



The Kingdom of Morocco

STI Profile of the OIC Member State

Science, Technology and Innovation Indicators



Edited by:

Prof. Dr. S. Khurshid Hasanain
Adviser COMSTECH

Assisted by:

Mr. Umer Ali
Programme Officer COMSTECH

Mr. Muhammad Jamil
PS COMSTECH

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 being shared on the COMSTECH website. A few words are therefore in order 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

CONTENT DISCLAIMER

The views mentioned in the document are those of authors and may not necessarily represent or reflect the views of everyone reading it. We have tried our best to mention source of every information or data we have shared in this document. The sole purpose of the content is for knowledge and awareness of readers/consumers.

Copyright Disclaimer, **Under Pakistan's COPYRIGHT ORDINANCE 1962**, allowance is made for 'fair use' for purposes such as criticism, comment, news reporting, teaching, and research.

Fair use is a use permitted by copyright statute that might otherwise be infringing. Non-profit, educational, or personal use tips the balance in favor of fair use.

If you have a complaint about something or find our content to be inaccurate or incomplete. Please contact COMSTECH prior to making any complaint. Any infringement if found was not done on purpose.

www.comstech.org

next two centuries expanded diplomatic and commercial relations with the Western world.

Morocco wields significant influence in both Africa and the Arab world. It holds membership in the Arab League, the Union for the Mediterranean, and the African Union. Morocco is a unitary semi-constitutional monarchy with an elected parliament. The executive branch is led by the King of Morocco and the prime minister, while legislative power is vested in the two chambers of parliament: the House of Representatives and the House of Councillors.



It has the fifth-largest economy in Africa with 39% of the population engaged in Agriculture, about 20% in Industry and almost 41% in the services sector. Main industries relate to phosphates, rock mining and processing, high tech, food processing, leather goods, textiles, construction, tourism, automobile manufacturing.

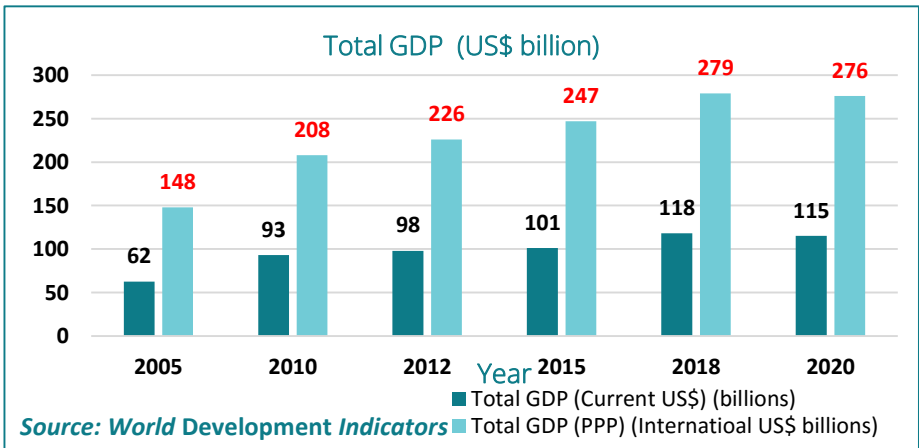
Source: <https://en.wikipedia.org/wiki/Morocco>

MOROCCO



A. ECONOMIC OVERVIEW

❖ Morocco's economy is considered a relatively liberal economy governed by the law of supply and demand. Since 1993, the country has followed a policy of privatisation of certain economic sectors which used to be in the hands of the government. Morocco has become a major player in African economic affairs, and is the fifth largest economy in Africa by GDP (PPP). Morocco was ranked as the first African country by the Economist Intelligence Unit's quality-of-life index, ahead of South Africa. However, in the years since that first-place ranking was given, Morocco has slipped into fourth place behind Egypt.



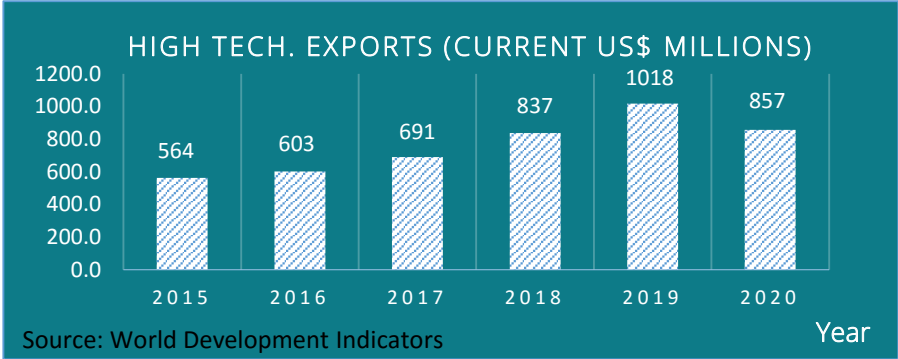
❖ Government reforms and steady yearly growth in the region of 4–5% from 2000 to 2007, including 4.9% year-on-year growth in 2003–2007 helped the Moroccan economy to become much more robust

compared to a few years earlier. Between 2012 and 2015 the average growth rate has been 3.69% while it slowed down to 2.65% between 2016 and 2019. The per capita GDP (constant 2017 PPS) in 2019 was recorded as 7515.

GDP per economic sector 2019 (%)



- ❖ The services sector accounts for just over half of GDP, while industry, made up of mining, construction and manufacturing, is an additional quarter. The industries that recorded the highest recent growth are tourism, telecoms, information technology, and textile.



- ❖ The High Technology Exports of Morocco almost doubled from US\$ 564 in 2015 to a peak of US\$1018 in 2019, before the onset of the pandemic. Although the share of industry and manufacturing in GDP has remained roughly level in Morocco since 2015, key industries have improved their export performance, including those with higher added value. This is the case of the aeronautics assembly and component manufacturing sector, one of the country's fastest-growing sub-sectors. It saw the value of exports nearly double to MAD 14.7 billion (ca US\$ 1.5 billion) over 2014–2018. According to the Office des Changes, automotive exports increased by 69% over the same period. With the opening of a US\$ 630 million automotive manufacturing plant in June

2019, Morocco had an annual production capacity of about 700 000 cars by late 2019. The new plant is expected to boast an annual production capacity of 200 000 vehicles by 2023 (OBG, 2020). This sector is also a major recipient of FDI, some of which goes towards technologies such as batteries, cameras and electrical goods. In 2017 alone, 26 investments were made in this sector for a total value of US\$ 1.45 billion (UNCTAD, 2018).



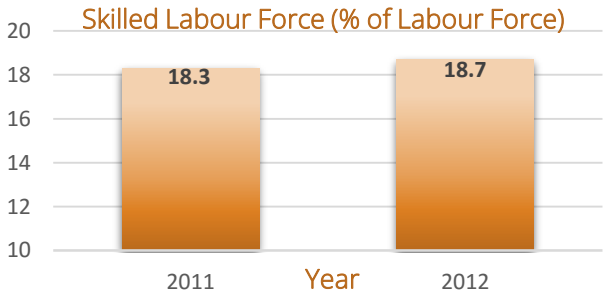
B. SOCIAL AND HUMAN DEVELOPMENT

❖ **The following are some of Morocco's key social indicators:**

Life expectancy at birth, total (years)	76.68 (2019)
Literacy rate, adult total (% of people ages 15 and above)	73.75 (2018)
Literacy rate, adult female (% of females ages 15 and above)	64.59 (2018)
Literacy rate, adult male (% of males ages 15 and above)	83.30 (2018)
Mortality rate, infant, male (per 1,000 live births)	17.7 (2020)
Mortality rate, infant, female (per 1,000 live births)	14.3 (2020)
Individuals using the Internet (% of population)	84.12 (2020)
Mobile cellular subscriptions (per 100 people)	133.89 (2020)
Mobile cellular subscriptions	49421023 (2020)

Source: *World Development Indicators*

While more recent data is not available, the percentage of skilled labour force as shown in the figure was about 18-19% in 2011-2012 depicting a need for much more attention.



