



Republic of Tunisia

Ministry of Economy and Planification

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# Global Innovation Index 2022 :

**TUNISIA** gains  
in efficiency

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## Introduction

Entitled "What is the future of innovation-driven growth", the 15th edition of the report of the World Intellectual Property Organization WIPO "Global Innovation Index 2022" was published in September 2022.

The Global Innovation Index (GII) aims to capture, to assess and to rank the performance of innovation ecosystems in 132 economies by using 81 indicators that cover areas related to the political environment, the education, infrastructure and knowledge creation (see indicator structure in the annex).

Having become the ultimate reference guide, the GII has established itself as a powerful instrument for the development and implementation of policies that are favorable to innovation. Indeed, the index attempts to capture the multidimensional facets of innovation and to provide the tools to promote the adoption of policies allowing long-term growth in production, through the improvement of productivity and the creation of jobs.

Therefore, this note aims to present, in a first part, the GII as well as the economic context in which the 15th edition was established. The main results at the global and regional level will be examined in a second part, to move, finally, to the presentation of the results concerning Tunisia in the third part. The general conclusion will be allocated to the main recommendations that can improve Tunisia's performance and its ranking in the GII.

### I. **GII 2022 : context and challenges**

For this year, the GII captures global innovation trends in the context of the pandemic, global economic recession and other timely challenges.

According to the GII 2022, this economic context could have hindered Research & Development (R&D), the flow of property titles and investment in venture capital in 2020 and 2021. However, and against all expectations, innovation was able to escape this crisis, as evidenced by its growth through the improvement of the following related indicators:

- The number of scientific articles published
- Public and private spendings on Research and Development
- Filing of intellectual property applications
- "Venture capital" operations

Furthermore, and as announced in the title of this edition's report: "What is the future of innovation-driven growth?" the GII has attempted to chart the prospects for innovation-driven global growth, based on indicators of technical progress, technology adoption and the socio-economic impact of innovation, all of which have shown signs of weakness.

- *Indicators of technical progress in the areas of speed of semiconductors, price of electric batteries, cost of renewable energy and drug marketing authorizations show a slowdown compared to long-term trends.*
- *Technology adoption shows low average penetration rates, although it shows an increase for a whole range of technologies analyzed, in particular for electric vehicles.*
- *The socio-economic impact of innovation seems to be at its lowest level (notably due to the short-term effects of COVID-19) and all related indicators are experiencing a significant slowdown. For example, productivity growth is at its lowest level ever, which calls into question the ability of innovation to drive future growth.*

In this regard, two points of view have been put forward:

- The view of innovation pessimists who claim that low productivity growth will last.
- The point of view of innovation optimists (on which the GII 2022 has bet), who rather anticipate a new economic and social era with a new surge of massive innovation promoting a rise in productivity.

In this optimistic perspective, the GII 2022 is betting on two new waves of innovation :

- 1. The wave of innovation of the digital age:** it is based on supercomputers, artificial intelligence and automation and is about to have a considerable impact on productivity in all sectors, including that of services. Moreover, it would contribute to the achievement of scientific breakthroughs in the basic sciences of all fields.
- 2. The “Deep Science” wave of innovation:** it is based on breakthroughs in biotechnology, nanotechnology, new materials and other sciences that are revolutionizing innovations in health, food, environment and mobility.

However, the report insists on the fact that the expected positive effects of these two new waves will take time to materialize in order to achieve significant productivity growth based on innovation. In fact, to get there, the GII 2022 points to the existence of many obstacles, particularly in the area of technology adoption and diffusion that must be overcome.

## II. GII 2022, main resultats

### *A change in the ranking of the TOP 15*

The year 2022 is marked by a change in the top 15 of the ranking of the most innovative economies with the advancement of the United States of America, Singapore, Germany, China and Canada and with the progress achieved in countries considered to be major innovation poles such as Turkey, India and Iran.

In addition, Switzerland is ranked in the first place for the twelfth consecutive year with a score of 64.6/100. The United States of America (61.8/100) rises to second place followed by Sweden (61.6/100), the United Kingdom (59.7/100), the Netherlands (58/100) and Korea (57.8/100).

China (11th) with a score of 55.3, remains the only middle-income economy in the TOP 15. On the other hand, Canada, with a score of 50.8/100, joins its place among the top 15 global innovators (15th rank against 16th in 2021).

The countries which have shown promising innovation potentials and which have been able to catch up most rapidly are China, India (40th, 36.6/100), Vietnam (48th, 34.2/100), Iran (53rd, 32.9) and the Philippines (59th, 30.7/100).

