5G COUNTRY PROFILE

TURKEY

© ITU October 2020

Version 1.1

1. ICT background and current status of broadband

Turkey's telecommunication sector has gone through tremendous changes during the last decade, driven by advancements in technology and increasing customer demand.[1] The ICT sector is considered a priority sector by the Turkish government and various initiatives have been taken to promote investments in the area.[2] Government contributions to the country's ICT ecosystem include programs and strategies such as the Turkish National Information Infrastructure Plan – TUENA (1999), e-Turkey Initiative Action Plan (2000), e-Transformation Turkey Project Short-term Action Plan (2003-2004, 2005) Information Society Strategy and Action Plan (2006-2010), the second Information Society Strategy and Action Plan (2015-2018),[3] and others. Turkey's Strategic Vision of 2023 sets out important goals for the country, giving special importance to ICTs as an accelerator for the achievement of the UN's 2030 Agenda for Sustainable Development and the SDGs. The country's goals include I) Expanding the economy to rank among the global top ten; II) Transformation to knowledge-based society; III) Building an intercontinental hub for ICTs; and IV) Providing an ICT-based economic growth, enhancing high-speed broadband access for all. In the 2017 ICT development index, Turkey ranks 67th out of 176 countries.[4]

The country's telecom network has been undergoing a fast modernization process, with a considerable expansion of its geographical coverage and provision of various telecom services. On the one hand, communication infrastructure between cities is largely possible due to an advanced networked of intercity backbone that relies both on fibre-optic cable and digital microwave radio relay. On the other hand, domestic satellites currently cover most of the country's rural areas, and more satellite-projects are underway with expected launches for the upcoming years.[5]

In terms of broadband development, Turkey's National Broadband Strategy and Action Plan for 2017 to 2020, which emerged within the framework of the 2015-2018 Information Society Strategy, outlines the following basic principles:

- Improvement of the broadband infrastructure across the country,
- Expanding fiber access across the country,
- Increasing capacity and speed of broadband connectivity,
- Ensuring the sectorial development based on competition and in compliance with the market requirements,
- Developing the demand on the broadband internet services.

In terms of private sector expansion, the country's privatization program has reduced state involvement and attracted a significant number of international companies to make investments in Turkey's digital market.[6] As of now, xDSL and mobile broadband technologies are the most common Internet technologies

---

[1] See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf
[2] See: https://www.invest.gov.tr/en/sectors/pages/ict.aspx
[3] See: http://www.bilgitoplumu.gov.tr/en/wp-content/uploads/2016/03/Information_Society_Strategy_and_Action_Plan_2015-2018.pdf
[4] See: https://www.itu.int/net4/ITU-D/idi/2017/index.html
[5] See: https://www.satellitetoday.com/innovation/2020/06/18/space-ambitions-turkey-prepares-to-compete-and-capture/
[6] See: https://www.brodynt.com/business-internet-connectivity-in-turkey/

in Turkey. Although cable and fibre penetration is low in Turkey, both connectivity technologies are steadily growing.

Turkey has also experienced a steady growth in e-commerce. Data from the Turkish Statistical Institute show that in 2018 the rate of e-sales of enterprises increased by 1.4 points compared to 2017 and became 11.2%. E-sales concern the receipt of orders by methods specifically designed for the purpose of receiving orders, either via electronic data interchange (EDI) or through websites or apps (web sales). This percentage was 24.4% in enterprises with 250 or more employees, while 12.9% in enterprises with 50-249 employees, 10.5% in enterprises with 10-49 employees.[7]

2. Broadband and mobile telecommunication sectors data

BTK data for the first quarter of 2020 shows that 79.0% of individuals in Turkey had access to the Internet, an increase compared to 2019 official ITU data[8] standing at 73.98. In 2010, the ITU data for the country was 39.82% and 3.76% in 2000.[9] In 2018, the number of fixed-broadband subscriptions per 100 inhabitants was 17.06.[10] BTK data which will feed into ITU 2020 statistics shows that 90.7% of households in Turkey had Internet access at home in 2020.[11] While 50.8% of households used fixed broadband connection (ADSL, cable, optic fibre, etc.) as reported by Turkstat,[12] ITU data shows that 98.6% of households used mobile broadband connection to access the Internet. Over the years, fixed-broadband usage has increased considerably, reaching about 3.3 million subscribers relying on fibre technology (FTTH/FTTB) by the first quarter of 2020. In 2019, 93.3% of enterprises used a fixed-broadband connection to access the Internet.[13]