Source: Human Development Report



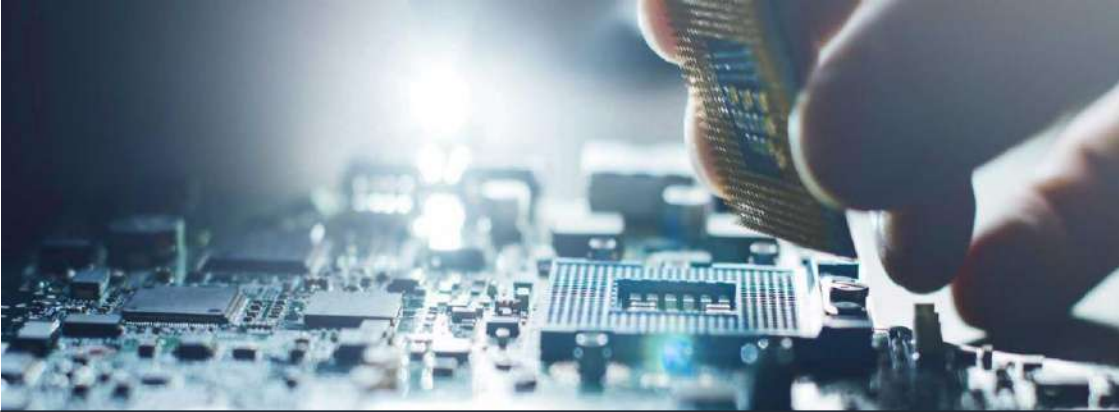
C. KEY GOVERNMENT ORGANIZATIONS RELATED TO SCIENCE, TECHNOLOGY AND HIGHER EDUCATION

1. Ministry of National Education, Vocational Training, Higher Education and Scientific Research
2. The Inter-Ministerial Permanent Committee on Scientific Research and Technological Development (est. 2002).
3. The Hassan II Academy of Science and Technology (est. 2006).
4. The National Centre for Scientific and Technical Research (CNRST).
5. A National Council for Scientific research (NCSR) is being established to strengthen the capacity of universities and research institutions to institutionalise scientific research as a lever for national sustainable development. The new initiative was adopted at a meeting of Morocco's Council of Government on 24 June 2021.

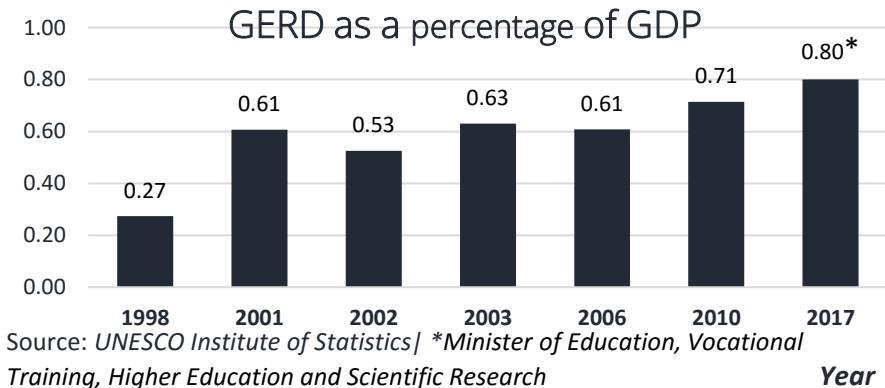
❖ **Key Policy Initiatives:**

- National Strategy for the Development of Scientific Research (Horizon 2025) –2015
- Morocco Innovation Initiative
- Digital Morocco: Morocco has adopted several national programs to enable digital development.
 - In 2012, Morocco developed its National Digital Strategy entitled “Morocco Numeric 2013”. This plan has created significant development momentum, including the introduction of e-governance services.

- Morocco has devised an ambitious digital transformation strategy, called “Digital Morocco 2025” framing digitalization as a strategic lever for development. In order to bring this plan to reality, it has created a strategic public institution l’Agence de Développement du Digital (ADD).
- The Industrial Acceleration Plan 2014–2020 (2014) has guided Morocco’s efforts to diversify the economy and support emerging industries such as aeronautics and automotive manufacturing. Its goals include transferring informal activities to the formal sector, improving the competitiveness of SMEs.
- A new Industrial Acceleration Plan for 2021–2025 was announced in December 2019; it will focus on integrating SMEs into the value chain and preparing for the technological changes brought about by Industry 4.0
- *The National Sustainable Development Strategy*, for meeting the challenges of the twenty-first century by making sustainable development a true social project and a new model for development.



D. RESEARCH AND DEVELOPMENT



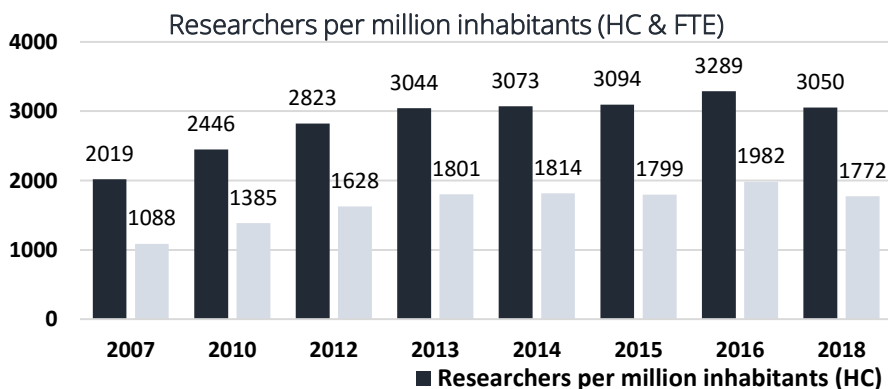
- ❖ The trend of variation of GERD in the 1998-2010 period is depicted in the above graph showing an increase from 0.27 to 0.71% of GDP. According to the Minister of Education, Vocational Training, Higher Education and Scientific Research, expenditure on R&D surged from 0.3% of GDP in 2016 to 0.8% in 2017 but these figures have not been independently verified. The legal framework for public-private partnerships was updated in 2014, to support large infrastructure projects, then again in 2019 to extend these partnerships to local administrations and other public entities. In January 2020, the government launched a call for bids for three new industrial parks in the Casablanca-Settat region, to be developed via public-private partnerships.

❖ National Fund for R&D:

The National Fund for Scientific Research and Technological Development was adopted by law in 2001. At the time, domestic enterprises funded just 22% of domestic research spending. The government encouraged companies to contribute to the fund to support research in their sector. Moroccan telecom operators were persuaded to cede 0.25% of their turnover; today, they finance about 80% of all public research projects in telecommunications supported through this fund. The financial contribution of the business enterprise sector to domestic research spending has meanwhile risen to 30% (2010).