### **Europe : 15 countries in the TOP 25 most innovative**

- Switzerland, at the top of the world ranking, also takes the 1st place in the world in terms of “outputs of knowledge and technology” as well as for “outputs of creativity”.
- Sweden ranks first for “infrastructure” and “business sophistication”.
- Estonia (18th) leads the world ranking in indicators relating to "e-participation", "venture capital", "imports of ICT services", "starting a business" and to "online public services".

### **North America : the most innovative region in the world**

- The United States of America ranks as a world leader in 15 of the 81 indicators used in the GII. These include, in particular, "private investment in research and development", "investment in venture capital", "spending on computer software", "the quality of universities", "the quality and impact of scientific publications", "the importance of intangible assets of enterprises" and the "number of patents by origin",
- Canada (15th) ranks first in the world in indicators relating to “Venture Capital Recipients” and “Joint Ventures and Strategic Alliances”.

### ***Asia : Singapore leads the world in 11 partial indicators***

- Singapore leads in 11 indicators including, among others, “government effectiveness”, “access to ICT”, “venture capitalists”, “high tech” and “platform GitHub”.
- China and Hong Kong lead in “brands”, “high-tech imports” and “R&D spending”.
- The Republic of Korea, who reached the top 10 by 2020, continues to progress to reach 6th place in 2022. This country is at the top of the world ranking for "the number of researchers".

### ***Sub-Saharan Africa : Region with the highest number of economies (8) performing above expectations***

- Mauritius (45th) has the best ranking in the region in terms of “institutions”, “infrastructure”, “market sophistication” and “outcome of creativity”. It is also the world leader in “venture capital operations”.
- Namibia (96th) ranks 1st in the world in terms of “spending on education” and stands out in “human capital and research” by obtaining a score higher than the regional average.
- South Africa (61st) tops the regional rankings in “Business Sophistication” and “Knowledge and technology outputs”.

### ***THE MENA region: The United Arab Emirates still lead the ranking***

- The United Arab Emirates has gained 2 places compared to 2021 by appearing 31st against 33rd in 2021 and still dominates the ranking of the region as well as that of the Arab world. Likewise, they are at the top of the world ranking in terms of “business environment” with a score of 98.4/100 and in “higher education” (71.5/100).
- 10 other countries in the region have also moved up the rankings. These include Saudi Arabia (51st vs. 66th), Qatar (52nd vs. 68th), Kuwait (62nd vs. 72nd), Morocco (67th vs. 77th) and Bahrain (72nd vs. 78th).

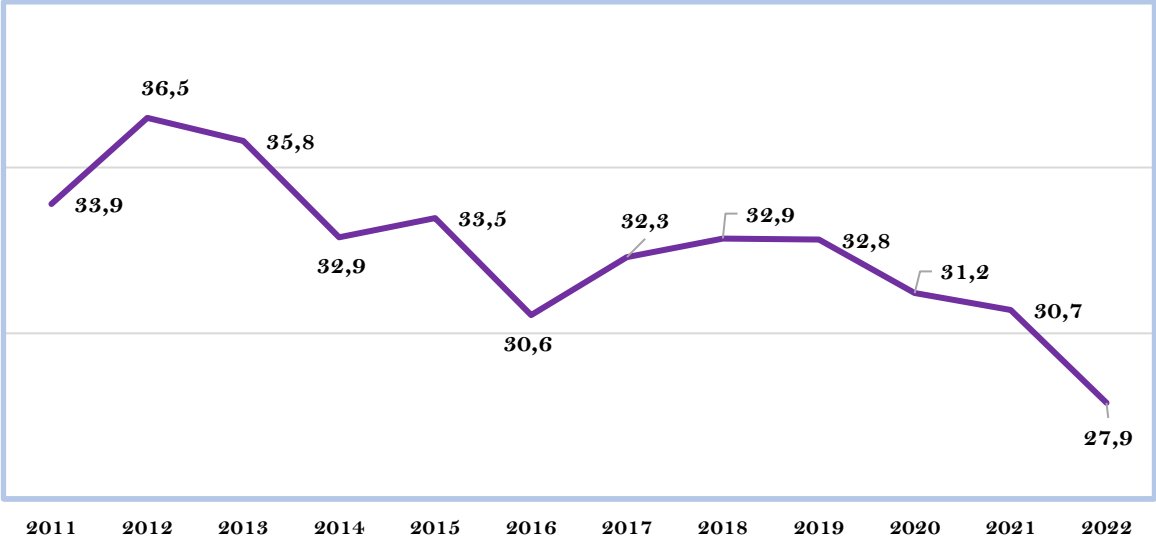
## **III. Results for Tunisia : efficiency noted by WIPO**

### ***Overall the downtrend continues***

The global analysis of Tunisia's results for this year shows that it has again lost ground in terms of innovation by falling two positions in the ranking (73rd against 71st in 2021) with a score which drops to 27.9 in 2022 (compared to 30.7 in 2021). It is ranked 7th in the Arab world, 10th in the MENA region and 8th among the 36 lower middle-income economies.

