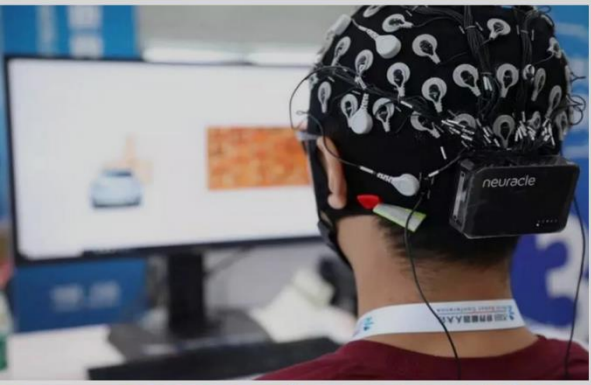


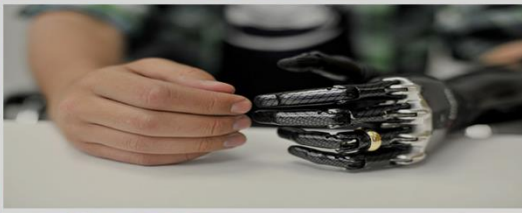
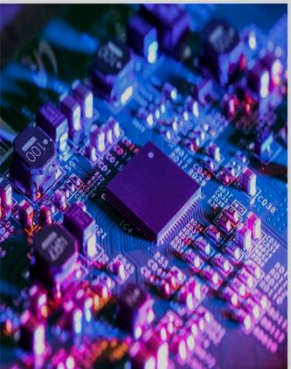


TUNISIA

STI Profile of the OIC Member State

Science, Technology and Innovation Indicators



COMSTECH

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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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TUNISIA officially the Republic of Tunisia,is the northernmost country in Africa. It is a part of the Maghreb region of North Africa, and is bordered by Algeria to the west and southwest, Libya to the southeast, and the Mediterranean Sea to the north and east; covering 163,610 km^2 (63,170 sq mi), with a population of 11 million. It contains the eastern end of the Atlas Mountains and the northern reaches of the Sahara desert, with much of its remaining territory arable land. Its 1,300 km (810 mi) of coastline include the African conjunction of the western and eastern parts of the Mediterranean Basin. Tunisia is home to Africa's northernmost point, Cape Angela; and its capital and largest city is Tunis, located on its northeastern coast, which lends the country its name.

From early antiquity, Tunisia was inhabited by the indigenous Berbers. Phoenicians began to arrive in the 12th century BC, establishing several settlements, of which Carthage emerged as the most powerful by the 7th century BC. A major mercantile empire and a military rival of the Roman Republic, Carthage was defeated by the Romans in 146 BC, who occupied Tunisia for most of the next 800 years, introducing Christianity and leaving architectural legacies like the amphitheatre of El Jem. After several attempts starting in 647, Muslims conquered all of Tunisia by

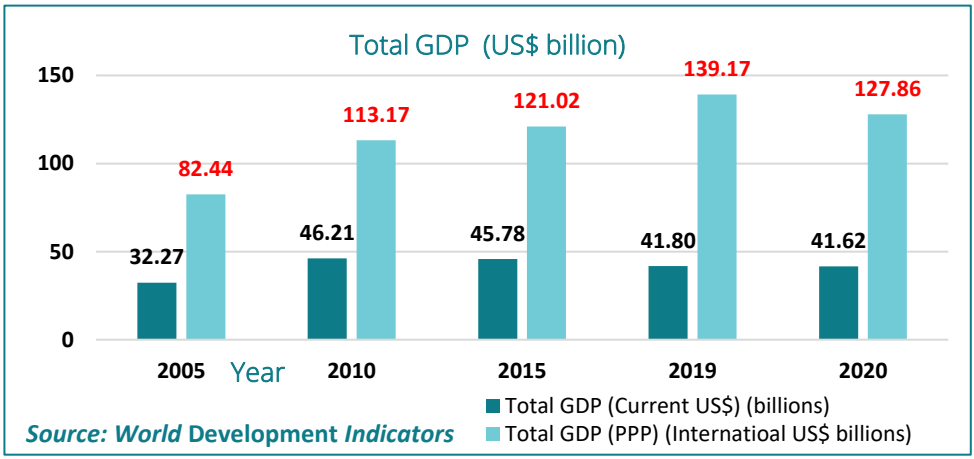
697, bringing Islam and Arab culture to the local inhabitants. The Ottoman Empire established control in 1574 and held sway for over 300 years, until the French conquered Tunisia in 1881. Tunisia gained independence under the leadership of Habib Bourguiba, who declared the Tunisian Republic in 1957. Today's Tunisia has its culture and identity rooted in this centuries-long intersection of different cultures and ethnicities. Tunisia's economic growth historically has depended on oil, phosphates, agri-food products, car parts manufacturing, and tourism.

Tunisia is well integrated into the international community. It is a member of the United Nations, La Francophonie, the Arab League, the OIC, the African Union, the Non-Aligned Movement, the International Criminal Court, and the Group of 77, among others. It maintains close economic and political relations with some European countries, particularly with France, and Italy, which geographically lie very close to it. Tunisia also has an association agreement with the European Union, and has also attained the status of a major non-NATO ally of the United States.

Tunisia remains a unitary semi-presidential representative democratic republic. It is one of the few countries in Africa ranking high in the Human Development Index, with one of the highest per capita incomes in the continent.

Source: https://en.wikipedia.org/wiki/Tunisia

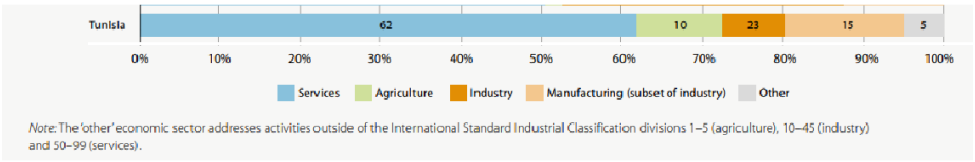
A. ECONOMIC OVERVIEW



Source: World* Development *Indicators

- Tunisia has a diverse economy, ranging from agriculture, mining, manufacturing, and petroleum products, to tourism. In 2019 it had a GDP of US $41.80 billion (current US$), or almost $139 billion in terms of purchasing power parity. As for many other countries affected by the COVID19 pandemic its GDP has actually decreased in 2020 as shown in the accompanying graph. Its per capita GDP of US$1022 (PPP current US$) is one of Africa's highest.

