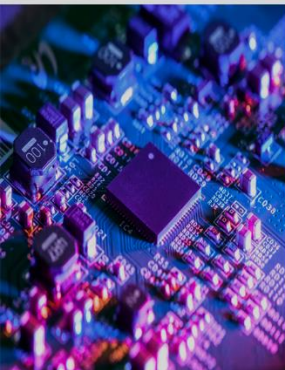
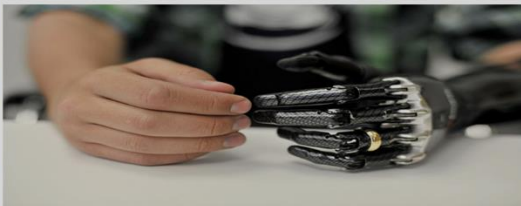
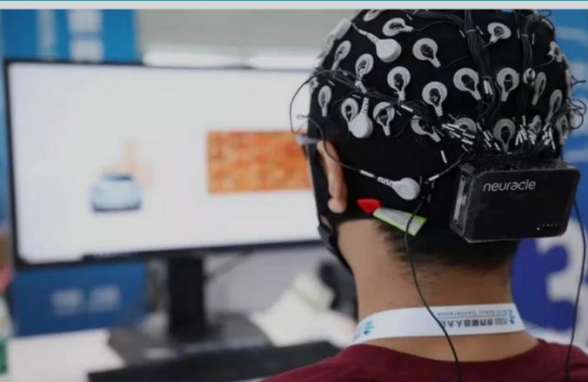




INDONESIA

STI Profile of the OIC Member State

Science, Technology and Innovation Indicators



COMSTECH

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FOREWORD

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

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

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

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

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

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

CONTENT DISCLAIMER

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INDONESIA an archipelago straddling the equator, is located between the Indian Ocean and the Pacific Ocean, consists of total number of 17,508 islands of which about 6000 are inhabited. Indonesia shares land borders with Papua New Guinea, East Timor, and the eastern part of Malaysia, as well as maritime borders with Singapore, Vietnam, Thailand, the Philippines, Australia, Palau, and India (Andaman and Nicobar Islands). It is the 14th largest country by area with the total area of 1,919,443 square kilometers and have 54,720 km long coastline.



Indonesia is a presidential, constitutional republic with an elected legislature. Indonesia is the world's fourth most populous nation with the population of 275.3 million (In 2020). Jakarta, the capital of Indonesia is the world's second most populous urban area. It is a country with the world's highest levels of biodiversity. Java is one of the largest islands of Indonesia with some 130 million inhabitants and it is also considered the most fertile land of the country. Indonesia's geography comprises of tropical rainforests and jungles, swampy mangrove areas, fertile lands, and high mountains. Many of the mountains are active volcanoes.

It is the world's most populous Muslim-majority country but it comprises numerous other religious groups, which include Hindus, Christians,

Buddhists and Confucianists. Ethnically, Indonesia is a highly diverse country with over 580 languages and dialects. Indonesian also referred as Bahasa Indonesia is the official language and spoken by over 94% of the population. Comprising large number of islands, the country is united as one nation through the concepts of “gotong royong” (Mutual Assistance) and “Musyawarah” (consultations) to achieve a “mufakat” (consensus) on any matter. Indonesia is rich in handicrafts and several forms of handicrafts are practiced there which include woodcarvings for ornamentation and furniture, silverwork and engraving, filgree, and clay, stones & wood sculptures. The batik process of waxing and dying was also originated in Java many centuries ago. 90% of Indonesia's population is engaged in agriculture and they mostly grow rice, cassava, peanuts and rubber.

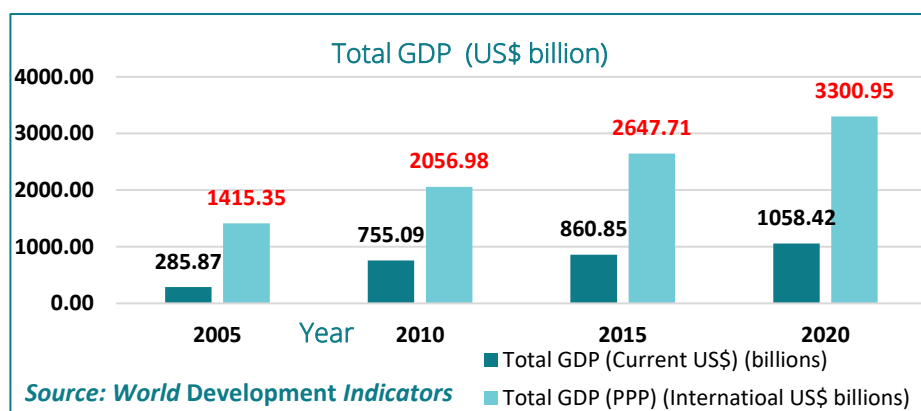


Indonesia is considered as a middle power in global affairs and a member of most of the major inter-government organizations, including the Organization of Islamic Cooperation (OIC), United Nations (UN), World Trade Organization, G20, and a founding member of the Non-Aligned Movement, Association of Southeast Asian Nations, and East Asia Summit.

Sources include: World Bank; <https://www.embassyofindonesia.org/basic-facts/>; Wikipedia.



A. ECONOMIC OVERVIEW

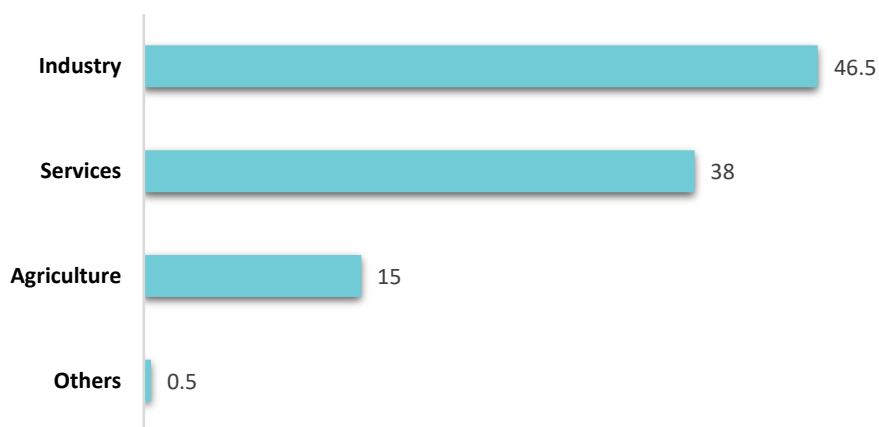


- ❖ Indonesia is the largest economy in Southeast Asia. In terms of purchasing power parity, it is the 10th largest economy in the world and a member of the G-20. In 2005, Indonesia's GDP per capita value was US\$ 1263.28, which increased by approximately three folds and reached the value of US\$ 3869.588 in 2020. The highest value for GDP per capita was US\$ 4135.20 in 2019. Between 2005 and 2019, the total GDP of Indonesia increased by almost 133% in terms of current US dollars, while in terms of the purchasing power parity the total GDP increased by almost 270%.
- ❖ In 2019, Indonesia imported a total of \$164 billion meanwhile exported the total of \$186 billion worth of products. The top

exports of Indonesia are Coal Briquettes (\$20.3B), Palm Oil (\$15.3B), Petroleum Gas (\$8.32B), Cars (\$4.52B), and Gold (\$4.01B), exporting mostly to China (\$28.6B), United States (\$19.2B), Japan (\$16.8B), Singapore (\$14.6B), and India (\$13.6B). Major countries importing Indonesian products are China (\$28.6B), United States (\$19.2B), Japan (\$16.8B), Singapore (\$14.6B), and India (\$13.6B).

