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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.

SENEGAL
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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Senegal, officially the Republic of Senegal, is a country in West Africa. Senegal is bordered by Mauritania in the north, Mali to the east, Guinea to the southeast, and Guinea-Bissau to the southwest. Senegal nearly surrounds the Gambia, a country occupying a sliver of land along the banks of the Gambia River, which separates Senegal's southern region of Casamance from the rest of the country. Senegal also shares a maritime border with Cape Verde. The climate is typically Sahelian, though there is a rainy season. Senegal's economic and political capital is Dakar.

It is a unitary presidential republic and is the westernmost country in the mainland of the Old World, or Afro-Eurasia. It owes its name to the Senegal River, which borders it to the east and north. Senegal covers a land area of almost 197,000 square kilometres (76,000 sq mi) and has a population of around 2 million. The state was formed as part of the independence of French West Africa from French colonial rule. Because of this history, the official language is French. Like other post-colonial African states, the country includes a wide mix of ethnic and linguistic communities, with the largest being the Wolof, Fula, and Serer people, and the Wolof and French languages acting as lingua francas. Senegal is classified as a country with a relatively low Human Development Index. Most of the population is on the coast and works in agriculture or other food industries. Other major industries include mining, tourism, and services.
Senegal is a member state of the African Union, the United Nations, the Economic Community of West African States (ECOWAS), and the Community of Sahel-Saharan States.

Source: https://en.wikipedia.org/wiki/Senegal
The economy of Senegal is driven by mining, construction, tourism, fishing and agriculture, which are the main sources of employment in rural areas. Despite abundant natural resources in iron, zircon, gas, gold, phosphates, and numerous oil discoveries recently, Senegal's economy gains most of its foreign exchange from fisheries, phosphates, groundnuts, tourism, and services. As one of the dominant parts of the economy, the agricultural sector of Senegal is highly vulnerable to environmental conditions, such as variations in rainfall and climate change, and changes in world commodity prices.

Dakar, the former capital of French West Africa, is also home to banks and other institutions which serve all of Francophone West Africa, and is a hub for shipping and transport in the region.

Senegal also has one of the best developed tourist industries in Africa. Senegal's economy depends on foreign assistance. It is a member of the World Trade Organization.

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

**Senegal GDP**

Senegal has shown a rise in GDP from US$ 11 billion in 2005 to US$ 28 billion in 2021. The GDP in terms of PPP also shows a consistent increase over the entire period shown, averaging an annual growth of about 9.3% in the sixteen-year period (2005-2021).
The high technology exports of Senegal are small (between 49 and 7.5 million US$) and inconsistent, as the graph displays. However, prior to 2019 it has shown higher levels in general.
## Human Development Indicators

The indicators are shown in the table below.

<table>
<thead>
<tr>
<th>Series Name</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life expectancy at birth, total (years)</td>
<td>67.078</td>
<td>67.38</td>
<td>67.665</td>
<td>67.941</td>
<td>..</td>
</tr>
<tr>
<td>Literacy rate, adult total (% of people ages 15 and above)</td>
<td>..</td>
<td>51.90042</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Labor force with advanced education (% of total working-age population)</td>
<td>62.97</td>
<td>56.22</td>
<td>75.5</td>
<td>51.46</td>
<td>..</td>
</tr>
<tr>
<td>Labor force with intermediate education (% of total working-age population)</td>
<td>34.24</td>
<td>27.94</td>
<td>43.38</td>
<td>33.89</td>
<td>..</td>
</tr>
<tr>
<td>Mortality rate, infant, male (per 1,000 live births)</td>
<td>37.1</td>
<td>35.6</td>
<td>34.3</td>
<td>33.2</td>
<td>32.1</td>
</tr>
<tr>
<td>Mortality rate, infant, female (per 1,000 live births)</td>
<td>29.3</td>
<td>28.2</td>
<td>27.1</td>
<td>26.2</td>
<td>25.4</td>
</tr>
<tr>
<td>Individuals using the Internet (% of population)</td>
<td>25.67</td>
<td>29.64</td>
<td>35.3</td>
<td>39.5</td>
<td>..</td>
</tr>
<tr>
<td>Mobile cellular subscriptions (per 100 people)</td>
<td>101.29</td>
<td>102.19</td>
<td>104.45</td>
<td>109.72</td>
<td>113.94</td>
</tr>
<tr>
<td>Mobile cellular subscriptions</td>
<td>15186485</td>
<td>15758366</td>
<td>16559942</td>
<td>17880594</td>
<td>19078948</td>
</tr>
</tbody>
</table>

Data from database: *World Development Indicators*

Life expectancy is still under 70 years of age, while the last recorded overall literacy rate (2017) was about 52%. The infant mortality rate which is decreasing over recent years is still high at 25-32 deaths per million. Usage of the internet was last reported (2019) at about 40% of the population.
population. There are about 114 mobile cellular subscriptions per one hundred populations.

- Senegal's skilled labour force was determined as 10.8% in 2015, up from 7.2% in 2011.

![Graph showing skilled labour force in Senegal](http://www.hdr.undp.org/en/indicators/179406)
C. KEY POLICIES AND GOVERNMENT ORGANISATIONS RELATED TO SCIENCE, TECHNOLOGY AND HIGHER EDUCATION

 Organizations Responsible for STI
- Ministry of Higher Education, Research and Innovation
- The Academy of Science and Technology of Senegal

 The Academy of Science and Technology of Senegal (ASTS)
ASTS was created with the intention of capitalizing on the stock of human capital, essential to the scientific and technological advancement of Senegal. The General Assembly that constitutes the ASTS first met on November 9, 1999. Governmental authorities had agreed to the creation of this institution, and they gave it an official recognition. Envisioned as an academic society and placed under the patronage of the President of the Republic of Senegal, the ASTS has as its mission assistance, consultation, advice, and expertise. The ASTS is currently the only Academy that exists in Senegal. The ASTS is a member of several international networks, including: The Inter Academy Panel (IAP), a network of more than 90 academies worldwide. The ASTS is a member of the Executive Committee of the IAP and leads the Science and Education for Africa program;
NASAC (Network of the Academies of Science of Africa), where the ASTS has been given the responsibility of establishing the Academies of Science in French-speaking Africa; and,

NASIC (Network of the Academies of Science of the Member States of the Organization of the Islamic Conference).

The ASTS cooperates with academies of science and technology in many countries, including France, the United States, Canada, Italy, China, Kenya, and Uganda, as well as with international organizations such as the International Center for Development Research (IDRC) and the Agency for French-Language Universities (AUF). This cooperation is often framed by a signed agreement between the ASTS and these institutions.

