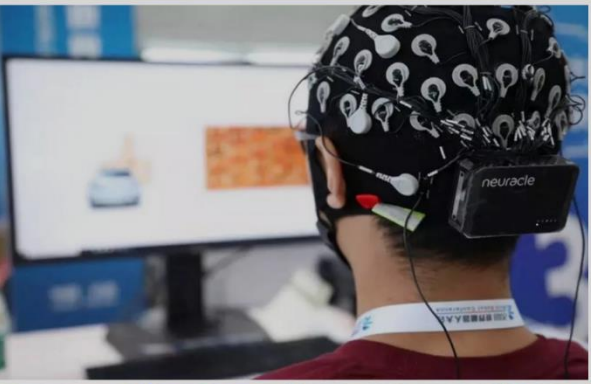


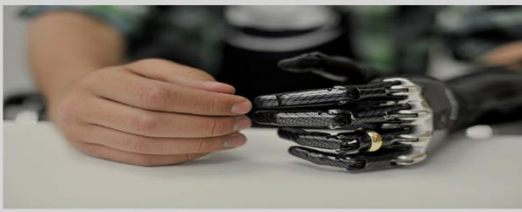
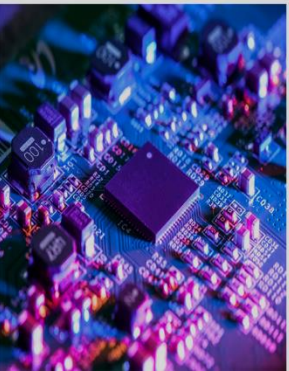



TÜRKIYE

STI Profile of the OIC Member State

Science, Technology and Innovation Indicators



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FOREWORD

It gives me great pleasure to share the *Science, Technology and Innovation Profiles of OIC Member States* as prepared by COMSTECH. These profiles of member states are being printed, as well as shared on the COMSTECH website. A few words are therefore presented to explain the wider aims and purposes of this exercise.

The member countries of the OIC are vigorously engaged with science, technology and innovation, both as a pursuit of knowledge and in harnessing the forces of nature for human betterment. Depending on their circumstances they have advanced to different levels, but much needs to be done, in general, to catch up with the attainments of the more advanced countries. However, there exists a well-defined need to catalogue national efforts in this direction. In particular, to identify respective strengths, achievements and shortcomings, as well as the institutions and policies that are shaping the scientific research and development profiles of OIC member states.

It is with the above goals and purposes that COMSTECH has ventured on this ambitious task viz. preparing a summarized version of the science, technology and innovation landscape of each member state. We have initiated this effort starting with the profiles of countries leading in this area, and will be continuing and sharing as we proceed onwards.

Undoubtedly much more could be said about each country than the summary that we have presented, but our emphasis is on the essentials and on maintaining brevity. COMSTECH welcomes feedback from member states on this effort and will be happy to update the website profiles on the basis of information received officially.

I hope that the scientific community as well as the planners and administrators of member states will find these profiles both useful and inspiring.

Prof. Dr. M. Iqbal Choudhary
Coordinator General COMSTECH
UNESCO Chair

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Following is the list of topics covered in the STI profiles of OIC Member States. All sub-sections/topics may not appear for every country due to unavailability of some data.

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TÜRKIYE is located in South Eastern Europe and West Asia bordering the Black Sea between Bulgaria and Georgia and bordering the Aegean Sea and the Mediterranean Sea between Greece and Syria. The bordering countries are Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Iran, Iraq and Syria. The total land area is 769.63 thousand km^2 and coastline is 7200 km long. Forested area of the country covers almost 29% of the land area. The capital of Türkiye is Ankara. Istanbul is the largest city of the country.

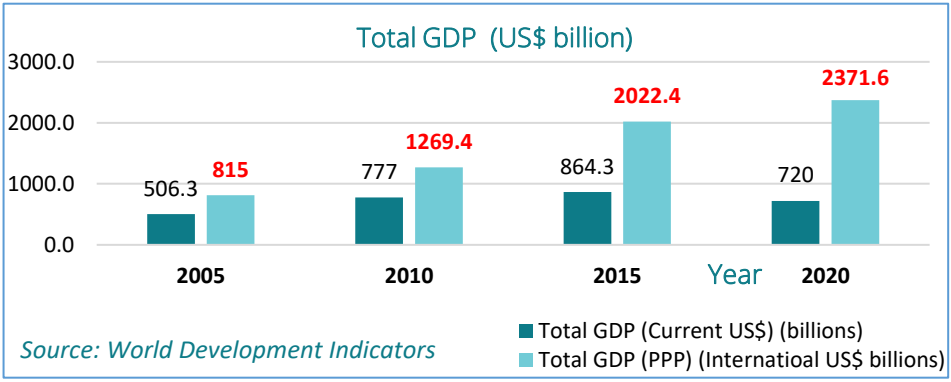
Türkiye is a powerful economic country and a part of many international organizations. Türkiye is the founding member of the United Nations (UN), the Organization of Islamic Cooperation (OIC), the Organization of Economic Cooperation and Development (OECD) and the Organization for Security and Co-operation in Europe (OSCE). Türkiye is also a member of the G20 Industrial nations, the Council of Europe, the North Atlantic Treaty Organization (NATO) and the World Trade Organization (WTO).

Türkiye has a population of 70.71 million. Majority of the population claim Turkish as their mother language, while the remaining population speaks Kurdish with a small number of Arabic speaking people live there. The country has achieved an overall 96% literacy with 99% male and 93% female literacy. The ethnics groups in Türkiye include Turk, Kurd, Crimean Tatar, Arab, Azerbaijani, Yoruk and others. Above 90% of the Turkish population is Muslim by religion with a small population size of Jews and Christians.

Türkiye is richly endowed with natural resources such as coal, iron ore, copper, chromium, antimony, mercury, gold, barite, feldspar strontium, magnetite and pyrite. Türkiye is the Middle East's leading steel producer. The leading manufactures of Türkiye are chemicals, food, beverages, tobacco, textiles, clothing and footwear. The leading exports of Türkiye are textile fibres, yarns, fabrics, and clothing, iron and steel, fruits and vegetables, livestock products, tobacco, and machinery.