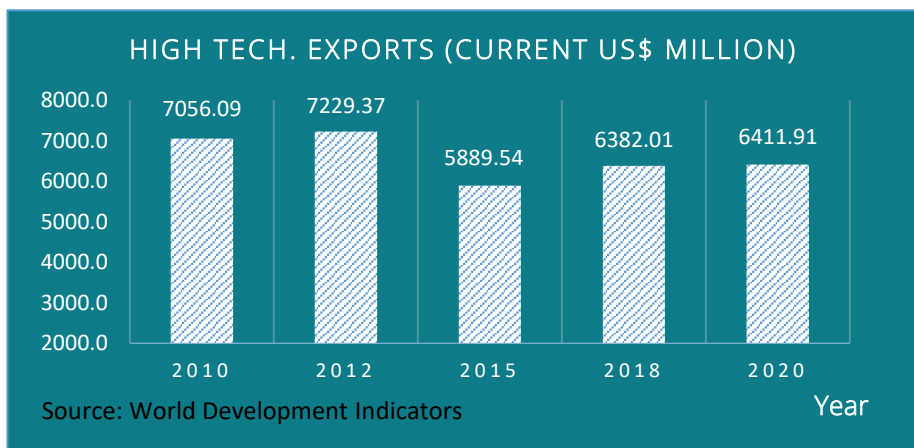
Source: <https://oec.world/en/profile/country/idn>

GDP share by economic sectors of Indonesia Year 2021 (%)



- ❖ The accompanying figure shows that Industry (46.5%) sector accounts for the largest share of Indonesia's GDP. 24% of the total GDP growth is produced through Manufacturing which is the part of the Industry sector. Services contributed to 38% of total GDP which constituted the major share from trade, hotel and restaurants (around 14% of GDP), while other services include transport and communication (7% of GDP), finance, real estate and business services (7% of GDP) and government services (6% of GDP). 15% share of the total GDP was accounted from Agriculture sector.

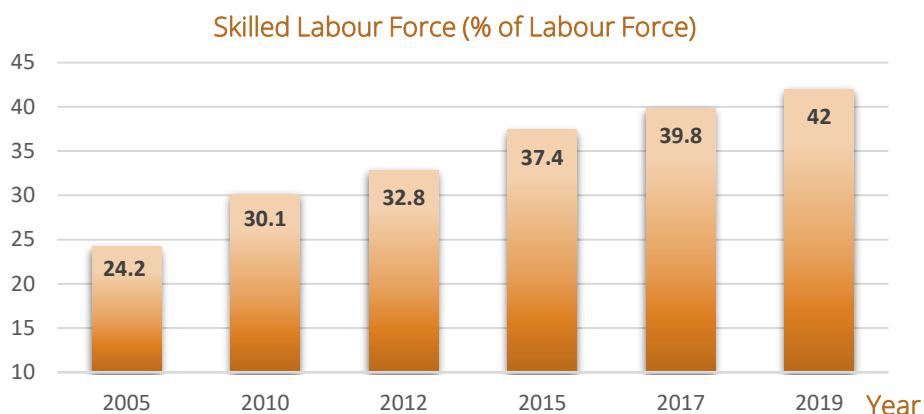
Source: <https://tradingeconomics.com/indonesia/gdp-growth-annual>



- ❖ In 2012, high technology exports were at the highest value of the past 10 years i.e. US\$ 7229.37 million. Between 2012 and 2015, the trend of high technology exports depict the slump in the value by 22% and reached the lowest value of US\$ 5889.54 million. After 2015, the trend started increasing and by the end of 2020, the value increased by around 9% and reached US\$ 6411.91 million. The curbs of COVID-19 pandemic did not let the trend slump again due to good economic policies. Indonesia is the only OIC member state who has WHO authorization to export vaccines around the world. Bio Farma is the state owned enterprise and major vaccine manufacturer in Indonesia.



B. SOCIAL AND HUMAN DEVELOPMENT



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

- ❖ Indonesia has very significantly improved the skill level of its workforce. In 2005, Indonesian skilled labour force was 24.2% of total labour force, which has steadily increased to 42% of total labour force in 2019.
- ❖ In 2020, Literacy rate of adult males was 97.4% while for adult females it was 94.6%. Overall literacy rate was 96%. In 2019, Indonesia's government expenditure on education was 2.8% of total GDP.
- ❖ Total life expectancy at birth increased from almost 67 years in 2005 to over 71 years in 2019. In 2015, maternal mortality ratio

per 100,000 live births was 359 which reduced to the value of 305 per 100,000 live births in 2021.

- ❖ Gender Development Index (GDI) is increasing steadily and reached 0.94 in 2019.
- ❖ In 2005, the percentage of people using internet was just 3.6% but it increased to the value of 53.7% in 2020. In 2019, Electricity was accessible to 98.85% of the population.
- ❖ In 2010, 13.3% of population was below national poverty line, which reduced to 9.2% in 2019, which is one of many positive indicators that depicts Indonesian social and human development.



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

- ❖ **Ministries and Organizations responsible for Science, Technology and Higher Education:**
- **Ministry of Education, Culture, Research and Technology, Indonesia:** It is responsible for assisting the President of the Republic of Indonesia in formulating national policies and implementing coordination in the field of research, science, technology culture and education, with the vision of establishing Science and Technology as the main force for sustainable prosperity and national culture.
- **National Research and Innovation Agency, Badan Riset dan Inovasi Nasional (BRIN), Indonesia:** BRIN aims to improve the lifestyle of Indonesians by improving Science and Technology Capability, Research Culture, and Creating Innovation through improving the Quality of Science and Technology Human Resources, Strengthening Economic Transformation, and Sustainable Development based on Science and Technology Culture to Increase Competitiveness.

Source: <https://www.brin.go.id/>

❖ **Policy Frameworks:**

➤ **National Development Agenda:**

The RPJMN, 2020–2024, which is the part of the National Long-Term Development Plan (RPJPN), 2005–2024, mandates the goal of achieving prosperous, fair, and sustainable development of Indonesia by 2024. Under the umbrella of THE RPJMN 2020 - 2024, BRIN set the vision to establish a National Research and Innovation Agency. The strategic goals of the National Research and Innovation Agency in the 2020-2024 period are:

1. Increased Productivity of Inventions and Innovations to Strengthen Competitive and Sustainable Economic Transformation.
2. Increasing Good Governance in the Context of Bureaucratic Reform.