❖ Researchers Intensity:

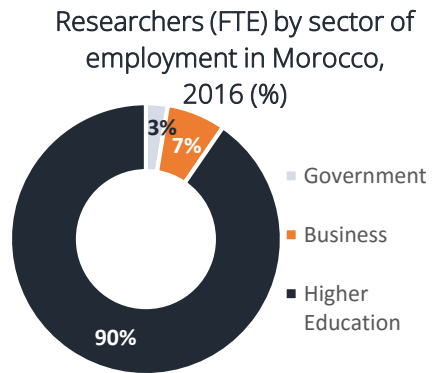
In 2016, the number of researchers (including post graduate PhD students) in R&D for Morocco was 1,073.5 per million people. This number increased from 640.6 per million people in 2007 to 1,073.5 per million people in 2016 growing at an average annual rate of 9.24%. (The global average for researchers per million inhabitants was 1,368 in 2018). Some 27.6% of researchers were women in 2008 and 30.2% in 2011 and 34% in 2016.



Source: UNESCO Institute of Statistics

❖ Despite the fact that technicians play a key role in technology-based manufacturing and maintenance, there were only 53 technicians per million inhabitants in 2011.

❖ As the accompanying figure illustrates the overwhelming number of the researchers are employed in the higher education sector and with a very small percentage being in the government (7%) or business sectors (2.6%). This does suggest the need for more government and business involvement in scientific R&D.



❖ In 2011, Moroccan researchers (in head counts) were employed primarily in natural sciences (34%), social sciences (26%) and humanities (20%). The lack of jobs in engineering and technology (8% of total employment in research and development) reflects the fledgling culture of entrepreneurship and innovation in Morocco. A further 10% of researchers work in medical sciences and 2% in agriculture.

❖ **National Research Centres and Agencies:**

- Agency for Agricultural Development (ADA)
- Development Agency Renewable Energy (CDER)
- National Centre for Scientific and Technical Research (CNRST)
- Royal Centre for Remote Sensing (CRTS)
- National School of Mineral Industry (ENIM)
- Agronomic and Veterinary Institute (IAV)
- National Institute of Agronomic Research (INRA)
- MOROCCO WEATHER (MAROC METEO)
- Moroccan Agency for Solar Energy (MASE)
- National Office of Hydrocarbons and Mines (ONHM)
(Office National des Hydrocarbures et des Mines)

- Agency for Sanitary Safety of Food Products (ONSSA)
- Moroccan Office for Industrial and Commercial Property
- National Centre for Energy and Nuclear Science and Technology



Centre National pour la Recherche Scientifique et Technique



Moroccan Office of Industrial and Commercial Property



وكالة التنمية الفلاحية

AGENCE POUR LE DEVELOPPEMENT AGRICOLE



المركز الوطني للميدروكربورات والمعادن
 .ΘΣΟ. α.Γ:Ο | ΗΦΣΛΟ:Κ.ΟΘ:Ο. + Λ Σ*:Υ.%.
 OFFICE NATIONAL DES HYDROCARBURES ET DES MINES

❖ **Key Organizations in Science:**

The Hassan II Academy of Sciences and Technology has the mission of promoting and developing scientific and technical research, contributing to setting the general orientations for scientific and technological development, making pertinent recommendations regarding national priorities in terms of research, evaluating research programs and ensuring their grants and contributing to integrating the Moroccan scientific and technical research activities within the national and international socio-economical environments.

The academy is composed of 90 members. 30 of them are national members holding resident status, 30 are foreign scientists and are qualified as associates and 30 are corresponding members composed of both national and foreign scientific personalities.

The Academy includes six scientific colleges: Life science; Science and techniques of the environment, earth and sea; Physics and chemistry; Modelling and science of information; Engineering, transfer and technological innovation; Strategic studies, development and economics.

The Academy organizes one plenary session a year, where the general public may be admitted upon invitation. The plenary session should also gather together the maximum number possible of its members, residents, associates and corresponding members. It provides a unique national tribune for local scientists to present their work and their scientific and technical findings. Ordinary sessions are also held among the resident members for studying various problems related to the national priorities in terms of research and technology and discuss and evaluate the submitted reports and projects.

❖ **Areas of Focus:**

The Permanent Inter-Ministerial Committee has earmarked strategic sectors such as mineral resources, renewable energy and high-tech exports as priority areas for research.

• **Renewable Energies, Solar parks**

- A Green Park for solar research Morocco is also developing wind and solar energy. The aim is partly to reduce dependence on energy imports, which accounted for 92% of energy consumption in 2018, and to meet Morocco's 2016 commitment under the Paris Agreement to reduce greenhouse gas emissions by 17%.
- By 2018, renewable sources accounted for 3% of total energy consumption. As of 2018, modern renewables were contributing 18% of the electricity generation in Morocco, the highest percentage in the Arab region.
- In 2017, the Green Energy Park opened in Benguerir, situated 50 km north of Marrakech. Built on an 8-hectare site, the Green Energy Park has been designed by the Research Institute for Solar Energy and New Energies (IRESEN). The park houses laboratories specializing in areas such as solar photovoltaics and desalination using solar energy. Morocco is also developing two solar parks with a total capacity of 320 MW, Noor Tafilalet and Noor Atlas.
- In 2016, Morocco opened Noor 1 (160 MW), one of the world's largest concentrated solar power plants, as the first stage of the 580-MW Noor Ourzazate Solar Complex. Noor II and Noor III followed in 2018, bringing the total installed concentrated solar capacity at the complex to 510 MW.
- The number of scientific publications on wind-turbine technologies has tripled from 148 (2012–2015) to 477 (2016–2019) and almost quadrupled for solar photovoltaics (from 145 to 569).



E. HIGHER EDUCATION

❖ **Universities in Morocco:**

The tertiary education in Morocco is made up of public and private universities; there are 14 public universities, 11 private universities, 5 institutes, and 8 colleges. More than 19% of her population is currently pursuing their education in Morocco. There are over 9,000 foreign students in Morocco.

❖ **Following is a list of 10 top universities in Morocco ranked during 2022:**

- University Cadi Ayyad, Marrakech
- University Mohammed V - Agdal, Rabat
- University of Hassan II Casablanca, Casablanca
- University Sidi Mohammed Ben Abdellah Fés, Fez
- University Ibn Zohr, Agadir
- University Ibn Tofail, Kénitra
- University Moulay Ismail, Meknès
- Mohammed VI Polytechnic University, Ben Guerir
- Chouaib Doukkali University, El Jadida
- University Mohammed Premier, Oujda

Source: <https://www.alluniversity.info/morocco/>

❖ Morocco public universities:

- Université Ibnou Zohr -Agadir
- Université Moulat Slimane - Béni Mellal
- Université Hassan II Ain Chock-Casablanca
- Université Chouaïb Eddoukkali - El Jadida
- Université Sidi Mohammed Ben Abdellah - Fès
- Université Ibn Tofaïl -Kénitra
- Université Cadi Ayyad -Marrakech
- Université Moulay Ismaïl -Meknès
- Université Hassan II de Mohammedia
- Université Mohammed Premier -Oujda
- Université Mohammed V Agdal -Rabat
- Université Hassan Premier - Settat
- Université Abdelmalek Essaâdi -Tétouan
- Al Akhawayn University in Ifrane
- Université Euro-Méditerranéenne de Fès



