



**Arab Republic of Egypt
Ministry of Higher Education and Scientific Research**



**National Strategy for Science, Technology
and Innovation 2030**

2019

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Statement of Minister of Higher Education and Scientific Research

In September 2015, the UN General Assembly decided to include the 17 Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development, which focuses on achieving the sustainable development in different regions around the world, through the achievement of integrated social and economic development that addresses a number of major issues and matters, such as: poverty, hungry, health, education, climate change, gender equality, water, etc.

Countries of the world welcomed these goals with great approval , with some of them hurrying up to build their national sustainable development plans based on these goals, which helped achieve the same to the fullest extent around the world. Egypt has not been far apart from all this, as Egypt developed the National Sustainable Development Strategy (Egypt Vision 2030), which identified some goals required to be achieved by 2030. As to the scientific research sector, the strategy identified the following goals:

- Reviewing and developing laws and legislations related to the empowerment of knowledge and innovation.
- Developing and restructuring the knowledge and innovation system.
- Adopting a comprehensive program to instil the innovation and knowledge culture in the society.
- Developing a comprehensive program to encourage small and medium-sized enterprises to innovate.
- Activating the partnership between the State and private sector in supporting and motivating innovation.

Based on these goals, the National Strategy for Science, Technology and Innovation was developed, with a view to being a national guide for moving towards the future in this area, through monitoring the available components of the national science, technology and innovation system, bringing forward operational plans and programs with specific mechanisms, in cooperation and with communication with all national and international concerned entities , developing a formula for full and continuous connection between the research, technology and innovation sector and the industry and services sector, leveraging from the human and material resources available with academic institutions throughout Egypt, in a way that supports the State's direction towards a knowledge-based economy that achieves the progress, prosperity and well-being desired by the Egyptian society.

Since the commencement to implement the strategy in 2016, the Ministry has been committed at the time of evaluation to communicate with all concerned entities in order to exchange opinions, expertise and experiences regarding the amendment of the strategy and its operational plans in light of the rapid changes in top sciences ,and the prioritization of State's needs to technological solutions, in addition to rendering the opportunity to these entities to discover the strategy and participate in a way that supports concerted efforts to achieve the National Development Goals.

I am pleased to present this strategy update, which includes some addenda based on opinions, ideas and proposals derived from a number of events and brainstorming sessions among different concerned entities in the State, in the presence of an elite group of professors ,and experts in different fields. This update takes into account the elimination of programs completed during the previous period and the non-repetition of programs and addition of new programs that provide unconventional solutions to many challenges facing the society through the use of emerging technologies.

I hope that this update will help achieve the strategy goals ,and provide a real added value to the national serious steps and strenuous efforts aiming to achieve the sustainable development. I would like to thank and express my deep appreciation for the team that supervised the update preparation. My thanks go also to all relevant engaged institutions and entities and to any person who played a role or participated in the preparation of this update. I wish Allah -Almighty- would lead us all to the good of our beloved nation.

For the Sake of Allah,,,

Prof. Dr. Khalid Abdel Ghaffar
Minister of Higher Education and Scientific Research

Introduction

Within the framework of the vision of Egypt 2030, which emanates from the 17 Sustainable Development Goals adopted by the United Nations, and based on the crucial role played by the scientific research, the National Strategy for Science, Technology and Innovation 2030 constitutes a main pillar of the national vision, especially in relation to the production and localization of science and knowledge.

From this standpoint and as part of the endeavors of the Ministry of Higher Education and Scientific Research to provide its service to all the State-owned institutions and sectors in coordination with the different ministries, it was necessary for the Ministry, at the time of evaluating this strategy, which started to be implemented in 2016, to communicate with all concerned parties with a view to exchanging opinions and experiences in relation to amending the strategy and its operational plans in light of the rapid changes in top sciences, as well as the prioritization of the State's needs for technological solutions, in addition to giving the change to those entities to discover the strategy and participate in the creation of solutions, taking into account the non-repetition of efforts and the achievement of the necessary connection between the scientific research and technology, on the one hand, and the industry and production, on the other hand.

A number of workshops with all concerned entities , including ministries, institutions and State-owned and society entities have resulted in a number of research proposals, which fall under the sub-axes and main tracks of the National Strategy for Science, Technology and Innovation. Under the supervision of a working group from the Ministry of Higher Education and Scientific Research, a large working group from specialized awareness-raising councils at the Academy of Scientific Research and Technology considered these proposals ,and included the same in work programs of various axes, taking into account the removal of programs completed during the previous period since the commencement of the strategy implementation and, at the same time, non-repetition of programs and addition of new programs that provide solution through the use of emerging technologies.

It is probably important for the reader of the National Strategy for Science, Technology and Innovation 2030 (2019 update) to be aware that the programs listed under different axes are proposals that are required to be implemented in the light of the vision of specialized scientists and even more, but they are a think-tank to cover the implementation of the biggest part of the plan and to benefit executive entities of universities ,and research center in developing their strategic plans, as well as researchers in conducting their scientific and filed research.

In this respect, we review the update of the operational plan of the National Strategy for Science, Technology and Innovation(NSSTI), hoping to have the desired effect as to achieving the strategy objectives and providing a real addition to the ongoing national efforts to achieve the progress, advancement and comprehensive sustainable development for our beloved country.

Executive Committee of Strategy Update

Prof. Dr. Yasser Refaat Abdel-Fattah	Deputy Minister of Higher Education and Scientific Research for Scientific Research
Prof. Dr. Amr Adly	Deputy Minister of Higher Education and Scientific Research for Universities Affairs
Prof. Dr. Mahmoud Mohamed Sakr	President of the Academy of Scientific Research and Technology
Prof. Dr. Walid Khalid Al-Zawawy	Secretary of the Council of Research Centers, Institutes and Entities
Prof. Dr. Essam Khamis	Former Deputy Minister of Higher Education and Scientific Research for Scientific Research
Prof. Dr. Mostafa El-Missiry	Secretary of the Council of Research Centers, Institutes (CRCI)
Prof. Dr. Mohamed Rashad Abdel Fattah	Dean of the Arid Land Cultivation Research Institute-City of Scientific Research and Technological Applications (SRTA-City)
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Dr. Mohamed Maher	Strategic Planning-Office of the Minister of Higher Education and Scientific Research
Dr. Hayam Helmy Ibrahim	Deputy Supervisor of the Egyptian Science, Technology and Innovation Observatory (ESTIO) , ASRT
Mr. Ahmed Adel	Technical Office-Ministry of Scientific Research
Ms. Hoda Al-Sagheer	Technical Office-Ministry of Scientific Research
Mr. Ahmed Moawad Roshdy	Technical Office-Ministry of Scientific Research
Specialized Councils	Members of Specialized councils of the Academy of Scientific Research and Technology.