Moreover, the study of Tunisia's score for the last decade 2011-2022, shows that the trend has been rather downward since 2011. This drop coincides with a decline in government expenditure on R&D during the same period.

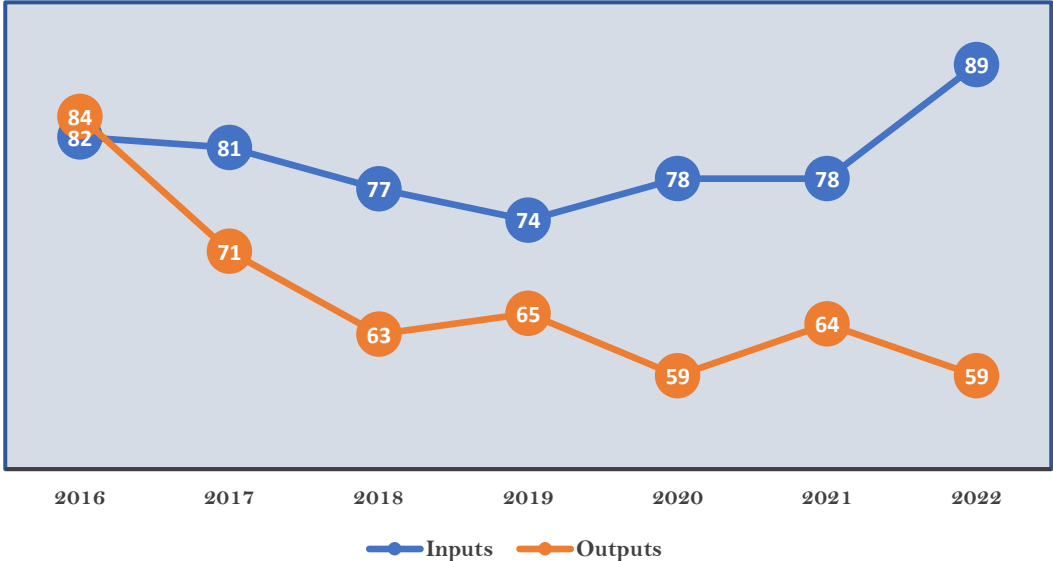
Figure 1 : GII Tunisia 2011-2022



*Tunisia is better positioned in outputs than in inputs*

The ranking in 2022 in the partial indicators shows better results at the level of innovation outputs than inputs. Indeed, and as shown in the graph below, Tunisia gains 5 positions in one year at the level of outputs while it loses 11 at the level of inputs.