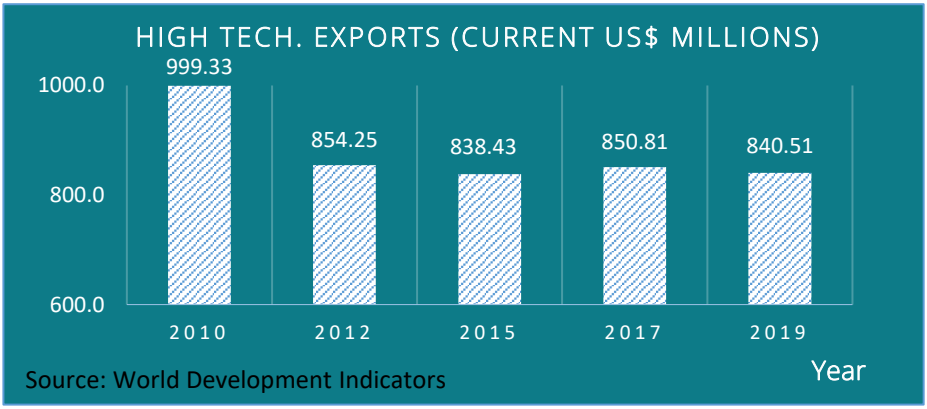
- **GDP per economic sector 2019 (%)**



Note: The 'other' economic sector addresses activities outside of the International Standard Industrial Classification divisions 1–5 (agriculture), 10–45 (industry) and 50–99 (services).

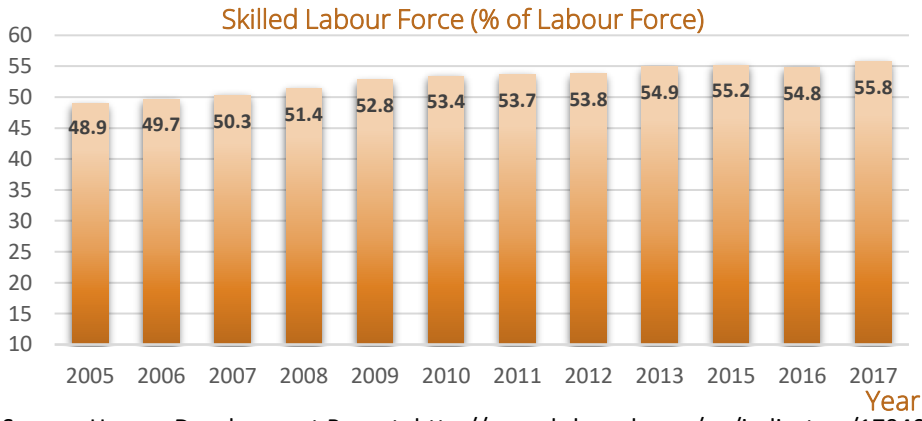
The agricultural sector contributes 10% of the GDP, industry 23%, and services 62%. The industrial sector is mainly made up of clothing and footwear manufacturing, production of car parts, and electric machinery. Main industries include petroleum, mining (particularly phosphate, iron ore), tourism, textiles, footwear, agribusiness and beverages. Tourism accounts for a significant number of jobs in its economy.

- Tunisia was ranked 87th in the world in the Global Competitiveness Index in 2019 with a score of 56 and the most competitive economy in Africa.
- Tunisia has managed to attract many international companies such as Airbus and Hewlett-Packard. The European Union remains Tunisia's first trading partner, currently accounting for 72.5% of Tunisian imports and 75% of Tunisian exports and as the European Union's most established trading partners in the Mediterranean region.
- Tunisia also attracted large Persian Gulf investments (especially from United Arab Emirates). The largest include Mediterranean gate, Tunis Sport City, Tunis Financial harbor and Tunis Telecom City.



- The High Technology Exports of Tunisia have remained steady around US$850 million since 2012 and in 2019 constituted about 7.4% of its manufactured exports.

B. SOCIAL AND HUMAN DEVELOPMENT

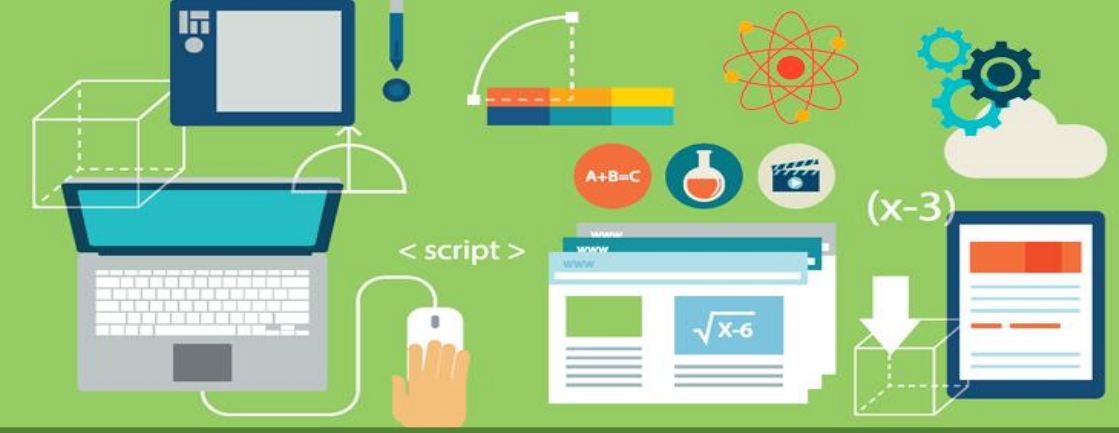


Source: Human Development Report: http://www.hdr.undp.org/en/indicators/179406

- **Skilled Labour Force:** Skills training has become a common focus area of strategic planning. Currently almost 56% of the labour force is classified as being skilled. This percentage has increased slowly but steadily over the past 15 years. This may be attributed to about a dozen schemes that have been developed since 2015 to improve the employability of graduates, such as the Decent Work Country Programme (2017–2022) and the PAX-co scheme, under which training programmes are co-constructed by enterprises and public universities. Vocational education and training has benefited from a 2017 law guaranteeing free access to initial training and improved responses to labour market requirements.

  Source: UNESCO Science Report 2021

- Tunisia achieved a Human Development Index rating of 0.793 in 2019, ranking 91st among 189 countries. The average life expectancy at birth has increased from almost 76 to almost 77 years between 2016 and 2019. Aaccording to UNESCO, it has an adult literacy rate of 79.04%. While the male literacy rate is 86.06%, for females it is 72.22%, showing a gap between the genders. The infant mortality rate (deaths per 1000 births) has decreased for both females and males between 2016 and 2020 and is currently almost 13 and almost 15.6, respectively. About 66% of the population uses internet while mobile cellular subscriptions are about 125 per 100 people.



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

- Tunisia's S&T policies are now perhaps the most developed and sophisticated in the Maghreb. A number of ministries and national agencies are directly involved in Tunisia's S&T policy framework, the most important actors being:

- **Secrétariat d'Etat à la Recherche Scientifique et à la Technologie (SERST):** The key central agency in administering and co-ordinating national S&T programmes is the SERST which was set up in 1991 and is directly linked to the Office of the Prime Minister. It collaborates closely with other Ministries through the "Conseil Supérieur de La Recherche Scientifique et de la Technologie (CSRT)" in formulating and managing national S&T activities, plays a lead role in the commercialisation and valorisation of S&T research results. SERST is also charged with developing and encouraging international scientific and technological co-operation for Tunisian institutions.