Recent data by the Information and Communication Technologies Authority (Bilgi Teknolojileri ve İletişim Kurumu – BTK), Turk Telekom has the widest fibre infrastructure in the country with a 308,000-kilometre network, while other operators' fibre length was 89,000 kilometres in 2020.[14] Compared to the OECD average of 31.4% fixed broadband population penetration rate, Turkey has important growth potential with its 17.5% penetration rate.[15]

With regards to mobile, there are 3 mobile network operators (MNOs) operating in Turkey with the following subscriber market share: Turk Telekom (28.4%), Turkcell (40.6%), and Vodafone Turkey (31%).[16] According to the latest BTK data, in the first quarter of 2020, the number of active mobile-cellular subscriptions per 100 inhabitants was of 98.40,[17] while the same official ITU data from 2019 reports

---

[7] See: http://www.turkstat.gov.tr/PreTablo.do?alt_id=1048

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

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

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

[11] See: https://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2019/CoreHouseholdIndicators.xlsx

[12] See: http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=30574

[13] See: http://www.turkstat.gov.tr/PreTablo.do?alt_id=1048".

[14] See: http://www.ttyatirimciiliskileri.com.tr/Documents/en/ICTA-Q1-2020-Market-Data.xlsx

[15] See: http://www.ttyatirimciiliskileri.com.tr/en-us/turk-telekom-group/investing-in-turk-telekom/pages/turkish-telecom-sector.aspx#:~:text=Total%20broadband%20subscribers%20exceeded%2077.4,subscribers%20increased%20to%2014.6%20million.

[16] See: http://www.ttyatirimciiliskileri.com.tr/Documents/en/ICTA-Q1-2020-Market-Data.xlsx

[17] See: https://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2019/Mobile_cellular_2000-2018_Dec2019.xls

96.84%.[18] Moreover, according to ITU statistics, mobile broadband subscriptions per 100 inhabitants amount at 74.80.[19] 4G LTE networks are well developed and cover about 98% of the population in the country;[20] the official figure for 2019 stood at 96.71%.[21] In 2019, the mobile-broadband Internet traffic within the country corresponds to 4.1 exabytes.[22] As of 2020, BTK data show that the average monthly mobile data usage per active LTE subscriber in Turkey was 9,1 GB.

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

In April 2016, BTK established the "Turkish 5G Forum," also known as the 5GTR Forum—a baseline program that brings together Turkey's prominent academics, research and development firms, vendors and operators to discuss 5G development in the country.[23] There are four working groups under the 5GTR Forum. Working groups for Core Network, Physical Network, Service and Applications and Standardization under the 5GTR Forum organization structure, that are established to provide 5GTR Forum activities to be efficient in a short period of time.

5GTR Forum organises different meetings, workshops and cooperation agreements with relevant platforms. In this context, "The Automotive Sector on the Road to 5G Workshop" was organized on 11 May 2017. This workshop, dedicated to one of the sectors that will use 5G technology mostly, aimed to see the trends, studies, plans and challenges related to 5G automotive vision and to establish a common working platform between the electronic communication sector and the automotive sector.

Also "Turkey-Japan Terahertz Communications Technology Workshop" was held on 13 October 2017. The workshop hosted by the BTK was organized in cooperation with the Japanese National Institute of Information and Communication Technology (NICT) and Medipol University with participation of many university and sector representatives. In addition, in the 4th Global 5G Event held in Seoul within the frame of international collaborations, two separate Memorandum of Understandings were signed on 23 November 2017 between the 5GTR Forum and the 5G Forum Korea and between the 5GTR Forum and Japan 5GMF in order to develop the external relations of the 5GTR Forum with the equivalent institutions.