Source: https://nap.nationalacademies.org/read/11880/chapter/6#37
**S&T Policies**

The Ministry of Higher Education, Research and Innovation has drafted Senegal’s first explicit science and technology policy, with the technical and financial assistance of UNESCO. The lack of sufficient national data to inform the process has, however, impeded finalization of the document in the past couple of years.

This policy would be the logical expression of the political will to commit more resources to R&D.

**S&T RELATED POLICIES AND FUNDS**

- Fund for Scientific and Technological Research (FIRST)
- Fund for Agricultural and Food Research
- Fund for Scientific and Technical Publications

**STI Policy Implementation**

The implementation of STI policies is done at the level of the Ministère de l’Enseignement Supérieur, de la Recherche et de l’Innovation (MESRI) [Ministry of Higher Education, Research and Innovation], and other ministries (e.g. Ministry of Industry, Ministry of Agriculture, Ministry of Health), Universities and Research Institutes (Gaillard and Kane 2011). MESRI is the main governing body for science and technology (S&T) policy. In addition, MESRI defines the national priorities for S&T research and funds research through various funding instruments. Furthermore,
it coordinates S&T activities and works in close collaboration with the technical ministries on which the research institutes depend.

- In December 1973, the Délégation générale à la recherche scientifique et technique (DGRST) was created and attached directly to the Prime Minister’s office. Its role is threefold: to promote, to coordinate and to manage research activities.

The DGRST was in charge of agricultural and agri-food research in the university research sector. Agriculture is a key sector, in Senegal’s economy. The desire to federate all research by integrating them led the DGRST to set up horizontal commissions: medical, pharmaceutical, agricultural, agri-food and social research, scientific and technical documentation.

- The Ministry of Scientific Research was reinstated in October 2009 to the ministry of higher education. Since then, research policy in Senegal has been carried out by the current Ministry of Higher Education and Research, which was enhanced in September 2017 by becoming the Ministère de l’Enseignement Supérieur, de la Recherche et de l’Innovation (MESRI).

➢ Innovation Policy in the Context of R&D

Senegal has a policy of rewarding excellence through the regular organization of the President's Grand Price for Science and the Grand President's Award for Innovation. An African exhibition of Research and Innovation in Senegal (SARIS) is regularly organized by the Agence Nationale de la Recherche Scientifique Appliquée (ANRSA) in partnership with all national components of research and innovation.

❖ GERD as a Share of GDP in Senegal, (%)

Between 2008 and 2015, Senegal raised its research effort from 0.29% to 0.58% of GDP. Moreover, the proportion of funds coming from abroad shrank over the same period from 41% to 8%. The higher education and private sectors contribute little research funding and there is no financial mechanism in place at present to incite the industrial sector to do more.
GERD by Sector of Performance in Senegal, 2017

As shown in accompanying figure, the bulk of Senegal’s R&D funds are provided by the Higher Education Sector (64.6%). Government (30.9) is the next largest source. The private non-profit sector has a small share of the whole.

R&D Human Capital

SENEGAL
There has been a steady increase in the number of Full Time Equivalent (FTE) researchers in Senegal as shown in above graph; from 265 per million in 2006 to more than double of that (564 per million) in 2015. According to the UNESCO Institute for Statistics (UIS) in 2015, Senegal had a total of 14335 researchers, 822 technicians and 1443 support staff. However, the majority of researchers are in the social sciences and humanities sector. The distribution of researchers between different disciplines of S&T in 2015 is depicted in the graph following. In terms of head count Senegal had 983 researchers per million in S&T in 2015.

<table>
<thead>
<tr>
<th>Major Fields</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and veterinary sciences</td>
<td>185</td>
</tr>
<tr>
<td>Engineering and technology</td>
<td>1,012</td>
</tr>
<tr>
<td>Medical and health sciences</td>
<td>2,117</td>
</tr>
<tr>
<td>Natural sciences</td>
<td>2,993</td>
</tr>
</tbody>
</table>

Source: UNESCO Institute for Statistics (UIS)

**Female researchers as a share of total researchers (HC) by field, 2018 (%)**

<table>
<thead>
<tr>
<th>Field</th>
<th>Total</th>
<th>Natural sciences</th>
<th>Engineering &amp; technology</th>
<th>Health &amp; welfare</th>
<th>Agricultural sciences</th>
<th>Social sciences &amp; humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>29.3</td>
<td>23.1</td>
<td>19.9</td>
<td>36.7</td>
<td>29.6</td>
<td>30.9</td>
</tr>
</tbody>
</table>

Female researchers constitute 29.3% or under one third of the total number of researchers. Of these, the largest fraction 36.7% is in the health and welfare section followed by the agricultural and natural sciences. However, almost 20% of female researchers are engaged in the engineering and technology sector.

Source: UNESCO Science Report 2021
Researchers by field of science (HC) in Senegal, 2017 or closest year (%)

As shown in accompanying figure, the largest number of science researchers are in the disciplines of natural science. Medical sciences constitute the second largest group. It is noticeable that engineering employs a very small percentage of researchers, viz. 7.1%.

Source: UNESCO Science Report 2021

R&D Funding and Support

- In 2015, a study by the National Agency for Statistics and Demographics found that only 8.7% of companies maintained relations with research centers but that more than half (52.3%) of companies with ties to research centers used their products. Between 2012 and 2016, the Ministry of Higher Education Research and Innovation (MHERI) created 14 research and testing centers, bringing the total to 23.

- Since 2015, the Ministry of Higher Education Research and Innovation (MHERI) has invested heavily in the acquisition of heavy laboratory equipment and in a super intensive parallel computer; it has also given researchers free access to online scientific databases.

- In order to improve access to project funding for women researchers, the Ministry of Higher Education Research and Innovation (MHERI) has introduced a Project for Supporting Female University Researchers in Senegal (PAPES) which had financed more than 100 projects by mid-2018. In November 2019, two women students from Gaston Berger University won Nestlé’s Africa Innovation Challenge in the university category for their food technology project.
• In order to make research and innovation drivers of socioeconomic development, the government has strengthened co-ordination within the Ministry of Higher Education, Research and Innovation since 2018 by creating a Directorate for Research and Innovation.