- **Ministry of Higher Education:** The Ministry has an important role to play in Tunisian S&T policy through its responsibility for the 89 faculties and schools in the nation's six universities, and for two (non S&T) NRIs within its remit. The Ministry's General Director for Scientific Research and Technology has responsibility for R&D co-ordination between the three universities with S&T activities, and for funding their S&T teaching, research and building programmes and

initiatives.

- In addition, the following ministries are directly involved in Tunisian RTD activities and the funding of S&T:

- The Ministry of National Defence, for example, has funding and policy responsibility for the Centre National de Télédétection.

- The Ministry of the Environment and Communities is both evolving a funding and policy role in a number of important S&T areas and involved in controlling environmental impacts through the "Agence de Protection du Littoral".

- The Ministry of telecommunications which is responsible for the "Centre d'Etudes et de Recherche des Télécommunications" and the "Ecole Supérieure des Postes et Télécommunications de Tunis".

- The Higer Council of Scientific Research and Technology, chaired by the prime minister himself.

- The Ministry of Higher Education, Scientific Research and Information and Communication Technologies, as the body responsible for formulating policy and implementation strategies.

- The National Observatory of Science and Technology is another vital component of the Tunisian STI system. It was established in 2006, two years before being placed under the Ministry of Higher Education and Scientific Research.

- The University Council is presided by the Minister of Higher Education, Scientific Research and Information and Communication Technologies.

❖ Key Policy Initiatives:

➢ Strategic plans for artificial intelligence:

The Tunisian Ministry of Industry and SMEs published an AI Roadmap in April 2019, which resulted in the holding of a smart industry forum the same year and the inclusion of AI as a priority focus of the National Programme for Research and Innovation, which funds 80% of industrial research.

➢ STI policy to 2040 under development:

MESRS is presently developing a national STI policy to cover the period to 2040. The STI policy should follow in 2022, with industrial diversification being one of its focus areas. Pending such a policy, the National Development Plan 2016–2020 fixed the target of raising expenditure on R&D to 1.2% by 2020.

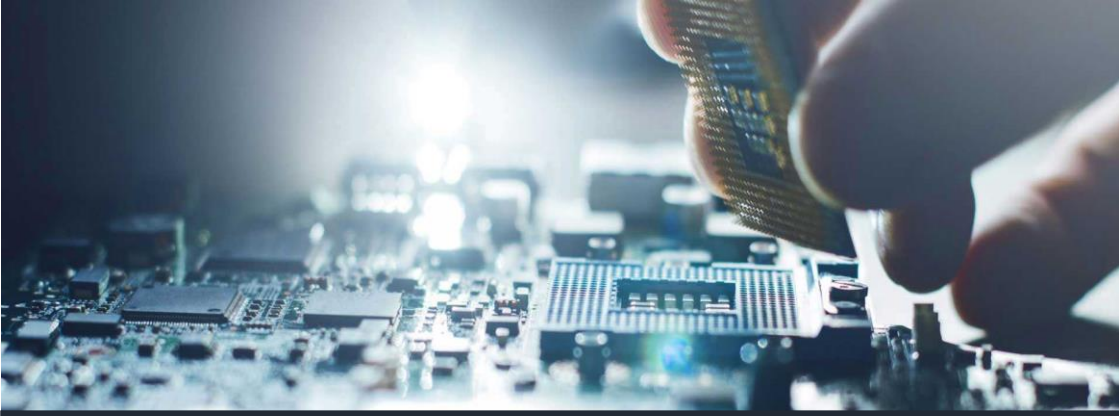
The National Development Plan also set the goals of creating a new generation of innovative institutions and directing research towards areas of national priority. These research areas were subsequently defined by MESRS' Strategic Plan for Scientific Research 2017–2022 (2017). It has three overarching objectives: to promote academic excellence; innovative and pioneering companies; and innovative and prosperous regions. Its six thematic priorities for scientific research are:

- emerging democratic society: education, culture and youth;
- governance and decentralization;
- the circular economy;
- water, energy and food security
- quality health care; and
- the digital economy.

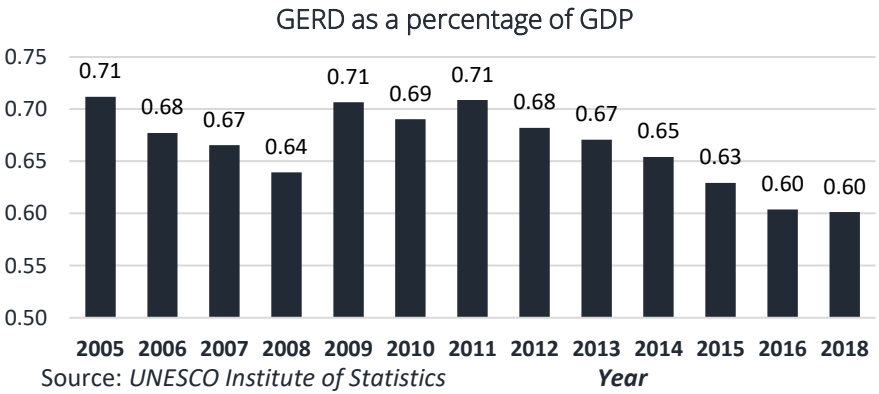
Subsequent research programmes, such as the MESRS National Priority Research and Innovation Programmes (2018–2020), have been aligned with this strategy.

- **Digital Tunisia 2020 (2014):**
  This initiative fixes the targets of achieving 50% mobile broadband penetration and increasing the value of digital exports from TND 950 million (ca US$ 344 million) to TND 5 billion (ca US$ 1.8 billion). It has five thrust areas:
  - to digitize government services;
  - develop telecommunications infrastructure for high-speed Internet;
  - cultivate a 'digital culture' in the private sector;
  - foster entrepreneurship; and
  - improve the regulatory framework.

- **Reform of Scientific research and Higher Education:**
  In January 2015, the University Council approved a broad reform of scientific research and higher education that is to be implemented over the period 2015–2025. The reform will focus on modernizing university curricula, in order to give graduates the skills employers need, and on giving universities greater administrative and financial autonomy.