In June 2018, the signing ceremony of "End to End Domestic and National 5G Communication Network Project" was held in Ankara by the Ministry of Industry and Technology, the Ministry of Transport and Infrastructure and BTK. This project, which is supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) has been carried out by 14 companies under the Cluster of Communication Technologies (*HTK*) and 3 mobile operators. As a result of the project, critical infrastructure components

---

[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] Data submitted to BTK by cellular mobile network operators. It will be incorporated into ITU World Telecommunication/ICT Indicators Database online (http://handle.itu.int/11.1002/pub/81550f97-en)
[21] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i271GA")
[22] See: ITU World Telecommunication/ICT Indicators Database online (2020): http://handle.itu.int/11.1002/pub/81550f97-en (indicator "i136mwi")
[23] See: https://www.itu.int/en/ITU-D/Conferences/GSR/2019/Documents/Turkey_Contribution-GSR-19.pdf

for 5G will be produced locally and nationally such as 5G core network, 5G base station, 5G network and business management software.[24]

Since 2016, 5GTR Forum members had various meetings and prepared the "5G and Beyond White Book" in 2018,[25] in addition to providing support of Turkish companies within the framework of the EU HORIZON 2020 programs. Turkey's 2018 5G white paper discusses the possible and necessary work to be done regarding the network and physical layers, and the services and applications that will run over these layers that form the core 5G network in Turkey.[26] The "5G and Beyond White Book" provides a perspective on the current situation in 5G technologies and studies in other nations, showing predictions of 5G architecture and the potential technology building blocks for 5G requirements. In addition, "5G and Vertical Sectors Report" has been published by BTK on the use of 5G and its effects on vertical sectors.

As part of the Turkish government's plan to deploy an advanced telecom infrastructure serving millions of citizens, Turkish operators are moving ahead with more robust software and hardware development. The strategy also predicts that the 5G-related research and development will prioritize domestic production, which will likely increase supply and demand together, and that operators will require incentives and obligations.[27]

An example of this is the "End-to-End Domestic and National 5G Network Project," which was recently initiated by the Communication Technologies Cluster (HTK) with the support of BTK, OSTİM and TÜBİTAK. The project's goal focus on the development of critical network hardware and software that are specific for 5G technology in order to improve Turkey's domestic and national 5G infrastructure. In July 2020, the project's executive board had a digital meeting with high-level government servants and more than 100 participants from public institutions and private sector representatives.

Furthermore, as part of Turkey's 2023 Goals, several 5G smart city-related projects are being implemented across various cities. These smart city projects aim to generate cost savings and provide the infrastructure necessary to fuel future tech developments.[28]

4. Spectrum assignment for 5G & and market development

The GSM frequencies in the Turkish mobile market range from 800MHz to 2600 MHz, with Turkcell possessing overall the widest amount of spectrum.[29] In August 2015, BTK held an auction for 4G, which represented an important milestone for Turkey's transition to 5G.[30] Excluding value-added tax, the total auction fee for 365.4 MHz of spectrum across 18 packages in 5 separate frequency bands (800, 900, 1800,

---

[24] See: https://www.mondaq.com/broadcasting-film-tv-radio/901520/5g-spectrum-auctionsi-in-kinstellar-jurisdictions-
[25] See: https://www.uab.gov.tr/haberler/bakan-turhan-dan-5g-cagrisi
[26] See: https://www.btk.gov.tr/uploads/announcements/5g-ve-otesi-beyaz-kitap/beyaz-kitap-son.pdf
[27] See: https://www.uab.gov.tr/haberler/her-yerden-herkese-genis-bant
[28] See: https://www.4yfn.com/wp-content/uploads/2018/12/2018-11-26-5G-in-MENA.pdf
[29] See: https://www.export.gov/apex/article2?id=Turkey-Information-and-Communications-Technology
[30] See: https://www.itu.int/web/pp-18/uploads/turkey-council-brochure.pdf

2100 and 2600MHz bands) amounted to the equivalent of 3,356 million EUR. Following the auction, the portion of frequencies allocated to mobile operators increased from a total of 184MHz to 549MHz.[31]

With regards to 5G, testing licenses have been provided to operators for the 3.5, 3.7 and 26 GHz bands.[32] However, there is no prediction for 5G spectrum auctions in Turkey in the foreseeable future.[33] The regulator has announced that upon the renewal of the infrastructure by the current operators from the 2015 auction, and will automatically be used without the need for licensing a new service provider.[34]

According to BTK, in the context of operators' need of wider spectrum blocks required by 5G, the public announcement of spectrum identified for mobile broadband services with release dates enables operators to make their plans effectively. This information enables operators to save cost of installation of more base stations due to the lack of spectrum and the increase in data usages.