**The sovereign fund for Strategic Investments FONSIS: Prioritizing Senegal’s sustainable development agenda**

- In 2012, the government created, by law, the Sovereign Fund for Strategic Investments (FONSIS). This fund uses state revenue from oil and gas to invest in capital funds targeting SMEs in sectors prioritized by the Senegal Emerging Plan, such as solar energy, agriculture and health. The long-term goal is to reduce dependence on this form of revenue through a diversified investment portfolio.
- In 2015, FONSIS created a subsidiary, the Medical Infrastructure Hub (POLIMED), which designs and manages clinics and hospitals. POMIMED is currently rehabilitating the Matlaboul Fawzaini Hospital and putting in place an e-information system for patient files.
- In February 2020, FONSIS signed an agreement with General Electric to equip public and private clinics and hospitals with scanners and other modern medical equipment.
- In January 2019, the pharmaceutical company Parenterus, a subsidiary of FONSIS, opened its first factory in Senegal. Another subsidiary is Sogenas, a company specializing in the production and commercialization of dairy cows, genetically modified to resist hot, dry conditions.
- In November 2019, FONSIS raised 31 billion francs CFA to build solar plants in Kaél and Kahone with a total capacity of 50 MW. Approximately 25 billion francs CFA are being provided by a consortium consisting of Proparco, part of the Agence française de développement, the World Bank and European Investment Bank. These new solar plants bring the total to four. They will help Senegal to reach its objective of raising the share of renewable sources to at least 21% of the country’s energy mix by 2018. Moreover, the Senegalese electricity company, Senelec, will be able to buy each kilowatt hour for just 25 francs CFA, reportedly the lowest price in sub-Saharan Africa.

➢ A key indication that other West African countries have woken up to the space challenge is Senegal’s participation in the August 2018 mission to collect data in preparation for the flyby of an asteroid called Ultima Thule in January 2019. Scientists from France and the US National Aeronautics and Space Administration brought five tons of astronomical equipment to observe the skies with their counterparts in Senegal. This progress owes much to the vibrancy of the Senegalese Association for the Promotion of Astronomy.
R&D Centres and Initiatives

Senegal Space Program
Senegal announced in March 2023 the creation of an agency for space studies, to drive further discoveries of the universe. Maram Kaire, a Senegalese astronaut, will head the agency. The Govt has reiterated the country’s plans to launch the nanosatellite in the third quarter of 2023. Through this satellite, Senegal aims to take advantage of space applications for socio-economic and scientific development and create a thriving local space ecosystem for scientific research and industrial innovation.

Institut Pasteur de Dakar (IPD)

Institut Pasteur de Dakar (IPD) is a biomedical research center, in Dakar City founded in 1896 by Émile Marchoux, a French physician and microbiologist who had studied under Louis Pasteur. The Institut (IPD) is a non-profit foundation of public utility, dedicated to promoting public health and well-being in West Africa. Since its foundation the IPD has been at the forefront of the fight against infectious diseases. The IPD became a Senegalese foundation in 2009, thanks the government of Senegal and the Institut Pasteur in Paris signature of its defined statutes.
Among its main missions, the IPD is responsible for:

- Research.
- Health protection and promotion.
- Providing expertise in public health.
- Education.
- Provide high quality services ranging from clinical diagnosis, human vaccination and food safety testing.
- Production of human vaccines.

**The Centre of Excellence in Mathematics and ICT (CEA-MITIC)**

The Centre of Excellence in Mathematics and ICT (CEA-MITIC) hosted by Gaston Berger University (UGB) of Saint-Louis in Senegal actively develops human capital through masters and PhD programmes, strengthening research capacities in the areas of secure networks and systems with mobility (including the Internet of Things); modeling of complex systems; materials-components-systems; mathematics and modeling; and computer systems and knowledge (including artificial intelligence). MITIC is spearheading the Saint-Louis Digital 2025 project. Green technology and climate are another key area of research pursued at MITIC.

**The African Institute for Mathematical Sciences (AIMS)**

The AIMS is a Pan-African network of Centres of Excellence for postgraduate training in mathematical sciences, research and public engagement in Science, Technology, Engineering and Mathematics (STEM). AIMS is enabling Africa’s talented students to become innovators driving the continent’s scientific, educational and economic self-sufficiency. The Research Centre at AIMS Senegal came into existence in 2013 and its mission is to conduct and foster exceptional research as well as national, continental and international collaborations. It is supported by the German Federal Ministry of Education and
Research via the Alexander von Humboldt Foundation and the German Academic Exchange Service (DAAD). They act as partners in the project to promote networking between AIMS Senegal and German universities as well as with other AIMS Centres.

➢ Photovoltaics in Senegal
  • Solar Photovoltaic Plants

Nearly 540,000 people in Senegal will get access to clean and affordable power following the launch of two solar photovoltaic (PV) plants, financed by IFC, the European Investment Bank and Proparco, under the World Bank Group’s Scaling Solar program.

The two plants that launched operations in June, 2021 are located in Kael and Kahone in Western Senegal and have a total capacity of 60MWac. They will provide energy at tariffs of 3.98 and 3.80 Euro cents per kilowatt hour, respectively – one of the lowest prices for electricity in Sub-Saharan Africa – and will help avoid 89,000 tons of CO₂ emissions per year. The two plants are sponsored by Engie, Meridiam, and the Senegalese Sovereign Wealth Fund for Strategic Investments (FONSIS).
Grand Challenges Senegal

It was launched by the Government of Senegal in October 2022 with a vision to enable the next set of breakthroughs in discovery and translational life science in West Africa, with seed funding from the Bill & Melinda Gates Foundation, Grand Challenges Canada, and ELMA Philanthropies. Grand Challenges Senegal is a not-for-profit innovation fund, hosted by the Institut Pasteur de Dakar (IPD) foundation. The purpose of Grand Challenges Senegal is to advance the ecosystem for public health innovation in Africa. It will deploy grant funding to test new ideas led by innovators working in the region and African scientists in the diaspora. Senegal is rapidly advancing with its strategy to manufacture countermeasures for epidemics, starting with vaccines and diagnostics.
E. HIGHER EDUCATION

Following is the list of national and global ranking of leading Senegal universities:

<table>
<thead>
<tr>
<th>University Name</th>
<th>National Ranking</th>
<th>Global Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Université Cheikh Anta Diop de Dakar</td>
<td>1</td>
<td>3045</td>
</tr>
<tr>
<td>Université Gaston Berger de Saint Louis</td>
<td>2</td>
<td>5837</td>
</tr>
<tr>
<td>Université Assane SECK de Ziguinchor</td>
<td>3</td>
<td>7476</td>
</tr>
<tr>
<td>Université de Thiès</td>
<td>4</td>
<td>11796</td>
</tr>
<tr>
<td>Université Alioune DIOP de Bambey</td>
<td>5</td>
<td>14457</td>
</tr>
<tr>
<td>École Inter Etats des Sciences et Medecine Veterinaires</td>
<td>6</td>
<td>15315</td>
</tr>
<tr>
<td>Centre Africain d’Études Supérieures en Gestión Senegal</td>
<td>7</td>
<td>16189</td>
</tr>
<tr>
<td>École Supérieure Multinationale des Telecommunications</td>
<td>8</td>
<td>16861</td>
</tr>
<tr>
<td>Ecole Supérieure de Commerce de Dakar</td>
<td>9</td>
<td>18752</td>
</tr>
<tr>
<td>ISM Institute Supérieur de Management</td>
<td>10</td>
<td>19261</td>
</tr>
<tr>
<td>MIT University Dakar</td>
<td>11</td>
<td>19924</td>
</tr>
<tr>
<td>École Polytechique de Thies</td>
<td>12</td>
<td>21739</td>
</tr>
</tbody>
</table>