❖ Morocco private universities:

- Université Internationale d'Agadir
- Université Internationale de Casablanca
- Université Mundiapolis de Casablanca
- Université Mohammed VI des Sciences de la Santé – Casablanca
- Université privée de Fès
- Université privée de Marrakech
- Hôpital Universitaire International Cheikh Zaid - Rabat
- Université Internationale de Rabat

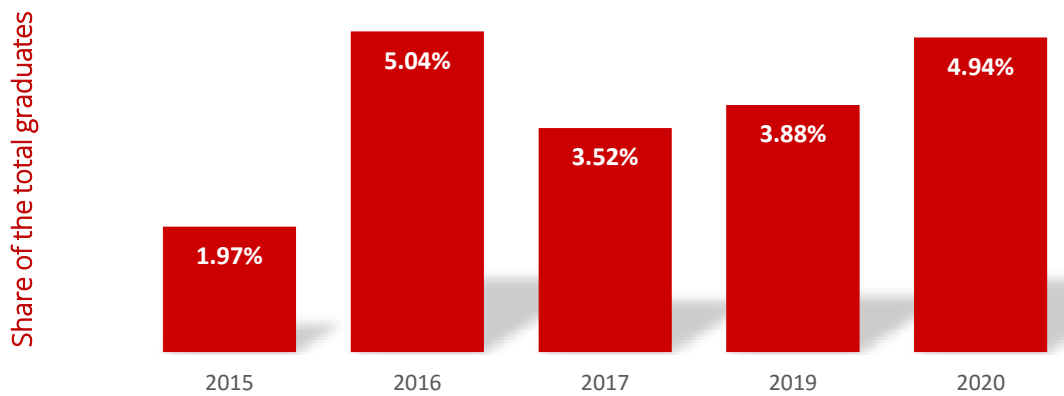
❖ **Enrollment in tertiary education**, both sexes (number) in Morocco was reported at 184520 Persons in 2018, according to the World Bank collection of development indicators, compiled from officially recognized sources.

❖ Morocco tertiary graduates in science, engineering and agriculture, 2010

	Year	Total (all fields)	Science, engineering and agriculture		Science			Engineering, manufacturing and construction			Agriculture		
			Number	Share of total (%)	Number	Share of science, engineering and agriculture (%)	Share of total (%)	Number	Share of science, engineering and agriculture (%)	Share of total (%)	Number	Share of science, engineering and agriculture (%)	Share of total (%)
Morocco	2010	75 744	27 524	36.3	17 046	61.9	22.5	9 393	34.1	12.4	1 085	3.9	1.4

The data (2010) for graduating students in tertiary programs shows that about 36% were enrolled in programs of science, engineering and agriculture. Of these tertiary level science graduates 62% were in disciplines of natural sciences and medicine, 34% in disciplines related to engineering, manufacturing and construction, while 3.9% were in agriculture.

Source: UNESCO Science Report 2015



❖ **Share of graduates from Information and communication technologies in recent years:**

It is clear that the number of ICT graduates as a percentage of the total number of graduates has risen from about 2 to 5% in the last five years depicting a growing emphasis of this vital discipline.

Source: <http://www.dynamicuniversity.eu/jaunumi/education-and-research-in-the-kingdom-of-morocco/53/>



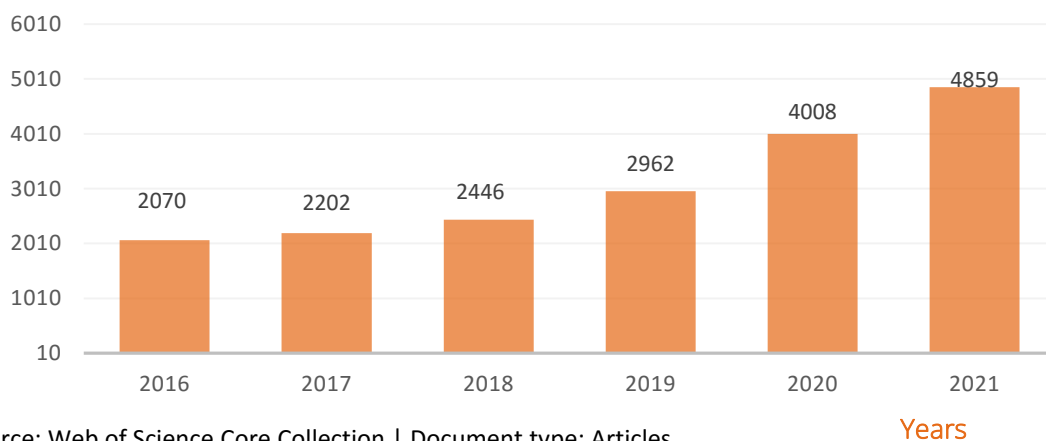
The oldest existing, and continually operating educational institution in the world is the University of Karueein, founded in 859 AD in Fez, Morocco



F. RESEARCH PUBLICATIONS

Morocco's numbers of science publications have more than doubled between 2016 and 2021, being recorded at 4859 according to our own survey. This amounts to a healthy 27% average increase per annum. In 2019 this amounted to an average of 197 publications per million population, whereas the G20 average for comparison is 420 publications per million.

Research Publications (Science and Technology)

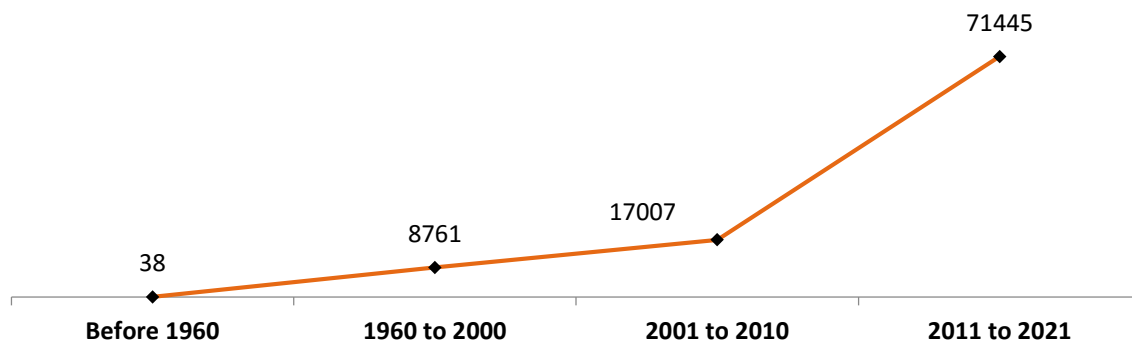


Source: Web of Science Core Collection | Document type: Articles

Based on Scopus record, Morocco has published 97251 research documents comprising of articles, reviews, letters, book chapters and books etc...Before 1960 only 38 documents are published. Or in 20th Century, Morocco published app 8800 research documents. Since 2001, an exponential increase can be noticed. The data for different eras is

presented in the figure. In the last ten years (from 2012 to 2021), approximately 70% (or 68554) documents are published.