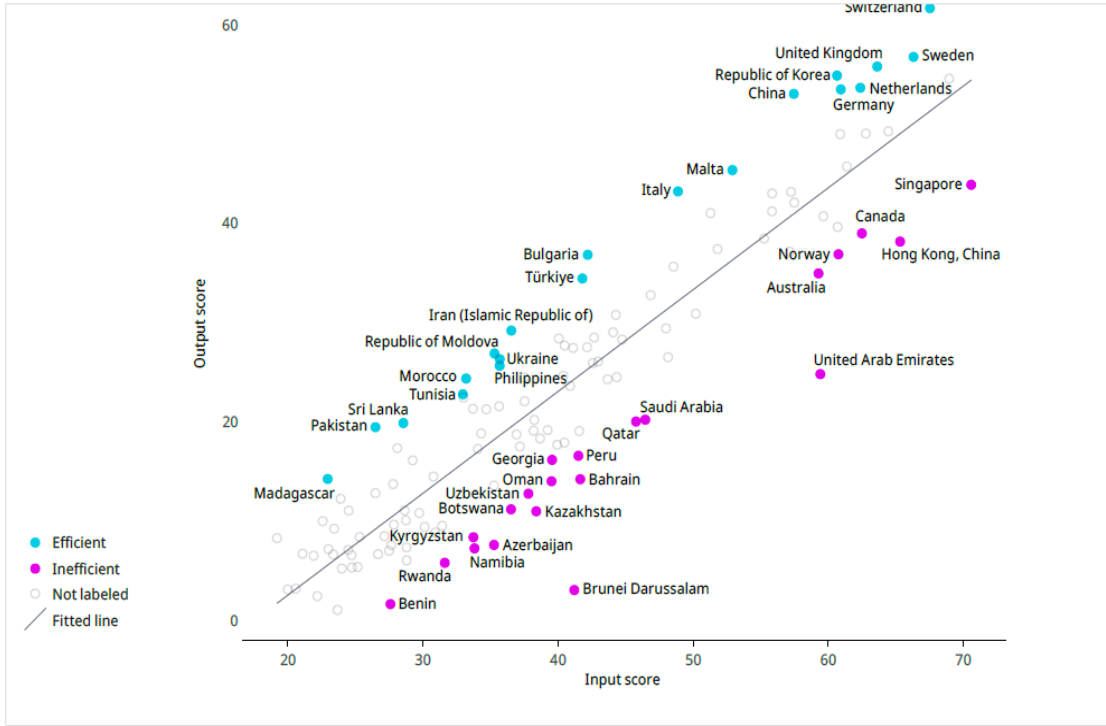
Figure 2 : Innovation inputs and outputs : 2016-2022





This difference in favor of outputs over this period is indicative of increased effectiveness of the ecosystem dedicated to innovation, unlike the majority of countries in the Arab world, as shown in the following graph :

**Figure 3 : Efficiency of inputs versus outputs by country**



Source : GII 2022

**Tunisia is the second Arab country in terms of efficiency**

The efficiency ratio calculated by the WIPO shows that among the countries of the Arab world, only Morocco and Tunisia are ranked in 2022 in the area of efficient countries. This ratio for the rest of the region does not follow the overall ranking because the highest ranked countries in this region are not the most efficient. We note, as well as the United Arab Emirates, 1st Arab country, Saudi Arabia (2nd) and Qatar (3rd) are all in the zone of non-efficient countries.

**III.1 Innovation inputs**

Knowing that the indicator relating to the inputs of innovation synthesizes 5 sub-indicators: institutions, human capital and research, infrastructure, market sophistication and business sophistication, it is important to analyze Tunisia's key results for each of these sectors.

### ***A setback at the institutional level due to the change of certain indicators***

With a score of 48.4 (against 61.4 in 2021), slightly below the average score for the Arab region (54.29), Tunisia ranks 92nd (against 75th in 2021) in this pillar. The decline at this level is due to the regression in the ranking in the “Political environment” and “Business environment” sub-indicators for which Tunisia lost 9 and 42 positions respectively.

It is important to emphasize that Tunisia's downgrading in terms of business environment does not result from a deterioration of the business environment itself, but is due, rather, to the shift in data sources as a result of the suspension of the Doing Business report.

With regard to the third sub-indicator in this field, which concerns "regulatory efficiency", it is characterized by a slight improvement in terms of the "role of the law" with a score of 49.6 in 2022 (compared to 48.4 in 2021). Such a result is considered as a strong point for Tunisia compared with lower middle-income economies.

### ***Tunisia keeps its place in the Arab top 3 in terms of "Human capital and research"***

This pillar, which has always been considered in the GII as a strong point for Tunisia, includes, among other things, State expenditure in education and in Research & Development. For this component, Tunisia recorded a drop of 5.3 points in the score in 2022 but remains ranked 3rd Arab country in this area.

The more detailed analysis shows that Tunisia leads the ranking of the Arab world in the "Education" pillar and maintains its position at the top of the world ranking at the level of "Government expenditure per pupil in secondary education as % of GDP" despite the drop in its score (49.4 in 2022 against 52.4 in 2021).

On the other hand, and despite the government spending dedicated to education which is higher than that of the OECD average, the indicator “PISA scale in reading, mathematics and science” emerges as a weakness for Tunisia (73rd rank). This suggests that the quality of learning outcomes in Tunisia is below the world average and some Arab countries like the UAE, Qatar and Jordan.

Such results call into question the content of the education provided in Tunisia and its adequacy with the social, technological and digital changes of recent years.

Furthermore, it must be noted that "Science and engineering graduates" are still a strong point for Tunisia, although the related score fell between 2021 and 2022 (38.3% in 2022 against 43.3% in 2021) bringing Tunisia from 2nd to 5th in the world.