Source: [https://www.webometrics.info/en/Africa/Senegal](https://www.webometrics.info/en/Africa/Senegal)

- **Public universities in Senegal**
  - UCAD: Cheikh-Anta-Diop University
  - UGB: Gaston-Berger University, in Saint-Louis
  - UADB: Alioune Diop University of Bambey
  - UT: University of Thiès
  - UASZ: Assane Seck Ziguinchor University
  - UVS: Virtual University of Senegal
• USSEIN: University of Sine Saloum El Hadji Ibrahima Niass
• UAM: Amadou Mahtar Mbow University

**Private universities in Senegal**

- Amadou Hampaté Bâ University
  Dakar-Bourguiba
- University Sahel University
- Catholic University of West Africa
- Barma University El Hadji Ibrahima Niass University
- Dakar Institute of Technology
- **Enrolment in Centres of Excellence in West Africa, 2014–2018**

<table>
<thead>
<tr>
<th>Country</th>
<th>Lead institution</th>
<th>Focus of centre of excellence</th>
<th>PhD</th>
<th>Master's</th>
<th>Short-term</th>
<th>Total, 2014–2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>Cheikh Anta Diop University</td>
<td>Maternal and infant health</td>
<td>193</td>
<td>168</td>
<td>504</td>
<td>865</td>
</tr>
<tr>
<td>Senegal</td>
<td>University Gaston Berger</td>
<td>Mathematics, informatics and ICTs</td>
<td>204</td>
<td>1,110</td>
<td>42</td>
<td>1,356</td>
</tr>
</tbody>
</table>

Source: UNESCO Science Report 2021

- **Public Expenditure on Education and Higher Education in Senegal as A Share of GDP (2018) Closest Year (%).**

While Senegal spent 4.7% of its GDP on education as a whole, it spent 1.5% of GDP on higher education.

- **Gross Enrolment Ratio in Senegal, 2018**
  - In the 18–25-year cohort, 12.28% are enrolled in higher education.
  - Tertiary enrolment in Senegal by level of study, is depicted in the table below (2018).

<table>
<thead>
<tr>
<th>Post-secondary diploma</th>
<th>Bachelor's degree or equivalent</th>
<th>Master's degree or equivalent</th>
<th>PhD or equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>345</td>
<td>143 621</td>
<td>33 701</td>
</tr>
</tbody>
</table>

  - Rapidly growing demand for higher education is putting pressure on the existing university network. Between 2015 and 2018, gross tertiary enrolment rose sharply from 10.8% to 12.8% of the 18–25-year-old cohort. According to the Ministry of Higher Education, Research and Innovation's Evaluation de la carte universitaire: rapport d'activités 2012–2019, the number of students almost doubled between 2012 and 2018 from 93 866 to 190 145, with 35% enrolled in private institutions.
  - In public universities, about 32% of students (nearly 35 000) were enrolled in STEM disciplines in 2017. This may partly explain why the number of FTE researchers climbed steeply from 362 to 564 per million inhabitants between 2010 and 2015.
• Females constituted 18% of the PhD students in Senegal in 2017
  
  Source: UNESCO Science Report 2021
  
  ❖ **Recent Developments in Higher Education**
  
  To operationalize the Senegal Emerging Plan, a sectoral plan for higher education and scientific research was implemented from 2013 to 2017. This has since been revised and published as a Sectoral Policy Paper for the Development of Higher Education, Research and Innovation covering the period 2018–2022. Both plans have invested massively in infrastructure development to expand the physical capacity of universities and link education, science and industry.

  - Six universities have been extended and rehabilitated;
  - Two universities have been built with a capacity each of 30,000 students: Sine Saloum El Hadji Ibrahima Niass University and Amadou Mahtar Mbow University, the latter specializing in scientific disciplines and having welcomed its first student intake in October 2019;
  - A network of 14 Higher Institutes of Professional Training (ISEP) is being created, beginning with those of Thiès, Diamniadio, Matam, Bignona and Richard Toll;
  - The Virtual University of Senegal was created in 2013 with 20 open digital spaces initially – a further 30 are being built across the country and it has served as a model for Burkina Faso’s own virtual university; and
  - **The City of Knowledge** opened in October 2019 in the new city of Diamniadio near Dakar (Diallo, 2018). This ‘ecosystem’ for the incubation of start-ups groups a House of Science, the local ISEP, the headquarters of the Virtual University, a media centre and administrative offices. The City of Knowledge offers training in robotics, AI, big data, molecular genetics, computer simulations and cybersecurity, the aim being to involve a cross-section of tertiary institutions from Senegal and beyond in giving budding entrepreneurs the skills they need (Diallo, 2018). Diamniadio’s role as a budding technopole led to it being chosen as the site of the
country’s first data centre in 2016, established by the country’s second-biggest telecoms operator, Tigo, at a cost of more than 3 billion FCFA (ca US$ 5 million).

- The Senegal Emerging Plan (2014) provides the national framework for turning Senegal into an upper middle-income country by 2035. The plan has three thrusts: structural transformation of the economy; promotion of human capital; and good governance.

- In order to address underemployment and provide businesses with the skills they need, three flagship reforms are being implemented under the plan:
  - Alignment of graduate skills with the needs of the economy: more than 342 tertiary curricula and skills benchmarks have been revised, a professionalization programme has been developed for universities and a Programme for Youth Entrepreneurship has been launched; it targets both universities and colleges offering technical and vocational training, in addition to young entrepreneurs;
  - Accelerated development of technical and vocational training: a strategic development plan has been developed for the period 2016–2020; and
  - The structuring and promotion of continuing education.
In this section, we provide numerical data about all the science and technology research publications or scholarly output (SO) of Senegal. Note that the SO includes:

- Journal publications
- Book series
- Stand-alone books (including edited volumes, monographs, textbooks and reference works).

- Based on the scholarly output we analyze the last ten years (from 2016 to 2021) data. The data retrieved from Scopus was employed for above purposes.
- Based on Scopus database, Senegal has published a total of 15949 papers over the full period. The majorly comprise of articles (n=12931), conference papers (n=1193), reviews (n=690), book chapters (n=412), letters (n=334), editorials (n=105), notes (n=132),

Source: Web of Science Core Collection | Document type: Articles
errata (n=49), short surveys (n=72), books (n=21), data papers (n=7), and 3 documents was undefined.