Vision .. Mission .. Ruling Values

Vision

An Egyptian scientific society that , in construction and development ,depends on a perpetually learning generations that generate and use the knowledge to provide scientific practical solutions to society problems, and export the knowledge within a system that supports innovation and stimulates knowledge-based economy.

Mission

Creating an encouraging environment for science, technology and innovation, capable of producing and marketing knowledge efficiently and effectively, and creating an atmosphere of excellence-based scientific competition, in order to increase the growth rate of the national economy ,and achieve the type of sustainable development that elevates the society and human well-being to higher levels.

Ruling Values of National Strategy for Scientific Research and Innovation:

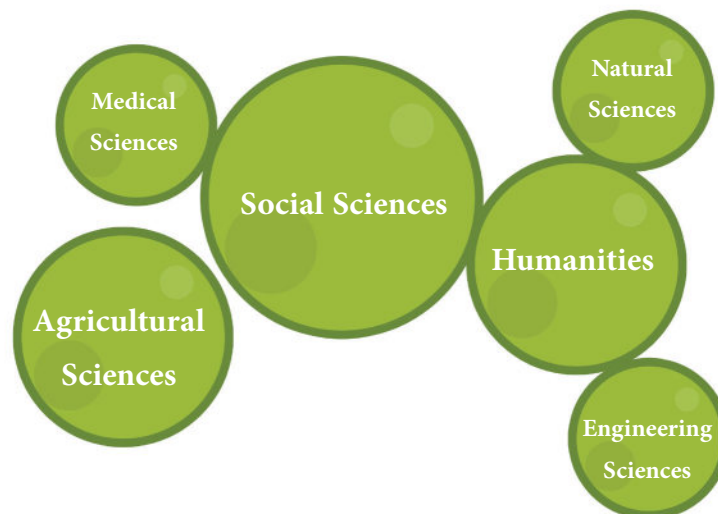
- 1- Academic freedom: preserving the independence of universities as to making their decisions in relation to the scientific research system, and enabling the freedom of scientific research in a way that does not contradict moral values.
- 2- Transparency and scientific integrity: dealing in an honest, clear and sincere manner with all matters related to the scientific research process, taking into account the copyright, intellectual property rights and moral values of scientific research.
- 3- Collective work: teamwork to maximize the benefits and results of the scientific research system.
- 4- Innovation: encouraging innovation and innovation solutions in fields of scientific research.
- 5- Integration: mutual conformity among universities one another and between them and research centers.
- 6- Uniqueness: the leading influence of the university, which reflects its own identity.
- 7- Sustainability: developing the returns of scientific applied research in pursuit of sustainable development.
- 8- Social responsibility: employing scientific research outputs to face chronic and emergent society challenges.

Current Situation of Scientific Research in Egypt

The study of the current situation is based on the indicators of science and technology, which analyze the data of sciences and technology in Egypt and its status it among the world countries. It includes many research and development inputs that include indicators of manpower, research and development expenditure and many research and development outputs, which comprise the research and development results from research publications, patents and indicators of information technology and indicators, in addition to analyzing Egypt's global situation in the Global Innovation Index report. The following is an overview of the current situation of scientific research in Egypt in accordance with reports issued by the Egyptian Science, Technology and Innovation Observatory at the Academy of Scientific Research and Technology.

1- Higher Education Indicators

- The higher education system in Egypt has developed over the last 50 years, from one governmental university (Cairo University) and one private university (American University) to 11 additional governmental universities until the late 1980s. The current total number of universities is now 52 universities, divided into 26 governmental universities and 26 private universities. By analyzing the specialization of colleges in governmental universities, it has been found out that scientific colleges (natural, engineering, medical and agricultural sciences) represent 51.6%, while theoretical schools(social sciences and humanities) account for 48.4% of the total number of colleges.



Specialization of Governmental and Private Colleges (Size of circle refers to more sovereign field)

- The total number of students enrolled in governmental and private universities was about 2.4 millions. With reference to the scientific specializations of students enrolled in universities, the largest percentage of students are enrolled in social sciences (50%), followed by humanities (24.9), while the natural sciences account for 4.1% of enrolled students, medical and health sciences represent 11.1%, engineering sciences account for 6.3%, and agricultural and veterinary sciences represent 3.4%. It is noted that the percentage of students enrolled in scientific colleges is low, which

is the basis for the future industry in many industrial and agricultural areas of infrastructure in Egypt, while there is a large number of students enrolled in theoretical specializations. By studying the specializations of graduates of public universities, the results reflect the enrolled students, as the graduates specialized in social sciences and humanities account for 50.2% and 24.9%, respectively, while the low percentage of graduates in science and technology colleges was in the medical sciences (11.1%), followed by engineering sciences (6.3%), natural sciences (4.1%) and finally agricultural sciences (3.4%).

- An important indicator of higher education that is directly reflected in research and development in the students enrolled in higher studies, as the students enrolled in the master's and doctorate degree are considered researchers in the field of research and development and they can be added to the total number of researcher in Egypt in accordance with the international standards (Frascati Manual, OECD 2015). Over the past years, the number of students enrolled in university degrees has increased at different rates. The number of students who have obtained a master's or doctorate degree in the last three years is 83,306, of whom 71.6% hold a master's degree and 28.4% with a doctorate degree.

2- Research & Development Inputs

- Research and development inputs include those working in research and development and research and development expenditure. These indicators are calculated in accordance with the standards followed by the UNESCO and OECD, which adopted the international Frascati Manual for indicator calculation, which help compare data at the national, regional and international levels.

- Researchers are classified in accordance with the total number of researchers (HC), which is the total number of people who work mainly or partially in research and development. They are also classified according to the number of employees at the Full-time Equivalent (FTE), which calculates the actual time a researcher spends in research and development works.

Research & Development Researchers

• Public Sector

- The public sector refers to research centers affiliated to various ministries. Research and development in the public sector include 11 research centers and institutes affiliated to the Ministry of Scientific Research and 14 research centers, institutes and entities affiliated to other ministries. The actual number of researchers of the public sector was 24,255 in 2018, compared to 21,843 in 2017, with a growth rate of 11%. Female researchers account for 40.7% of the total number of researchers.

- By studying the Full-time Equivalent to calculate the actual number of full-time researchers in research and development activities, the total number of full-time researchers was 22,713.4 in 2018. Female researchers account for 41% of the total number of researchers. Through analyzing the scientific qualifications of full-time researchers, it was found out that the majority of researchers hold a doctorate degree (75%), while the researchers with a master's degree represent 18% and researcher with only bachelor's degree account for 7% of the total number of full-time researchers.