### ***Infrastructure, 2 out of 3 pillars are considered strong points for Tunisia***

In the "Infrastructure" area, which includes indicators relating to the technological, logistical and ecological ecosystem, Tunisia gained 4 ranks and 3 points in its score, compared to the 2021 ranking. It ranks 85th globally (with a score of 37.2 in 2022) and 7th in the Arab world. In addition, two pillars have made infrastructure a strong point for Tunisia, namely "Information and Communication Technologies" and "Sustainable ecology".

With regard to the first area which is approached through "The index of online government services", Tunisia remains ranked 83rd at the world level and 7th at the Arab level and its strengths lie in "the access to ICT" and "the use of ICT" where it recorded scores above the average (83.5 and 58.6 respectively).

This composite indicator measures the use of ICT by governments in the delivery of public services at the national level by assessing each country's national websites, including the national portal, the e-services portal and the e-participation portal, as well as the websites of the relevant ministries.

It should be recalled that the use of Information and Communication Technologies has increased in a post-COVID environment and that the use of online administrative services by individuals and businesses has developed. Indeed, the results of the 22nd survey on the business climate conducted by ITCEQ show that the percentage of companies confirming their use of the various online administrative services such as customs clearance, online filing of taxes, payroll taxes, paying bills, filing in the National Business Register or even using various financial services, increased in 2022 compared to 2020.

As for "Sustainable ecology", Tunisia has gained 2 ranks by ranking 56th (against 58th in 2021) and is in 3rd Arab rank after the United Arab Emirates and Yemen. At the partial level and with more than 200 companies certified ISO 14001, the sub-indicator "ISO 14001 Certification" is a strong point for Tunisia, occupying the 36th world ranking and the 2nd Arab ranking.

### ***Market sophistication: domestic credit for the private sector is a strong point for Tunisia***

Compared to the MENA region and lower middle-income economies, Tunisia has a comparative advantage in terms of "Market Perfection" which remains a strong point for Tunisia, despite the drop in its score (23.9 against 40.7 in 2021).

Thus, Tunisia's asset concerns mainly the "Domestic credit to the private sector" which refers to the financial resources provided to the private sector by the financial corporations with a

score of 81.7 to rank in the world top 50 (41st). Nevertheless, it should be noted that despite the existence of panoply of credit lines available to businesses through various national bodies and funds, the score recorded for this indicator is lower than certain Arab countries such as the Morocco (96.3), Kuwait (90.9) and Qatar (138.9).

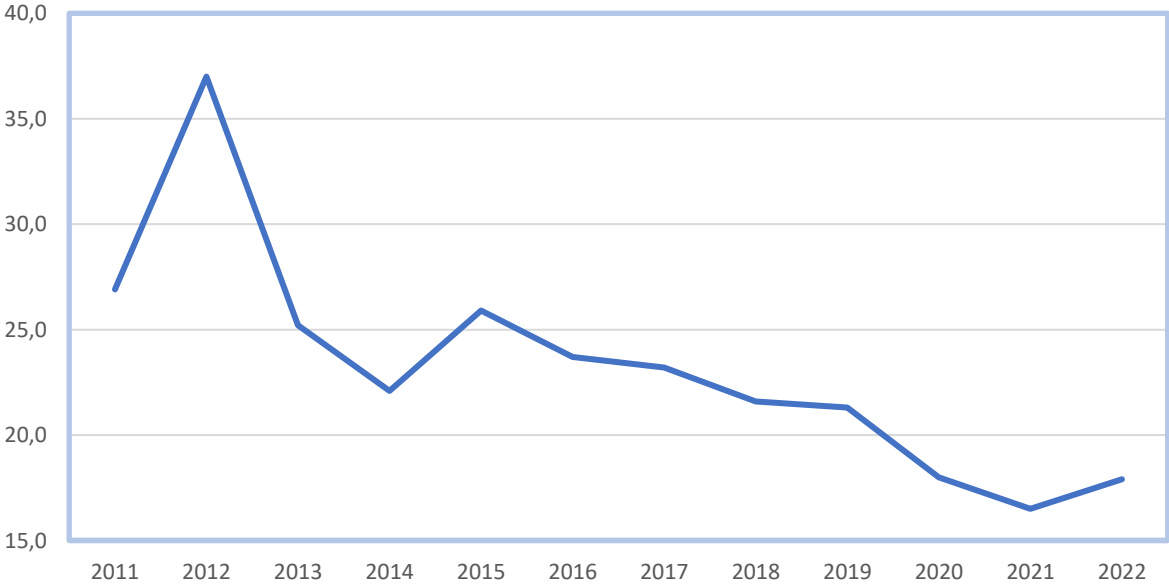
The second indicator of market openness relating to "risk capital investment" is approached from "Venture capital investors", "Venture capital recipients" and "Venture capital received". At this level, Tunisia has lost ground after being ranked among the top 50 countries. This decline is attributable, in particular, to the drop of venture capital flows in Tunisia following the crisis triggered by COVID-19.