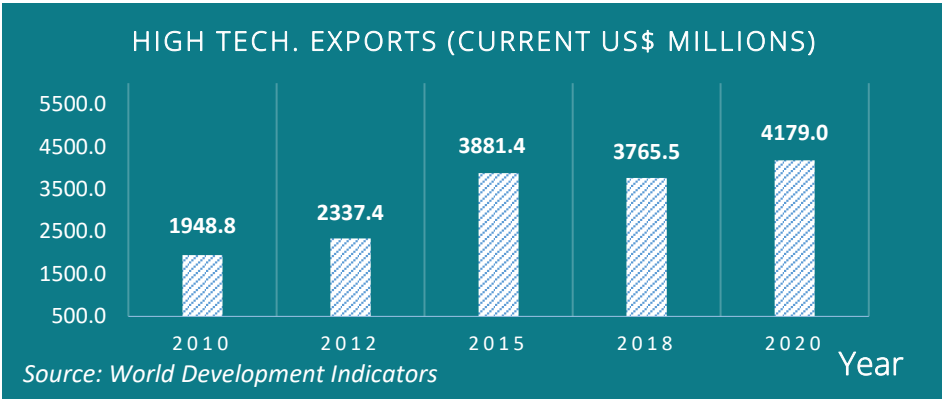
Source: https://www.britannica.com/place/Turkey/; Wikipedia.

A. ECONOMIC OVERVIEW



- Major industries are machinery, tourism, automobile manufacturing and ship building, electronics, mining and textiles. The economy is largely based on industry and services. In 2020 the GDP the share of agriculture (value added % of GDP) is reported as 6.6%, while the same for industry is 27.8% and services 54.6%. Manufacturing, a part of which is also included in industry, has 18.8% value added share of the GDP. In recent years Türkiye has successfully managed a shift from resource based textiles industry to knowledge based electronics and automotive industries.
- Between 2005 and 2015 Türkiye's GDP increased by almost 71% in terms of current US dollars, while in terms of the purchasing power parity the GDP increased by 148%. The per capita GDP in current US dollars increased by 47.6% over the same period. However,

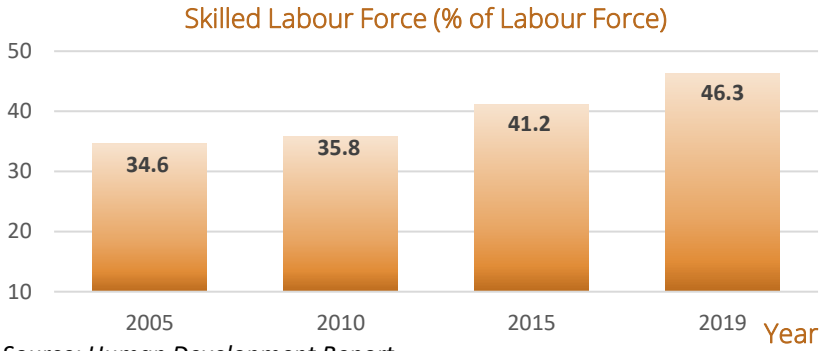
between 2015 and 2020, the total and per capita GDP have both shown a decline, presumably reflective of the effects of the COVID-19 pandemic on the economy. Türkiye's exports have continued to exhibit an increasing trend over the 2005-2020 period and today account for over a quarter (28.6%) of the GDP. The main exports for 2020 are vehicles and their parts (21.4 billion dollars), machineries and mechanical appliances (15.68 billion dollars), iron and steel, electrical machinery, knitted and crocheted goods etc.



- It is noticeable that high technology exports have more than doubled in dollar value over the past ten years with the figure for 2020 having reached about 4.18 billion dollars. In recent years high technology exports account for nearly three percent of the total exports. Globally, Türkiye stands at 39th position, while it is in 3rd position within the OIC in terms of the total volume of high technology exports.

- The main high technology exports of Türkiye are wristwatches, air vehicles, cardiac pacemakers, medicines, aircraft parts, medical devices, optical devices, and electronic circuits. The growth in high technology exports is indicative of increasing efforts for indigenous production of advanced technological products of exportable quality.

B. SOCIAL AND HUMAN DEVELOPMENT



Source: Human Development Report

- Türkiye's economic growth has very significantly contributed to the betterment of its population, with the percentage below poverty line decreasing from 24.4% to 10.2% between 2005 and 2019. Similar positive impact of a rapidly growing economy can be seen in other indicators. For example, the average life expectancy has increased to 77.7 years, and the percentage of the skilled labour force constituted over 46% of the population in 2019. The ratio of skilled labour force has reasoned steadily from 34.6 to 46.3 percent of the labour force, between 2005 and 2019. The most basic necessities such as access to electricity is available to 100% of the population while piped water supply (95%) is provided to 95% of the population.

C. KEY GOVERNMENT ORGANIZATIONS RELATED TO SCIENCE, TECHNOLOGY AND HIGHER EDUCATION

- **The Ministry of Industry and Technology:**
  A government ministry office responsible for industrial and commercial affairs. It oversees 1229 R&D Centers, 360 Design Centers, and 87 Technology Development Zones.

- **The Council of Higher Education:**
  Responsible for the supervision of universities in Türkiye.

- **Türkiye, Scientific and Technical Research Council of Türkiye (TÜBITAK):**
  Its mission is to develop and carry out, promote and sponsor, organize and coordinate basic and applied research in natural sciences in Türkiye and to set up institutes to work in this field. The Council has one Research Centre with five affiliated Research Institutes and six other Research Institutes which carry out in-house research.

- **The Turkish Academy of Sciences TÜBA** is an autonomous scholarly association aimed at promoting scientific activities in

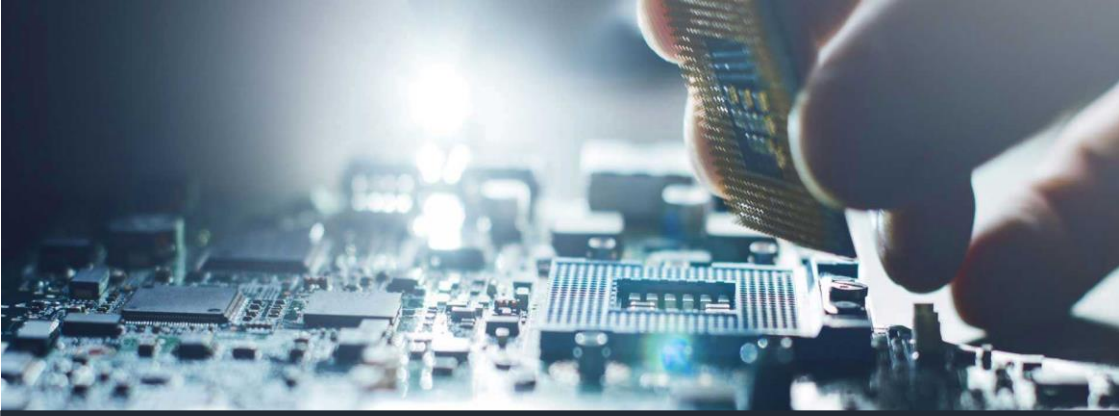
Türkiye. It is attached to the office of the Prime Minister and is largely funded by the government. In addition to conferring awards and fellowships to distinguished scientists, the academy is also responsible with determining scientific priority areas and proposing policies and needed changes in legislation to the government.