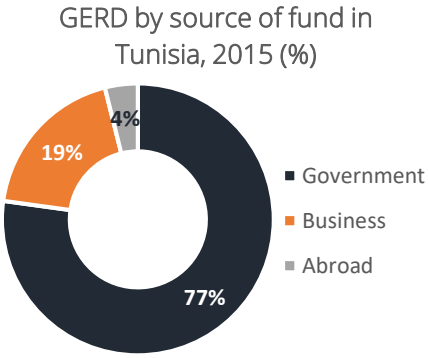


D. RESEARCH AND DEVELOPMENT



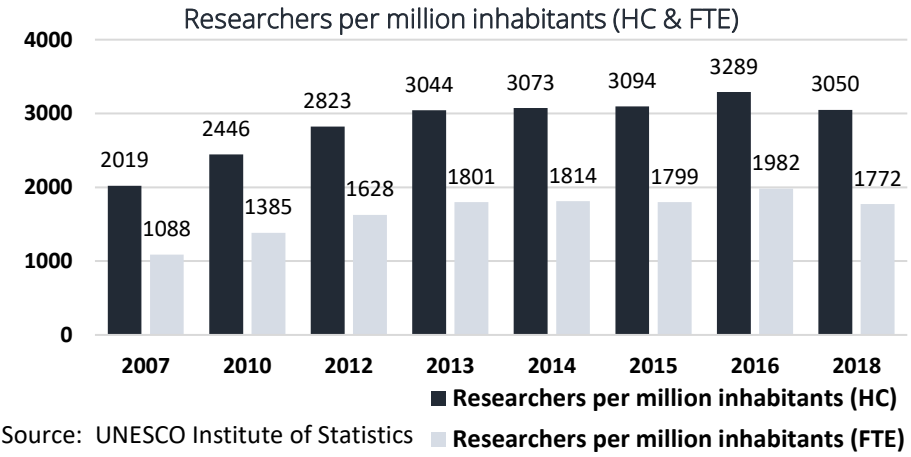
Source: *UNESCO Institute of Statistics*

- Tunisia's GERD as a percentage of GDP has shown a decline from a maximum of 0.71%in 2011 to 0.60 in 2018. According to 2015 data, the government provides about 77% of the research funding while business accounts for about 19%.



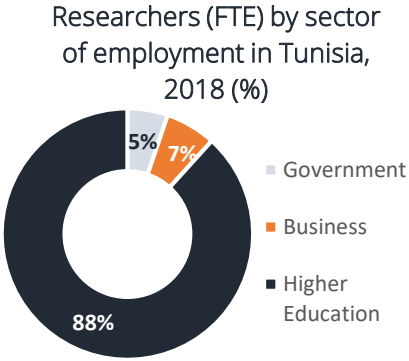
❖ Researchers Intensity:

The number of researchers per million (full time equivalent) in 2010 was 1385 while in 2018 it had increased to 1772. In terms of head count the number of researchers increased over the same period from 2446 to 3050. An overwhelming percentage of these researchers (88%) are employed by the higher education sector while the remaining 12% are shared between the government and the business sectors. Females constitute 56.1% of the research personnel in Tunisia. The number of technicians per million has not shown any growth between 2013 and 2018, being constant around 62 per million.



Source: UNESCO Institute of Statistics

❖ Employment data is indicative that researchers are overwhelmingly employed by the higher education sector (88%) and research would be directed more by academic priorities and much less motivated by business and commercialization. However, Tunisia is one of the few Arab countries where the private sector does support R&D, albeit to a small extent.



❖ Some key S&T research institutions of Tunisia:

- The National University Center for Scientific and Technical Documentation (CNUDST).
- Borj Cedria Energy Research and Technology Center
- Borj Cedria Water Research and Technology Center
- The Biotechnology Center of Sfax (CBS)
- The National Institute for Research and Physico-Chemical Analysis (INRAP)
- The National Center for Research in Material Sciences
- The National Center for Nuclear Sciences and Technologies (CNSTN)

Source: Ministry of Higher Education and Scientific Research;
http://www.mes.tn/page.php?code_menu=559&code_menu_parent=12

cnstn INRAP

cnudst
Centre National Universitaire de Documentation Scientifique et Technique
www.cnudst.rnrt.tn

❖ Areas of Research focus:

- **Electronics:** Foreign electronics companies have been drawn to Tunisia. Some 41 electronics companies with cumulative annual sales of about US$ 1.2 billion launched their own cluster in May 2017. Going by the name of ELENTICA, the cluster entered into a partnership with the Ministry of Higher Education and Scientific

Research (MESRS) in October 2018, with the goal of promoting scientific collaboration and installing research centres in ELENTICA companies. These research centres will focus on areas such as the Internet of Things, smart cities, renewable energy and smart-grid technology, electric cars and e-farming (OBG, 2019). Other tech-based sectors are experiencing rapid growth. Exports in the aeronautics sector grew over 2010–2018 from Tunisian National Dinar (TND) 85 million to TND 1.5 billion (ca US$ 544 million).

- **The pharmaceuticals sector**, meanwhile appears to be growing significantly where exports more than tripled to TND 192 million over 2012–2018.

- **Global change:** Thematic areas such as health research, including biotechnology, renewable energies, energy efficiency, nutrition and agriculture, environmental technologies, climate change, climate protection, and water are the key areas of research cooperation with the European Union.

E. HIGHER EDUCATION

- Following are the University Rankings of Tunisian universities:

University Name	National Ranking	Global Ranking
Tunis El Manar University	1	952
University of Sfax	2	1143
University of Carthage	3	1344
University of Monastir	4	1359
University of Sousse	5	1983

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

- The International Association of Universities lists a total of 42 higher education institutions.
  https://www.whed.net/results_institutions.php
- About 44% of Tunisian students graduated in S&T fields and this ratio was highest amongst the Arab countries. Tunisia's graduates are distributed almost evenly between a: business, administration and law; b: arts and humanities; and c: engineering, with each sector having 20-23% share of graduates. ICT (12%), Health (10%) are the next most popular.

❖ **Distribution of Students by Programs, 2018 0r closest year (%)**

Agriculture	Engineering	ICTs	Health	Natural sciences & maths	Social sciences	Business, admin. & law	Arts & humanities
2	20	12	10	7	7	23	20

❖ **Leading Universities:**

- Virtual University
- Ezzitouna University
- University of Tunis
- University of Tunis El Manar
- Carthage University
- University of Manouba
- University of Jendouba
- University of Sousse
- University of Monastir
- University of Kairouan
- University of Sfax
- University of Gabes
- University of Gafsa

- 12 out of 33 Universities in Tunisia Ranked in at least one international ranking.
- According to the 2021: Publication of URAP World Ranking – (University Ranking by Academic Performance) Tunis el Manar University is ranked the highest among universities in Tunisia, ranked #590.
- The Sousse University is generally ranked overall as the 2nd leading university in Tunisia.
- Sfax University is regarded overall as the 3rd leading university and the top one in sciences and engineering. It has faculties of medicine and science.