1. The per year data of the last ten years i.e. from 2012 to 2021 is presented in the table. It contains, the number of publications or scholarly output (SO), citations, and citations per publications (CPP) of 8363 documents (as shown in the table).
2. The highest documents were published in 2020 (n=1062), followed by 2021 (n=1057) and 2019 (n=907).
3. The total number of citations over the period was 111490, or the CPP was 113.3.
4. Article Field Weighted Citation Impact (FWCI) is another indicator which can be used to present the quality of papers. 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 total FWCI was found to be 1.03 which indicates that the articles received 3% higher citations as compared with global average.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scholarly Output</td>
<td>8363</td>
<td>644</td>
<td>660</td>
<td>691</td>
<td>793</td>
<td>816</td>
<td>842</td>
<td>891</td>
<td>907</td>
<td>1062</td>
<td>1057</td>
</tr>
<tr>
<td>2</td>
<td>Citations</td>
<td>111490</td>
<td>12807</td>
<td>10212</td>
<td>12644</td>
<td>13847</td>
<td>13838</td>
<td>11700</td>
<td>13293</td>
<td>9311</td>
<td>10151</td>
<td>3687</td>
</tr>
<tr>
<td>3</td>
<td>Citations per Publication</td>
<td>13.3</td>
<td>19.9</td>
<td>15.5</td>
<td>18.3</td>
<td>17.5</td>
<td>17</td>
<td>13.9</td>
<td>14.9</td>
<td>10.3</td>
<td>9.6</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>Field-Weighted Citation Impact</td>
<td>1.03</td>
<td>0.83</td>
<td>0.82</td>
<td>1.22</td>
<td>1.04</td>
<td>1.2</td>
<td>0.91</td>
<td>1.1</td>
<td>1.04</td>
<td>0.91</td>
<td></td>
</tr>
</tbody>
</table>
The quality of journals can be used as a Metrix for the quality of research. For the purpose, Scopus has categorized all journals in seven quartile (Q) groups (from Q1 to Q7). Q1 is occupied by the top 1%, and Q7 is occupied by journals in the 75 to 100% group. The per year publications details in different quartile groups are presented in the table. We note that 1067 papers in the last ten years were published in those journals/sources, which do not have citescore data. The per year breakup for the remaining 7296 papers are presented in the table.

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pub in top 1% Sources (Q1)</td>
<td>216</td>
<td>10</td>
<td>11</td>
<td>14</td>
<td>25</td>
<td>23</td>
<td>28</td>
<td>32</td>
<td>21</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>Pub in top 5% Sources (Q2)</td>
<td>930</td>
<td>78</td>
<td>51</td>
<td>74</td>
<td>97</td>
<td>100</td>
<td>95</td>
<td>100</td>
<td>89</td>
<td>128</td>
<td>118</td>
</tr>
<tr>
<td>3</td>
<td>Pub in top 10% Sources (Q3)</td>
<td>1751</td>
<td>143</td>
<td>124</td>
<td>133</td>
<td>164</td>
<td>174</td>
<td>191</td>
<td>184</td>
<td>187</td>
<td>238</td>
<td>213</td>
</tr>
<tr>
<td>4</td>
<td>Pub in top 25% Sources (Q4)</td>
<td>3187</td>
<td>246</td>
<td>251</td>
<td>248</td>
<td>278</td>
<td>291</td>
<td>330</td>
<td>316</td>
<td>346</td>
<td>421</td>
<td>460</td>
</tr>
<tr>
<td>5</td>
<td>Pub in top 50% Sources (Q5)</td>
<td>4705</td>
<td>348</td>
<td>368</td>
<td>351</td>
<td>404</td>
<td>458</td>
<td>485</td>
<td>480</td>
<td>515</td>
<td>623</td>
<td>673</td>
</tr>
<tr>
<td>6</td>
<td>Pub in top 75% Sources (Q6)</td>
<td>6036</td>
<td>458</td>
<td>463</td>
<td>475</td>
<td>537</td>
<td>565</td>
<td>638</td>
<td>600</td>
<td>668</td>
<td>802</td>
<td>830</td>
</tr>
<tr>
<td>7</td>
<td>Pub in top 100% Sources (Q7)</td>
<td>7296</td>
<td>538</td>
<td>560</td>
<td>606</td>
<td>695</td>
<td>699</td>
<td>749</td>
<td>759</td>
<td>810</td>
<td>925</td>
<td>955</td>
</tr>
</tbody>
</table>

In the figure below the overall percentage of publications in Q-groups are described. The highest documents are published in Q5, followed by Q4 and Q6.

For the period 2012-2021, we also described the number of publications in twenty-seven (n=27) major subject areas in the given...
The highest documents and citations were recorded for Medicine i.e. 3260 and 50860, respectively.