❖ Major Research Institutes:

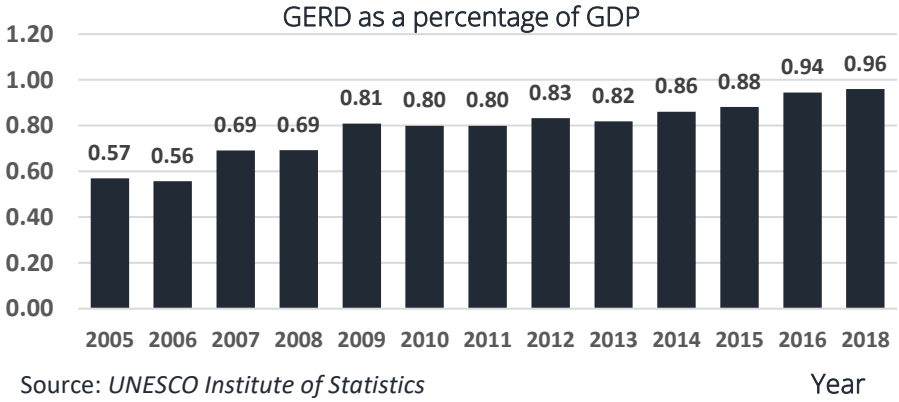
- Atomic Energy Authority
- Defense Industries Research and Development Institute
- Informatics and Information Security Research Center
- Institute of Materials Science and Nanotechnology
- Izmir Biomedicine and Genome Center
- Marmara Research Center
- Nanotechnology Research and Application Center
- National Magnetic Resonance Research Center
- National Metrology Institute
- National Research Institute of Electronics and Cryptology
- Space Technologies Research Institute

❖ Agencies:

- Turkish Space Agency
- Türkiye Energy, Nuclear and Mineral Research Organization

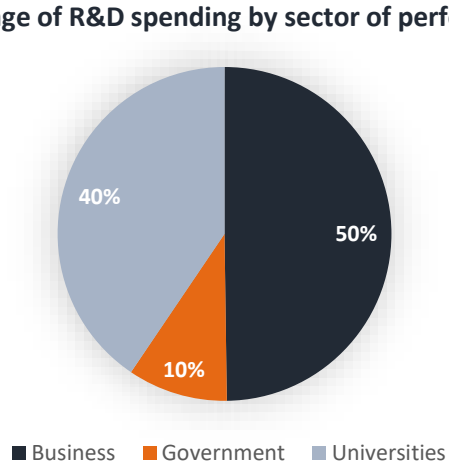


D. RESEARCH AND DEVELOPMENT



Source: *UNESCO Institute of Statistics*

- Türkiye's gross expenditure on R&D, GERD, as a percentage of GDP, has increased from 0.57% in 2005 to 0.96% in 2018. While this GERD/GDP ratio is significantly lower than the 2018 global average of 1.7%, it is currently amongst the highest in the OIC and is targeted to increase to 1.8% by 2023. It is important that a significant part of Türkiye's GERD is financed by business enterprises. Türkiye ranks 28th in the world in this respect.



1. Expenditure on R&D by Sectors:

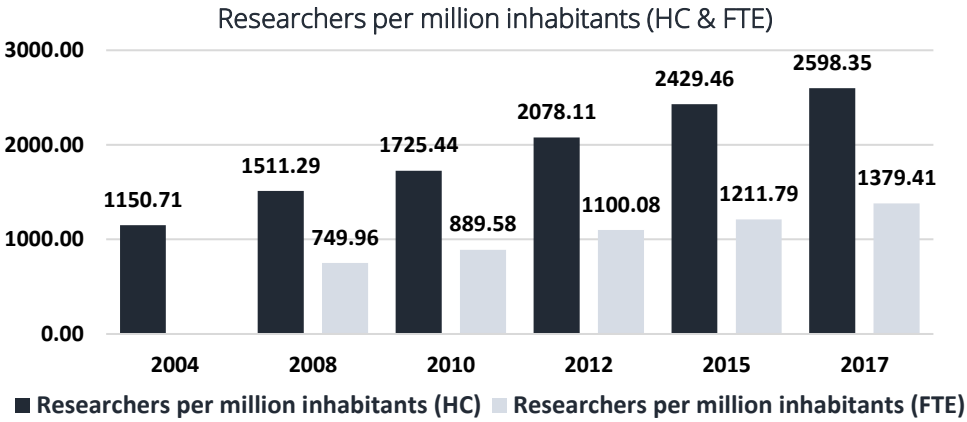
According to UNESCO Institute for Statistics, Türkiye spends 0.9% of GDP on R&D which is about $15,933.0M in PPP$. The major proportion of spending is done by Business sector ($7931.2M) which depicts the strong interest of business enterprises in Research and Development. The second major contributor to R&D spending is the universities sector. Government is spending comparably lesser amount i.e. $6457.8M but it is putting more efforts on policy making and providing private enterprises and organizations with R&D favorable infrastructure and legal facilities. In 2016, The Turkish Government introduced two incentive packages to provide comprehensive support to the qualified investments named as:

1. Centre of attraction programme
2. Super incentives programme

Super incentives programme aim to empower the efforts of business sector in R&D. This programme vows to reduce dependency on imports/foreign sources, improve Türkiye's competitive power and appreciates R&D focused investments which help private enterprises to participate more actively to develop technological capacity in the fields where the country technologically fall behind.

2. Researchers Intensity:

The number of researchers (full time equivalent) in 2012 was 82,122 while in 2018 it has increased to about 300,000. About 56% of these researchers are employed (FTE) in the private sector. Out of 63 countries, Türkiye ranks 30th in female researchers and 12th in R&D productivity by publication. In terms of actual numbers, the head count of researchers shows a consistent increase with the latest reports showing almost 2600 researchers per million.