❖ Research Institutes:

- **The Pasteur Institute,** the Institut Pasteur de Tunis (IP Tunis) founded in 1893, conducts medical research in Tunis. It is a public health institution under the authority of the Ministry of Health commissioned to carry out epidemiological and clinical studies, biomedical investigations, as well as research activities pertaining to human and animal health. The IP Tunis also produces vaccines and sera for the need of the country. Affiliated to the "Université de Tunis El Manar", the institute contributes to higher education at both the national and regional levels. The IP Tunis is internationally well established and collaborates with several foreign scientific institutions. Since its creation, in 1893, the IP Tunis has focused its research activities on infectious diseases of viral, bac¬terial and parasitological origin, including zoonotic and vector-borne diseases.

  Research and training programs are mainly oriented towards national health priorities including rabies, viral hepatitis, measles, enteroviral infections, coronavirus, papillomavirus infections, leishmaniases, hydatidosis, tuberculosis, mycoplasmosis and bovine theileriosis.

معهد باستور تونس
Institut Pasteur de Tunis

- **National Agricultural Research Institute of Tunisia, Tunisia:**
  The National Agricultural Research Institute of Tunisia INRAT is a governmental scientific research institution depending on the Ministry of Agriculture and Water Resources. It is located in Tunis, and was founded in 1906. It is the first Tunisian institute specialized in agricultural research. Since 1961, research activities at INRAT cover all fields of agricultural science research; namely, animal and crop production, biophysical and socio-economic research. INRAT has been reorganized into consolidated laboratories and research units. Regional research activities are carried out through 12 experimental stations.

- **Water Research and Technologies Centre (CERTE), Tunisia:**
  CERTE was established in 2005, and operates under the Ministry of Higher Education and Scientific Research of the Republic of Tunisia. Its mission is to carry out research innovation activities and technological development in water sector and to transfer the scientific results to the socio-economic sectors. The Center is a part of the Borj-Cedria Technopark, specialized in Water and Environment.

- Tunis is also home to institutes for the study of veterinary science and geology.

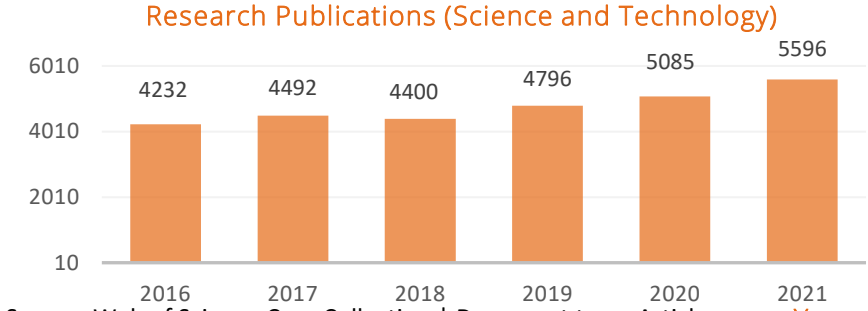
- The city of Ariana houses research centers for agronomy (founded in 1914) and forestry (1967).

❖ **Service establishments:**

- El Khawarizmi Computing Center
- University Publication Center
- Nabeul Language Village
- City of Sciences in Tunis
- Palace of Sciences in Monastir

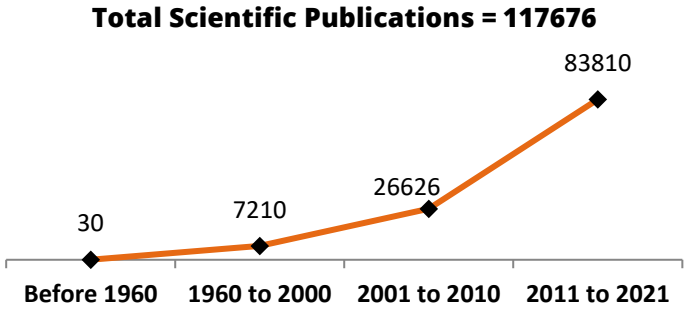
مركز الحساب الخوارزمي
Centre de Calcul El-Khawarizmi
www.cck.rnu.tn

F. RESEARCH PUBLICATIONS



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

- Tunisia ranks 7th amongst the OIC countries in terms of the number of scientific publications. There has been a relatively slow increase in its publication numbers over the past 6 years. With regards to publications per million inhabitants, Tunisia with 610 per million is 4th in the Arab world.



Source: Scopus

- As shown in the figure, Tunisia published only 30 research documents before 1960. Until December 2021, it has published 117676 documents. In fact, 66.67 % (or 78465) documents were published in the last decade. They received 768475 citation or 9.8 **citations per publication (CPP)**. Another interesting bibliometric indicator is **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 Tunisia was found to be 0.91, which means, that the articles received 9 % lower citations as compared with global average. The per year data is present in below table.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Scholarly Output (SO)	78465	5670	6250	6704	7463	8290	8753	8924	8384	8532	9495
2	Citations	768475	77801	76876	87836	106454	106492	99319	86861	57064	49247	20525
3	FWCI	0.91	0.77	0.74	0.79	0.99	0.97	0.91	0.95	0.87	0.99	1.02
4	CPP	9.8	13.7	12.3	13.1	14.3	12.8	11.3	9.7	6.8	5.8	2.2

- It is apparent from the table that the highest documents are published in Engineering (n=20304), followed by Computer Science (n=19747), and Medicine (n=14603). While the lowest number of publications were noted in Nursing (n=425), Psychology (n=356) and Dentistry (n=154). However the highest citations were noted for Medicine (n=184339), Engineering (n=154965) and Computer Science (n=106089). The scholarly output, citations, number of authors, CPP and FWCI details for all 27 areas are provided in the subsequent table.

Source: Scopus

S#	Subject Area	SO	Citations	Authors	CPP	FWCI
1	Engineering	20304	154965	13967	7.6	0.89
2	Computer Science	19747	106089	10724	5.4	0.8
3	Medicine	14603	184339	18470	12.6	1.12
4	Mathematics	11178	56765	7859	5.1	0.83
5	Physics and Astronomy	9452	88640	7359	9.4	0.84
6	Materials Science	9093	99219	6547	10.9	0.85
7	Agricultural and Biological Sciences	7380	96914	7840	13.1	1.01
8	Chemistry	7001	91443	6533	13.1	0.88
9	Biochemistry, Genetics and Molecular Biology	6548	87692	9727	13.4	0.83
10	Environmental Science	5984	81744	7146	13.7	1.01
11	Chemical Engineering	4251	56789	5397	13.4	0.93
12	Energy	4125	52808	4909	12.8	1.01
13	Business, Management and Accounting	2993	20154	3039	6.7	0.82
14	Social Sciences	2962	19050	3852	6.4	0.97
15	Earth and Planetary Sciences	2600	26235	2999	10.1	0.78
16	Decision Sciences	2461	12560	3068	5.1	0.78
17	Immunology and Microbiology	2420	35908	4373	14.8	0.9
18	Economics, Econometrics and Finance	2416	29706	2175	12.3	1.22
19	Pharmacology, Toxicology and Pharmaceutics	1814	24750	3223	13.6	0.88
20	Health Professions	784	10122	1353	12.9	1.29
21	Multidisciplinary	724	12113	1879	16.7	0.83
22	Arts and Humanities	704	3052	978	4.3	0.8
23	Neuroscience	659	9279	1307	14.1	1.04
24	Veterinary	462	4490	864	9.7	1.18
25	Nursing	425	5736	1273	13.5	1.12
26	Psychology	356	2922	778	8.2	0.86
27	Dentistry	154	476	410	3.1	0.54