<table>
<thead>
<tr>
<th>S#</th>
<th>Subject Area</th>
<th>SO</th>
<th>Citations</th>
<th>CPP</th>
<th>FWCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medicine</td>
<td>3260</td>
<td>50860</td>
<td>15.6</td>
<td>1.22</td>
</tr>
<tr>
<td>2</td>
<td>Agricultural and Biological Sciences</td>
<td>1398</td>
<td>22322</td>
<td>16</td>
<td>1.11</td>
</tr>
<tr>
<td>3</td>
<td>Computer Science</td>
<td>874</td>
<td>3163</td>
<td>3.6</td>
<td>0.51</td>
</tr>
<tr>
<td>4</td>
<td>Social Sciences</td>
<td>836</td>
<td>6473</td>
<td>7.7</td>
<td>0.8</td>
</tr>
<tr>
<td>5</td>
<td>Immunology and Microbiology</td>
<td>829</td>
<td>14959</td>
<td>18</td>
<td>1.16</td>
</tr>
<tr>
<td>6</td>
<td>Environmental Science</td>
<td>775</td>
<td>12398</td>
<td>16</td>
<td>1.1</td>
</tr>
<tr>
<td>7</td>
<td>Engineering</td>
<td>709</td>
<td>4436</td>
<td>6.3</td>
<td>0.76</td>
</tr>
<tr>
<td>8</td>
<td>Mathematics</td>
<td>707</td>
<td>3566</td>
<td>5</td>
<td>0.69</td>
</tr>
<tr>
<td>9</td>
<td>Biochemistry, Genetics and Molecular Biology</td>
<td>683</td>
<td>11449</td>
<td>16.8</td>
<td>1.02</td>
</tr>
<tr>
<td>10</td>
<td>Earth and Planetary Sciences</td>
<td>503</td>
<td>8996</td>
<td>17.9</td>
<td>1.26</td>
</tr>
<tr>
<td>11</td>
<td>Physics and Astronomy</td>
<td>393</td>
<td>4063</td>
<td>10.3</td>
<td>0.87</td>
</tr>
<tr>
<td>12</td>
<td>Chemistry</td>
<td>363</td>
<td>4119</td>
<td>11.3</td>
<td>0.64</td>
</tr>
<tr>
<td>13</td>
<td>Multidisciplinary</td>
<td>329</td>
<td>10590</td>
<td>32.2</td>
<td>1.25</td>
</tr>
<tr>
<td>14</td>
<td>Materials Science</td>
<td>255</td>
<td>2466</td>
<td>9.7</td>
<td>0.61</td>
</tr>
<tr>
<td>15</td>
<td>Economics, Econometrics and Finance</td>
<td>200</td>
<td>1556</td>
<td>7.8</td>
<td>0.75</td>
</tr>
<tr>
<td>16</td>
<td>Veterinary</td>
<td>190</td>
<td>2015</td>
<td>10.6</td>
<td>1.41</td>
</tr>
<tr>
<td>17</td>
<td>Arts and Humanities</td>
<td>162</td>
<td>788</td>
<td>4.9</td>
<td>1.11</td>
</tr>
<tr>
<td>18</td>
<td>Energy</td>
<td>162</td>
<td>2366</td>
<td>14.6</td>
<td>1.01</td>
</tr>
<tr>
<td>19</td>
<td>Decision Sciences</td>
<td>125</td>
<td>562</td>
<td>4.5</td>
<td>0.68</td>
</tr>
<tr>
<td>20</td>
<td>Nursing</td>
<td>121</td>
<td>1772</td>
<td>14.6</td>
<td>0.88</td>
</tr>
<tr>
<td>21</td>
<td>Chemical Engineering</td>
<td>116</td>
<td>1545</td>
<td>13.3</td>
<td>0.86</td>
</tr>
<tr>
<td>22</td>
<td>Pharmacology, Toxicology and Pharmaceutics</td>
<td>113</td>
<td>1528</td>
<td>13.5</td>
<td>0.81</td>
</tr>
<tr>
<td>23</td>
<td>Business, Management and Accounting</td>
<td>109</td>
<td>812</td>
<td>7.4</td>
<td>0.61</td>
</tr>
<tr>
<td>24</td>
<td>Neuroscience</td>
<td>78</td>
<td>782</td>
<td>10</td>
<td>0.85</td>
</tr>
<tr>
<td>25</td>
<td>Psychology</td>
<td>63</td>
<td>957</td>
<td>15.2</td>
<td>1.26</td>
</tr>
<tr>
<td>26</td>
<td>Dentistry</td>
<td>56</td>
<td>277</td>
<td>4.9</td>
<td>0.4</td>
</tr>
<tr>
<td>27</td>
<td>Health Professions</td>
<td>42</td>
<td>235</td>
<td>5.6</td>
<td>0.91</td>
</tr>
</tbody>
</table>

**NOTE:** The total scholarly output (SO) may be different from the sum total of publications (sorted according to Journal classification) because the same publication may be appearing under various classifications, concurrently.

The total number of authors, citations per paper (CPP) and Field Weighted Citation Impact (FWCI) for all 27 areas are described in the preceding table. The total publications of Senegal are 8363.

- The list of top ten most productive universities with number of publications is provided in the table.

<table>
<thead>
<tr>
<th>S#</th>
<th>Institution</th>
<th>SO</th>
<th>Citations</th>
<th>CPP</th>
<th>FWCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Université Cheikh Anta Diop de Dakar</td>
<td>4479</td>
<td>53447</td>
<td>11.9</td>
<td>0.85</td>
</tr>
<tr>
<td>2</td>
<td>Université Gaston Berger</td>
<td>1504</td>
<td>19035</td>
<td>12.7</td>
<td>0.89</td>
</tr>
</tbody>
</table>
• Senegal has published 73.8% documents with international collaboration. The rate of per year % collaboration (from 2012 to 2021) is presented in the figure.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Documents</th>
<th>Citations</th>
<th>Collaboration Rate</th>
<th>Publications Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Centre Hospitalier Universitaire Aristide Le Dantec de Dakar</td>
<td>507</td>
<td>3002</td>
<td>5.9</td>
<td>0.44</td>
</tr>
<tr>
<td>2</td>
<td>Institut Pasteur de Dakar</td>
<td>466</td>
<td>15420</td>
<td>33.1</td>
<td>2.85</td>
</tr>
<tr>
<td>3</td>
<td>Institut Sénégalais de Recherche Agricole</td>
<td>449</td>
<td>8170</td>
<td>18.2</td>
<td>1.22</td>
</tr>
<tr>
<td>4</td>
<td>Hôpital Principal de Dakar</td>
<td>125</td>
<td>1192</td>
<td>9.5</td>
<td>0.58</td>
</tr>
<tr>
<td>5</td>
<td>Hôpital Général de Grand Yoff</td>
<td>102</td>
<td>354</td>
<td>3.5</td>
<td>0.17</td>
</tr>
<tr>
<td>6</td>
<td>Third World Forum Dakar</td>
<td>98</td>
<td>1052</td>
<td>10.7</td>
<td>0.98</td>
</tr>
<tr>
<td>7</td>
<td>Institut Pasteur de Dakar</td>
<td>81</td>
<td>708</td>
<td>8.7</td>
<td>0.84</td>
</tr>
<tr>
<td>8</td>
<td>Third World Forum Dakar</td>
<td>98</td>
<td>1052</td>
<td>10.7</td>
<td>0.98</td>
</tr>
<tr>
<td>9</td>
<td>École Inter-États des Sciences et Médecine Vétérinaires de Dakar</td>
<td>81</td>
<td>708</td>
<td>8.7</td>
<td>0.84</td>
</tr>
<tr>
<td>10</td>
<td>École Inter-États des Sciences et Médecine Vétérinaires de Dakar</td>
<td>43</td>
<td>1063</td>
<td>24.7</td>
<td>1.82</td>
</tr>
</tbody>
</table>

• The data of the top ten collaborating countries is presented in the figure. For example, the highest documents were published in collaboration with France (n=5219).
In 2018 Iran’s Vice-Presidency for Science and Technology and the Senegalese government agreed to forge closer scientific cooperation, especially in the field of nanotechnology.

The International Atomic Energy Agency (IAEA) is working with Senegal to strengthen its ability to respond to pandemics and building its capacity to fight cancer. Increased cooperation is being discussed under the Zoonotic Disease Integrated Action (ZODIAC) initiative, which seeks to help countries respond to future pandemics, and Rays of Hope, an upcoming initiative to increase access to cancer care in Africa.

**Franco-Senegalese Cooperation**

- **Franco-Senegalese Campus:** This Campus opened in 2019 and now has almost 700 students, in some 30 different programmes. The programmes offered, managed jointly by French and Senegalese higher education establishments, enable students to acquire skills in fields directly tied in with the world of work and sustainable development. These university hubs enable African students to obtain dual diplomas awarded jointly by French and African establishments, while continuing to study in Africa. They also aim to receive more French students and develop international cooperation.
Space Cooperation: The French national space agency, Centre National d'études Spatiales (CNES), and the Senegalese Ministry for Higher Education, Research, and Innovation signed a space cooperation roadmap in Dakar, Senegal, on 12 December 2019 to partake in the events marking the 60th anniversary of the Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA). The new roadmap enables France and Senegal to collaborate in the areas of Earth observation, the use of satellite imagery and applications to study ecosystems, human capacity development and the International Charter on Space and Major Disasters.