The third indicator used by the GII 2022 to measure the degree of market sophistication is "Industrial diversification". The score obtained in 2022 is 86 (compared to 88.5 in 2021). It is higher than the average for the Arab world, but lower than North African competitors, namely Morocco (93.1) and Egypt (95.1).

***Business sophistication: a weak point with an improvement, particularly in terms of knowledge***

Although its score improved in 2022 from 16.5 to 17.9, this component is Tunisia's greatest weakness. The relative improvement in the score level is primarily due to the slight improvement in the level of collaboration between the university and the industrialists in terms of research and development.

**Figure 4 : Business sophistication 2011-2022**



"Innovation Links" and "Knowledge Absorption" are considered, as well, as weaknesses for Tunisia. It ranks among the 20 worst performing economies in these 2 sub-indicators. Indeed, it ranks 107th in "The state of cluster development", 88th in "Joint ventures / strategic alliances", 103rd for "The payment of intellectual property as a % of trade" and 115th in terms of "the 'import of ICT services as % of trade'".

### **III.2 Innovation outputs:**

The output pillar is made up of two indicators: "Knowledge and technology outputs" and "Creativity outputs". Key findings for this pillar are:

#### ***Knowledge and technology results: Tunisia leads the ranking of Arab countries and approaches the world's top 50***

The "knowledge and technology results" indicator is considered by the GII 2022 as a strength of Tunisia compared to countries belonging to the same income group. As such and gaining 2 ranks, Tunisia ranks 53rd with a score above the average of the Arab world (25.3 against 15.28 respectively).

This ranking is attributable to the indicator "Knowledge creation" which places Tunisia in the 39th position and to that relating to "Scientific and technical articles/GDP" in which Tunisia ranks 12th in the world with a score that recorded a significant improvement from 40.9 in 2021 to 48.2 in 2022.

Moreover, another strong point is also noted and which concerns "expenditure on computer software/GDP". Indeed, Tunisia ranks 42nd in the world, as well as for the "ISO 9001 Certification" component, in which it ranks 32nd in the world.

#### ***"Production of creativity": performance above the average for the Arab world***

Although this pillar dragged the innovation output score down, "Creativity Production" gained ground this year and ranks Tunisia 61st (compared to 80th in 2021). The best ranking recorded at this level is that relating to "The intensity of intangible assets", where Tunisia recorded a rating of 44.9 and ranks 57th.

Similarly, among the indicators which constituted strong points for Tunisia in 2022, at this level, we find, firstly, "The export of creative products as a % of total trade" for which Tunisia records a score of 1.2 and ranks in the top 50 (39th.), and "Generic Top-Level Domains (TLDs)" where Tunisia ranks 67th globally and 7th in the Arab world with a score of 2.7.

## Conclusion : several challenges remain

By way of conclusion, Tunisia has several assets in the field of innovation. The most important of them are: i) the growing stock of researchers where women are well represented, ii) its sustained flow of students and graduates from higher education in science and engineering, iii) its net growth in scientific production, iv) the orientation of its exports towards high-tech products and v) its openness to international multilateral research and development and innovation programs.

However, despite the continuous improvement of the innovation ecosystem and although Tunisia is trying to reach the rest of the world, efforts remain to be consolidated, more particularly at the level of the business environment, education, collaboration between the university and companies at the level of Research & Development.

To this end, the public authorities should act urgently to be able to improve and optimize the entire ecosystem dedicated to innovation by means of:

- The organization of public/private dialogues for the promotion of innovative financing;
- The reform of the education system to orient it strongly towards modern science and technology based on R&D and innovation and better adapt it to the real needs of the economy;
- The strengthening of public-private research and the intersectoral mobility of researchers;
- The reform of the financial system in order to allow different exit options for companies, including the introduction on capital markets;
- The streamlining of administrative procedures related to SICARs and venture capital funds while adapting them to the specific nature of R&D and innovation activities;
- Improving the legal and tax framework for investment capital in order to enable, in particular, SICARs to be able to benefit effectively from several means of participation in the capital of companies, to invest abroad and to withdraw from the capital of companies within a reasonable time;
- The acceleration of the updating of the Tunisian classification of economic activities (NAT) to follow the rapid and continuous emergence of new activities relating to technology and knowledge.