- According to research centers at the level of ministries, the center with the largest number of researcher is the Agricultural Research Center affiliated to the Ministry of Agriculture, as it embraces

41% of the total number of researchers in the public sector, followed by the National Research Center affiliated to the Ministry of Scientific Research, which represents 20% of the total number of researchers.

▪ **Higher Education Sector**

- The higher education sector comprises all researchers in 52 governmental and private universities. The higher education sector includes the largest number of researchers, as the total number of researcher was 108,675 in 2018. The percentage of higher education researcher increased by 2.4%, compared to 2017. Female researchers represent 48% of the total number of higher education researchers.

- By analyzing the number of researcher with the FTE, and determining the time assigned to scientific research, as the activities of higher education researchers are divided into teaching, scientific research and other activities, the FTE of researchers was calculated by 35% for professors, associate professors and lecturer, and 40% for assistant lecturers and teaching assistants. The number of full-time researchers in the higher education sector was 40,408.9 in 2018, with 50% being female researchers.

- Al-Azhar University has the largest number of researcher in the university education sector with 15% of the total number of researchers in public universities, followed by Cairo University and Ain-Shams University by 12.5 and 11.4%, respectively. The Arab Academy for Science, Technology & Maritime Transport and Misr University for Science and Technology are among the private universities with the largest number of research papersresearchers by 12.8% and 13%, respectively.

• **Private Sector**

- The private sector comprises all researchers in the business sector institutions. Activities of sciences, technology and innovation are included in the National Survey of Research, Development and Innovation, which includes all units working in research and development within institutions. The number of researchers in the private sector is 5,340, with 10.4% being female researchers, which is a low percentage. The number of full-time researchers in private sectors is 4,272.

➤ **Growth of Number of Researchers in Egypt**

- The number of researchers in Egypt has grown up over recent years, with the number rising from 108,504 in 2012 to 138,491 in 2018, with an annual growth rate of 3.9%. the higher education has the largest percentage of the total number of researchers.

- By analyzing the number of researcher per million people during the period from 2015 to 2018, the number of researcher per million people increased, whether the total number or full-time researchers, with a little difference as a result of the population increase. The total number of researchers per million people was 1,362.5 in 2015 and became 1,393.6 in 2018.

➤ **Research & Development Outputs**

- Science and technology outputs are used to assess the outputs of research and development activities. This includes research papers published at the international level and patents produced by scientists.

➤ **International Scientific Publication**

- The number of international research papers published by Egyptian researchers in international magazines increased during the period from 2008 to 2018. The total number of research papers published during the last ten years is 156,128 international research papers. The number of international publication increased from 9,479 in 2010 to 21,961 in 2018, with annual growth rate of 16,4%. By calculating the rate of international and local cooperation in publication, in 2018, the proportion of international cooperation in the publication of international research papers was 50.1%, while the proportion of local cooperation was 15.4%.
- By analyzing the research papers published at the international level according to the scientific specialization during the period from 2015 to 2018, the largest number of scientific publications was specialized in the field of natural sciences (44.4), followed by medical sciences (24.8%), engineering sciences (21.2%), agricultural sciences (6.3%), social sciences (2.8%), with only 0.6% in humanities.
- By comparing the research production of universities to research centers and institutes, it was found out that the research production of university is relatively high compared to research centers, with Cairo University ranking the first local place in the international scientific publication (4,070), followed by Ain- Shams University, which occupies the second place (2,286), then the National Research Center (2,035).
- By studying the international cooperation of Egyptian researchers in the publication of international research papers, during the period from 2015 to 2018, Egyptian researchers cooperated with 196 countries around the world and 37,549 joint research papers were published. The Kingdom of Saudi Arabia was among the countries with the largest number of cooperation projects with Egypt in the publication of scientific research, as 12,720 joint research papers were published, followed by the United States of America with 7,607 joint research papers, and then Germany, US(sic.) and China.

➤ **Patents**

- The number of patent applications submitted to the Egyptian Patent Office increased from 2136 in 2014 to 2255 in 2018. The majority of patent applications were submitted by non-residents in Egypt (54%), while 46% were submitted by residents in Egypt. It was also found out that the majority of Egyptian applications were submitted by companies (1221), followed by individuals (803), then research centers (231), while Egyptian universities did not submit any application in 2018.
- The number of patents issued by the Egyptian Patent Office increased from 415 to 690 in 2018. The patents issued for non-resident were 524 and those issued for residents in Egypt were 166. The number of patents issued for companies were 534, while individuals were granted 94 patents and research centers were granted 62 patents. No patent was issued for universities.

➤ **Egypt's Status in International Reports**

- The International Innovation Index and global competitiveness reports are the most international reports that measure the research, development and innovation in countries. They are composite indexes, which are a value derived from a combination of different indexes based on the measurement of a theoretical model of multidimensional concept. Egypt has advanced 10 places in the International Innovation Index ,and was ranked 95th globally in 2018, after it was ranked 105th in 2017. Egypt was ranked 53rd in the Sub-index of Research and Development of the International Innovation Index, as Egypt advanced from the 54th place in 2017. The Sub-index of Research and Development consists of four indicators, namely: indicator of the number of researchers, indicator of research ,and development expenditure, indicator of average expenditure on private companies and the indicator of the average top three universities in QS. Egypt ranked 94th internationally from among 140 countries in 2018 in the Global Competitiveness Index, which is a composite index that consists of 98 indicators, such as the economic situation, infrastructure, information technology, market capacity, health, innovative capacity, etc.
- Egypt ranked 38th internationally in the SCIMAGO classification of international scientific publication from among 230 countries around the world.
- It has been found out that Egypt has a clear and increasing interest in agricultural sciences over the last five years. It has also been found out that there a large amount of produced research papers in other fields, such as medicine, engineering and chemistry, while Egypt suffers from the very low production in the area of humanities and social sciences over the last ten years at the international level.
- When considering the research impact, it has been found out that the area of computer sciences has been the most influential area over the last five years, followed by mathematics, then energy, then physics and astronomy.
- It has been found that the total number of authors in Egypt over the last five years is 58,129, who participated in the production of 106,814 research papers in all fields. In 2013, the number of researchers was 20,869, but it increased to 32,621 in 2018. In accordance with the Citation Factor, the quality of published scientific research papers increased from 0.88 in 2013 to 1.1 in 2018, which is higher than the international rate that is 1.
- By analyzing researcher groups, it has been found out that the largest number of Egyptian researchers are specialized in medical fields, followed by engineering, then chemistry, then biochemistry, then genetics and molecular biology. By analyzing capacities, it has been proved that Egypt occupies a distinguished place in research papers specialized in biochemistry, general chemistry, geophysics, geology and water sciences.