Total Scientific Publications = 97251



This further motivated us to collect the relevant bibliometric data. For example, the per year scholarly output (SO), citations, citations per publications (CPP), and field-weighted citations impact (FWCI) of all (n=68554) documents are presented in the table. The highest documents are published in 2021 (n=11273), followed by 2020 (n=10099) and 2019 (n=8795). Total citations in the last ten year were 614356, or the citations per publications were exactly 9.0. We will specifically highlight the article field weighted citation impact (FWCI) of Morocco. It “indicates how the number of citations received by an article compares to the average or expected number of citations received by other similar publications”. The FWCI was found to be 0.98. Which means the articles received 2 % lower citations as compared with global average.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Scholarly Output	68554	3690	3970	4975	4950	6287	6793	7722	8795	10099	11273
2	Citations	614356	59119	50166	56180	69510	89781	73570	78711	58384	53608	25327
3	Field-Weighted Citation Impact	0.98	0.84	0.76	0.75	1.02	1.1	0.91	1.06	0.96	1.01	1.11
4	Citations per Publication	9	16	12.6	11.3	14	14.3	10.8	10.2	6.6	5.3	2.2

S#	Subject Area	SO	Citations	Authors	CPP	FWCI
1	Computer Science	16944	77199	12377	4.6	0.85
2	Engineering	16778	111476	14721	6.6	0.98
3	Medicine	13102	140772	15901	10.7	0.98
4	Mathematics	10275	46456	8685	4.5	0.81
5	Physics and Astronomy	8653	133133	10509	15.4	1.46
6	Materials Science	8168	84117	8751	10.3	0.95
7	Chemistry	6048	77830	6828	12.9	0.98
8	Environmental Science	5837	55520	9046	9.5	0.96
9	Agricultural and Biological Sciences	4679	46963	6235	10	1.03
10	Energy	4130	35369	5578	8.6	1.13
11	Biochemistry, Genetics and Molecular Biology	3757	45376	6686	12.1	0.9
12	Social Sciences	3073	15926	4583	5.2	1.01
13	Earth and Planetary Sciences	3006	32090	4248	10.7	1.16
14	Decision Sciences	2930	11159	4140	3.8	0.88
15	Chemical Engineering	2532	32503	4389	12.8	1.01
16	Business, Management and Accounting	2163	11295	2918	5.2	0.9
17	Pharmacology, Toxicology and Pharmaceutics	1506	18934	2810	12.6	1.03
18	Immunology and Microbiology	1272	19663	2789	15.5	1.18
19	Economics, Econometrics and Finance	860	5012	1138	5.8	0.99
20	Arts and Humanities	790	2544	905	3.2	0.8
21	Multidisciplinary	732	16111	1916	22	1.4
22	Neuroscience	497	4535	974	9.1	0.85
23	Nursing	372	2509	1008	6.7	0.59
24	Health Professions	292	4216	710	14.4	1.21
25	Veterinary	277	2378	567	8.6	1.16
26	Dentistry	225	1028	403	4.6	0.68
27	Psychology	181	1376	380	7.6	1.98

According to the Scopus database, Morocco published all documents in twenty-seven (n=27) subject areas. We provided relevant numerical details i.e. the total scholarly output (SO), citations, number of authors, citations per paper (CPP) and field weighted citation impact (FWCI) for all 27 subject areas. As shown in the table, the highest documents are published in Computer Science (n= 16944), followed by Engineering (n=

16778), and Medicine (n= 13102). While, the highest citations were recorded for Medicine (n= 140772), followed by Physics and Astronomy (n= 133133) and Engineering (n= 111476). The number of contributing authors, CPP and FWCI details are presented in the table.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
5	Pub in top 1% Sources (Q1)	528	27	41	41	36	63	48	46	48	64	114
6	Pub in top 1% (Percent)	1	1	1.3	1	0.9	1.4	1	0.8	0.7	0.8	1.1
7	Pub in top 5% Sources(Q2)	3062	173	193	194	206	240	298	333	332	443	650
8	Pub in top 5% (Percent)	5.6	6.2	6.1	4.9	5.1	5.3	6.1	5.8	4.8	5.4	6.3
9	Pub in top 10% Sources(Q3)	6596	349	375	391	468	562	606	718	738	968	1421
10	Pub in top 10% (Percent)	12.1	12.5	11.8	9.9	11.6	12.4	12.3	12.5	10.6	11.7	13.7
11	Pub in top 25% Sources(Q4)	14551	763	787	849	1009	1200	1281	1489	1678	2307	3188
12	Pub in top 25% (Percent)	26.6	27.2	24.7	21.6	25	26.6	26.1	25.9	24.1	27.9	30.8
13	Pub in top 50% Sources(Q5)	28771	1357	1465	1772	2019	2416	2532	3152	3485	4563	6010
14	Pub in top 50% (Percent)	52.6	48.4	46	45	49.9	53.5	51.6	54.8	50	55.2	58.1
15	Pub in top 75% Sources(Q6)	43998	2081	2267	2743	2843	3786	4283	4726	5496	6976	8797
16	Pub in top 75% (Percent)	80.4	74.3	71.2	69.6	70.3	83.8	87.2	82.2	78.8	84.5	85
17	Pub in top 100% Sources(Q7)	54730	2802	3186	3939	4044	4516	4909	5751	6971	8259	10353
18	Pub in top 100% (Percent)	100	100	100	100	100	100	100	100	100	100	100

Scopus also categorized the journals in seven different categories or quartiles (Q). For example, the top 1% or the highest ranked journals are included in Q1 and Q7 presents the 75 to 100% group. The quality or

ranking of the journal can also help in describing the quality of publications. Its worthy to note that 13824 documents are published in those journals which do not have citespace data. 54730 documents are published in Q1 to Q7 journals. Precisely, the highest documents are published in Q6 (n=15227/27.8%) and Q5 (n=12767/26.0%). The per year breakup details in all seven quartile sets are presented in the above table.

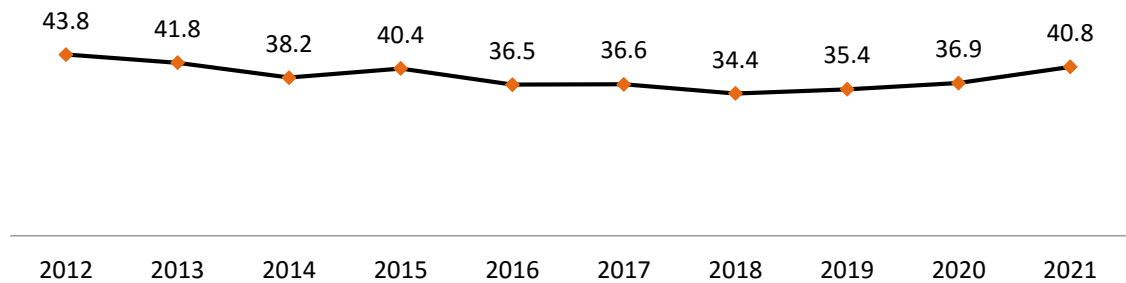
We also collected the publications data of the most productive universities. Four indicators were employed for the purpose. Based on the number of publications, the highest documents are published by Mohammed V University in Rabat (n= 17220), University of Hassan II Casablanca (n= 10801) and Cadi Ayyad University (n= 8761). While, the highest citations were noted for Mohammed V University in Rabat (n= 176006), Cadi Ayyad University (n= 138760) and University of Hassan II Casablanca (n= 128620). The publications detail for the top ten universities are presented in the table below.