Source: <https://www.brin.go.id/>

➤ **National Strategy for Artificial intelligence 2020 - 2045:**

Indonesian government realized the importance of the usage of cutting edge technologies and how it can impact the country's economic growth. Artificial Intelligence is a popular cutting edge technology around the world, so Indonesian government also compiled National Strategy to use Artificial Intelligence based applications in the country. National Research and Innovation Agency (BRIN) is the responsible authority for implementing this strategy. This will bring disruptive changes in the technological structure of the country if properly implemented.

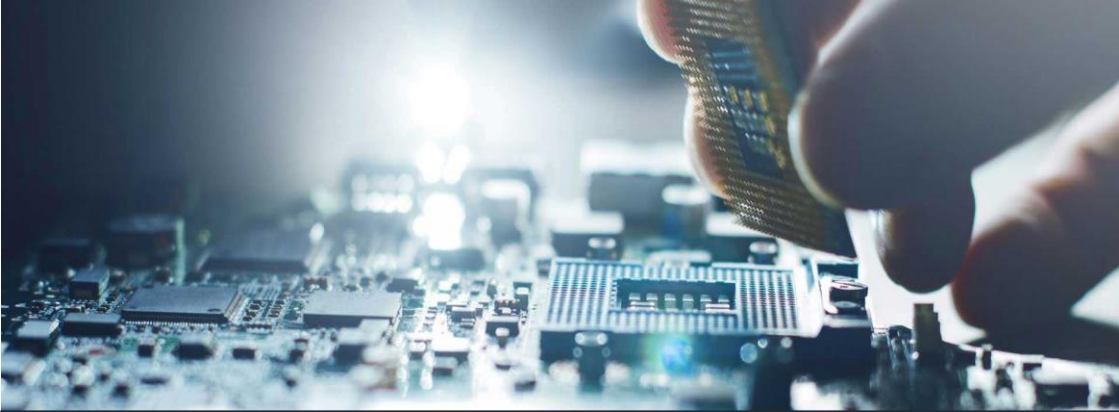
There are four key focus areas of AI Strategy:

1. Industrial research & innovation for the development of research ecosystem and AI innovation platform in order to accelerate bureaucratic and industrial reforms, infrastructure & data development.

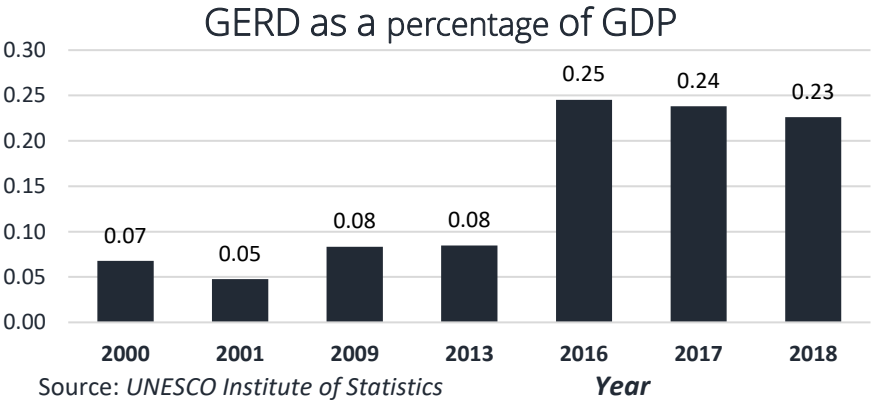
2. Create a data ecosystem and supporting infrastructure for AI to contribute to national priorities.
3. Nurture AI talent that is competitive and has good character.
4. Ethics & policies to create ethical artificial intelligence in accordance with national values.

❖ Following are the names of few major research centers/institutes of Indonesia contributing to different research areas of S&T:

1. Aeronautics and Space Research Organization-LAPAN
2. Assessment and Application of Technology Research Organization-BPPT
3. Balai Penelitian Ternak, Ciawi, Bogor
4. Center for International Forestry Research
5. Earth Sciences and Maritime Research Organization
6. Eijkman Molecular Biology Research Center
7. Electronics and Informatics Research Organization
8. Energy and Manufacture Research Organization
9. Engineering Science Research Organization
10. Food and Agriculture Research Organization
11. FORDA-MOF
12. Health Research Organization
13. Indian Committee for Scientific Investigations
14. KPTT Agricultural Training Center
15. Nanotechnology and Material Research Organization
16. National Archaeology Research Institute (Indonesia)
17. National Institute of Health Research and Development (Indonesia)
18. Nuclear Power Research Organization-BATAN
19. Social Sciences and Humanities Research Organization

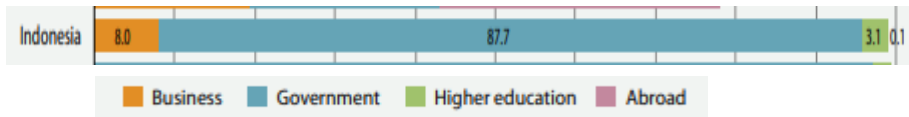


D. RESEARCH AND DEVELOPMENT



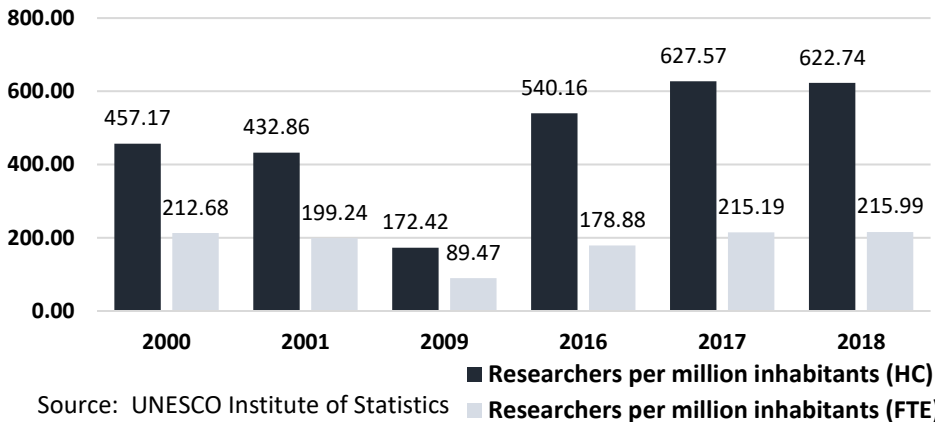
❖ The trend of Indonesia’s investment in Research and Development as manifested in its Gross Expenditure on Research and Development (GERD) depicts not much noticeable growth before 2013 but later on the GERD increased over 3 folds and reached at the peak value of 0.25% in 2016. Between 2016 and 2018, it started decreasing slowly with time and reached to the value of 0.23% of GDP. In 2019, the Indonesian government after realizing the importance of expenditure in R&D and its impact on socio-economic growth of the country, introduced a 300% tax reduction on research expenditure for firms.