In this regard, BTK has prepared a draft mobile broadband spectrum strategy[35] to identify the roadmap which is necessary to achieve our country targets related to mobile broadband services (such as increasing minimum downlink rates per user to EU level, decreasing the customers' fees for accessing these services, release of new technologies). Taking into account the assigned mobile spectrum and the level of mobile service usage, the report consisting of all spectrum identified for IMT services with assignment dates and the determination of necessary spectrum for sustainable growth of mobile services has been presented to the stakeholders.

In this draft strategy document, spectrum blocks are classified under three periods for the dates of assignments: Short, mid and long term. According to the draft report, Turkey plans to assign mainly 694-790 MHz, the remaining spectrum in 2500-2690 MHz, 3400-3800 MHz and 24.25-27.5 GHz frequency bands in the short term for IMT. Also within the 700 MHz frequency band 698-703 MHz and 733-736 MHz bands (2x8 MHz) are foreseen for BB PPDR services.

Regarding 5G additional spectrum planning, legal framework for granting of right of use of spectrum is drawn by Electronic Communication Law Numbered 5809, which assigns the Ministry of Transport and Infrastructure as strategy and policy decision maker and BTK to develop strategy proposals. Within this framework, BTK will also develop a strategy proposal for the granting of rights of use of 5G frequencies and present to the Ministry of Transport and Infrastructure for final revisions. After the approval by the Ministry of Transport and Infrastructure, BTK will take necessary actions to apply all steps defined.

5. Electromagnetic fields levels and the implementation dynamics
In 1999, the Turkish government held a symposium on "Electromagnetic Pollution," and since then the country has been involved with EMF, providing studies on the biological effects of electromagnetic and

---

[31] See: http://www.ttyatirimciiliskileri.com.tr/en-us/turk-telekom-group/investing-in-turk-telekom/pages/turkish-telecom-sector.aspx#:~:text=Total%20broadband%20subscribers%20exceeded%2077.4,subscribers%20increased%20to%2014.6%20million.
[32] See: https://www.trthaber.com/haber/turkiye/5g-denemeleri-basliyor-404503.html
[33] See: https://www.btk.gov.tr/uploads/announcements/5g-ve-otesi-beyaz-kitap/5gtr-beyazkitap.pdf
[34] See: https://www.mondaq.com/broadcasting-film-tv-radio/901520/5g-spectrum-auctionsi-in-kinstellar-jurisdictions-
[35] The draft strategy has been submitted for stakeholder consultation and is not yet publicly available. For more info, please contact BTK.

possible ways of providing guidance. While many different radiation frequencies are under consideration, most of the research activities have focused on 50 MHz TV broadcasting frequencies, 900MHz, 1800MHz, 2100MHz and 2450MHz. Effects of electromagnetic radiation are frequently shared with the public by Universities, Chamber of Electrical and Electronics Engineers, Chamber of Medical Physicists, Technology Informing Platform. Some groups also plan to deal with electromagnetic radiation accompanied by ultraviolet and infrared light incidence.[36]

BTK has a special division on EMF and follows the most recent guidelines released by the International Committee on Non-ionizing Radiation Protection (ICNRP). The Ministry of Transport and Infrastructure, in particular, have published regulations based on ICNIRP's Standards and regulations. In 2011, they had prepared "Limiting, controlling and directing Electromagnetic field intensity caused by the electronic communication devices by taking the international limits" regulations,[37] which mandate four times stricter limits than those indicated by ICNIRP.[38] Then, with several revisions of this regulation, as of April 2018 the name was changed to "Electronic Communication Devices Safety Certificate Regulation". In the context of principle of precaution, the limit values allowed to cellular systems for the environment was set to 70% of the limit values set by ICNIRP, which keeps the general practice of applying stricter limits than those indicated by ICNIRP.