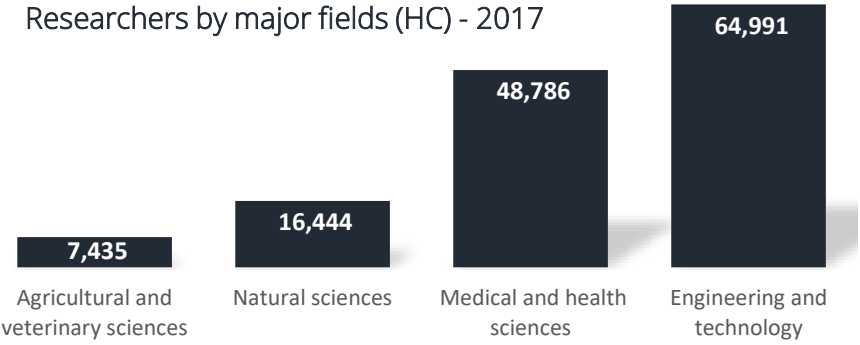


Source: *UNESCO Institute of Statistics*

3. Researchers distribution by major fields:

- The whole world is putting efforts in the field of engineering and technology particularly to bring disruptive innovative changes. The data of the distribution of Türkiye's researchers in different major fields show a very prominent contribution of Engineering and Technology field researchers. Second most dense field of researchers in Türkiye is Medical and Health sciences. The research in Medical and Health sciences play a vital role in the nourishment of healthy society because the research leads to innovation and development in the particular field. Türkiye's

efforts to cope the COVID pandemic is true representation of their hard work and dedication in the field of Medical and Health sciences. The other two most preferred fields by researchers are Natural sciences and Agricultural and veterinary sciences.



Source: UNESCO Institute for Statistics (UIS)

4. Research and Development in Private Sector

Several large scale enterprises are established in Türkiye and they are working actively in the field of research and development. These companies are manufacturing and doing R&D in Petroleum, Automotive, Steel and Home Appliances sector.

Some examples of private sector R&D activity:

1. **Tupras** is the largest company by revenue in Türkiye and they are Operating Petroleum refineries, Izmit Refinery, Izmir Refinery, Kirikkale Refinery, and Batman Refinery in Türkiye with around 30 million Tons capacity. Tupras R&D Center was established on August 2, 2010. R&D Center comprise of three buildings which include R&D laboratories, Pilot plant, and administrative building. The Product Research and Development team conducts innovative product design studies for enhancing regulation compliant and unique products. Innovative products are developed according to the

industry standards. Tupras achieve their R&D goals by taking profit from TUBITAK and EU incentive mechanisms.
https://www.tupras.com.tr/

2. **Ford Otosan** is the automotive company of Türkiye who has achieved automotive industry championship for 8 consecutive years since 2004. Company is doing big investments in the field of R&D and they have announced TL 20.5 billion investment plan until 2026. This investment is for the production of next-generation electric and connected commercial vehicles. Their Product Development Department was founded in 1961 and due to their strong R&D activities they designed and developed the first Turkish passenger car "Anadol" which was produced in 1966. Their R&D organization with over 1,300 R&D engineers, possesses all the capabilities and infrastructure required to design, develop, and test a whole vehicle, including its engine, from scratch to the complete commercial product.
https://www.fordotosan.com.tr/en

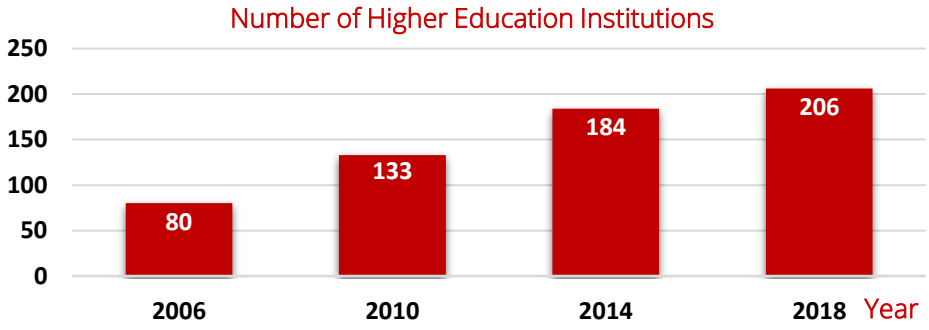
3. Turkish multinational household appliances manufacturer, **Arçelik A.Ş.** is ranked at 67th place in the WIPO Patent list and it acquires 17 R&D centers with over 1500 researchers. The company is in the list of top 10 largest companies of Türkiye. They design intelligent and networked products at the intersection of artificial intelligence, software and hardware. As a result of their cooperation with global and competent partners in research and development, they develop cloud-based platforms in the fields of voice, vision and health and are supported by machine and deep learning and establish ever-growing ecosystems with collaborations.

4. **Eredmir** is the largest integrated flat steel producer in Türkiye. It is producing hot and cold rolled tin, chromium, and zinc coated flat steel according to industry standards. The company is

investing in R&D and their R&D Center is the first of its kind in their industry which aims to increase diversity of products with high added value.

Above mentioned companies are just few of many companies who are participating in the R&D based production of products. In nutshell, it can be said that Türkiye's private enterprises and businesses are very proactively and keenly involved in the nourishment of country's R&D sector.

E. HIGHER EDUCATION



Source: Higher Education System in Türkiye. Jan. 2019
https://www.yok.gov.tr/Documents/Yayinlar/Yayinlarimiz/2019/Higher_Education_in_Turkey_2019_en.pdf

- In the area of higher education, there are very significant positive indicators for Türkiye. According to Türkiye's own database the number of higher education institutions has more than doubled in this period, increasing from a total of 80 to 206, between 2006 and 2018. (The International Association of Universities (IAU) however shows 173 higher education institutions, according to its criteria). Tertiary enrolment has grown rapidly in Türkiye. To accommodate this new influx, no fewer than 30 universities were founded between 2016 and 2019, 20 of which are

public institutions. By 2018, the gross tertiary enrolment ratio was 109.5% and the number of doctoral students had risen by 22% to 95,100 since 2015. In 2017, a total of 4,516 students were awarded Ph.D. degrees. According to QS World Rankings there are 9 Turkish universities in Top 1000 and 1 in the Top 500. (QS World University Rankings 2021).

- In 2017, the share of population, 25 years or older, holding a bachelor's degree was 16.4%, while 0.42% had a doctoral degree. The gross tertiary enrolment showed an increase of 27.8% over a five-year period, 2012-2017. Over four thousand and five hundred students graduated with PhD in 2017 and almost 48% of them were females.