➤ **Scientific Research Expenditure in Egypt**

- Research and experimental development expenditure includes all expenses of research and experimental development within a sector of the economy (quoted from the Frascati Manual), including current expenses (manpower costs such as wages, annual salaries, all costs of research papers, technicians and support staff, and other current costs).
- Regarding the sector of various ministries (research centers), almost all expenses are calculated,

as research centers and institutes affiliated to various ministries have been established for research and development purposes ,and all expenditure activities are limited to research and development only. As for universities, the calculation of research and development expenditure is different from that in research centers, as universities have more than one activity such as the teaching activity and other activities, in addition to research and development activities. The calculation of research and development expenditure is based on the actual time (FTE) spent by faculty members in research and development activities.

- By studying the evolution of scientific research expenditure, it was found out that the Gross Domestic Expenditure on R&D (GERD) increased from 8.52 billion Egyptian pounds in 2012 to 23.6 Egyptian pounds in 2017, with an annual growth rate of 25.2%. The expenditure includes the higher education sector, represented by universities, public sector, represented by research centers, and expenditure in private sector and non-profit organizations.
- The share of research and development expenditure out of the GHP did not change during 2009 and 2010 (0.43%), but it increased to 0.7% of the national income in 2017. This percentage will increase in the coming period pursuant to the new constitution to at least 1%.

SWOT ANALYSIS

After describing the current situation of scientific research, it has been necessary to analyze the inputs and outputs. This has been done through the SWOT analysis, which is globally recognized method for the analysis of data obtained through studies and research papers. This study was published by the ESTIO at the Academy of Scientific Research and Technology in an international magazine specialized in science, technology and innovation policies.

Strengths & Weaknesses:

The following table identifies the strengths and weaknesses of the scientific research system and identifies the opportunities and threats, which helps us find out the challenges that face the scientific and technological society and, therefore, prepare an appropriate strategy to confront them. The following factors were used as the basis for the analysis process: human capacity, infrastructure, finance, regulations and legislative system, supportive local environment of innovation and scientific .research, intellectual property investment, maximization of economic return and scientific research

Table showing the strengths and weaknesses of the scientific research system:

	Strengths	Weaknesses
Human resources	<ul style="list-style-type: none"> - Availability of a good scientific base consisting in more than 138.5 thousand researchers in 56 public and private universities and 25 research centers, institutes and entities affiliated to ministries, as well as civil society institutions concerned with research and development. - Egypt has the largest amount of production of a research society of scientific researchers in the Middle East over the last ten years. - There are more than 500 thousand students enrolled in science, medicine and technology colleges. - Graduation of thousands of higher studies students (doctorate and master) from Egyptian universities. - Further growth in the number of researchers from different research entities . - Increased number of young researchers. - There is a group of national young experts in the management of scientific research finance, science and technology indexes and evaluation of scientific research institution performance. 	<ul style="list-style-type: none"> - Absence of good distribution of researchers in proportion to distinguished capacities on a national scale. - The number of full-time scientific researcher does not exceed 50% of the total number of researchers in Egypt. - Lack of expertise in some rare specializations (nuclear physics). - Absence of a sufficient number of engineers and assistant technicians (lab assistants) in scientific research institutions and their low capacities and incomes. - Not empowering young people and marginalizing their role in planning and management of science, technology and innovation system. - Reluctance of students to enroll in the scientific section in secondary school. - Low number of scientists in physics and mathematics. - Most private universities focus only on education, without developing research and innovation capacities of faculty members.
Supportive local environment of innovation and scientific research	<ul style="list-style-type: none"> -Rapid growth of a young and mature environment that supports innovation and scientific research development, including civil society organizations, technology incubators, capital investment organizations, business plan contests, initial model support program and technology transfer programs. 	

	Strengths	Weaknesses
International visions	<ul style="list-style-type: none"> - Egypt has achieved advanced positions in the productivity of scientific research in fields of chemistry, medicine, materials science, and advanced positions in terms of influence for research in fields of computer science, mathematics and physics. - Egypt achieved a high rank in international publishing, ranking 38th out of 230 countries. - The scientific production of some scientific schools in Egypt is higher than the world average. 	<ul style="list-style-type: none"> - Egypt ranked low in the Global Innovation Index (95th out of 126 countries). - The emergence of an advanced ranking of Egypt in indicators of plagiarism. - Lack of exploitation of funding opportunities, opportunities of international partnership and opportunities to support the capacities available to Egypt and North African countries from many intergovernmental institutions. - There is no clear and unified mechanism for marketing scientific research results for investors and businesspersons.
Intellectual Property Investment and Maximizing Economic Revenue	<ul style="list-style-type: none"> - Existence of networks of Technology, Innovation and Commercialization Offices (TICOs) in universities, research centers and sub-offices of the Egyptian Patent Office. - Existence of a network of technological incubators and increased support in the establishment of technology companies. - Initiating initiatives to support graduation projects and transform them into services and products. 	<ul style="list-style-type: none"> - Poor economic returns and tangible (measurable) returns gained from scientific research. - The poor number of patents registered annually for Egyptians, as well as the poor number of patents registered by universities and research centers, amounting to no more than 10% per annum of total patents - Deteriorating culture of science, technology, innovation and intellectual property rights (IPRs). - Existence of some regulations that impede the holders of intellectual property.
Scientific Research	<ul style="list-style-type: none"> - Scientific publication based on international cooperation is on the rise. - Increase of the rate of international publication in ascending order. - Integration of a large number of local scientific journals into international databases. 	<ul style="list-style-type: none"> - Lack of clear priorities for scientific research across schools and departments. - Lack of interest in interdisciplinary departments. - Poor impact of international scientific publication in many disciplines is. - Poor quality of scientific publications of institutions. - Lack of scientific publications of social and human research in international journals.