Furthermore, the government Ministry of Health is paying attention to raise public awareness of the health effects of electromagnetic field. Non-Governmental Organizations (NGOs) like Temkoder, Turkish Electrical and electronics Chamber, as well as the Chambers of Physicians are sensitive on the issue of health effects on electromagnetic fields. Workgroups have been formed in the body of these NGOs. These groups have organized public awareness meetings to inform the society about the effects of electromagnetic fields on health. The Turkish Electrical and Electronics Engineering Society is organizing meetings on recent issues on electrical, electronics and computer engineering issues including effects of electromagnetic fields.[39]

6. Commercial launches: announcements, trail cities, and digital cross-border corridors

Turkey is making great strides with its 5G evolution and operators have conducted significant 5G trials and engaged with commercial negotiations. 5G is considered as an investment worth approximately TL 253 million (approx. 40 million EUR) in Turkey, and private stakeholders such as Türk Telekom, Turkcell, and Vodafone Turkey are the major investors in the networks.

In 2016, Turk Telekom signed a Memorandum of Understanding with Nokia to accelerate the development of 5G radio access network technology and the applications driving the Internet of Things (IoT) and other sectors as diverse as healthcare, smart cities, etc.[40] During the same year, Vodafone Turkey reported that it tested 10Gbps 'E-band' point-to-point radio link technology in densely populated urban

---

[36] See: https://www.who.int/peh-emf/project/mapnatreps/TURKEY_2014.pdf?ua=1
[37] See: https://www.who.int/peh-emf/project/mapnatreps/TURKEY_2014.pdf?ua=1
[38] See: https://www.who.int/peh-emf/project/mapnatreps/TURKEY_2014.pdf?ua=1
[39] See: https://www.who.int/peh-emf/project/mapnatreps/TURKEY_2014.pdf?ua=1
[40] See: https://www.nokia.com/about-us/news/releases/2016/04/15/nokia-and-turk-telekom-collaborate-to-advance-development-of-5g-and-internet-of-things-technologies/

areas, saying the tests paved the way for 5G commercial launches using the 71GhZ-86Ghz ranges.[41] Since 2016, Turkcell has also established partnerships with Ericsson, Samsung, and Huawei,[42] becoming the telecom operator with most 5G-related expansion as of September 2020.

In 2017, Turkcell rolled out a Narrow Band-Internet of Things (NB-IoT) network across Turkey. The operator informed that the technology could be used by industries such as energy and logistics as well as healthcare and education, allowing machines to communicate with each other via Turkcell's LTE-A infrastructure, extending possible smart city applications.[43]

In February 2018, Turkcell and Samsung signed a Memorandum of Understanding that resulted in Turkey's first 'live 5G trial' offering a live trial the technology in Istanbul in November 2018. The 5G experience zones featured ultra-high-definition live streaming, cloud gaming, 360-degree camera and virtual reality streaming by using Samsung's 5G Fixed Wireless Access (FWA) solutions, combined with the operator's network infrastructure.[44]

In March 2018, during the Mobile World Congress, the Turkish government signed a protocol to test the latest communication technologies with the Open Networking Foundation,[45] a non-profit operator-led consortium funded by Deutsche Telekom, Facebook, Google, Microsoft, Verizon, and Yahoo. The consortium in collaboration with the ministry is working on Turkey's network infrastructure and carrier business models to help the country resolve its network coverage.[46] In July 2018 a Memorandum of Understanding for the installation of test network infrastructures were signed between the stakeholders of the 5G Valley Open Test Bed at the campuses of Middle East Technical University, Bilkent University, Hacettepe University and BTK.[47] The area between these three universities and BTK headquarters is a developing region with a dynamic population and various vertical sector components such as hospitals and shopping malls. In November 2018, BTK launched the country's first "5G Open Test Site" at the BKT Market Surveillance Laboratory located in Ankara's Hacettepe University.[48] Academics, researchers and start-ups can utilise the 5G Valley Open testbed for R&D tests for 5G and beyond technologies.[49] Tests were carried out on various issues such as 5.9 GHz C-V2X Channel Measurement, Energy Harvesting, 28 GHz Intravehicular Channel Measurement, Power Amplifier Modelling Efficiency and Linearization, V2X, MIMO and spectral efficiency in the 5G Valley.