❖ GERD by source of funds in Indonesia, 2018



In 2018, the government sector of Indonesia has been a major source of fund in R&D by contributing the 87.7% share of total GERD. 8% funds were contributed by Business sector while 3.1% funds were contributed by higher education sector.

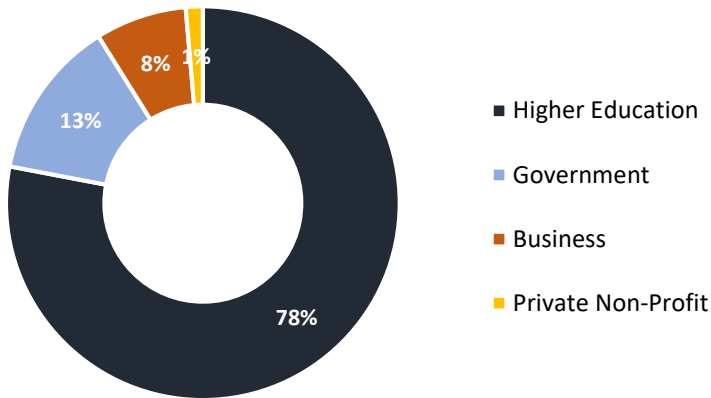
Researchers per million inhabitants (HC & FTE)



❖ Researchers Intensity:

The number of researchers per million (Head Count, HC) has increased over three folds between 2009 and 2016 while in the same period the number of full-time equivalent (FTE) researchers has increased by approximately 2 folds. Both values kept increasing with time and reached to the number of 622.74 researchers per million inhabitants (HC) and 215.99 researchers per million inhabitants (FTE).

Researchers(FTE) by sector of employment in Indonesia, 2018 (%)



Source: UNESCO Science Report 2021

- ❖ In the year 2018, highest number of researchers (FTE) i.e. 78% were employed by higher education sector which depicts that this sector performs the major share in the R&D, while 13.1% were employed by the government sector. Meanwhile lesser percentages, viz. 7.7% and 1.4% were employed by Business and Private Non-Profit sector, respectively.
- To increase the performance of Indonesia's research and innovation, **2017-2045 The National Research Master Plan (RIRN)** was introduced. The RIRN promotes two abstract goals:
 1. To create an innovative Indonesia society, on the basis of science and technology.
 2. To create the nation's global, competitive excellence.

❖ **Key Areas of Focus:**

➤ **Vaccine Development:**

- **PT Bio Farma (Persero):** An Indonesian state-owned enterprise, Bio Farma is the major indigenous vaccine manufacturer of Indonesia based in Bandung, West Java. They have been actively supplying high quality vaccines and serum, which include vaccines against measles, polio, hepatitis B, and pentavalent vaccine. Bio Farma has an outstanding international reputation based on the WHO prequalification for all of its vaccine products and has also implemented green industry and is environment friendly. World Health Organization (WHO) acknowledges that Bio Farma vaccine products are of high quality, efficacious, and affordable.

Source: <https://www.kebijakankesehatanindonesia.net/>



- **OIC Center of Excellence on Vaccines and Biotechnology Products:**

In 2011, during the OIC's Islamic Conference of Health Ministers (ICHM) in Kazakhstan, it was decided to start the establishment of CoE for Vaccines and Biotechnology Products. In 2017, the 6th ICHM recognized Indonesia as OIC COE on Vaccines and Biotechnology Products and approved its TOR. In 2018, The Center of Excellence (COE) on Vaccines and Biotechnology Products was officially launched by the Minister of Health of the Republic of Indonesia.

- **Objectives and Expected Result of OIC COE:**

- To achieve self-reliance on vaccine and biotechnology production in OIC region.
- To develop low-cost and affordable vaccines and biotechnology products for protection against diseases of global public health importance especially in OIC member states.
- To collaborate with scientists, research institutions and vaccine manufacturers from OIC member states and collaborate with international institutions for technology transfer.
- Disease burden and health economic studies to provide evidence of the demand for vaccines and biotechnology products.
- Building capacity in vaccines and vaccination amongst OIC member states.

Source: <https://farmalkes.kemkes.go.id/coe-oic-secretariat/>

➤ **Conservation of Biodiversity:**

Indonesia is one of the most biologically diverse countries in the world. It is one of the 17 global “Megadiversity Countries” that together contain 70% of the world’s biodiversity. The country’s coral reefs, tropical forests, and mangrove ecosystems support what is generally recognized as one of the greatest concentrations of biodiversity on earth. The Indonesian Institute of Sciences (LIPI) was formed with



the primary objective to conserve biodiversity in Indonesia. LIPI established the Research Center for Biology (RCB), which is composed of zoological, botanical and microbiological division. RCB formulates a national biological research policy and plays an extensive role in the overall monitoring & evaluation of biological research activities as well as implementing specimen management and fundamental research. The Japanese government also grant aid to RCB so that they can fulfill the following goals:

- a) Strengthen the capacity to store plant and microorganism specimens.
- b) Consolidate the research facilities, which are currently scattered.
- c) Add the capacity of environmental education.

Source: <https://www.jica.go.jp/indonesia/english/activities/activity15.html>



❖ **R&D in private sector:**

- **PT. Meiji Indonesian Pharmaceutical Industries** is involved in research and development with the focus on producing antibiotic, skin care and health supplement products since 1974.
- **Shell plc Indonesia** has launched **The Shell Graduate Programme** to promote Research and Development in Indonesia. During this 2 and a half year programme, the selected graduate experience real-life assignment-based projects designed to broaden their development within R&D. They get the chance to work on exciting engineering projects, using and developing state-of-the-art technology.

Source: https://www.shell.co.id/en_id/careers/students-and-graduates/degree-matcher/research-and-development.html



E. HIGHER EDUCATION

❖ Following are the QS University Rankings of Indonesian universities:

University Name	National Ranking	Global Ranking
<i>Gadjah Mada University</i>	1	254
<i>University of Indonesia</i>	2	305
<i>Institute of Technology Bandung</i>	3	313
<i>Airlangga University</i>	4	521-530
<i>Bogor Agricultural University</i>	5	531-540
<i>Sepuluh Nopember Institute of Technology</i>	6	751-800
<i>Bina Nusantara University</i>	7	801-1000
<i>Padjadjaran University</i>	8	801-1000

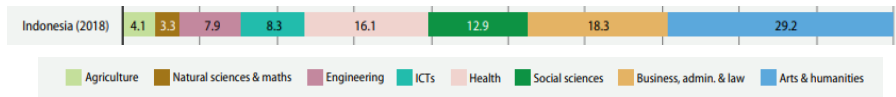
Source:

<https://www.universityrankings.ch/results?ranking=QS®ion=World&year=2021&q=Indonesia>

❖ *The International Association of Universities lists a total of 1258 higher education institutions.*

https://www.whed.net/results_institutions.php

❖ Distribution of tertiary graduates in Indonesia by programme, 2018 (%)



In 2018, the highest concentration of Indonesia's tertiary graduates were in the field of Art & Humanities (29.2%). The second higher concentration was in Business, Admin & Law (18.3%), while the fields of Health and Social Sciences comprised 16.1% and 12.9% tertiary graduates, respectively. Comparatively, a smaller percentage is in the field of Engineering (7.9%). The remaining percentage is distributed in fields such as Agriculture (4.1%) and Natural Sciences & Maths (3.3%).