Opportunity and Threats:

Table indicating opportunities and threats in the scientific research system:

Opportunities	Threats
Human Resources	Human Resources
- There are several thousand Egyptian scientists in all disciplines who immigrated abroad and a large number of them take leadership positions there.	- A continuous drain of the distinguished minds due to strong material attraction factors in the West and the Gulf (selective immigration).
Funding	Funding
- An Article in the Constitution allocates at least 1% of the national income to support scientific research.	- Lack of coordination between different donors leads to recurrent funding for the same research points. - Lack of coordination between scientific research institutions leads to the repetition of research topics. - Scarcity of specialized research institutions in a specific field.
Regulations and Legislative Regime	Regulations and Legislative Regime
- Political and national will in support of scientific research and innovation. - Existence of a law for incentives for scientific research.	- More continuous changes in the science and technology system. - Absence of a binding mechanism to follow up the implementation of strategic plans and follow-up research performance of universities and research centers. - Emergence of some restrictions on the localization of advanced technologies and the ownership of their tools by developed countries.
International Visions	International Visions
- Equal International cooperation with all developed countries in scientific research. - Good reputation of the Egyptian schools of medicine in the Arab and Islamic worlds	- Emerging changes in the Middle East and North Africa region and change in the international relations with the donor countries.
Intellectual Property Investment and Maximizing Economic Revenue	Intellectual Property Investment and Maximizing Economic Revenue
- Launching some major national projects such as the New Suez Canal, the Grain Stock Market, and the expansion outside the valley; a project over an area of 1.5 million acres. - Establishment of investments in the fields of new energy and transportation. - The State aims to deepen local industrialization and support national industries such as spinning, weaving, medication and petrochemicals.	- Dependence of the national industry on foreign expertise (lack of trust). - Difficulty of competition with imported technologies after full liberalization of trade. - Lack of coordination on the national side with government agencies supporting the investment and marketing of the outputs of scientific research.

Scientific Research	Scientific Research
<ul style="list-style-type: none"> - International entities welcoming the participation of the Egyptian authorities in high-competitive international programs to support the infrastructure, raise capacities and support joint applied research. 	<ul style="list-style-type: none"> Lack of awareness of intellectual property rights and scientific integrity of some researchers. - Publishing in Arabic in the field of Humanities and Social Sciences. - Low evaluation by scientific committees of national journals.

Based on the previous postulates and the results of the SWOT analysis, the most important challenges facing the system of scientific research and innovation in Egypt can be summarized as follows:

- Poor infrastructure and information required for the development of scientific research, leading to the weakness of the database of different research institutions, thereby causing poor ability to support decision-making.
- Confining the production of universities and research centers to the scientific publication for the purpose of professional promotion, leading to the reluctance of researchers to make efforts to enter into contracts with the Industry Sector to develop it through scientific research.
- Industry Sector usage of researchers personally rather than institutionally to find some solutions and solve some manufacturing problems.
- Poor rate of innovation in industry.
- Most of innovations in these industrial establishments are not related to the product, but are limited to administrative processes and purchase of new production lines.
- Even in the few cases of innovation within productive or service institutions, no reference to research and development institutions or universities is made because of the low level of trust between the parties.
- Poor spending on research and development, especially by the beneficiary.
- Lack of major and increasing resources to pump the necessary support for the budget of scientific research.
- Reluctance of employers and the private sector to fund education and scientific research.
- Weak turnout of faculty members to get projects from institutions funding scientific research.
- Lack of mechanisms to finance scientific research and innovation for non-workers in scientific research by the State.
- Poor marketing for Egyptian universities and research centers as consultancies to expand participation in development and technological projects.
- Lack of cultural awareness among different individuals, institutions and sectors of the role of scientific research in addressing societal challenges.
- Lack of components of the educational programs that is established to create the scientific mentality of the students in the bachelor's degree and pre-university education.
- Lack of incentives to encourage excellence, research teams, and adequacy of promotion rules for the nature of the tasks required from researchers.
- Lack of effective partnerships between scientific research institutions and economic sectors that are directly or indirectly related to scientific research.
- Lack of emphasis on research that are applicable and developmental, directly contributing to the development process and solving the social problems.
- Some scientific and research institutions in Egypt still lack intellectual property policies that regulate the relationship between institutions, researchers and employees.
- The limited works operated according to the system of Egyptian scientific advisors abroad to link Egyptian scientific research with the scientific achievements all over the world.

In Case of Cooperation with the Industry Sector:

- The Industry Sector faces difficulties in accessing the information it needs from the research institutions on the one hand, and the industry requirements of laboratories and the research sector in general are unclear and unspecific on the other hand.
-
- Successful industries rely entirely on “turnkey” technologies from foreign countries and do not recognize research and development by local research institutions.
-
- Small size of small and medium industries makes them unable to spend on research and development (R&D), increasing the lack of effective mechanisms linking these industries to research and development institutions.
-
- Lack of R&D culture in the Industry Sector in general.
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- The large number of unregistered industries, which prevents them from benefiting from the programs available for their development.

Objectives of the NSSTI:

The NSSTI aims at developing an effective scientific and technological base that is knowledge-driven, capable of innovation and has an international standing, driving the national economy for continuous progress; for achieving sustainable development, increasing knowledge production, improving quality and raising its response to address societal challenges and increase the competitiveness of national industry.

Based on the previous analysis, the vision of the plan and its mission and the results of the SWOT analysis, two main integral tracks were identified on which the strategy is based. Both of these tracks represent a strategic objective of the NSSTI:

Achievements for the period from 2014 to 2018

Within the framework of the directives of the President of the Republic to accelerate the implementation of the Sustainable Development Strategy “Egypt Vision 2030”, which represents a basic station in the process of comprehensive development in Egypt to link the present to the future. The strategy is inspired by the achievements of the ancient Egyptian civilization, for adoption of a clear development process for an advanced and prosperous nation, in which economic and social justice prevail, reviving the historic role of Egypt in regional leadership. The strategy also draws the roadmap, aiming at maximizing the benefits of competitive advantages and factors and working on implementing the dreams and aspirations of the Egyptian people to enjoy a decent and dignified life. The directives and keenness of HE Dr. Khalid Abdul Ghaffar, Minister of Higher Education and Scientific Research, indicated the necessity of continuing the programs, projects and activities of the Ministry of Scientific Research within the framework of the implementation plan of the NSSTI (STI-EGY2030), which is an integral part of the Sustainable Development Strategy “Egypt Vision 2030” and the work program of the government “Egypt Begins”.

The Sustainable Development Strategy “Egypt Vision 2030” concentrates on the concept of sustainable development in its three basic dimensions: economic, social and environmental. The economic dimension includes the axes of economic development, energy, science and technology, innovation, transparency and the efficiency of government institutions, whereas it aims at helping the Egyptian society to be creative, innovative and productive of science, technology and knowledge through an integrated system that ensures development value. The work program of the government addressed many objectives. The second objective “Building the Egyptian Individual” included the main program of scientific research. The program includes the confirmation of the scientific identity, including the subprograms of higher education and scientific research:

- Subprogram 3: Dissemination of science and innovation culture.
- Subprogram 5: Improving the quality of the research and technological system.
- Subprogram 7: Expanding technological development.
- Subprogram 9: Establishment of the endowment fund for education and scientific and technological research.