BTK also established "5G and Beyond Joint Graduate Program" between universities and disciplines to contribute to the cultivation of qualified human resources that Turkey will need in 5G and Beyond in short,

---

[41] See: https://5g-ppp.eu/5g-trials-2/#1512735201378-378a772f-b5c0
[42] See: https://www.globenewswire.com/news-release/2020/06/22/2051453/0/en/5G-and-fibre-infrastructure-important-to-the-future-in-Turkey.html
[43] See: https://www.smartcitiesworld.net/news/news/turkey-opens-the-door-to-5g-2040
[44] See: https://www.rcrwireless.com/20181109/5g/turkcell-samsung-electronics-carry-out-live-5g-trial-turkey
[45] See: https://www.uab.gov.tr/haberler/yeni-nesil-iletisim-teknolojileri-dunyada-ilk-turkiye-de-test-edilecek
[46] See: https://internationalfinance.com/5g-network-vision-turkey-is-at-a-turning-point/
[47] See: https://www.itu.int/en/ITU-D/Conferences/GSR/2019/Documents/Turkey_Contribution-GSR-19.pdf
[48] See: https://www.aa.com.tr/tr/bilim-teknoloji/5g-vadisi-acik-test-sahasi-acildi/1305986
[49] See: https://www.4yfn.com/wp-content/uploads/2018/12/2018-11-26-5G-in-MENA.pdf

medium and long term. The program aims to produce sustainable competence on advanced communication technologies and to produce outputs in a wide variety of forms such as patents, projects, articles, spin-off companies and thesis studies. Currently 38 students are employed in the operators and continue their academic studies at the same time.

In January 2019, Turkcell has achieved Turkey's first end-to-end, 3GPP-compliant, multivendor 5G data call on 2.5 GHz band in a partnership with Ericsson. The call used Ericsson Radio System solutions and Ericsson Cloud Core and test devices from ecosystem partners over Turkcell's 5G test network. The tests in Istanbul used the 5G systems over Turkcell's existing Gigabit LTE (4.5G) network.[50]

In February 2019, BTK approved applications by the country's three mobile network operators Turkcell, Vodafone and Turk Telekom (TT Mobil, formerly Avea) to conduct 5G trials in different frequency bands in the largest three cities of Istanbul, Izmir, and Ankara.[51] In August 2019, the local press reported that Turkcell broke world 5G speed record, reaching 2.283 Gbps speed on a 5G-enabled smartphone with allocated 3.5GHz frequency using 1,000MHz bandwidth.[52]

In February 2020, Turkcell showcased Turkey's first 5G live TV broadcast in high quality and capacity combined with and low latency while covering a soccer match at the Trabzonspor stadium. The broadcasting also relied on a local software, which was used along with Turkcell's 5G test network.[53]

Co-financed by the European Commission within the framework of the Horizon 2020 programme, 5G-MOBIX is developing and testing automated vehicle functionalities using 5G core technological innovations along multiple cross-border corridors and urban trial sites.[54] The project envisions a Greek-Turkish cross-border trial corridor as one of the eight trial sites with a strategic geopolitical environment.[55]

With the participation of the two largest MNOs in Greece and Turkey and the guaranteed cell-edge conditions to be created at the border, 5G-MOBIX will also offer a unique opportunity to address 5G cross-border deployment issues while driving across a hard border where trucks have to stop and are subject to human control. It will also provide important insights into the limits of coverage and performance that can be expected by 5G technology and the level of support provided for CCAM (Connected and Cooperative Automated Mobility) use cases.[56]

In March 2020, the Ministry of Transport and Infrastructure announced that they are preparing to launch 5G services in the Istanbul airport through its 5G indoor network. [57]

---

[50] See: https://www.ericsson.com/en/news/1/20192/turkcell-and-ericsson-achieve-turkeys-first-standard-compliant-5g-call
[51] See: https://www.commsupdate.com/articles/2019/02/12/regulator-permits-5g-trials-in-ankara-istanbul-izmir/
[52] See: https://www.aa.com.tr/en/science-technology/turkeys-turkcell-breaks-world-5g-network-speed-record/1551008
[53] See: https://www.businesswire.com/news/home/20200204005639/en/
[54] See: https://www.5g-mobix.com/about
[55] See: https://ec.europa.eu/digital-single-market/en/cross-border-corridors-connected-and-automated-mobility-cam
[56] See: https://www.5g-mobix.com/x-border-trials/greece-turkey
[57] See: https://sigmatelecom.com/5g-mobile-internet-will-be-launched-in-istanbul-airport/