- ❖ The public education spending as a percentage of GDP has stagnated in Indonesia over the past decade and remains well below recommended levels for emerging economies. In 2016, the percentage of Indonesians over the age of 25 that had attained at least a bachelor's degree was just under 9%, low compared to other member states of the ASEAN.
- ❖ Despite being the world's fourth-largest country in terms of population, Indonesia was only the 22nd largest sender of international students worldwide in 2017, making up less than 1 percent of the more than 5 million students studying abroad that year. But the demographic and socio-economic factors suggest that Indonesia will play a major role in international education in the coming years because it not only has by far the largest student age population in the ASEAN, it also has the third-largest population under the age of 25 in the entire world. All these figures indicate that Indonesia has a substantial pool of potential international students.

Source: <https://wenr.wes.org/2019/03/education-in-indonesia-2>

❖ **Lemb Pengelola Dana Pendidikan (Indonesia Endowment Fund for Education), LPDP** is the government entity which works as the fund management agency and aims to:

- Prepare Indonesia's future leaders and professionals through education funding.
- Promote strategic research and/or innovative, value-added, and practical research through research funding.
- Ensure the continuity of education funding for the next generation through optimal management of the education endowment fund.

LPDP also manages the scholarship program named **Indonesian Education Scholarship (BPI)** for Master and Doctoral Programs, funded by Indonesian government through the use of the National Trust for Education Development (DPPN). At the end of 2021, LPDP is mandated to manage endowments other than DPPN, namely the Research Endowment Fund, Culture Endowment Fund and Higher Education Endowment Fund.

Source: <https://lpdp.kemenkeu.go.id/en/tentang/visi-misi/>



❖ **Following are the names of some engineering universities of Indonesia:**

- Bandung Institute of Technology, Bandung.
- University of Indonesia, Depok.
- Sepuluh Nopember Institute of Technology, Surabaya.
- Gadjah Mada University, Sleman.
- Diponegoro University, Semarang.
- Bogor Agricultural University, Bogor.
- Sebelas Maret University, Surakarta.
- Brawijaya University, Malang.
- Syiah Kuala University, Banda Aceh.
- University of North Sumatra, Medan.
- Telkom University, Bandung.
- Andalas University, Padang.

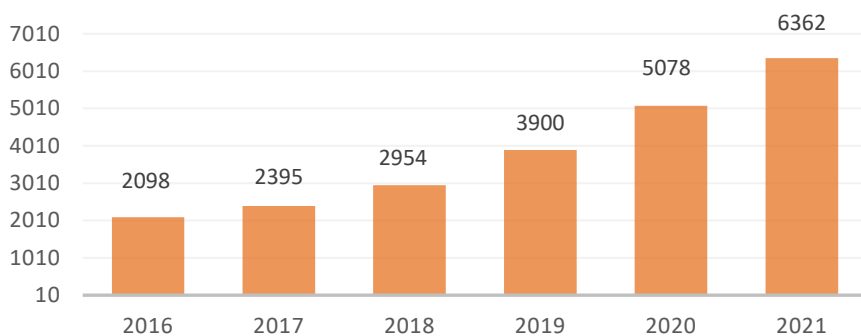
Source: <https://edurank.org/engineering/id/>





F. RESEARCH PUBLICATIONS

Research Publications (Science and Technology)

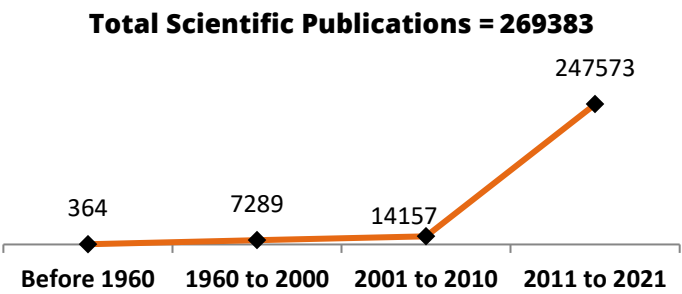


Source: Web of Science Core Collection | Document type: Articles **Years**

- ❖ There is a consistent increase in number of research publications from Indonesia in the field of Science and Technology. In 2016, the number of scientific research publications were 2098 which increased by around 200% to the number of 6362 in 2021. Top five partners for scientific co-authorship with Indonesia are Malaysia (3,633), Japan (3,548), Australia (1,805), USA (1,743) and UK (1,395).
- ❖ With the growth rate of about 31%, Materials Science field ranks top in Indonesia for the number of scientific research publications with a total volume of 11,715 publications between 2012 and 2019. Indonesia published four times more than the expectation on the local impact of climate related hazards and disasters. Indonesian

researchers had published on each of the 56 SDG related topics, and the output at least tripled between 2011 and 2019. Researchers in Indonesia are now publishing 5-9 times more than would be expected on sustainable alternatives to plastic, with the output remarkably increasing from 6 (2012–2015) to 155 (2016–2019) publications.

Source: UNESCO Science Report 2021



❖ The research scholarly output of Indonesia is presented in the figure. By a closer inspection of the data, it is apparent that the highest numbers of documents (90.57% or 243984) are published in the last decade (from 2012 to 2021). All publications received 1079017 citations or 4.4 citations per publications (CPP). It is noteworthy that field weighted citation impact (FWCI), which “indicates how the number of citations received by an article compares to the average or expected number of citations received by other similar publications”. For Indonesia, the FWCI is 0.83, which means, that the articles received 17 % lower citations as compared with global average. The per year data is present in the table.

Source: Scopus

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Scholarly Output (SO)	243984	4189	5424	6867	8578	12742	21586	35037	47553	51243	50765
2	Citations	1079017	69024	75486	90883	100497	116147	159115	163433	143369	114290	46773
3	FWCI	0.83	0.82	0.86	0.94	0.9	0.97	1.01	0.92	0.77	0.73	0.78
4	CPP	4.4	16.5	13.9	13.2	11.7	9.1	7.4	4.7	3	2.2	0.9

