropped in 2018 for all major operators.[21] Falling revenues are largely attributed to increasing tariff competition between firms, and consumers switching providers at almost unprecedented levels.[22] Despite the situation, the country's mobile-data basket cost corresponded to 0.3 per cent of the GNI per capita in 2019 for a monthly allowance of 30 Gb, while the European region's average was 0.8 per cent (and the CIS region was 2.2) for the same year.[23] This makes the 3G and 4G services one of the cheapest in relation to the European region and with coverage of nearly the entire territory[24] and 94% of the population covered by 4G/LTE services and 99% covered by 3G.[25] In 2020, the number of MNOs in Israel declined to 5 after a merger between Cellcom and Golan Telecom approved by the Israeli regulators.

3. Current progress on 5G: consultations and national strategies
The government of Israel started consultations on 5G as early as 2018, focusing initially on the expansion of the deployment of cellular communications infrastructure in order to commence a robust deployment of 5G.[26]

In July 2019, the government launched a tender for the development of 5G networks with expected launch and development to occur between the 2020-2023 period.[27] The 5G tender was conducted in three main

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[15] See: https://www.brodynt.com/business-internet-connectivity-in-israel/

[16] See: https://en.globes.co.il/en/article-israel-lags-oecd-peers-in-fiber-optic-infrastructure-1001335931

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

[18] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i911")

[19] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i911mw")

[20] See: https://www.spectrummonitoring.com/frequencies/frequencies1.html#Israel

[21] See: https://www.globenewswire.com/news-release/2019/06/24/1872897/0/en/Israel-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses-2019-Broadband-Penetration-Recently-Reached-100.html

[22] See: https://www.jpost.com/israel-news/israel-launches-race-to-build-5g-mobile-networks-595637

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

[24] See: https://www.brodynt.com/business-internet-connectivity-in-israel/

[25] ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicators "i 271G and i271GA")

[26] See: https://www.gov.il/BlobFolder/news/27122018/en/Expanding%20the%20deployment%20of%20cellular%20communications%20infrastructure.pdf

[27] See: https://www.gov.il/BlobFolder/news/11072019_01/he/Tender%20for%20Generation%205,%2014.07.19.pdf

stages and considered the following frequencies: 700MHz, 2,600Mhz, and 3,500-3,800 MHz.[28] The 2,600 MHz frequency range is meant to initially provide services for 4G and ultimately 5G once the transfer is complete, while the 3,500 MHz range is assigned entirely for 5G use-cases.[29] Accordingly, the 5G tender outlined the following frequency inventory for each frequency band:[30]

- 700MHz – Bandwidth of 30x2 MHz in the Frequency Division Duplexing (FDD) method;
- 2,600MHz – Bandwidth of 60x2 MHz in the Frequency Division Duplexing (FDD) method; and
- 3,500-3,800MHz – Bandwidth of 300 MHz in the Time Division Duplex (TDD) method.

As the Ministry of Communication articulated in the 2019 5G tender in Israel, the expected outcomes encompassed the following:[31]

- The frequencies offered in the tender will enable a response to the growing demand for broadband communications by expanding capacity;
- For the first time, the frequencies tender will be accompanied by an incentive system that includes grants and a reduction of 500 million NIS (125 million EUR) in fees;
- Tender payments will be deferred to September 2022 in order to enable the operators to direct their financial resources to invest in upgrading the networks;
- In the tender, the owners of existing networks will be able to compete by submitting joint proposals in a manner that will lead to effective allocation of frequencies for the benefit of the public;
- Besides, the tender will include an open segment of 100MHz for new players that will generate technological competition in the infrastructure and services of the 5th generation networks.

Operators will be expected to pay a total of 80 million NIS (20 million EUR) per year for the use of the new frequencies—in addition to the 320 million NIS (79.8 million EUR) they currently fork out for 4G and 3G services. Winners can receive a 28% reduction for the first four years, subject to government approval. They will be required to complete the deployment within five years and begin providing 5G services within 18 months of the start of the deployment. The total cost of the deployment is estimated at 2 billion NIS (448.6 million EUR).