  Source: UNESCO Science Report 2021

- **Technical Universities:**

  The following are the names of some universities in Türkiye, which are dedicated to engineering, technology and sciences:

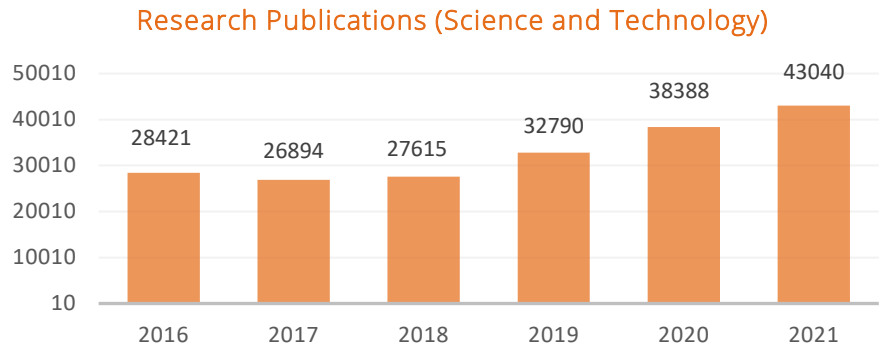
  - Istanbul Technical University
  - Yıldız Technical University
  - Karadeniz Technical University
  - Middle East Technical University
  - Gebze Technical University
  - Bursa Technical University
  - Erzurum Technical University
  - İzmir Institute of Technology
  - TOBB University of Economics and Technology
  - Adana Science and Technology University



University Name	National Ranking	Global Ranking
Middle East Technical University	1	573
Bogazici University	2	637
Hacettepe University	3	650
Ankara University	4	652
Istanbul Universty	5	673
Istanbul Technical University	6	682
Ege University	7	839
Gazi University	8	844
Cukurova University	9	913
Bilkent University	10	940

Source: https://cwur.org/2021-22/country/turkey.php

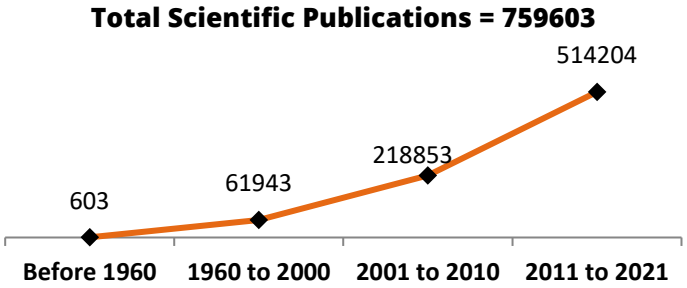
F. RESEARCH PUBLICATIONS



Source: Web of Science Core Collection | Document type: Articles

- The number of research publications in impact factor journals of science and technology, according to the Web of Science, has increased by about 50%, from over twenty-eight thousand in 2016 to about fourty-three thousand in 2021. Based on the number of publications in respective disciplines, medicine and surgery, environmental sciences, materials science, and electrical and electronic engineering constitute the most productive areas of research. Istanbul Teknik University, Hacettepe University, METU, Bilkent University and Bogazichi University are some of the leading institutions with regards to scientific publications in different disciplines. Türkiye ranks 2nd in the OIC in terms of the total number of scientific publications in impact factor journals.

- In 2019, the number of scientific publications per million inhabitants in Türkiye was 518 and which was above the G20 average value of 452 meanwhile the value for other Black Sea Basin countries remained below the G20 average value.



Source: Scopus

- Türkiye has published 795603 research documents. Almost 60% (or 476836) are published in the last ten years (2012 to 2021). The per era details are presented in the figure.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	SO	476836	36567	40039	40864	44701	47787	45310	46647	50841	56464	67616
2	Citations	4675033	575612	563204	556750	591179	572382	490406	449913	377434	340309	157844
3	FWCI	0.92	0.8	0.8	0.81	0.83	0.86	0.89	0.95	0.94	1.05	1.08
4	CPP	9.8	15.7	14.1	13.6	13.2	12	10.8	9.6	7.4	6	2.3

- The per year details from (2012 to 2021) are described in the table. The highest documents (n=67616) are published in 2021. All documents received 4675033 citations, while the CPP was 9.8. The per year data for the article field weighted citation impact (FWCI), which "indicates how the number of citations received by an article compares to the average or expected number of citations received by other similar publications". FWCI for Türkiye (for the last ten years) was 0.92, which means, that the articles received 8 % lesser citations as compared with global average.

S#	Subject Area	SO	Citations	Authors	CPP	FWCI
1	Medicine	169922	1417378	128505	8.3	0.76
2	Engineering	79751	875035	60043	11	1.12
3	Computer Science	48011	424699	36273	8.8	1.09
4	Physics and Astronomy	47967	660587	35755	13.8	1.25
5	Materials Science	43201	542229	33390	12.6	1
6	Social Sciences	40783	229523	37207	5.6	0.83
7	Biochemistry, Genetics and Molecular Biology	38417	553397	55669	14.4	0.93
8	Agricultural and Biological Sciences	36339	346096	33056	9.5	0.82
9	Chemistry	35032	497064	31046	14.2	0.99
10	Mathematics	34195	283150	23016	8.3	1.33
11	Environmental Science	27186	366771	31944	13.5	1.06
12	Chemical Engineering	18566	294709	23066	15.9	1.07
13	Energy	16933	277262	17285	16.4	1.34
14	Earth and Planetary Sciences	15989	179889	13948	11.3	0.87
15	Arts and Humanities	13229	49893	12312	3.8	0.82
16	Pharmacology, Toxicology and Pharmaceutics	12961	155630	21414	12	0.97
17	Business, Management and Accounting	12293	118022	11797	9.6	1.05
18	Economics, Econometrics and Finance	9784	68233	8673	7	0.95
19	Immunology and Microbiology	9735	150826	18901	15.5	0.97
20	Neuroscience	9496	101051	17505	10.6	0.77
21	Nursing	7514	53115	14083	7.1	0.93
22	Health Professions	6830	49963	14101	7.3	0.81
23	Psychology	6639	66899	9196	10.1	1.03
24	Decision Sciences	6465	63864	7447	9.9	1.17
25	Dentistry	6437	62165	7506	9.7	0.96
26	Veterinary	6219	25839	7745	4.2	0.55
27	Multidisciplinary	4275	81772	9039	19.1	0.89