S#	Subject Area	SO	Citations	Authors	CPP	FWCI
1	Engineering	58768	199443	75799	3.4	0.69
2	Physics and Astronomy	46235	107000	65736	2.3	1.02
3	Environmental Science	45808	161177	68564	3.5	0.9
4	Computer Science	41154	129533	52245	3.1	0.63
5	Earth and Planetary Sciences	34889	77932	54331	2.2	0.95
6	Social Sciences	30462	109027	47244	3.6	0.7
7	Medicine	24535	233269	37687	9.5	1.08
8	Agricultural and Biological Sciences	22049	151334	32128	6.9	0.69
9	Materials Science	21482	86076	32545	4	0.85
10	Business, Management and Accounting	17681	57824	27802	3.3	0.56
11	Energy	14001	73087	24906	5.2	0.72
12	Biochemistry, Genetics and Molecular Biology	12719	92333	24164	7.3	0.64
13	Mathematics	12592	42674	19588	3.4	0.67
14	Decision Sciences	11722	26303	20840	2.2	0.63
15	Pharmacology, Toxicology and Pharmaceutics	9970	39232	18875	3.9	0.46
16	Chemistry	8563	70852	14205	8.3	0.74
17	Arts and Humanities	7912	15210	12502	1.9	0.65
18	Economics, Econometrics and Finance	7618	33778	11108	4.4	0.76
19	Chemical Engineering	6465	53156	12001	8.2	0.78
20	Nursing	3281	13093	6450	4	0.65
21	Immunology and Microbiology	2854	30907	6099	10.8	0.84
22	Multidisciplinary	2726	43153	6787	15.8	0.84
23	Veterinary	2314	8422	4514	3.6	0.7
24	Dentistry	1659	5010	2854	3	0.5
25	Psychology	1467	9416	2924	6.4	0.97
26	Health Professions	1102	3846	2764	3.5	0.61
27	Neuroscience	682	7445	1556	10.9	1.11

- ❖ The list of publications with scholarly output, citations, authors, citations per publication and field-weighted citation impact for different subject areas are provided in the table. The data is for the publications from 2012 to 2021. Based on the scholarly output, the highest documents are published in Engineering (n=58768), followed by Physics and Astronomy (n=46235), and Environmental Science (n=45808) and lowest data was observed in Neuroscience field respectively. However, the highest citations were recorded for Medicine (n= 233269), Engineering (n= 199443) and Environmental Science (n= 161177).

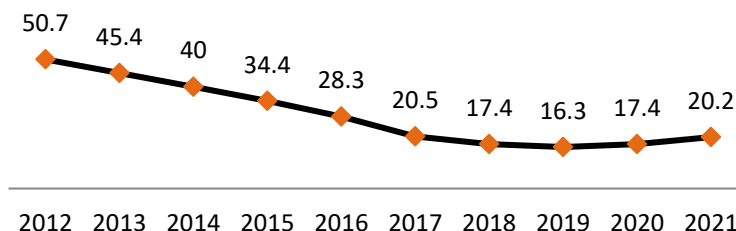
Sr. No.	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Pub in top 1% Sources (Q1)	983	39	56	77	70	96	98	119	106	133	189
2	Pub in top 1% (Percent)	0.5	1.6	1.7	1.7	1.1	1.1	0.7	0.5	0.3	0.3	0.4
3	Pub in top 5% Sources (Q2)	5180	259	291	317	330	426	451	530	631	790	1155
4	Pub in top 5% (Percent)	2.7	10.4	8.7	7.2	5.1	4.7	3	2.1	1.6	1.9	2.7
5	Pub in top 10% Sources (Q3)	10669	442	531	507	617	845	922	1098	1300	1849	2558
6	Pub in top 10% (Percent)	5.6	17.8	15.9	11.5	9.6	9.3	6.1	4.2	3.3	4.6	5.9
7	Pub in top 25% Sources (Q4)	25273	923	1068	1101	1247	1523	1828	2276	3611	4913	6783
8	Pub in top 25% (Percent)	13.3	37.1	32	24.9	19.4	16.7	12.2	8.8	9.3	12.1	15.6
9	Pub in top 50% Sources (Q5)	51169	1424	1710	2034	2395	2722	3878	5523	8140	10277	13066
10	Pub in top 50% (Percent)	27	57.2	51.2	46	37.3	29.9	25.9	21.4	20.9	25.3	30.1
11	Pub in top 75% Sources (Q6)	96983	1994	2575	3222	4182	5102	7621	12583	18834	18704	22166
12	Pub in top 75% (Percent)	51.2	80.1	77	72.9	65.2	56.1	50.8	48.7	48.3	46.1	51
13	Pub in top 100% Sources (Q7)	189602	2488	3342	4417	6413	9097	14993	25841	38980	40559	43472
14	Pub in top 100% (Percent)	100	100	100	100	100	100	100	100	100	100	100

- ❖ It is note worthy that Scopus has introduced seven “quartiles” groups. For example Q1 and Q7 groups include the top 1% and 75 to 100% journals. 77. 71 % (or 189602) documents are published in all 7 quartiles group. In other words, 54382 documents are published in those journals, which do not have citesscore data. The highest documents are published in Q7 group (92619/48.8%) and Q6 (45814/24.2%). The per year data for each quartile group is presented in the table.

S#	Institution	SO	Citations	Authors	CPP	FWCI
1	University of Indonesia	23445	120809	19417	5.2	0.86
2	Bandung Institute of Technology	16014	78199	11140	4.9	0.78
3	Gadjah Mada University	14996	70181	11497	4.7	0.75
4	Universitas Airlangga	9714	39599	8242	4.1	0.77
5	Institut Pertanian Bogor	8995	47393	6735	5.3	0.79
6	Institut Teknologi Sepuluh Nopember	8891	36790	7029	4.1	0.85
7	Universitas Diponegoro	8791	29611	7336	3.4	0.74
8	Brawijaya University	8224	27051	6900	3.3	0.64
9	Universitas Hasanuddin	7868	29444	6403	3.7	0.85
10	Lembaga Ilmu Pengetahuan Indonesia	7447	47052	2944	6.3	1.02

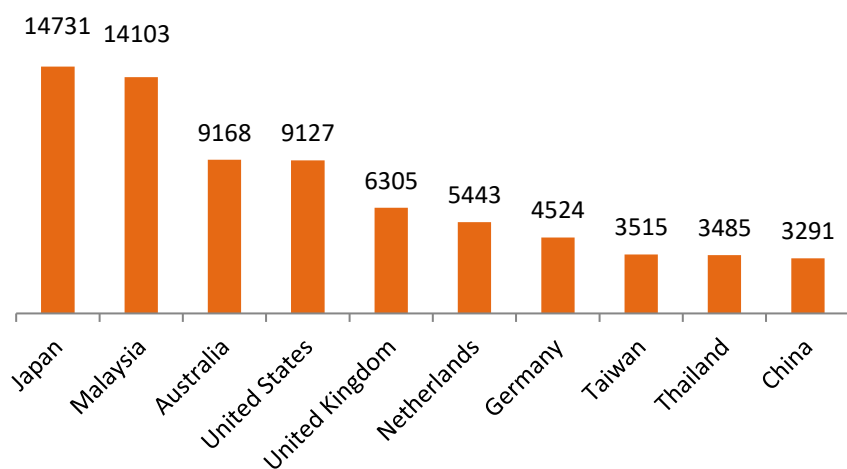
- ❖ The highest documents are published by University of Indonesia (n=23445), Bandung Institute of Technology (n=16014) and Gadjah Mada University (n=14996). In fact, these three universities received the highest citations well. The data is presented in the table.