In August 2020, The Ministry of Communications has initiated a series of conferences titled "Connected Authorities – Connect Israel" with the goal of assisting the local and district authorities in connecting to advanced communications infrastructure. The Ministry informed that additional conferences will be held for the heads of local councils and mayors in a similar format to facilitate a more effective dialogue and consultations regarding the Ministry's areas of operation in regard to 5G and other technologies.[32]

In a partnership with the Ministry of Economy's Innovation Authority, the Ministry of Communications is launching a new program that will allow Israeli start-ups and industry to submit applications for research

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[28] See: https://uk.reuters.com/article/uk-israel-telecoms-5g/israel-holds-5g-mobile-network-tender-aims-for-2020-launch-idUKKCN1U90CK?il=0
[29] See: https://www.calcalistech.com/ctech/articles/0,7340,L-3843219,00.html
[30] See: https://www.gov.il/BlobFolder/news/14072019_01/he/5th%20Gen%20Tender%20-%20English.pdf
[31] See: https://www.gov.il/he/departments/news/14072019_01
[32] See: https://www.gov.il/en/departments/news/19082020_1

and development programs at various sites (such as campuses, public spaces, hospitals, etc.), using 5G technologies in two formats: I) Materializing such on the frequencies allocated to the communications companies; and II) Materialization on designated experimental frequencies to be allocated by the Ministry of Communications for the purpose of the trials.[33]

In September 2020, India, Israel, and the United States have begun a collaboration for the development of 5G with the goal of establishing a transparent, open, reliable and secure 5G communication network.[34]

Upon the launch of the 5G tender, the Ministry of Communication also expressed strong interest in promoting the use of 5G for a potential smart city program for Israel, although not many details have been publicly announced as of September 2020.[35]

4. Spectrum assignment for 5G & market development

In August 2020, the Ministry of Communications has concluded the multi-spectrum auction to enable operators to roll out 5G, and the winning bidders were Pelephone, Cellcom Golan Marathon, and Partner HOT mobile. All three secured identical spectrum allocations, specifically a 10MHz block in the 700MHz band, a 20MHz block in the 2600MHz band and 100MHz in the 3.5GHz (3500MHz-3800MHz) band.[36] The 700MHz band allocations will be valid for 15 years, while both the 2600MHz and 3.5GHz allocations are valid for ten years, with all concessions being renewable at the end of those periods.

Cellcom, Israel's largest mobile phone operator which is in the process of acquiring rival Golan Telecom, stated it will pay 115 million NIS (28.7 million EUR) in license fees. Partner Communications, the second-largest mobile operator, stated it will pay, together with HOT mobile, 62.3 million NIS (15.5 million EUR) for its frequencies. Partner operates a joint radio network with HOT, a subsidiary of telecoms and cable group Altice Europe.[37] Bezeq's subsidiary Pelephone will pay over 88 million NIS (21.9 million EUR) for its spectrum allocations. The aforementioned operators will not be required to make payment for their new spectrum until September 2022.[38]

Based on the Ministry's estimation, the conclusion of the frequency tender and the commencement of the deployment of the 5G infrastructure by the license holders will occur during the second half of 2020.[39]

In terms of market development, local press reported that there are currently about 25 Israeli companies working on 5G-related technologies, ranging from transnational firms as large as Intel to small early-stage start-ups such as TetaVi Ltd. and Binah AI Ltd. From health care to autonomous traffic management and

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[33] See: https://www.gov.il/en/departments/news/230812020_2
[34] See: https://www.thehindu.com/business/india-us-and-israel-collaborating-in-5g-tech-official/article32548545.ece
[35] See: https://www.gov.il/en/departments/general/08032020
[36] See:
https://www.gov.il/BlobFolder/news/12082020_2/en/Letter%20passed%20to%20companies%20participating%20in%20the%20tender.pdf
[37] See: https://telecom.economictimes.indiatimes.com/news/israeli-regulator-awards-licences-for-5g-networks/77536914
[38] See: https://www.commsupdate.com/articles/2020/08/14/israel-concludes-5g-spectrum-auction-moc-approves-cellcoms-purchase-of-golan-telecom/
[39] See: https://www.gov.il/en/Departments/faq/01042020

from entertainment to drones, Israeli firms are gearing up for 5G by researching product potential and integrating with other verticals.[40]

5. Electromagnetic fields levels and the implementation dynamics

The 2006 Non-Ionizing Radiation (NIR) Law includes requirements related to the installation and operation of energy-emitting sources, as well as requirements for monitoring NIR sources and publicizing the results. The Law stipulates that in order to install a source of radiation, to operate a source of radiation, or to provide radiation measurement services, it is necessary to receive prior authorization from the Ministry of Environmental Protection. Permits are granted for a limited period and must comply with certain conditions. In the context of 5G, the Ministry of Environmental Protection determines the maximum power output of broadcast centres so that radiation exposure levels are at least 10 times less than the radiation exposure thresholds defined by the World Health Organization (WHO) as being harmless to the general population.[41]

The validity of the permit, depending on the different types of radiation sources, is stipulated in the regulations:[42]