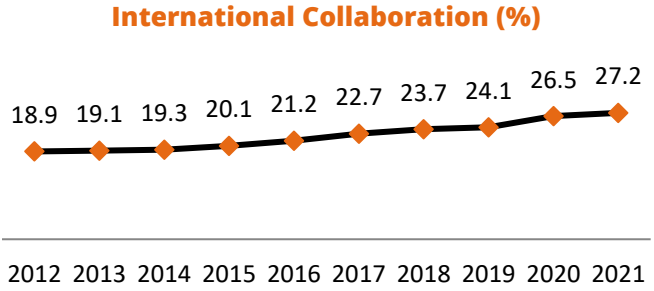
- Türkiye published the highest number of documents in Medicine (n= 169922), followed by Engineering (n= 79751) and Computer Science (n= 48011). While, in Veterinary (n= 6219) and Dentistry (n= 6437) it published the lowest number of documents. At the same time, the highest CPP was recorded for Multidisciplinary (n=19.1), followed by Energy (n=16.4) and Chemical Engineering (n=15.9). The list of **publications**, **citations**, **number of authors**, **Citations per publication (CPP)** and **Field Weighted Citations Impact (FWCI)** for 27 different subject areas is presented in the table.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Pub in top 1% Sources (Q1)	4447	275	317	372	422	487	427	397	397	452	901
2	Pub in top 1% (Percent)	1.1	0.9	0.9	1	1.1	1.2	1.1	1	0.9	0.9	1.4
3	Pub in top 5% Sources (Q2)	27665	1944	2065	2355	2319	2490	2544	2573	2776	3617	4982
4	Pub in top 5% (Percent)	6.6	6.2	6	6.5	6	6	6.6	6.4	6.3	7	8
5	Pub in top 10% Sources (Q3)	57774	3756	4207	4455	4992	5512	5217	5532	6106	7785	10212
6	Pub in top 10% (Percent)	13.8	12	12.2	12.4	12.8	13.2	13.5	13.7	13.8	15.1	16.4
7	Pub in top 25% Sources (Q4)	131149	9387	9681	10135	11165	12458	11396	12105	13886	17554	23382
8	Pub in top 25% (Percent)	31.3	30	28	28.1	28.7	29.9	29.5	30.1	31.4	34.1	37.6
9	Pub in top 50% Sources (Q5)	250315	17397	19305	19794	21363	24601	22421	23590	26497	32869	42478
10	Pub in top 50% (Percent)	59.7	55.6	55.9	54.9	54.8	59	58.1	58.6	59.9	63.8	68.3
11	Pub in top 75% Sources (Q6)	353077	25089	28162	29772	32171	35451	32311	33471	37318	44261	55071
12	Pub in top 75% (Percent)	84.2	80.2	81.6	82.6	82.6	85.1	83.7	83.1	84.4	85.9	88.6
13	Pub in top 100% Sources (Q7)	419252	31278	34532	36059	38964	41662	38594	40273	44214	51516	62160
14	Pub in top 100% (Percent)	100	100	100	100	100	100	100	100	100	100	100

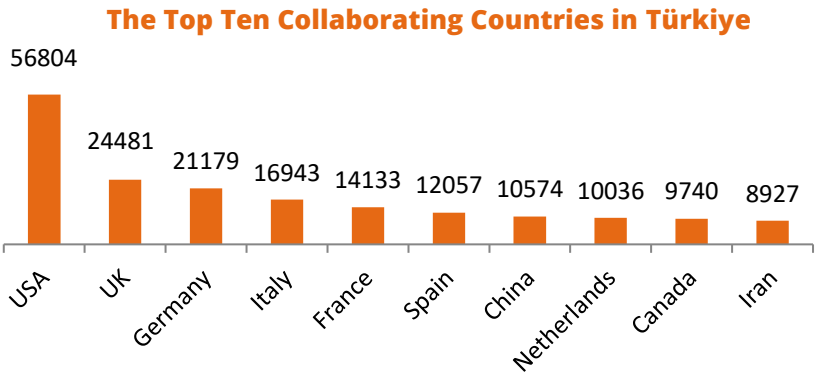
- One of the salient features of Scopus is, it categories the sources or journals in seven different categories. They are termed as quartile sets. For example the top 1% or the highest ranked journals are included in Q1 and Q7 presents the 75 to 100% group. In the last ten years Türkiye published 419252 research documents in Q1 to Q7 sets. The highest documents are published in Q5 (n=119166/28.4%) and Q6 (n=102762/24.5%). The per year breakup details in all seven quartile sets are presented in the table.

S#	Institution	SO	Citations	Authors	CPP	FWCI
1	Hacettepe University	23756	357846	8849	15.1	1.3
2	Istanbul University	22241	288832	11203	13	1
3	Istanbul Technical University	19255	261920	8146	13.6	1.19
4	Ankara University	18216	237520	8201	13	1.13
5	Middle East Technical University	17852	272343	7448	15.3	1.27
6	Gazi University	17636	189602	7635	10.8	0.93
7	Ege University	15613	179270	7346	11.5	0.89
8	Ministry of Health, Turkey	14364	112645	11838	7.8	0.76
9	Marmara University	11946	140125	5729	11.7	1.02
10	Dokuz Eylul University	11563	126987	5435	11	0.95

- In Türkiye, the highest documents are published by Hacettepe University (n=23756) and Istanbul University (n=22241). Both universities also received the 1st and 2nd highest citations. However, the highest CPP was noted for Middle East Technical University (n=15.3). The scholarly output citations, number of authors, CPP and FWCI for all ten universities is provided in the table.



- Türkiye also collaborated with various countries. This is apparent from the % collaboration data (presented in the figure). In fact in the last ten year Türkiye has published the highest number of documents in collaboration with USA (n=56804), UK (n=24481), Germany (n=21179) and Italy (n=16943).


The Top Ten Collaborating Countries in Türkiye
56804
24481
21179
16943
14133
12057
10574
10036
9740
8927
USA
UK
Germany
Italy
France
Spain
China
Netherlands
Canada
Iran

G. International Cooperation and Support Initiatives (selected)

There are bilateral cooperation agreements with a variety of countries at the intergovernmental or inter-institutional levels. Within the framework of such agreements, common research projects are supported and monitored; financial support is provided for several different types of activities such as common scientific meetings, exchange of scientists, scientific visits.