The Ministry of Education and Scientific Research doubled its efforts since the launch of the national sustainable development strategy of NSSTI, so that all programs and projects according to the government’s program which includes the axis of the NSSTI with its two tracks, the first is

preparing an innovative environment that supports excellence and invention in scientific research, which is the basis for a comprehensive social development and producing a new knowledge that achieves an international pioneering , the second is producing knowledge and transferring and localizing technology to participate in economic and social development and in light of Egypt's pioneering axis which is considered one of the sustainable development strategy axis and the government's work program, and in light of his excellency the president and his highness minister of high education and scientific research, Egypt lately won the hosting of African Space Agency (ASA), which is an international scientific event.

Legislations and preparing environment that supports science and technology:

In the framework of the Ministry of Scientific Research role in preparing a supportive environment that encourages invention, in 2018 and the first half of 2019, a package of legislations supporting science, technology and invention were completed, including the issuance of law no. 22/2018 ,and its executive regulations no. 2019, in addition to agreeing on Metrology draft law which will positively affect the support of Egyptian economy in a coordinating framework. The parliament also agreed on a law for establishing an authority for financing science and technology and invention which aims at non-governmental financing for researchers in universities and research centers. Another law also was issued for supporting the inventors and the genius for a form of finance from non-governmental sources for youth inventors and others.

Currently, the executive regulations in the research centers, institutes and authorities affiliated to the Ministry of Higher Education and scientific research to be able to carry out its role in the light of the legislative amendments that support invention. The ministry has also evaluated the NSSTI including the requirements which were collected during last year by all ministries such as Ministry of Health, Ministry of Industry and commerce- Ministry of Environment, Ministry of irrigation- Ministry of Finance- Ministry of Civil Aviation.

Accomplishments of Executive Authorities:

Supporting innovation and linking scientific research with industry and deepening regional manufacturing:



- The Scientific Research and Technology Academy launched the national program for electronic incubators (Intelaq) in October 2015 so that it becomes the largest umbrella for establishing and managing the technological incubators within the system of entrepreneurship and innovation so that it covers all different regions of Egypt, and in order to be able to transform ideas, innovations and findings of research to emerging technological companies capable on economic and technological competition, and its products has a competitive capacity that meets the knowledge economy objective by discovering new ideas and assimilate its owners of researchers, inventors, entrepreneurs and students in Egyptian universities and technical schools, and providing appropriate environment, financial, technical and logistic support for distinguished technological ideas, and creating new job opportunities in all Egypt's regions and contribute to face the national challenges through a clear, transparent, declared and ongoing corporate system.



- The number of incubators within the academy program reached 18 incubators including public and private incubators specialized in textiles, AI, IoT, education, electronics, virtual reality, and augmented reality. It also supported more than 90 technological companies, and the graduation of 62 companies operating in local and international markets alike with a total amount of EGP 48,000,000 with partnerships with public universities such as Suez University, Damietta University, Alexandria University, Ain- Shams University, Asiat University, Azhar University in Qena, and research centers such as Electronics Research Institute, and some civil work organizations such as Masr Elkhir Association, *Itesal* Association, and in cooperation with foreign entities operating in the field of supporting incubators, innovation and entrepreneurship such as SEED, GIZ. The national program for technological incubators "Intelaq" provided more than 270 work opportunities with an average of 3 opportunities inside each company.

- Technology, Innovation and Commercialization Office Network "TICOs" financed by the academy was completed in universities, research centers, industrial gatherings, military production and

industry ministries, and a team for technological marketing. The number of these offices reached 43 offices with a total finance of EGP 40,000,000.00. Through such offices, 2000 research papers were published, 25 patent applications were registered, 3 patents were obtained, 22 technological ideas were supported, 126 prototypes were designed, marketing for 120 technological products, the financial revenue for technological marketing contracting is EGP 25,000.

- The academy launched “Bedayaty” project to support the graduation projects for final year students in 2014 in order to relate and apply the outcomes of the graduation projects with SMEs to serve the community as well as qualifying graduate students to be entrepreneurs and translate their own graduation projects into emerging companies capable of competition.

- For the fifth year, the academy declared its support for the graduation projects, and introduced 800 graduation projects of which 300 were chosen to be financed with a value of EGP 13 million in many fields such as furniture and interior design, green technology, assistant programs for handicapped- software industry- IoT- animation movies and electronic games and electronics, and robotics, energy and water, aquaculture, waste recycling ,and landscape, petroleum industries..etc.

- The academy launched Knowledge and Technology Alliance Program aiming at directing and supporting the national capacities in the universities and research structures and non-governmental organizations to market invention and transfer technology to solve the urgent national problems. The program represents a group partnership for different structures in industrial and technological development where the industrial sectors are the main representatives for innovation in the alliance. Each alliance is made of ten partners, one partner at least representing a research and academic entity, in addition to relevant non-governmental organizations and local authorities, provided that it shall include three partners at least of the industry sector. The number of alliances reached 14 in the fields of water desalination, medication, electronics, food industries, space, new energy, petrochemicals and deepening local manufacturing. The financial support for each alliance is EGP 10 million, with a total finance of EGP 170,000,000 in which 120 industrial institutions participate in its implementation including universities, institutes, research centers, industrial institutions and civil society institutions

1. Electronics Alliance

Many projects are being under implementation such as:

- **Smart meters system**

Beneficiaries: electricity company, water and sewage company and gas company

The project aims at upgrading digital counters, pre-payment counters already existing in water, electricity and gas companies by setting up the local design for the upgrade process elements as a primary stage, follow up- collecting and processing readings and relevant data. The project also aims at setting an invented local design for smart measuring meters through which prepayment system can be applied and adding relevant communication methods as well as carrying out testing and calibration processes for meters to suit the current requirements of the company with the possibility of development according to the operation conditions and future expansions according to the requirements of targeted sector to reach a flexible system that makes it easy for ongoing monitoring of the network elements data in real-time, in addition to contributing to raising the ability and capacity of targeted sector for ongoing monitoring for the company performance through a dual communication network and controlling all the distribution network elements.

- **Museums Security system:**

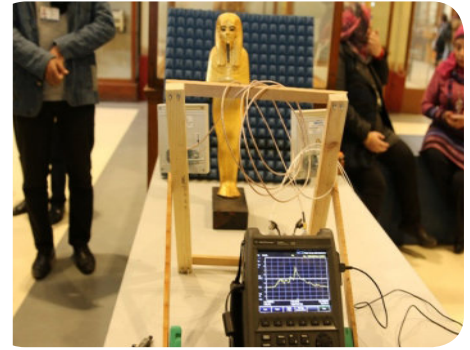
Beneficiaries: Ministry of Antiquities and all museums inside and outside Egypt, in addition to the insurance companies on antiquities and important belongings.