Africa-France Scientific Collaboration in Agriculture: On the sidelines of the New Africa-France Summit in Montpellier, the CEO of CIRAD, the French agricultural research and cooperation organization, and the CEO of INRAE, announced that they are actively working together, with some 20 African agricultural research bodies, to develop a joint study, training and innovation programme. The programme will focus on the themes of agroecology, preserving natural resources, health, food security, developing territories and jobs. Senegal is represented in this program by ISRA (Senegal Agricultural Research Institute), the Université Cheikh Anta Diop, and CORAF (West and Central African Council for Agricultural Research and Development).

The Franco-African research initiative TSARA
The TSARA initiative aims to stimulate a portfolio of original research, training and innovation projects, jointly developed by African and French institutions and that is both of high quality and geared towards impact and training for rural and urban actors, as well as support for public policies. Since March 2022, 8 thematic groups have been working through webinars, each gathering up to 60 participants from the 19 members and with potential new partners, in order to draw up an inventory of scientific knowledge and to list the priorities to be addressed in the following areas: soil, water and forests under climate change; the agro-ecological transition of agriculture and livestock farming; food system sustainability; human, animal and landscape health; work and employment.
Patent Activity

Senegal's patent activity is depicted in above graph. It is clear that there is no systematic trend, with the number of awarded patents being a maximum of 544 in 2017 and being in the 300-337 range thereafter. As the following table illustrates the major portion of the patents are attributed to the ‘abroad’ category indicating that innovative activity within Senegal itself is very highly limited. Nor are the foreign investors in Senegal contributing to new patents in any noticeable way.
Total Patents granted (Resident, Non-Resident and Abroad)

<table>
<thead>
<tr>
<th>Year</th>
<th>Resident</th>
<th>Non-Resident</th>
<th>Abroad</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>19</td>
<td>-</td>
<td>305</td>
<td>324</td>
</tr>
<tr>
<td>2015</td>
<td>12</td>
<td>-</td>
<td>192</td>
<td>204</td>
</tr>
<tr>
<td>2016</td>
<td>7</td>
<td>-</td>
<td>112</td>
<td>119</td>
</tr>
<tr>
<td>2017</td>
<td>32</td>
<td>-</td>
<td>512</td>
<td>544</td>
</tr>
<tr>
<td>2019</td>
<td>18</td>
<td>-</td>
<td>289</td>
<td>307</td>
</tr>
<tr>
<td>2020</td>
<td>21</td>
<td>-</td>
<td>337</td>
<td>358</td>
</tr>
</tbody>
</table>


**Global Innovation Index**

[Bar chart showing Global Innovation Index scores and rankings from 2011 to 2021.]

*Source: Global Innovation Index - WIPO*

Senegal's Innovation Ecosystem and its comparative status (ranking) are depicted in the above graph. It is clear that its ranking has slightly dropped between 2011 and 2021, reaching an all-time best of 84 in 2015. Its GII score depicts the same trend declining from 27 to 23 over the same period. Hence it appears on the basis of this index that Senegal's reforms in the innovative sphere have yet to make their mark.

**Techno Parks, Incubation Centres**

- Within the framework of the Senegal Emergent Plan (Plan Sénégal Émergent-PSE), the Ministry of Communications of Senegal has adopted a policy to stimulate the development of the ICT (Information and Communication Technologies) sector. The national ICT strategy aims to promote the creation of an attractive space for investment, as well as access to ICTs for the society in general.
• **Diamniadio Senegal Technology Park Development Project, Dakar** with above considerations in mind, the Government is promoting the construction of the Digital City project, an urban hub in which digital services are the main driving force for economic growth. This new hub, 35 km from Dakar and close to the new international airport (AIDB), aims to place the digital economy at the heart of the new administrative and business city of Diamniadio. The total investment is 70 million euros, of which 61 million is financed by the African Development Bank and 9 million from the Government of Senegal. The objective is to create a digital platform in an area of 25 Ha in the Diamniadio economic zone, with ICT office spaces for the public and private sector, including international companies. The first phase includes the design and construction of 33,000 m² of offices, incubators, teaching and research centres and a Tier III data centre integrated into the area. The project aims to place the emerging digital economy of Senegal at the heart of the new administrative and commercial city of Diamniadio.


➢ **Senegal: Digital Ecosystem and Startups**

Senegal has a rich digital ecosystem that ranks it 4th among African countries in terms of innovative startups. To strengthen the competitiveness of its digital ecosystem, the government is taking major initiatives to address the remaining constraints in the business environment. In late 2019 the bill on the creation and promotion of startups was drafted in Senegal through a Startup Act. Moreover, the financing environment for ICT businesses is strengthened by the operationalization of the DER/FJ in 2018. In addition, Senegal has a limited framework for supporting startups which is developing thanks to the implementation of the Digital Technologies Park (PTN). On the other hand, the investment efforts made by the government and private actors
have enabled Senegal to acquire some of the most advanced telecommunications infrastructure in West Africa. The country has thus risen to 14th place in Africa for Digital infrastructure.

Source: https://www.innovationagency.go.ke/uploads/php6EZ8II.pdf

❖ Financing Innovation

➢ **The Fonds d’Impulsion pour la Recherche Scientifique et Technique (FIRST)** (Fund for Scientific and Technical Research) was established in 1973 by the Ministry of Scientific Research to support economic growth through research.

➢ **The Grand Prix du Président de la République pour les Sciences et la Technologie (GPRST)** (The President of the Republic's Grand Price for Science and Technology) is a national distinction whose objective is to reward the researchers who have particularly distinguished themselves by their creativity, the importance or the originality of their works.

➢ **The Fonds National de Recherches Agricoles et Agro-alimentaires (FNRAA)** (National Fund for Agricultural and Agro-Food Research) was created on February 4, 1999, as an association of public utility whose purpose is to finance, with the available resources, agricultural and agrofood research projects considered as priorities by the State, the National Agricultural Research System agro-silvo-pastoral (SNRASP), the development partners and the users of the research results.

➢ **The Fonds de Promotion de l’Industrie Cinématographique et Audiovisuelle (FOPICA)** (Fund for the Promotion of the Cinematographic and Audiovisual Industry) was established by the law 2002-18 of April 15, 2002.