S#	Institution	SO	Citations	Authors	CPP	FWCI
1	Mohammed V University in Rabat	17220	176006	8634	10.2	1.05
2	University of Hassan II Casablanca	10801	128620	6468	11.9	1.24
3	Cadi Ayyad University	8761	138760	7018	15.8	1.38
4	Sidi Mohamed Ben Abdellah University	8713	79099	5082	9.1	1.07
5	Mohamed I University	5507	104153	2222	18.9	1.64
6	Ibn Tofail University	4797	39394	2660	8.2	1.11
7	University of Moulay Ismail	4379	33927	1887	7.7	1.03
8	Abdelmalek Essaâdi University	4093	25285	2455	6.2	0.82
9	Ibn Zohr University	3527	33491	1839	9.5	1.01
10	Chouaib Doukkali University	2788	24760	1220	8.9	0.95

We also retrieved the % international collaboration data of the last ten years. The highest % collaboration was noted in 2012 (43.8%) and 2013

(41.8) which decreased to lowest in 2018-2020. The data for the last ten year is depicted in following the figure.

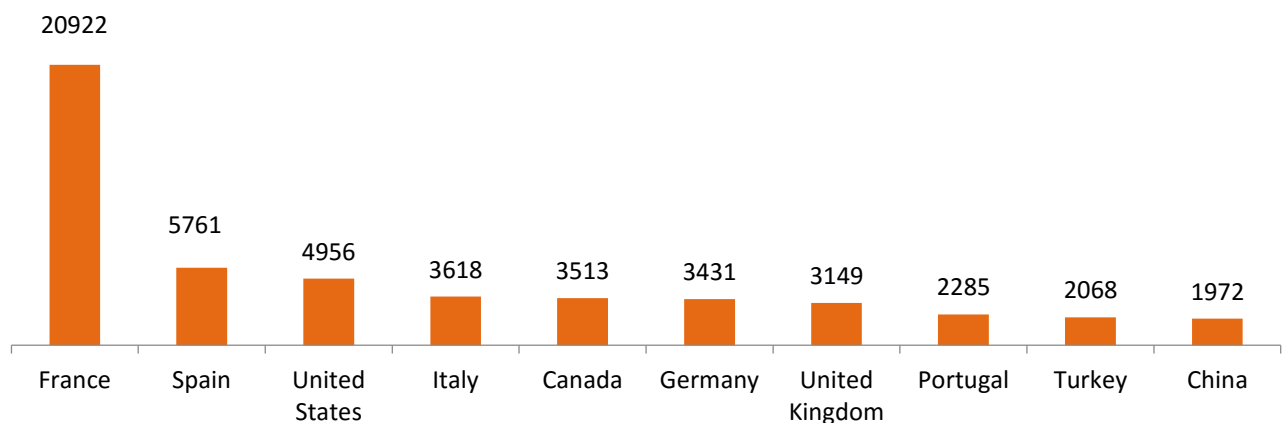
International Collaboration (%)



Morocco, published the highest number of documents in collaboration with France (n=20922), Spain (n=5761) and USA (n=4956).

The list of the top ten collaborating countries in described in the following figure.

The Top Ten Collaborating Countries in Morocco





G. International Cooperation and Support Initiatives (selected)

❖ International Cooperation:

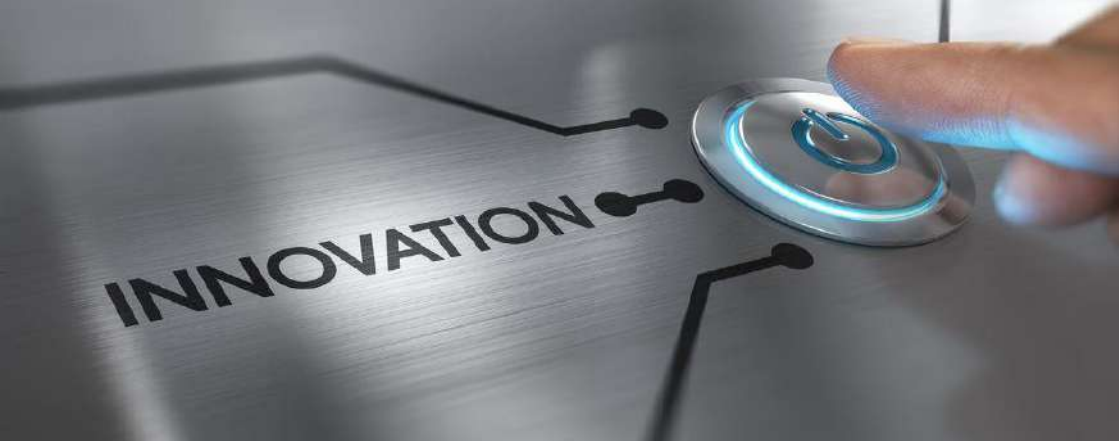
- The European Union (EU) and Morocco are fully engaged in a strong cooperation supported by a high level policy dialogue, and pertaining to multiple sectors including research and innovation. At the institutional level, the Association agreement (1996), the S&T agreement (2003), the European neighboring policy (2004), The new 'advanced status' and the program called "To succeed the advanced status" has put emphasis on the consolidation of scientific and technological ties, and are supported by relevant implementation mechanisms and instruments. In May 2011, an institutional twinning program was launched to strengthen and bring closer the Moroccan research and innovation system to ERA.
- Morocco participates in the [Erasmus+ program](#) which was launched in 2014 and which supports the modernization of the higher education sector and promotes mobility and co-operation with EU higher education institutions. In the framework of this program around 5,942 Moroccan students, professors and university staff moved to Europe and over 3,336 European counterparts traveled to Morocco between 2015 and 2019.

- Scientific and Technological Cooperation Agreement between the United States of America and Morocco Signed at Rabat November 14, 2006, and entered into force February 8, 2012. The principal objectives of this cooperation are to provide opportunities to exchange ideas, information, skills, and techniques, and to collaborate on scientific and technological projects of mutual interest.
<https://www.state.gov/12-208>; <https://cordis.europa.eu/project/id/312186>
- Morocco has S&T agreements with its regional neighbour [Tunisia](#) and countries related to its historical heritage ([France](#), [Belgium](#) and [Spain](#)). Many Moroccan scientists received training in France or are performing research in collaboration with French scientists.
- In 2009 Morocco and [South Korea](#) agreed to strengthen cooperation in the field of [ICT](#) and [cyber security](#).
- Morocco also signed an agreement on scientific and technical cooperation with [Turkey](#).

❖ **Cooperation with International Scientific Institutions:**

- **Regional Centre for Renewable Energy and Energy Efficiency**

Morocco is one of the ten founding members of this centre established in Cairo, Egypt, in June 2008. The centre acts as a platform for regional exchanges on policy and technical issues. It also encourages private-sector participation to promote the growth of a regional industry in renewable energy. The other eight founding partners are Algeria, Jordan, Lebanon, Libya, Palestine, Syria, Tunisia and Yemen. The centre has several development partners, including the [European Union](#), German Agency for Technical Co-operation and the [Danish International Development](#)



H. INNOVATION, ENTREPRENEURSHIP & TECHNOLOGY PARKS

❖ **Science Governance: Key policy initiatives**

- **The Industrial Acceleration Plan 2014–2020 (2014)** has guided Morocco's efforts to diversify the economy and support emerging industries such as aeronautics and automotive manufacturing. Its goals include transferring informal activities to the formal sector, improving the competitiveness of SMEs and establishing linkages between smaller suppliers and multinational manufacturing companies.