This product aims at producing a small and accurate commercial model to secure and protect important museums and places using electromagnetic waves, creating an electronic data base of antiquities based upon radar footprint for each statue and another system for the protection of entries, exits and surroundings of showcases in a form of an invisible curtain or wall of electromagnetic waves to prevent approaching or giving a warning in case of penetration in addition to the third system ,which is based on electronic survey to define where the statue is ,as well as acknowledging the electronic print of the statue (body) ,which needs to be protected either using a conductive or semi insulating material. The radar footprint system was applied in cooperation with the Ministry of Antiquities- Tahrir Museum to be applied on the antiquities and exhibits participating in the mobile show for the statues of Tutankhamun ,which will tour most of the world countries. Cooperation is going in securing the internal and external gates of the great Egyptian museum in Haram.

- **Solar Energy transformers:**

Beneficiaries: Ministry of Electricity and Energy, new and renewed energy authority and all customers and citizens

The project aims at developing and producing solar energy production units with locally manufactured transformers linked



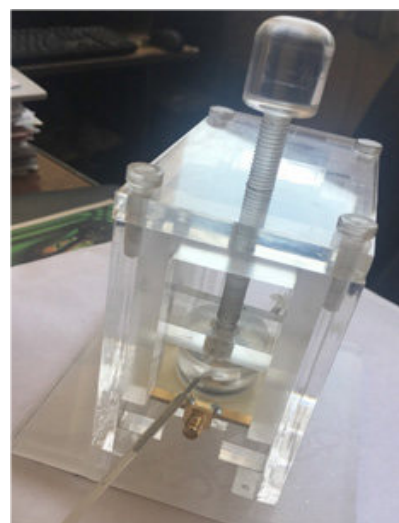
to the electric network with multi capacities. These units can be used in electricity power production from solar energy in houses and other places. The primary production is estimated with a capacity of 10 kw. Other bigger capacities will be produced in the plan set consequently.

The project started with a prototype for a solar energy transformer linked to the network ,which was developed in the Egyptian universities. The primary results showed a successful follow up of maximum energy from the sun and its production as well as operating the load linked to the network and the solar system appropriately The system showed a symmetric performance of the international commercial systems with very competitive prices.

- **Gap Resonant Sensor for the detection of viruses and microbial materials in biological samples**

Beneficiaries: Hospitals, medical tests labs as well as livestock and poultry production farms ,and the mobile medical campaigns, customs ports and military applications.

There is a limited set of specifications for the detection of viruses and bacteria in biological samples ,and the degree of severity of infection. These data are extremely important for diagnosing and determining the type of treatment of these viruses and bacteria methods. The diagnosis currently available in the markets either takes a long time or is very expensive; therefore, we need to increase detection speed and accuracy while reducing cost ,and minimizing device size.



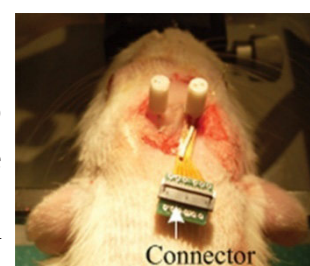
There are several techniques in this regard, but what we propose is a technology-based diagnostic method ,which is Microstrip Cavity Resonator Biosensor(MCRB) to diagnose an infection or bacteria. The proposed method relies on the interaction of antibodies and change in the electrical properties of the sample, such as electrical conductivity coefficient, dielectric constant and quality resistance. These interactions are translated into changes in the electrical properties of the sensor that can be measured such as reflection coefficient, internal resistance, and changes in the working frequency of the antenna. Upon comparing the affected samples with the negative samples, the affected samples can be automatically separated from the sound ones. Using the MCRB for rapid discovery of viruses and bacteria will limit the usage of lab discovery methods that need high experience ,and takes a very long time as well as being expensive. The proposed method is quick and accurate, and the device can be easily carried to different areas especially remote ones.

- **Electrode stimulation treatment, or deep brain stimulation (DBS),. for the treatment of epilepsy and Parkinson's disease**

Beneficiaries: hospitals, epilepsy and Parkinson's disease patients

The device contributes significantly to the treatment of diseases related to the regulation of brain electricity such as epilepsy and Parkinson's disease

This product includes the manufacture of electrodes for brain implantation

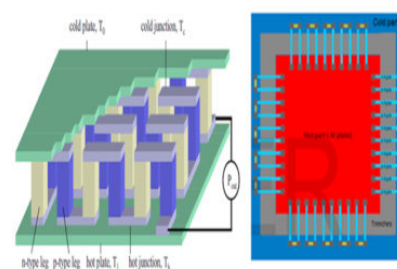


for people with epilepsy or Parkinson's disease to measure and control the EEG brain signal and make ratings upon it to predict whether there will be a seizure or not. It also stimulates the brain with electric signals before the occurrence of epileptic seizures to prevent convulsions associated with epilepsy or Parkinson's disease. These electrodes are manufactured from materials accepted by the human immune system. The importance of these electrodes is due to the increasing number of people suffering from epilepsy and Parkinson's disease for about one million people in Egypt ,and the percentage of those patients who are not responsive to medication and surgeries is 40%.



- **Micro thermal power transformers**

This project aims at benefiting from thermal energy generated by electronic systems (Microelectronics) ,and convert them into electrical energy (microwatt) that can be used. New designs were made in this project (designs and calculations are the main factor ,and are 100% Egyptian). Doing the necessary calculations and using simulation programs that help to detect the performance of the thermal generator proposed using nanotechnology (130 nanometers).



- **Gas sensors based on microelectromechanical systems (MEMS)**

The aim of the project is to provide a gas sensor based on MEMS that can easily detect the presence of toxic gases laboratories , factories, and oil pipelines. Environmentalists use such sensors to detect any gas leakage, and monitor harmful industrial emissions. The proposed sensor consists of a gas-sensitive material and an electronic circuit that determines the concentration of the leaked gas. Comparing this to other sensors that do not depend on MEMS ,we find that this sensor is more economical because thousands of these sensors can be manufactured at the same time ,and this reduces the final cost of the sensor compared to other kinds. About 85% of design and industrial execution have been already completed, so that MEMS sensors would be industrially produced by the end of the project in May 2018. Note that the proposed device will provide a significant price difference compared to similar imported devices as the cost of each of them is about \$ 150 ,and is used once.



2. Integrated Pharmaceutical Alliance - Towards the production of Egyptian pharmaceutical products on a technological basis

• Functional food from stabilized rice bran

Oryza is a 100% natural product of stabilized rice bran. It is Gluten free. Oryza is a product rich in natural, soluble and non-soluble vital fibers and vitamins and rare mineral elements. Oryza has all the benefits of brown rice (65% of the rice value of rice). Oryza is registered with the Ministry of Health as a rich source of fiber.