International Collaboration (%)



- ❖ We also compiled the international collaboration (%) data for the last ten years. As shown in the figure, the rate of collaboration decreased from 2012 to 2019, which later increased in the last two years. The highest collaboration was noted with Japan (n=14731), followed by Malaysia (n=14103) and Australia (n=9168). The data for the top collaborating country is also presented in the figure.

The Top Ten Collaborating Countries in Indonesia





G. INTERNATIONAL COOPERATION AND SUPPORT INITIATIVES

- ❖ The International Office of Ministry of State for Research and Technology, Indonesia supports bi-lateral and multi-lateral science and technology cooperation with more than 10 countries, among others: Germany (BMBF), Netherlands (KNAW), China (MOST), South Africa (DST), Australia (DEST), Italy (Ministry of Foreign Affairs), Iran, Austria, Hungary, in order to strengthen long standing relationship with several countries. The on-going multi-lateral cooperation is ASEAN Committee on Science and Technology (ASEAN COST), Non Aligned Movement Science and Technology Centre (NAM S&T), IAEA, FEALAC, APSCO.

Source: <https://www.zsi.at/en/object/partner/1693>

- ❖ **MoU between Indonesia and Singapore:**

In October 2018, Singapore signed a memorandum of understanding with Indonesia to boost investment, knowledge sharing and training in areas related to Industry 4.0.

- ❖ **The KSI commitment between Australia and Indonesia:**

A MoU is signed between the governments of Indonesia and Australia named: "The Knowledge Sector Initiative (KSI)" that seeks to improve the lives of the Indonesian people through improved

public policies that make better use of research, analysis, and evidence.

Source: <https://www.rti.org/impact/strengthening-quality-and-policy-relevance-research-indonesia>

❖ **Indonesia – Australia Digital Technology Cooperation:**

Bukalapak, an Indonesian e-commerce company has set up a R&D Hub in Melbourne, Victoria. This is the Bukalapak's first international base for research and development. This cooperation was pushed by Indonesian Government and Bukalapak done it in partnership with Victorian Government in Australia.

Source: <https://kemlu.go.id/portal/en/read/3222/berita/to-boost-cooperation-in-digital-technology-the-indonesian-government-supports-opening-of-bukalapaks-tech-hub-in-melbourne>

❖ **U.S. - Indonesia Bilateral Relation:**

U.S. and Indonesia have a very strong partnership and show long-term commitment to deepen, and elevate the bilateral relation. The Plan of Action consist of three pillars: political and security; economic and development; and socio-cultural, education, science, and technology cooperation.

Source:

<https://www.usaid.gov/sites/default/files/documents/1861/Indonesia%20CDCS%20FINAL%20Version.pdf>

❖ **China – Indonesia cooperation in Science and Technology:**

China and Indonesia are cooperating with each other in many sectors for economic development of both countries. In 2017, China signed three cooperation agreements with Indonesia, including:

1. Three-year Action Plan on Science and Technology Innovation Cooperation between Ministry of Science and Technology and Ministry of Research, Technology and Higher Education (2018- 2020),

2. Implementation Agreement on Science Park,
3. Cooperation and Implementation Agreement on Co-constructing the Joint Research Center for China-Indonesia Port Construction and Disaster Prevention.

Source: <http://fi.china-embassy.org/eng/kxjs/201802/P020210628714814452286.pdf>

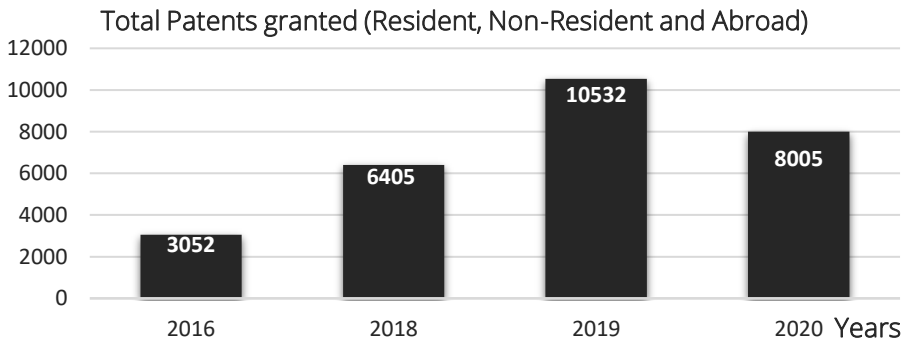


INNOVATION

H. INNOVATION, ENTREPRENEURSHIP & TECHNOLOGY PARKS

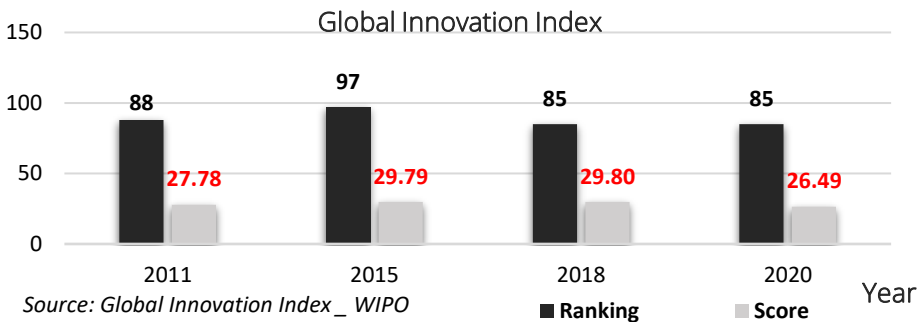
❖ Science Governance: Key Policy Initiatives:

- To revitalize manufacturing sector and become a powerhouse in the Fourth Industrial Revolution, Indonesia set up a road map named **“The Making Indonesia 4.0”**. Manufacturing sector has always played an important role in the Indonesian GDP growth and provided employment opportunities to millions of Indonesian people. The contribution of manufacturing sector in GDP of Indonesia has declined between the years 2001 to 2016. The Making Indonesia 4.0 roadmap can help Indonesia to reverse the declining trend and re-strengthen their manufacturing sector by incorporating innovative and disruptive technologies of 4IR in their production processes. The Making Indonesia 4.0 strategy aims to increase performance in five strategic industries by transitioning to high-tech, high value-added and specialized production in: food and beverages; textiles and garments; automotive; electronics; and chemicals.
- In January 2019, Indonesia launched its own **Industry 4.0 Readiness Index**, which assesses companies' performance against five indicators: technology; products and services; factory operations; management and organization; and people and culture. (Source: UNESCO Science Report 2021; OBG, 2019)



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

- ❖ In 2016, the total patents granted to Indonesian innovators were 3052, which increased by almost 3.5 folds and reached the number of 10,532 patents in 2019. Indonesian innovators obtained 8005 patents in the year 2020, which is against the increasing trend for the number of patents acquired in the last decade, but considering the COVID-19 pandemic situation, this is actually a positive outcome.



- ❖ The Global Innovation Index of Indonesia does not reflect any noticeable improvement in the innovation capabilities of the country. Indonesia ranks 87th among the 132 economies featured in the GII 2021. In 2015, the Global Innovation Score of Indonesia was 29.79, which slightly decreased to 26.49 in 2020. Indonesia ranks 14th among the 17 economies in South East Asia, East Asia, and Oceania, and ranks 17th amongst the 57 OIC countries.