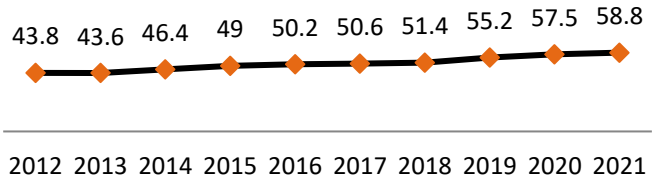
Source: Scopus

- Scopus has also introduced seven "quartiles" groups for research journals. For example Q1 and Q7 groups include the top 1% and 75 to 100% journals. 50224 (out of 78465) research documents are published in all 7 quartiles group. The highest documents are published in Q5 group (14899/29.6%) and Q6 (13512/26.9%). The per year data for each quartile group 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)	333	16	18	23	25	23	60	49	44	45	30
2	Pub in top 1% (Percent)	0.7	-	-	-	-	-	1.1	-	-	-	-
3	Pub in top 5% Sources (Q2)	2463	147	155	175	258	226	276	263	305	286	372
4	Pub in top 5% (Percent)	4.9	5.6	4.8	4.9	6.5	4.8	5.1	4.5	4.6	4.1	5
5	Pub in top 10% Sources (Q3)	5552	316	330	414	465	506	617	682	703	688	831
6	Pub in top 10% (Percent)	11.1	12.1	10.3	11.6	11.8	10.7	11.5	11.7	10.7	10	11.2
7	Pub in top 25% Sources (Q4)	13694	828	1025	976	1077	1176	1462	1642	1705	1748	2055
8	Pub in top 25% (Percent)	27.3	31.8	31.9	27.3	27.3	24.8	27.2	28.1	25.9	25.4	27.6
9	Pub in top 50% Sources (Q5)	28593	1517	1762	1996	2315	2607	3089	3494	3696	3837	4280
10	Pub in top 50% (Percent)	56.9	58.2	54.8	55.9	58.6	55.1	57.4	59.9	56.1	55.6	57.5
11	Pub in top 75% Sources (Q6)	42105	2136	2689	2935	3341	3895	4560	4966	5493	5729	6361
12	Pub in top 75% (Percent)	83.8	82	83.6	82.2	84.5	82.3	84.7	85.1	83.4	83.1	85.4
13	Pub in top 100% Sources (Q7)	50224	2605	3215	3569	3952	4735	5382	5834	6590	6895	7447
14	Pub in top 100% (Percent)	100	100	100	100	100	100	100	100	100	100	100

- International collaboration (%) data for the last ten years (for Tunisia) is collected from Scopus. An increasing trend in collaboration can be observed. In 2012, the percentage of international collaboration was 43.8, which increased to 58.8 in 2021. Tunisia published the highest number of documents (n=30140) in collaboration with France. Source: Scopus

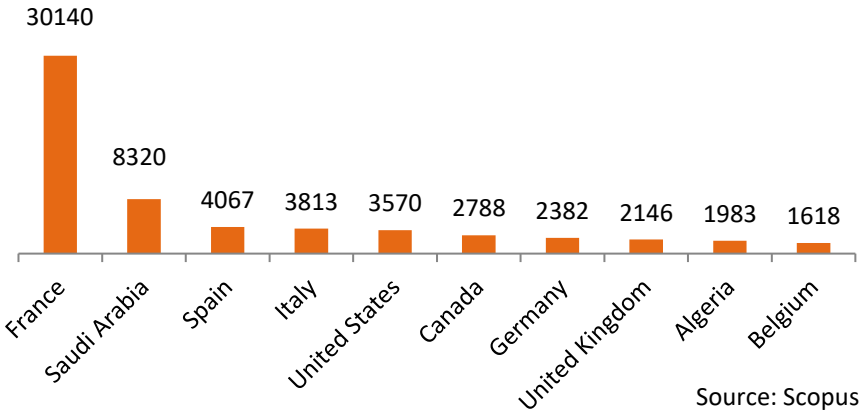
International Collaboration (%)



S#	Institution	SO	Citations	Authors	CPP	FWCI
1	Université de Tunis El Manar	22786	207217	15504	9.1	0.87
2	University of Sfax	19927	189795	9401	9.5	0.88
3	University of Carthage	13875	130853	6215	9.4	0.85
4	University of Monastir	10422	98316	5681	9.4	0.88
5	University of Sousse	6389	51003	4113	8	0.88
6	University of Tunis	5101	37409	2711	7.3	0.83
7	University of Gabes	3397	34339	1611	10.1	0.97
8	University of Manouba	3192	29350	1570	9.2	1.08
9	Centre de biotechnologie de Borj Cédria	1168	18877	589	16.2	1.1
10	Centre de Biotechnologie de Sfax	1166	17761	609	15.2	0.96

- Based on the number of the publications, the list of top ten universities is provided in the table. The highest documents are published by Université de Tunis El Manar (n= 22786), University of Sfax (n= 19927) and University of Carthage (n= 13875). In fact, these three universities received the highest citations as well. For each university the number of publications, citations, number of authors involved in publications, CPP and FWCI is provided in the table given above.

The Top Ten Collaborating Countries in Tunisia



Source: Scopus

G. INTERNATIONAL COOPERATION AND SUPPORT INITIATIVES

- Scientific relations between Tunisia and the European Union have intensified considerably in recent years. Since the 1995 Association Agreement and particularly since the 2003 Scientific and Technological Agreement, Tunisia and the EU have continued to strengthen the means of cooperation in higher education and scientific research. This collaboration has taken on an even more important dimension with the privileged partnership signed in the aftermath of the revolution with the ambition of consolidating Tunisia's democratic turn.

- In 2009, the government began negotiating an agreement for a joint research programme with the European Union (EU). The three-year programme was ultimately launched on 12 October 2011, with €12 million in EU funding. Programme funds are being distributed in accordance with the country's priority research areas: renewable energy, biotechnology, water, the environment, desertification, micro-electronics, nanotechnology, health and ICTs. The programme also sought to forge links between academic research and the Tunisian industrial sector.

- Most of Tunisia's international scientific collaboration takes place under the umbrella of EU co-operation programmes, through

bilateral projects with European partners. For instance, within the Horizon 2020 framework, a support programme on the green economy and climate change was launched in 2017.Tunisia has achieved a success rate of 18% for Horizon 2020 project proposals, according to the MESRS, which is higher than the average for EU countries. Under the Erasmus+ programme, 12 new capacity-building projects were launched in 2017 and a funding agreement was put in place.