- **The Scientific and Technological Research Council of Türkiye (TUBITAK)**
  The leading agency for management, funding and conduct of research in Türkiye. TUBITAK signed a MoU with Pakistan Science Foundation (PSF) to strengthen scientific and technological co-operation among Pakistan and Türkiye on the basis of equality and mutual benefit. Joint research projects can be submitted by researchers of the two countries.
  http://www.psf.gov.pk/turkey_linkage.aspx

- **European fora for S&T organizations**
  Europe has leading priority in Türkiye's international Science and Technology Cooperation Policy. Türkiye is a member of major European fora for S&T organizations named EUREKA, COST, ESF, EMBO/EMBC,

ESA, INTAS and the like.

https://www.ces.uc.pt/projectos/resist/cms/site/docs/ResIST_SEE_WBC_Sahin.pdf

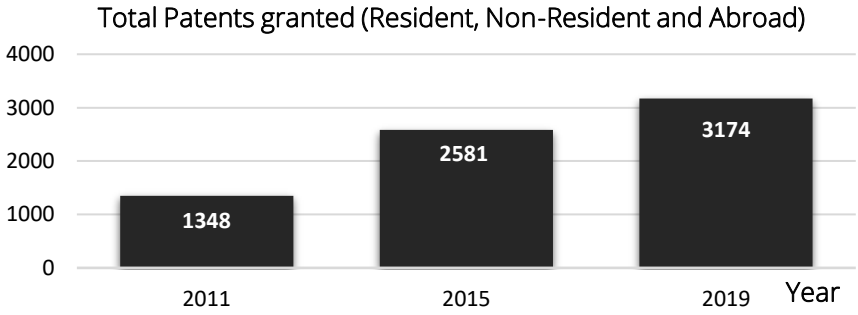
- **Horizon 2020 and Türkiye** European Union launched the biggest Research and Innovation Programme named Horizon 2020. It pledges breakthroughs, discoveries and innovations by taking great ideas from lab and commercializing them after proper R&D. Türkiye joined Horizon 2020 research and innovation programme in 2014. This programme aims to strengthening the capacity of Türkiye in STI and facilitating the integration of the Turkish Research Area to the European Research Area through increased participation in H2020. https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

- **Turkish - Russian Bilateral S&T Cooperation**
  Türkiye has signed Bilateral S&T Cooperation with Russia which comprises two programmes. Large scale cooperation programmes are mainly in the field of space technology and the small scale project funding programmes are announced in various other S&T domains.
  https://www.eranet-rus.eu/_media/Tallinn_Workshop_TUBITAK.pdf

- **The Technology Transfer Accelerator Türkiye (TTA Türkiye)**
  An Initiative managed by European Investment Fund (EIF) vows to commercialize applied research from universities and scale up the technology transfer market in Türkiye. This programme was launched in 2014 with the cooperation of Ministry of Science, Industry and Technology (MoSIT), the Scientific and Research Council of Türkiye (TUBITAK), the Delegation of the European Union to Türkiye and the DG Regional Policy of the European Commission.
  https://www.eif.org/what_we_do/resources/tta/index.htm

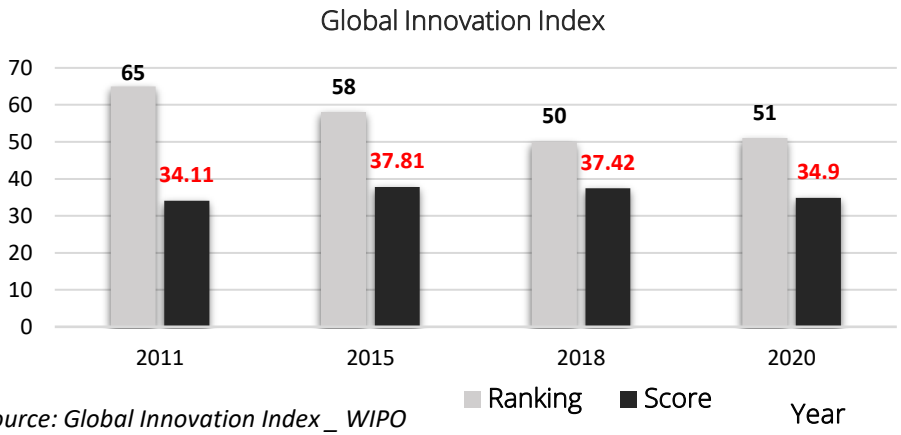
- **TUBITAK** has bilateral agreements with several famous science and technology organizations around the globe. For instance, NSF (National Science Foundation): USA, National Academy of Sciences of Belarus: Belarus, Academy of Sciences of Bulgaria: Bulgaria, DFG (Deutsche Forchungsgemeinschaft) and Jülich Research Center: Germany, CNRS (Centre National de la Recherche) and Ministry of Foreign Affairs: France, KRF (Korea Research Foundation): South Korea, CSIR (Council of Scientific and Industrial Research): India, CNR (Consiglio Nazionale delle Ricerche) and Ministry of Foreign Affairs: Italy, National Research and Technology Office (NKTH): Hungary, Ministry of Education and Science: Macedonia, Ministry of Science and Technology: Pakistan, Academy of Sciences: Slovakia, Ministry of Higher education, Scientific Research and Technology: Tunisia, and several more.
  https://www.ces.uc.pt/projectos/resist/cms/site/docs/ResIST_SEE_WBC_Sahin.pdf

H. INNOVATION, ENTREPRENEURSHIP & TECHNOLOGY PARKS



Source: WIPO: https://www.wipo.int/ipstats/en/statistics/country_profile/

- Increasing commercialization of research and innovation is noticeable from the increasing number of patents awarded to Turkish innovators. Between the years 2011 and 2019 the total number of patents granted to Turkish residents, non-residents and abroad, increased from 1348 to 3174, depicting an overall 135% increase over this period. Türkiye ranks in 13 in the World for new patent applications. This may indicate a quest for technology-based competitiveness in global markets, although the majority of these patents are for military-use technologies.



Source: Global Innovation Index _ WIPO

- A general improvement in the business and entrepreneurial climate is indicated by most indicators. For example, it is reflected in the improved ranking of Türkiye in the Global Innovation Index (GII) where its international ranking has moved from being 65th from the top, to being the 51st. However, its GII score has remained almost unchanged in this period, suggesting that no major improvements in the innovation ecosystem have taken place in this period. Within the OIC, Türkiye has improved its position with regard to the GII, moving from 11th position in 2011 to 3rd position in 2020. 74.5 % of the population has access to broadband in 2018 and by 2023 a full 100% are targeted to have the same. Related indicators on the business, entrepreneurship and innovation landscape show a favorable trend. These scores and rankings indicate that Türkiye has created a favorable environment for business and continues to improve on it.

❖ TECHNOPARKS

Türkiye's support for innovation and entrepreneurship is also reflected in the growing numbers of Technoparks and incubation centres and their role in the economy. The first technoparks were set up in 2001 in Ankara and Kocaeli in Türkiye's traditional industrial heartland. These technoparks have been created in association with universities as one of the Turkish government's flagship schemes to foster business incubation in recent years.