Source: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021/id.pdf

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

Indonesian government is putting efforts to promote the culture of innovation and R&D competitiveness. Few technology and innovation centers are under construction. Following is the list of some technology parks and incubation centers in Indonesia:

1. IPB Science Techno Park, Bogor.
2. Sepuluh Nopember Institute of Technology's Technopark and Incubation Centers.
3. National Science and Technology Park, PUSPIPTEK.
4. IncuBie (Pusat Inkubator Bisnis), IPB University.
5. Directorate of Business Innovation and Incubation (Direktorat Inovasi dan Inkubator Bisnis) (DIIB), University of Indonesia.
6. PENS Sky Venture, Politeknik Elektronika Negeri Surabaya (Surabaya State Electronics Polytechnic) (PENS).
7. Bandung High Tech Valley (BHTV)



- ❖ There are several national and international Acceleration programs to support, train and grow the startups & SMEs working in Indonesia. Following are the details about few of those programs:
1. **Plug and Play (PNP Indonesia)** invests in the startups and helps connect them to corporations that are looking for innovation.
 2. **GnB accelerator** is the first international accelerator in Indonesia that aims to advance the speed of innovation, and groups together the people, funding, and partners that will drive business innovation speed.
 3. **Google Launchpad Accelerator** is a programme initiated by Google in the hope to help start-up companies to accelerate their business and technology. Google accepts many Indonesian companies under this programme.
 4. A global programme named **“Founder Institute”** is available in Indonesia as part of Jakarta Founder Institute (JFI), which provides training programmes to startups and companies.
 5. **Global Entrepreneurship Program Indonesia (GEPI)** has been supported by several leading business leaders in Indonesia. This program has a vision to connect potential Indonesian business people with global development and investment prospects.

Source: <http://indonesiatatler.com/generation-t/10-top-incubators-and-accelerators-in-indonesia-that-can-help-your-startup#slide-6>



I. COMBATING THE COVID-19 PANDEMIC

Indonesia has taken numerous measures to respond to COVID-19 pandemic. In this section, few of the measures taken by Indonesian government to cope the pandemic situation are discussed.

❖ **Vaccine Development and Administration:**

- Indonesia initiated the testing of homegrown COVID-19 vaccine named **“Merah Putih”** also known as **“Red White Vaccine”**. The development of vaccine was led by Airlangga University and Biotis Pharmaceutical Indonesia. The vaccine has been granted a “Halal Certification from the Indonesia Ulema Council”.
- Indonesian government is putting best efforts to get their complete adult population vaccinated. For this sake, they received a loan of US\$500 million in June 2021 to strengthen the preparedness of its health system and support their free vaccination program.

Source: <https://www.worldbank.org/en/news/press-release/2021/06/17/new-support-for-indonesia-s-pandemic-response-and-vaccination-program>

❖ **Indonesia’s Indigenous efforts to combat COVID-19:**

- **The Indonesian Indigenous Peoples Alliance of Archipelago (AMAN)** is putting admirable efforts to tackle the pandemic situation. AMAN organized around 2400 Indigenous communities across the archipelago and took measures to limit the spread of the pandemic.

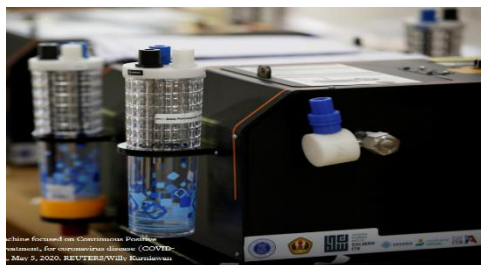
It has launched a cellphone app to gather data, register and report the cases of contagion. The app was also used to help people to reach nearest medical supply and surplus granary if available. This GPS-guided app and the related web-based service is named **Amankancovid**. Those who did not have access to internet were contacted by AMAN team through landline and kept on providing their services.

Read more about AMAN activities here:

<https://www.regnskog.no/en/news/indigenous-peoples-spearhead-innovative-approaches-to-counter-covid-19>

- **Ventilator production:** A team of Indonesian engineers produced a compact ventilator in two months. 40 engineers from the Bandung Institute of Technology (ITB) developed the “Vent-I Ventilator” which is the size of a mini-oven. These ventilators were produced using household materials such as plastic drinking tumblers to make the parts of it. The key feature of Vent-I is Continuous Positive Airway Pressure (CPAP), which is vital for a steady supply of air for people affected with COVID-19.

Source: <https://www.reuters.com/article/us-health-coronavirus-indonesia-ventilat-idUSKBN22J11H>



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

Peduli Lindungi is an application launched by Indonesian government and developed to assist relevant government agencies in tracking to stop the spread of Coronavirus Disease (COVID-19). This application relies on community participation to share location data with each other while traveling so that contact history tracing with COVID-19 sufferers can be carried out. Users of this application will also get a notification if they are in a crowd or are in a red zone, namely an area or village where it has been recorded that there are people infected with positive COVID-19 or there are patients under surveillance.

Source: <https://www.pedulilindungi.id/>

➤ **Telemedicine services:**

Indonesian government joined hands with 11 telemedicine companies to provide free telemedicine and telehealth services for asymptomatic and mild COVID-19 patients. The eleven telemedicine platforms are:

1. Alodokter
2. GetWell
3. Good Doctor and GrabHealth
4. Halodoc
5. KlikDokter
6. KlinikGo
7. Link Sehat
8. Milvik Dokter
9. ProSehat
10. SehatQ
11. YesDok

Read more: <https://setkab.go.id/en/govt-telemedicine-platforms-provide-free-services-for-covid-19self-isolation-patients/>

➤ **Autonomous Robots to tackle pandemic issues:**

- a) The **Autonomous UVC Mobile Robot (AUMR)** is developed in a collaboration between Tel-U and the Indonesian Institute of Sciences (LIPI) to assist Indonesian government against COVID-19. AUMR can be used to disinfect and sterilize isolation rooms for COVID-19 patients without direct human intervention.

Read More: <https://telkomuniversity.ac.id/en/telkom-university-created-the-first-aumr-in-indonesia-for-disinfection-and-sterilization-of-the-covid-19-patient-isolation-room/>



- b) A medical assistant robot named **RAISA**, which stands **Robot Medical Assistant ITS – Airlangga**, is developed by a joint team from the Institut Teknologi Sepuluh Nopember (ITS) and Airlangga University Hospital. The robot helps to minimize direct contact between medical personnel and COVID-19 patients. Operated with a joystick and with a blue smiley robotic face, the 1.5-metre tall RAISA has four trays to carry medicine, food, clothes, or other equipment to patients who are being treated in isolation units, such as intensive care units and high care units.

Source:

<https://www.australiaawardsindonesia.org/news/detail/244000016/raisa-robot-nurse-assists-medical-workers-to-treat-covid-19-patients-remotely>



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