Source: UNESCO Science Report 2021

- Over 2017–2018, Algeria, Egypt, Jordan, Lebanon, Morocco and Tunisia signed agreements to participate in the EU's Partnership for Research and Innovation in the Mediterranean Area (PRIMA) programme running to 2028. This programme is exploring new approaches to research and innovation in sustainable agriculture production and water availability. The EU is allocating € 220 million to the programme, with participating countries providing a further € 52 million.

  This project has been hailed as a major advance in science diplomacy. Six calls for research proposals were launched in February 2020 on water management, the agrifood value chain, the water–ecosystem–food nexus and farming systems.

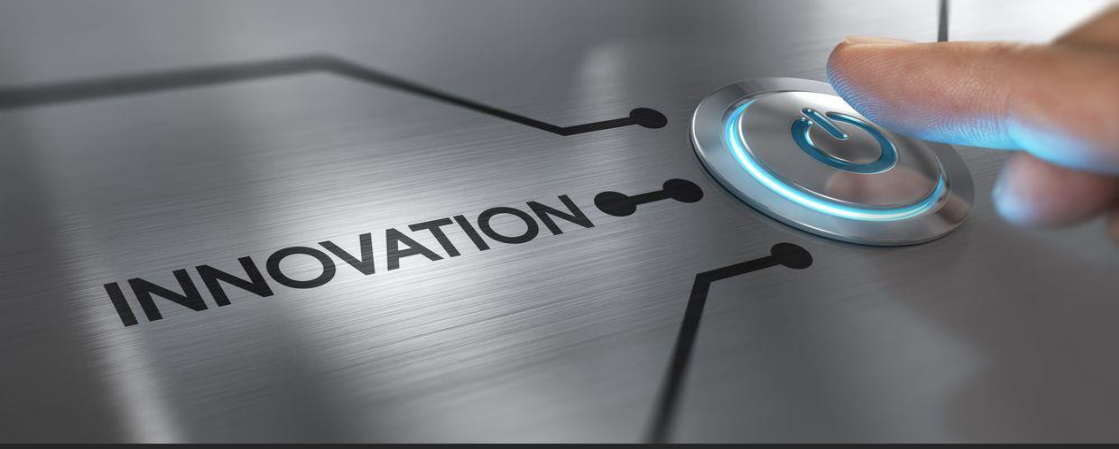
  Source: https://ec.europa.eu/info/news/10-years-eu-tunisia-cooperation-field-higher-education-and-scientific-research-2021-apr-07_en

- **U.S.-Tunisia Agreement on Science and Technology Cooperation**

  Agreement between the Government of the United States of America and the Government of the Republic of Tunisia on Science and Technology Cooperation was signed in 2004. Its goals are to strengthen scientific and technological capabilities of the Parties, to broaden and expand relations between the extensive scientific and technological communities of both countries and within the Maghreb region, and to promote scientific and technological

cooperation in areas of mutual benefit for peaceful purposes. The principal objectives of this cooperation are to provide opportunities to exchange ideas, information, skills, and techniques, and to collaborate on scientific and technological endeavors of mutual interest.

Source: https://2001-2009.state.gov/p/nea/rls/38368.htm



H. INNOVATION, ENTREPRENEURSHIP & TECHNOLOGY PARKS

❖ **Policy initiatives for encouraging innovation:**

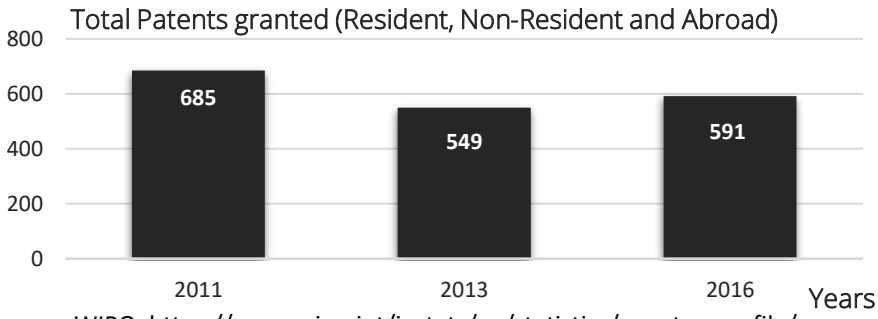
- Start-up Act passed into law in April 2018. It provides a number of legal and financial incentives for qualifying early-stage enterprises, such as corporate tax exemptions and mechanisms for financial support. About 250 start-ups have received support, financial or otherwise, within the framework of this act. It is also purportedly the world's first legal framework to grant aspiring entrepreneurs year-long leave, extendable to two years, to set up a new business.

- One programme with a focus on the commercialization of research results is the PAQ–PAES programme launched by MESRS in 2019. It finances young graduates up to a maximum of TND 100 000 (ca US$ 37 000) to help them launch spin-off projects or start-ups based on their research. The programme also provides training.

- Technology transfer offices were established at several universities and research centres in 2015 to improve university–industry linkages, protect intellectual property and provide researchers with commercial guidance.

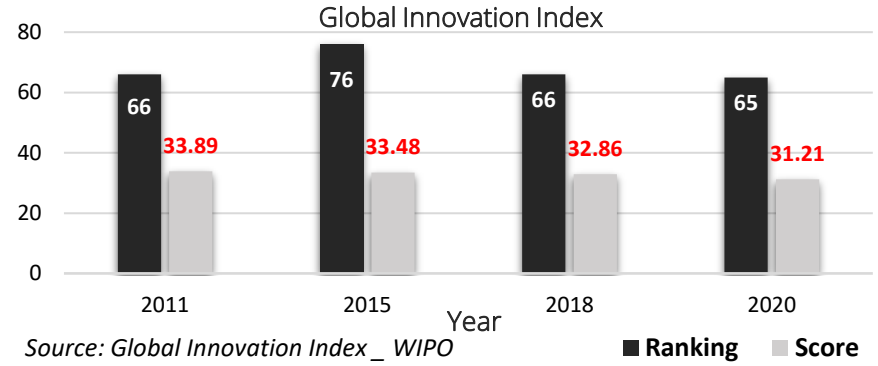
- In 2016, a UNESCO Chair in Science, Technology and Innovation Policy was established at the National School of Engineering in Tunis. It provides placements for graduate students in private companies to give them experience that they may subsequently apply to create their own business.

❖ **Innovation:**



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

There is a rather static trend with regards to the total number of granted patents in the recent years data available, as depicted in the above figure. Between 2010 and 2019, there were 5528 patent applications from Tunisia giving it a rank of 13 within the OIC countries.