# Annex 1 : Structure of the GII

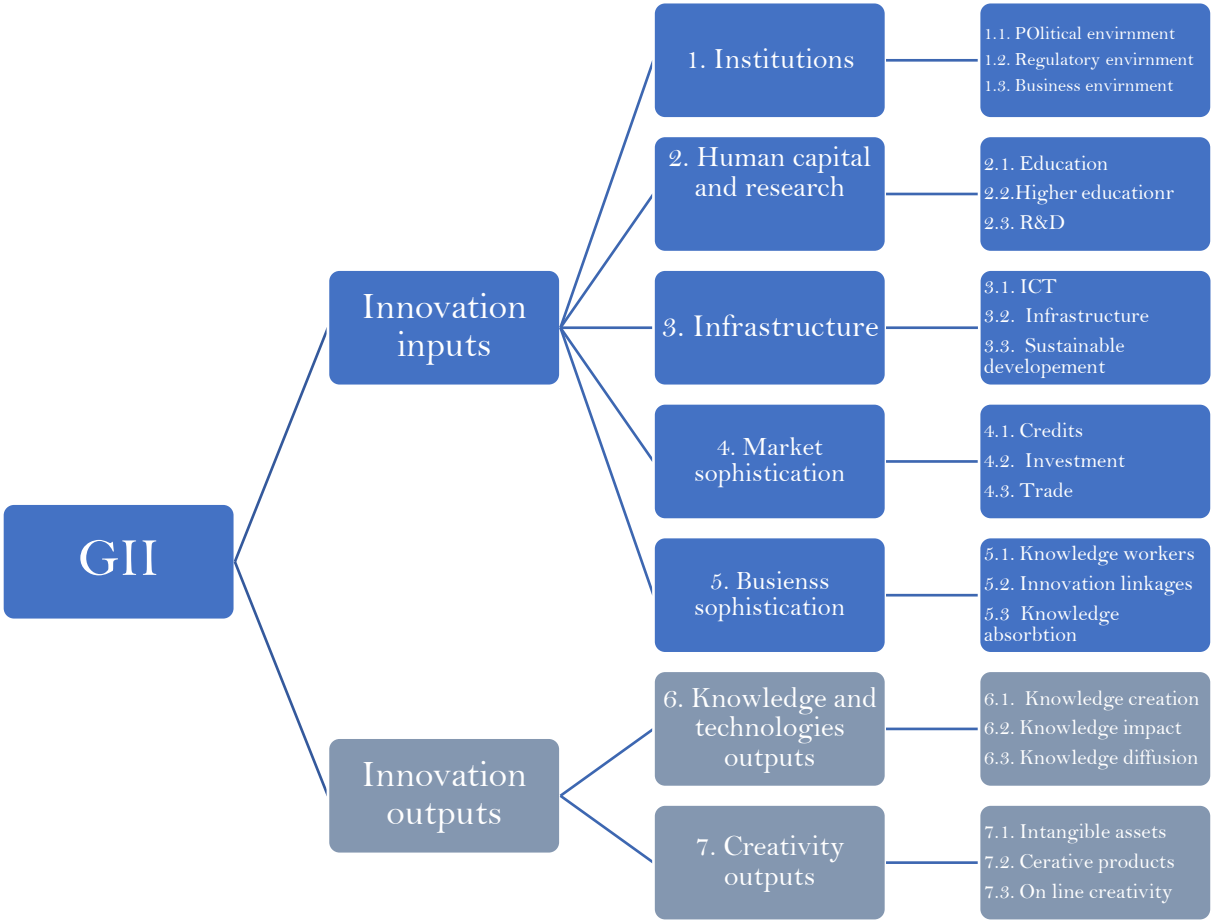
The GII index, whose score varies between 0 (for the worst performance) and 100 (for the best performance), is calculated on the basis of two sub-indicators: inputs and outputs.

Each pillar, in turn, is divided into sub-pillars and each sub-pillar is composed of individual indicators (81 in total in 2022).

The scores of the sub-pillars are calculated as the average of the individual indicators, and those of the 7 pillars are calculated as the average of the scores of the sub-pillars.