- Installation permit: In order to obtain a permit to install a radiation-emitting source, certain conditions detailed in the Law must be complied with. Among them: evaluation of maximal levels of exposure anticipated from the sources of radiation, based on the technical specifications, operation of the radiation sources for a limited period and performance of trial measurements, over a period defined by the Law;

- Operations permit: This is the second stage: subject to the validity of the measurements performed during the period allocated by the above Installation Permit, a permit must be obtained to operate the radiation sources for a defined number of years. This permit is subject to the conditions stipulated by the Law;

- Radiation Services permit: not everyone is entitled to measure radiation. In order to perform this activity, one must obtain a radiation measurement services permit according to the Law. This permit, too, must comply with certain conditions, such as professional training and possession of the appropriate equipment and means to provide the service.

In coordination with the Ministry of Science and Technology, the Ministry of Environmental protection established the Israeli National Information Center for Non-Ionizing Radiation (TNUDA) in 2013. The Center is guided by the precautionary principle and therefore promotes educated use of technologies involving nonionizing radiation while maintaining a balance between the rapid technological advances and protection of public health.

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[40] See: https://www.calcalistech.com/ctech/articles/0,7340,L-3833773,00.html
[41] See: https://www.gov.il/en/departments/news/01042020_2
[42] See: https://www.tnuda.org.il/en/policy-and-legislation/non-ionizing-radiation-law-israel

Since September 2014 the TNUDA website serves as the main information channel for various target audiences in Israel (the general public, governmental offices, scientists & industry). In light of the growing interest abroad and the wish to enable wider access to the information distributed by the centre, the English version of the website was launched in 2016.[43] To date, more than 200 articles have been published, covering a large spectrum of topics such as health, physics, legislation & policy. In addition, other items such as FAQ, selected publications & glossary are available to the readers.[44]

Within the context of 5G development in Israel, the Ministry of Communications has analysed the recommendations on the relationship between the network and EMF levels and announced that it will act, if necessary, to ensure the rollout of 5G networks in the country while maintaining standards of public health. In parallel to publishing the tender and the subsequent technological development, the Ministry of Health recommended further monitoring by the Ministry of Environmental Protection, which is expected to assess exposure levels, including an examination of the various sources of the exposure of multiple sources of radiation (cellular sites of different sizes) at different stages throughout the 5G development. The Ministry of Environmental Protection also recommends the following for the development of 5G:[45]

- Encouraging the sharing of cellular networks;
- Encouraging broader deployment within buildings which reduces exposure to radiation;
- Deployment of additional broadcasting centres in areas where there is insufficient deployment;
- To act in such a manner that most of the data volume is transmitted through wired networks that do not radiate.

The Ministry is especially expected to take into account exposure levels at "hot spots" — and with the combination of output data and antenna orientation (aggregating the application of beam deflection technology) while adhering to the principle of preventative precaution. The recommendation also included the establishment of an inter-ministerial committee to review the exist standards in 5G implementation and promote new actions or revisions if necessary.[46]

6. 5G commercial launches: announcements, trail Cities, and digital cross-border corridors
In July 2020, Partner announced the establishment of its 5G network, known as the "Partner 5G project," which positions the operator as the first private stakeholder to launch 5G in Israel. The operator announced that it is conducting 5G-related capabilities tests and managed to reach more than 1GB of transmission speed. Partner also stated that it is currently upgrading the core of its existing cellular network with the goal to pave the way for new technological capabilities, thus expanding the existing capacities of advanced voice calling services such as VoLTE (Voice Calls on Generation 4), Wi-Fi Calling and others.[47]

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[43] See: www.tnuda.org.il/en
[44] See: https://www.who.int/peh-emf/project/mapnatreps/israel-2017.pdf?ua=1
[45] See: https://www.gov.il/en/departments/general/09072019_01
[46] See: https://www.gov.il/en/departments/faq/01042020
[47] See: https://www.israelhayom.co.il/article/780765

In August 2020, the operator Pelephone Communications Ltd. announced the launch of its 5G network named "Pelephone Plus," which is set to start operations upon the finalization of frequencies allocation by the Israeli regulator. Pelephone acquired a network of 250 5G sites from Ericsson, which has earned it an 80 million NIS (19.9 million EUR) grant from the Ministry of Communications.[48]

In September 2020 3 MNOs Pelephone, Partner and Hot Mobile launched their 5G networks and start to provide commercial services, after the Ministry grant them the licences and the spectrum allocation was finalized.[49]

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[48] See: https://www.telecompaper.com/news/pelephone-launches-5g-network-in-israel--1349225
[49] See: https://www.gov.il/en/departments/news/29092020_5