Source: Global Innovation Index _ WIPO

❖ With a GII score of 31.2, Tunisia ranks 65th globally and 4th in the OIC, behind Malaysia, Turkey and UAE. This indicates that Tunisia has made significant progress in its innovation ecosystem.
Source: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021/ir.pdf

❖ **Technology Parks, Incubators centers and startup acceleration programs:**

- **Elgazala Technopark** in the Tunis region was the first, for both Tunisia and the Maghreb. Established in 1997, it specializes in communication technologies and now hosts about 80 companies, including 13 multinationals (Microsoft, Ericsson, Alcatel Lucent, etc).

- Several other technoparks have been established since, including those in **Sidi Thabet** (2002, for biotechnology and pharmaceuticals), **Borj Cedria** (2005, for environment, renewable energy, biotechnology and materials science), **Monastir** (2006, for textiles) and **Bizerte** (2006, for the agro-industry).

- In 2012, the government announced the creation of a new technopark in **Remada** specializing in ICTs.

- The **Ecosolar Village of Zarzis–Jerba** should soon be operational. It will create jobs in renewable energy production, seawater desalination and organic farming; this technopark also plans to position itself as a training platform for the entire African region. Tunisia intends to raise the share of renewables in the energy mix to 16% (1 000 MW) by 2016 and to 40% (4 700 MW) by 2030, within its Solar Plan23 adopted in 2009.

- In November 2013, the government signed an agreement with France Clusters, which groups French technoparks, for the provision of training and advice on the creation of new technoparks in Tunisia.

- **Elgazala and Sidi Thabet Technoparks** are both members of the International Association of Science Parks.

- **Gafsa Technopark**, which specializes in useful chemical substances, has been designed in partnership with the Korean International Cooperation Agency; it is being funded by the government, the park management companies and the tandem formed by the Chemical Group and the Compagnie des phosphates de Gafsa.

I. COMBATING THE COVID-19 PANDEMIC

As of now, (April 2022) 61% of Tunisia's population has received at least one dose of the vaccine while 54% are fully vaccinated.

- **Tunisia's Indigenous efforts to combat COVID-19:**

- **Manufacturing PPE's:**
  France's Orange Foundation, in collaboration with the Ministry of Health, Tunisia has been supporting six Solidarity FabLabs in Tunis, Sfax and Gabes in the production of face shields for hospital staff, created by using laser-cutting machines. Sfax's Djagora FabLab alone has been producing 1500 shields daily since March 20. The Orange Solidarity FabLab concept targets young people aged 12 to 25 who have left conventional education and offers them the opportunity to pursue free training to develop digital and technological skills.
  Source: https://atalayar.com/en/content/innovation-heart-covid-19-crisis-tunisia

- **AI and mobile applications to support the country's efforts to curb the spread of coronavirus.**

- **Contact-tracing app to combat coronavirus:**
  Tunisia has launched a contact-tracing mobile phone app that identifies and alerts users if they have been in close contact with someone who later reports positive for the novel coronavirus. The

E7mi application, available on Android and awaiting validation for Apple's iOS, was developed by a Tunisian start-up specialised in digital marketing tools for foreign companies.

If a user tests positive for Covid-19, Tunisia's Observatory of Emerging Diseases (ONME) contacts other users whose cell phones have been detected close to the infected user's device to notify them of the risk.
A Tunisian NGO set up a food bank that dispenses aid by text message to hundreds of needy families rendered more vulnerable amid the coronavirus pandemic.
Source: https://www.middleeasteye.net/news/tunisia-launches-contact-tracing-app-track-coronavirus-spread

- **Accelerating digital transformation through AI**

In Tunisia, key initiatives have played a significant role in supporting the government's mission to battle misinformation about COVID-19 by leveraging Artificial Intelligence and Natural Language Processing (NLP) techniques and fight information manipulation campaigns.

One such initiative comes from iCompass, a start-up that specialises in NLP solutions powered by AI technology. Founded in 2019, this startup designed the Aziza chatbot for the Ministry of Health, deployed across all its communication channels, to provide reliable and up-to-date information related to the pandemic, addressing COVID-19 queries with 90% precision. After language detection, this bot interacts with its interlocutors either in Modern Standard Arabic, French, or the Tunisian dialect depending on the language used by the user to initiate the chat.

In addition, the company has partnered with Sahloul hospital in Sousse (Tunisia) to create an AI-based diagnostic robot that conducts a verbal questionnaire in the Tunisian dialect with the patient. The automatic device facilitates hospitalisation decision-making to avoid hospital overload.

- **PGuard Robot for the Enforcement of the country's lockdown rules**

  Enova Robotics, a start-up based in Sousse engineers another innovation supporting the country in its fight against COVID-19. First seen on the streets of Tunis, PGuard, a robot ground vehicle, was acquired by the Ministry of Interior to assist with the enforcement of the country's lockdown rules. The device, controlled remotely by Tunisian officers, includes infrared and thermal cameras, an audio system, a GPS, and a sound and light alarm system that allows officers to request identification papers and issue verbal warnings to those breaching lockdown rules.

  Source: https://atalayar.com/en/content/innovation-heart-covid-19-crisis-tunisia

- **Tunisia deploys robot to care for coronavirus patients, Robonurse**

  Medics have deployed a robot in a Tunisian hospital caring for coronavirus victims to limit contact between staff and infected patients, in a first for the North African country. The tall, single-limbed machine is mounted on wheels and is capable of taking pulses and checking temperatures and blood oxygen levels. It enables nurses, doctors and patients' relatives to make virtual bedside visits. The robot was designed and made in Tunisia by Enova, a start-up based in Sousse.

  Source: https://english.alaraby.co.uk/english/news/2020/5/2/robonurse-tunisia-deploys-robot-to- care-for-coronavirus-patients

❖ COVID-19: Tunisia researchers use AI, X-rays to create online virus scan tool

Tunisian engineers have created a web-based platform that scans lung X-rays and evaluates whether patients are likely to be suffering from the novel coronavirus.

While it's not the first initiative of its kind in the world, its creators say it is the first to be openly available. And though not a diagnostic tool, the technology provides a "90%" reliable indication of the probability of infection, they add.

Teachers and students at the Tunisian engineering and technology institute INSAT have been developing the platform — Covid-19 Exam Ct/XR images by AI — since mid-March, with the support of German development agency GIZ, the Italian Society of Medical Radiology and US tech giant IBM.

Thousands of X-rays of the lungs of both healthy people and Covid-19 patients have been fed into the platform, allowing artificial intelligence to learn to recognise the marks of the virus on the lungs. It is still in the test phase, under evaluation by Tunisia's health ministry. But if approved, the technology would be particularly useful in areas of the country that lack major hospitals and specialist doctors.

Source: https://www.thestar.com.my/tech/tech-news/2020/04/18/covid-19-tunisia-researchers-use-ai-x-rays-to-create-online-virus-scan-tool

Tunisian police trucks spray disinfectant, as a measure against the Covid-19 coronavirus pandemic, outside a cathedral near Avenue Habib Bourguiba in the centre of the capital Tunis.

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