Two measures are then calculated: that relating to the sub-index of innovation inputs which is the average of the first five results and the measure of the sub-index of innovation production which is the average of the scores of the last two pillars. In the last phase, the overall GII score is calculated as the average of the Input and Output sub-indices.

The structure of the GII is schematized as follows :



## Annex 2 : World ranking

### Europe

Country	Score	Rank
Switzerland	64,62	1
Sweden	61,56	3
United Kingdom	59,73	4
Netherlands	58,04	5
Germany	57,23	8
Finland	56,88	9
Denmark	55,93	10
France	54,96	12
Austria	50,19	17
Estonia	50,19	18
Luxembourg	49,81	19
Iceland	49,45	20
Malta	49,15	21
Norway	48,84	22
Ireland	48,54	23
Belgium	46,88	26
Italy	46,06	28
Spain	44,62	29
Czech Republic	42,84	30
Portugal	42,11	32
Slovenia	40,56	33
Hungary	39,83	34
Bulgaria	39,53	35
Poland	37,55	38
Lithuania	37,35	39
Latvia	36,53	41
Croatia	35,60	42
Greece	34,54	44
Slovakia	34,30	46
Russian Federation	34,27	47
Romania	34,11	49
Serbia	32,28	55
Republic of Moldova	31,11	56
Ukraine	31,02	57
Montenegro	30,34	60
North Macedonia	28,84	66
Bosnia and Herzegovina	28,52	70
Belarus	27,53	77
Albania	24,44	84



## Sub-Saharan Africa

Country	Score	Rank
Angola	13,92	127
Benin	14,64	124
Botswana	23,88	86
Burkina Faso	15,29	120
Burundi	12,33	130
Cameroon	15,11	121
Côte d'Ivoire	17,83	109
Ethiopia	16,31	117
Ghana	20,78	95
Guinea	11,58	132
Kenya	22,75	88
Madagascar	18,62	106
Mali	14,24	126
Mauritania	12,39	129
Mauritius	34,44	45
Mozambique	15,02	123
Namibia	20,56	96
Niger	14,63	125
Nigeria	16,88	114
Rwanda	18,73	105
Senegal	19,91	99
South Africa	29,82	61
Togo	15,06	122
Uganda	15,66	119
United Republic of Tanzania	19,43	103
Zambia	15,80	118
Zimbabwe	18,10	107

## Latin America and the Caribbean

Country	Score	Rank
Argentina	28,62	69
Brazil	32,54	54
Chile	34,00	50
Colombia	29,22	63
Costa Rica	28,67	68
Dominican Republic	22,70	90
Ecuador	20,29	98
El Salvador	19,88	100
Guatemala	17,80	110
Honduras	17,27	113
Jamaica	27,73	76
Mexico	31,00	58
Nicaragua	18,09	108
Panama	25,69	81
Paraguay	22,65	91
Peru	29,07	65
Trinidad and Tobago	19,79	101
Uruguay	29,21	64

## Northern America

Country	Score	Rank
United States of America	61,78	2
Canada	50,76	15

## Central and Southern Asia

Country	Score	Rank
India	36,57	40
Iran (Islamic Republic of)	32,89	53
Uzbekistan	25,31	82
Kazakhstan	24,71	83
Sri Lanka	24,23	85
Pakistan	23,00	87
Kyrgyzstan	21,08	94
Bangladesh	19,67	102
Tajikistan	18,77	104
Nepal	17,64	111

## South East Asia, East Asia, and Oceania

Country	Score	Rank
Republic of Korea	57,78	6
Singapore	57,25	7
China	55,26	11
Japan	53,57	13
Hong Kong, China	51,76	14
New Zealand	47,17	24
Australia	47,14	25
Malaysia	38,72	36
Thailand	34,86	43
Viet Nam	34,25	48
Philippines	30,68	59
Mongolia	28,00	71
Indonesia	27,85	75
Brunei Darussalam	22,15	92
Cambodia	20,49	97
Lao People's Democratic Republic	17,45	112
Myanmar	16,35	116

## Northern Africa and Western Asia

Country	Score	Rank
Israel	50,23	16
Cyprus	46,17	27
United Arab Emirates	42,13	31
Türkiye	38,14	37
Saudi Arabia	33,36	51
Qatar	32,92	52
Kuwait	29,24	62
Morocco	28,80	67
Bahrain	27,95	72
Tunisia	27,89	73
Jordan	27,36	78
Oman	26,79	79
Armenia	26,59	80
Egypt	22,70	89
Algeria	16,70	115
Yemen	13,76	128
Iraq	11,91	131

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