➢ **Fonds de Financement Formation Professionnelle et Technique (3FPT)** (Fund for Financing Professional and Technical Training) was created by decree 2014-1264 of 7 October 2014. This fund, which replaces the former FONDEF, was set up as part of the reform of the financing system for vocational and technical training.
➢ **Délegation à l'Entrepreneuriat Rapide (DER)** (Delegation for Rapid Entrepreneurship) was created on a presidential decision since December 2017, this mechanism was set up to reduce youth and women's unemployment by promoting entrepreneurship and employment.

➢ Another important development is the creation, **by the Law No. 2017-06 of 6 January 2017 of the Special Economic Zones**, which is related to the Government objective of achieving the objective of Axis 1 of the PSE: the structural transformation of the economy. The first project of the Zone économique spéciale intégrée (ZESI)37 was launched in 2016. It is built on 90 hectares with a 50-hectare industrial park, office space or a logistics platform. A second integrated special economic zone is being developed in Sandiara in the department of Mbour (Thiès).


➢ In addition, a National Council for Higher Education, Research, Innovation, Science and Technology is being set up to serve as a think tank on national research policy. The government is also transforming its Investment Fund for Scientific Research, which offers competitive research grants, into a National Fund for Research and Innovation (MESRI du Sénégal, 2018). In 2012 and 2013, the government established two investment funds dedicated to supporting innovative SMEs: the Guarantee Fund for Priority Investments (FONGIP) and the Sovereign Fund for Strategic Investments (FONSIS, Box 18.4 on previous page).

Source: UNESCO Science Report 2021
I. COMBATING THE COVID-19 PANDEMIC

❄ Self Reliance in Vaccine Development, Diagnostics and Management

➢ Senegal Facility to Start COVID Vaccine Production
The Pasteur Institute in Dakar has partnered with BioNTech to build a production facility for its mRNA vaccines. Africa currently imports 99 percent of all its vaccines. The new facility can produce up to 300 million COVID doses annually. The institute hopes to manufacture vaccines not just for the next pandemic, but also for endemic diseases, such as measles and polio. Doses would be distributed throughout West Africa and perhaps even the entire continent.
Source: https://www.voanews.com/a/6434723.html

➢ COVID-19 Testing Kits
The Institut Pasteur in Dakar signed a partnership for the production of rapid test kits with the innovative British biotechnology company Mologic. The test kits, which would be manufactured in Dakar by DiaTropix - a platform specializing in innovations related to epidemics and launched in 2018 - can be used without requiring special training, electricity, or laboratory. Rural communities in Senegal, where access to electricity can sometimes be difficult, will particularly benefit. The test kits, would be available for just a dollar, or 5 to 20 times cheaper than the molecular
tests currently performed, will be able to diagnose Covid-19 in just 10 minutes.

➢ **Robot Doctors**
The Ecole Supérieure Polytechnique de Dakar has created “Docteur Car”, a multifunctional robot that will enable caregivers to treat patients without running the risk of being contaminated. Guided by a mounted camera and controlled via an app, doctors will also be able to communicate with patients through the robot, allowing them to treat people isolated in hard-to-reach rural areas. Not only will this innovative technology be able to prevent the spread of coronavirus, it even speaks several languages.

![Students at Dakar's Ecole Superieure Polytechnique with some of their innovations](image)

There are also automatic hand gel dispensers, protection visors made in these labs. Citizens also launched the SN 3D COVID 19 collective to produce tools to support healthcare workers (protective visors, alcohol hand gels, ventilators, etc.).

➢ **Making Effective Use of Available Resources**
Another area in which innovation has made a difference is in the development of affordable ventilators. At the onset of the pandemic, an urgent need for more ventilators was apparent, as there were only 50 in the entire country, which has a population of around 16 million. Thankfully, a means to mitigate this shortage was found, as 3D printers were used to produce new ventilators at a fraction of their conventional cost.
Digital Technology and ICT to combat the Pandemic

The “Alerte Santé Sénégal” App
After the first COVID-19 cases in Africa, Senegalese innovators created an app called “Alerte Santé Sénégal” (Senegal Health Alert). The App works by providing the public with the latest fact-checked information on the spread of COVID-19, Alerte Santé Sénégal helps combat the spread of fake news, ensuring that official information is readily available for the public. Alerte Santé Sénégal aims to provide information and statistics on all diseases based solely on official sources, namely the Ministry of Health and Social Action of Senegal, the Centre des Opérations d’Urgence Sanitaire (COUS), and the World Health Organisation.

Digital Platform for Communication
A digital platform called “Sunucity” allows local authorities and citizens to communicate. It includes an incident reporting feature, which has enabled populations to report any incidents that occur in their surroundings, such as a suspected case of COVID-19. The app also allows local authorities to communicate back with the public and inform them of any important notices. This digital innovation has helped ensure people in Senegal are aware of the latest news pertaining to coronavirus, and can hear about potential tools and solutions at the ministry and state level.

Source: https://www.one.org/international/blog/innovations-senegal-covid-19/

The Covid-19 Dashboard: The Open Knowledge Senegal community launched the COVID-19 Dashboard which centralizes epidemic data in Senegal and is easy to consult and download.

Engineers from the Polytechnic School of Dakar (ESP) created the SunuCity mobile app. It backs up the work of the Ministry of Health by publishing official information and lets users report any sanitary incident or risk of exposure verbally, by uploading photographs or by geolocation.

In the realm of healthcare, the State Information Agency (ADIE) launched Dr. Covid, a WhatsApp virtual doctor that provides useful
information and answers questions about coronavirus. It helps the Ministry of Health and Social Action of Senegal inform its citizens.

Finally, researchers from the Gaston Berger University (UGB) of Saint Louis collected data for two months and put together an algorithm to predict cases based on historical data. This work makes it possible to predict how the virus will evolve in Senegal, which is helpful for the Ministry of Health.

The Senegalese ICT sector is actively contributing to Senegal's efforts to combat Covid-19. In addition to financial support, industry players also contribute their technical knowledge and logistical skills. Sonatel, which is the most important player in the fixed and mobile telephony segments in the country, gives students the opportunity to activate a 1 GB education pass free of charge and a package valid for 30 days. This package gives access to educational content via partners such as the Virtual University of Senegal, the Virtual University of Tunisia and the National Center for Distance Education (CNED).

Innovative projects using data to combat covid-19: AFD, Expertise France and The GovLab launched call for projects that use data to combat Covid-19. The goal is to unlock the potential of under-exploited data, as part of the #Data4COVID19 challenge – with a focus on Africa. This call for innovative, data-based proposals aims to address the economic, social and health challenges caused by Covid-19 across the continent. Some 80 project proposals were submitted, and reviewed, with the help of a panel of independent data science experts. Project winners obtain funding (the total budget for the seven projects is €567,000), and will gain access to an online platform through which they can interact directly with data science experts to discuss their work, find solutions collectively to the challenges faced, and share results.