By August 2017, Morocco had reportedly created 97% of the 500 000 new jobs in industry that it had targeted to 2020. A new Industrial Acceleration Plan for 2021–2025 was announced in December 2019; it will focus on integrating SMEs into the value chain and preparing for the technological changes brought about by Industry 4.0.

- **Morocco's National Strategy for the Development of Scientific Research:** towards 2025 (2009), its innovation strategy Maroc Innovation (2009) and its Vision for Education, 2015–2030 have striven to improve co-ordination among the key players of the national innovation system while diversifying support for research.

- **UNESCO Chair in Science, Technology and Innovation Policy (2016)** 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.
Accomplishments, thus far, include:
 - a. the creation of the Innov Invest Fund in 2018 to support business incubators, via a World Bank loan (MAD 500 million, ca US\$ 57 million) [Govt. of Morocco, 2020];
 - b. the creation of 26 collaborative platforms since the inception of the National Programme for University– Industry Interface in 2004;
 - c. an increase in publication intensity overall and for crosscutting strategic technologies since 2012.

- **Morocco Innovation Initiative** (Ministry of Industry, Trade and new Technologies) and National Strategy for the Development of scientific Research towards Horizon 2025 (Ministry of Higher Education).

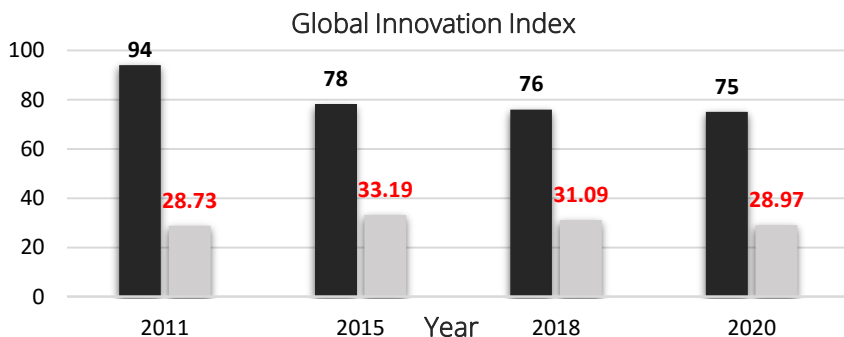
- Morocco has three strategies related to Innovation:
 - a. Innovation Initiative,
 - b. the National Strategy for Development of Scientific Research (Horizon 2025) and
 - c. Digital Morocco.

- **The National Strategy for Development of Scientific Research: Key points**
 - a. Focus on scientific research and has considerable implication for innovation.
 - b. Aims at increasing the spending on R&D from 0.71% of GDP (2009) to 3% of GDP in 2025.

- c. Include activities to ensure inventions and intellectual discoveries in scientific R&D are linked to innovation process.
- d. Proposes the establishment of National Award for Innovation and research in S&T.

- **The Digital Morocco 2020 strategy (2016)** has provided the framework for accelerating the digital transformation, cementing the country as a digital hub and improving digital governance and skills. Targets include placing half of all government administrative procedures online and ensuring that one-fifth of SMEs have Internet access. The Digital Development Agency (est. 2017) regulates digital projects and oversees reforms, including that of narrowing the urban–rural digital divide. This divide is visible in ownership rates of a computer or tablet: 36% in rural areas and 72% in urban areas. In 2018, only 17% of Moroccan bank account-holders made a digital transaction in 2018, compared to 80% of account-holders in Tunisia. In May 2019, the Digital Development Agency launched the Al Khawarizmi programme. Endowed with a budget of MAD 50 million (ca US\$ 5.6 million), the programme promotes R&D in AI and big data through calls for research proposals. It is also encouraging entrepreneurship and fostering the diffusion of digital tools through means such as digital parks and a smart factory.

❖ **Innovation Ecosystem and Patent applications:**

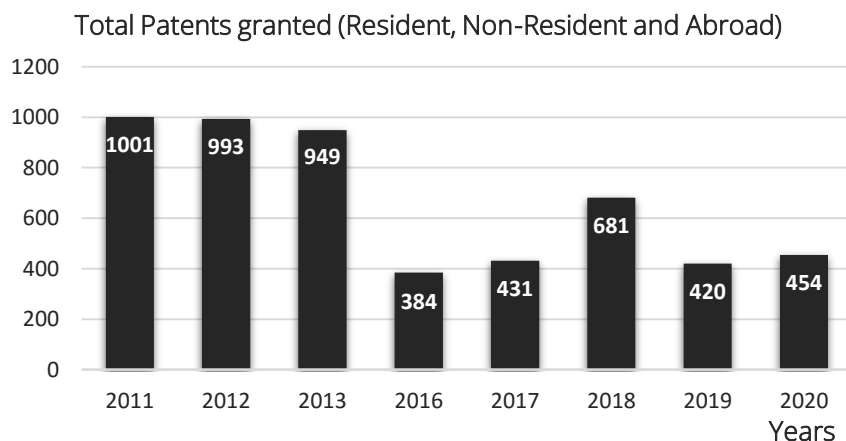


Source: *Global Innovation Index_ WIPO*

■ Ranking ■ Score

Morocco's innovation ecosystem displays a strong improvement between 2011 and 2015 as depicted in the graph. However, since 2015 its ranking and scores have remained essentially constant, with an Innovation Index improving from 78 to 75, while the score has decreased slightly from 33 to 29.

- ❖ The trend of total granted patents between 2011 and 2020 is depicted in the graph. The data include patents granted to resident, non-residents as well as those filed by foreign sources in Morocco. There is a strong decrease between 2013 and 2016 after which the numbers have slightly increased but the more recent data is still below 500. Although applications to the national patent office surged by 167% over 2015–2019, applications from abroad were largely responsible for this trend, since domestic patent applications actually declined by 14% over the same period. Numbers were also down in 2019 at the top five patent offices. This suggests that the national innovation system is less effectively converting research results into concrete applications.



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

- ❖ The changes in various contributing pillars of the Global Innovation Index for Morocco between 2011 and 2016 can be seen in the table above. Morocco has definitely improved its business infrastructure significantly, while positive changes are also noted in market sophistication, knowledge and technology, and creative outputs. Improvements in the ranking in some pillars is also noted.

Evolution of GII indicators for Morocco

GI pillar	2011 score	2011 rank	2016 score	2016 rank
1. Institutions	57.6	80	57.5	74
2. Human capital and research	38.0	61	32.3	61
3. Infrastructure	29.2	57	48.6	45
4. Market sophistication	34.4	84	38.0	98
5. Business sophistication	24.1	110	18.3	125
6. Knowledge and technology output	19.5	87	22.9	72
7. Creative outputs	22.1	109	28.2	67

Source: Cornell University and others, 2016.

❖ Technology Parks/Incubators/Industrial Zones

● Technopark Morocco

- Technopark Morocco's mission is to assist in the creation and development of companies in the ICT, Green Tech and cultural industries in Morocco. The Technopark management company, MITC is the result of a public-private partnership and is responsible for managing Technopark Morocco.
- It is based across three different sites in Casablanca, Rabat and Tangiers. Committed to a strategy of regional duplication of its model, Technopark opened first in Casablanca in 2001, then in Rabat in 2012 and in Tangiers in 2015, and is nearing completion in Agadir.