According to UN Science Report 2015, by 2011, there were a total of 43 technoparks, 32 of which were operational. Their number are reported to have increased to 52 by 2014, hosting some 2.500 firms, 91 of which have foreign capital. In 2013, they were employing about 23,000 R&D personnel and generated US$1.5 billion in exports (1% of the total).

Latest data (2021) from Turkish sources gives the number of technoparks as 72, with 6350 hosted companies and 67,000 employees. These technology parks are reported to have more than 1300 academic partnerships and total exports of US$5.7Billion. Of these companies, 45% are involved in software development and ICT and 7% in engineering areas. Besides, many companies involved in medical, energy, chemistry, food, defence, automotive and agriculture sectors are actively doing R&D in these zones. As of January 2021, the total number of R&D projects (completed and ongoing) in technology development zones are 49,688. The export volume of technological products of these companies reaches to 5.6 billion USD, and the major export markets are Japan, Israel, the UK, Germany and the US. When considered in terms of foreign capital, the number of enterprises that are foreign or with foreign shareholders, located in the technology development zones, are 322. The number of patents received (national/international) by the companies located in the zones is accounted as 1,262.

❖ Following is the list of some of the technology parks and incubation centres in Türkiye:

1. METU Technopolis (MUTP), Ankara
2. Hacettepe Technopark (HTP), Ankara
3. ARI Technopark (ATP), Istanbul
4. MRC Technological Free Zone (TEKSEB), Kocaeli
5. Kocaeli Technopark, Kocaeli
6. Bilkent Cyberpark - Ankara Technology Development Zone
7. Ankara University Technology Development Zone
8. Antalya Technokent
9. Ari Teknokent
10. Gazi Teknopark
11. GOSB Teknopark A.S.
12. Konya Teknokent Technology Development Services
13. Mersin Teknopark A.S.
14. Ortadogu Teknopark AS
15. Boğaziçi University Technology Development Zone
16. Erciyes University Technology Development Zone
17. Erzurum Ata Technopolis Technology Development Zone
18. Eskişehir Technology Development Zone
19. Fırat Technology Development Zone
20. Gazi Technopolis Technology Development Zone/ Gazi Technopark
21. Gaziantep University Technology Development Zone
22. Hacettepe University Technology Development Zone/Hacettepe Universitesi Teknoloji Gelistirme Bolgesi Yonetici A.S.

I. COMBATING THE COVID-19 PANDEMIC

❖ Vaccine Development and administration:

- A domestically produced COVID-19 vaccine, Turkovac, was developed by scientists at Erciyes University in Türkiye and started its Phase 3 human trials in June, 2021. The inactive vaccine is now at the emergency-use approval phase, and Health Minister Koca announced that its mass production would likely begin in October, 2021 once it gains approval.
- Turkish scientists have developed a substance against COVID-19 replication. This is a new active substance that prevents the coronavirus from reproducing itself once it infects a patient. When used in drugs, it will likely help patients to develop minimum to no symptoms, say the researchers.
- A team of Turkish researchers at Middle East Technical University and Bilkent University have developed a vaccine that is made up of virus-like particles. Each particle carries four of the coronavirus proteins. On March 26, 2021 they registered a small Phase 1 trial sponsored by TUBITAK, the Scientific and Technological Research Council of Türkiye.
- The World Health Organization (WHO) added an innovative inactive vaccine being developed by Turkish scientists to its list of vaccines in development.

- TÜBITAK maintains the COVID-19 Türkiye Platform, an initiative coordinating separate projects working on vaccines and drugs against the coronavirus. It currently endorses seven vaccines which are at several stages of development, including Phase 2 trials, the penultimate stage before approval and mass use. An inactive vaccine developed at Erciyes University wrapped up Phase 2 trials, while another vaccine will soon start Phase 1 trials. The country hopes to start inoculation with a locally-made vaccine later this year.
- Türkiye hits 105 million COVID-19 jabs amid rising cases. The country has administered nearly 105 million coronavirus vaccine jabs since the launch of an immunization drive in January. Some 52.6 million people have gotten their first doses of a COVID-19 vaccine, while more than 41.9 million are fully vaccinated, according to the Health Ministry. The data showed that 84.74% of the country's adult population has received at least one dose of a two-shot vaccine. Türkiye has also given third booster shots to over 9.7 million people.

❖ Expansion of medical treatment centres to cope with the pandemic

In response to the outbreak, Türkiye set up two outbreak hospitals, each with a capacity of accommodating 1,008 beds, in as little as 45 days. Equipped with qualified and single patient rooms, multiple intensive care beds, and units outfitted with cutting-edge medical technology and materials, played a significant role in service delivery, particularly in large cities. During the outbreak, 17 large city (Şehir) hospitals were opened in various Turkish cities, all of which could be turned into intensive care units. In 81 Turkish cities, 177 epidemic hospitals with level 3 adult intensive care beds were identified. During the outbreak, public hospitals boosted their adult intensive care bed capacity by 51 percent.

❖ Indigenous production to meet pandemic requirements:

- **Ventilator production**

  To overcome the shortage of ventilators, Türkiye roped in various private and public sectors and domestic brands like Arcelik, ASELSAN, Baykar, and Biosys, and started to produce ventilators at an impressive speed. The project has been initiated by the Ministry of Industry and Technology and carried out under the leadership of the Ministry of Health.

- **Visors for health care workers with 3D printing**

  A visor has been produced in the 3D printer for health care workers. The local 3D printer manufacturer Zaxe3D and Fibilo3d companies, which provide 3D printing services, contributes to the project, which will provide additional protection to health care workers with all their machine capacities.

- **Mobile application to support the country's efforts to curb the spread of the novel coronavirus.**

  Young Turkish entrepreneurs have developed a mobile application to support the country's efforts to curb the spread of the novel coronavirus. A group of 16 technology enthusiasts developed the "Corowarner" app which allows community-driven contact tracing. The Corowarner app alerts you instantly and anonymously if you had close contact with an individual in a market, pharmacy or bus who tested positive for the virus. The app provides advice based on the degree of proximity to the positive-tested individual by using an artificial intelligence-based algorithm.

- **Remote healthcare**

  The Turkish startup ecosystem has acted by initiating the Coronathon Türkiye Initiative with the mission of seeking creative solutions to the problems caused by the virus. Twelve projects were deemed worthy of awards from Coronathon Türkiye, which was organized in collaboration with Türkiye's leading entrepreneurs, universities, nongovernmental organizations, ministries and private companies with the mission of creating solutions for the problems caused by the coronavirus outbreak.

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