- The Technopark today is permanently home to over 300 Moroccan start-ups and SMEs, nearly 2,500 employees with an average age of less than 30 years, and is responsible for more than 10% of the national ICT turnover (excluding telecom) and a natural turnover of more than 60 new starts up each year.
- So far in the years since its creation, MITC has supported nearly 900 innovative companies in Casablanca, more than 150 in Rabat and 100 companies in Technopark Tangier.
- MEDZ, a subsidiary of CDG Développement, obtained (2012) a €100 million loan from the European Investment Bank (EIB) to launch seven technology park projects across the length and breadth of the Kingdom of Morocco. These innovative facilities are designed to provide international standard infrastructure and services and foster the development and competitiveness of Moroccan companies by catering for their training and R&D needs.

This operation will be mounted in the framework of Morocco's National Industrial Emergence Pact and will help to finance the construction of:

- Atlantic Free Zone in Kénitra.
- Haliopolis Park in Agadir.
- MidParc in Nouasser.
- Oujda Technopole.
- Technopolis Park in Rabat-Salé.
- Agropolis in Meknès.
- Agropole in Berkane.

❖ **These Industrial zones and Agro-parks have following emphases:**

- **Berkane agro-industrial park:** Industrial zone mainly dedicated to agro-industry, but also to other sectors linked to the agricultural value chain. It aims to create a regional leading platform for agricultural products bundling, marketing, processing and distribution.
- **Souss Massa agro-industrial park:** It is a park dedicated to the agro-industrial sector. Its purpose is to bundle all the industrial and logistical components as well as necessary infrastructures for the agricultural products value chain's development.
- **Agropolis:** Industrial zone welcoming all industries linked to the agricultural value chain: upstream support, agrofood processing, logistics, distribution and marketing.
- **Atlantic Free Zone:** Integrated industrial zone mainly dedicated to the automotive sector,
- **Haliopolis:** First industrial park dedicated to the seafood processing industry. Its purpose is to gather all the industrial and logistical components and infrastructure needed for the development of the seafood value chain.
- **MidParc:** Free zone targeting • Aeronautical industry • Related activities: space, defense, security • Other industries of the future: medical, onboard electronics • Industrial logistics
- **Jorf Lasfar industrial park:** Hosting all industrial activities, Jorf Lasfar Park particularly targets chemical-parachemical, metallurgical and energy sectors. It includes:
 - An industrial zone made up of large lots.

- **Selouane Industrial park:** It aims to accommodate SMEs / SMIs in the light industries and high value-added technologies, industrial logistics, as well as support services to industry (maintenance, design offices, insurance, etc.).
- **Oujda Technopole:** It is a multi-sector project, which includes: A free zone and an open zone composed of an SME / SMI zone, a retail park, a commercial platform, an Offshoring and services pole and zone dedicated to training.
- **Technopolis:** It is a center of excellence intended to offer shared services to businesses, to create synergy between education, research centers and businesses. Several poles are planned
 - Valorisation and Research center;
 - Research & Development center;
 - Microelectronics pole;
 - Media center;
 - Offshoring center;
 - Academic center.





I. COMBATING THE COVID-19 PANDEMIC

❖ **Vaccine Administration:**

As of April 2022, 67% percent of the population had been administered at least 1 dose, while 63.3 were fully vaccinated, while 16.8% had received booster shot.

❖ **Morocco's Indigenous efforts to combat COVID-19:**

● **Morocco Produces New COVID-19 Test Kits**

Morocco has designed the first 100% Moroccan diagnostic kit for Covid-19, tested and validated by national agencies and the world renowned Pasteur Institute in Paris. The kit has been designed by the MASclR Foundation (Moroccan Foundation for advanced science, innovation and research), a research and development institution based in the capital Rabat. The MASclR SARS-CoV-2 prototype kit was tested, validated on 450 clinical specimens and was approved for in vitro diagnostic use. The validation process was done in several national laboratories as well as internationally, by the Institut Pasteur in Paris.



Newly designed and produced in Morocco COVID-19 test kits

- **Moroccan - made respirator:**

Research and development institutes have designed a Moroccan-made respirator (SIRCOS) as well as a temperature measuring device for patients suffering from coronavirus. These technological innovations, made of components fully available on the Moroccan market, will be operational in both urban and rural areas and will be able to operate independently for more than 3,000 hours. The SIRCOS has several ventilation modes including controlled, pressure-assisted, and controlled assisted ventilation and it also complies with international safety and performance standards and requirements.



Employees work on a Moroccan ventilator at a factory in Casablanca

- **Ventilator Production**

According to Industry Ministry sources Morocco had started manufacturing its own ventilators with oxygen masks, by Mid-April 2020 to help meet demand caused by the COVID-19 pandemic. Morocco's Industry Ministry has asked aeronautics and electronics suppliers in the country to develop and manufacture both non-invasive ventilators, where an oxygen mask is secured over the patient's face, and invasive models where a tube feeds oxygen straight to a sedated patient's lungs. The first 500 non-invasive ventilators were made ready by Mid-April 2020.

❖ **AI and Information Technology to combat the virus:**

• **Use of Drone Technology:**

Morocco rapidly expanded its fleet of drones as it battled the coronavirus pandemic, deploying them for aerial surveillance, public service announcements and sanitisation. Authorities have employed drones to issue warnings, identify suspicious movement in the streets and disperse illegal rooftop and balcony gatherings. Local authorities in Temara, a town near the capital Rabat, launched a high-precision aerial surveillance system developed by local company Beti3D, which previously specialised in aerial mapping. Farasha, a startup has raised funds to produce drones for thermal surveillance and aerial disinfectant spraying. The aeronautics department of the International University of Rabat (UIR) offered its facilities, expertise and prototypes to authorities in March, deploying drones with loudspeakers or infrared cameras able to detect movement at night or spot individuals with high temperatures.



An employee of a Moroccan startup company pilots a drone equipped with disinfectant liquid.

• **A coronabot and apps for specialist medical staff:**

- The French-Moroccan start-up Dakibot unveiled a new free chatbot providing users with automatic answers in Moroccan Arabic to questions

concerning the coronavirus. The answers provided are based on information from the Moroccan Ministry of Health and the WHO.

- The Moroccan Ministry of Health also launched a new app for doctors, specialist medical staff and experts in a bid to ensure faster and improved exchange among experts in relation to medical strategies in the battle against the virus.

- **Award-winning student inventions to support healthcare**

Students from the Moroccan School of Engineering Sciences (EMSI) have developed three medical inventions that stole the show at the Hackathon Virtual MaroCovid19 competition. These can be applied to ease medical checks and healthcare processes in the fight against COVID-19.

- The first student invention is African Savior, an app-based system that delivers nasal swab test kits via drone to patients with COVID-19 symptoms. This allows healthcare professionals to remotely test for the virus without putting themselves at risk.
- Then there's the Digital Medical Respiratory System, which delivers information about the patient's respiratory system to doctors. Doctors can then remotely adjust pressure and respiratory flow and be alerted in critical situations.
- The third student invention digitises medical prescriptions. Called the Moroccan Electronic Perspective, doctors can use an app to send prescriptions directly to a pharmacy. To receive their medicine, all patients have to do is identify their pharmacy with a QR code.



**COMSTECH Secretariat
33 - Constitution Avenue
G-5/2, Islamabad - 44000
Islamic Republic of Pakistan**

**Tele: 92-51-9220681-3
Fax: 92-51-9211115, 9205264
www.comstech.org**

Compiled in 2022