• Food supplements from the stabilized rice bran extract

International research has been conducted on the beneficial effects of the Egyptian rice yield in cases of diabetes -Blood pressure - high cholesterol in addition to the obvious effect of the extract on the brain cells and protecting them from oxidation. More research has also been published on how brain cells work under the effect of this extract. Product comes in the form of gelatin capsules or tablets and is currently in the final stage of registration with the Ministry of Health.



3. National Alliance for Knowledge and Technology in the field of Recycling and Decomposition of Petrochemical Wastes

The alliance will present various models of plastic products produced from plastic waste using innovative, simple and economical chemical mixtures, to name but a few; plastic granules homogeneous in size and shape which are the primary raw material for the manufacture of various plastic products.



4. National Alliance for Knowledge and Technology in the Textile Sector

• Mixed flax / cotton yarns

The idea of the product is to eliminate the flax exhaust, which is a problem for the linen manufacturers, by mixing linen exhausts that have the same cotton hair length with Egyptian cotton so as to produce a type of yarns with the advantages of cotton and feel of linen with lower costs and no need to import from abroad. This mixture was executed and produced in in one of the subsidiaries of the Holding Company for Spinning and Weaving. Fabric was produced from threads produced and it was subjected to processing and dyeing.

A semi-industrial experiment was conducted by Golden Textiles Co. for wool to treat wool bristles with some natural salts to



produce antimicrobial properties for wool. At the same time, wool can be produced in colors and processed and it is considered eco-friendly, 10 kg of fibers were processed already ,pending the spinning of fibers to produce threads to manufacture a final product.

- **Spare parts for textile machines**

Spare parts are one of the problems facing any industry, especially the spinning and weaving industry as spare parts are imported from abroad. The big problem is for old machines as spare parts are very hard to be available. Thus a joint workshop was held with the Metals Research Center at the Center's headquarters in Tebin. Companies that operate in Textile and weaving sector were invited



by the Holding Company for Spinning and Weaving. The project and objectives of the Alliance were explained. Spare Parts Required for manufacturing were collected from the attendees and the Center performed the analysis required to know the raw materials from which the required spare parts were manufactured, and the first prototype samples were manufactured. The manufactured parts were sent through the Metals Research Center to Shebin El Koum Company and Helwan Spinning Company for trying the manufactured parts. The experience of the spare parts proved .their efficiency and compatibility with the original parts

- **Improving the properties of direct printing on cloth**

The alliance has entered into a cooperation agreement with BBG for printing and ready-made garments where the alliance provides technical services to the company and in return the company provides the raw materials needed by the alliance. A team was assigned to study the problem of the plant, which required work to determine the appropriate conditions for printing in terms of ratios of raw materials appropriate, and the operating conditions. The study was carried out and obtained the company's appreciation that started implementing the findings of the team's work. The most important results were the provision of chemical raw materials used by 50% and obtaining the results of quality.

- **Electronic test system for fabrics**

The product is a complete automatic system to check the fabrics to identify defects including guiding the factory to avoid these defects in order to reduce defects and increase the quality of the product. Factories need this system, especially factories that export. The screening process is usually done by workers which may be inaccurate and the estimation of the defect varies from one worker to another. The innovative system depends



on a camera and an analytical system programmed to identify the defects accurately.

- **Back strap**

The product is a back strap featuring high quality ,and a cheaper price. Product components are

manufactured with local raw materials. The product is lightweight and has all the amenities. It can also be worn under the clothes so that it will not affect the psychological state of the strap-wearer. The strap is also designed to fit the body. It can be washed easily without affecting its efficiency.



- **Creative Textile Technology Center**

Establishing Innovative Textiles Technology Center (ITTC) for the research, development and implementation of the prototype of many textile products at the National Research Center within the Textile Research Department, where many researchers from different disciplines will be represented at the center. Such Center will include machines necessary for producing prototypes or samples.. Such machines consume a very small amount of raw materials to produce prototypes and initial samples, thus reducing the cost of production. In addition, the time needed to produce a prototype is very small compared to using conventional production machines. In addition, undergraduate and post graduate students will be able to implement their graduation projects easily and at low cost



- **Clean room gowns**

This product is specially designed for use in a clean room where these clothes maintain the cleanliness of the room and are used in the medical and pharmaceutical fields. These gowns fabrics are made in a special way to prevent any contamination ,transmitted from the wearer to the room. The sewing process must also be precise to ensure the quality of the performance of the clothing. The cloth was supplied locally by Salam Tex and the garments were manufactured through the alliance.



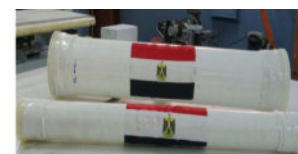
- **Beams from composite materials supported by fabric in the form of (i)**

The idea of the product is to manufacture complex compound materials such as beams and light poles in a quick and cost-effective way. These composite materials are lightweight and durable in comparison to wood and metal. The innovative method of production enables the fabrication of complex three-dimensional fabrics in an easy and fast manner. These textiles are processed into a light, durable, water-resistant, rust-resistant and chemical-resistant product that increases its lifespan.

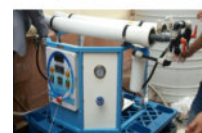


5. National Alliance for Knowledge and Technology in Desalination

The aim of this alliance is to deepen local industrialization and increase the proportion of the local component in desalination industries. This objective depends on the cooperation of partners to ensure the success of the Alliance’s goal. The Desalination Alliance is expected to be a desalination center, re-use research and associated training activities through membrane-based technology.



Pressure [bar]	RO Element	
	Flux [LPH]	R, %
10	183.2	90
14	252	90.9
15.5	294	91



• Launching the first Cairo International Electric Rally Car Contest for locally manufactured electric cars”, a national technology competition, the first of its kind in Egypt and the region, which is legally protected for the Academy of Scientific Research and Technology in December 2017 with a total budget of EGP 10,000,000. The competition was organized by the Faculty of Engineering, Ain-Shams University, after an open competition was held at the level



of the Republic. 312 students participated in the first phase of the rally representing 26 Egyptian universities. The Rally was held on October 13, 2018.

The Grand Prize amounting to EGP 500,000 was awarded to the Ain-Shams University team after a strong competition involving 9 Egyptian teams. The Suez Canal University team came in second place with a prize value of EGP 250,000 and the third place was awarded to the Higher Institute of Technology



In the tenth of Ramadan with a prize of EGP125,000, in addition to 5 prizes for excellence and the value of each prize is EGP 25,000, where 4 cars were able to complete the race to the end, which led to the winning of the team of the University of Kafr El-Sheikh for the best design, and the second prize in innovation was obtained by Ain-Shams University team, and the Military Technical College. While the third place for the best work plan went to the team of the Higher Institute of Technology at the 10th of Ramadan region. The fourth prize was the Safety Award. Two prizes of which were awarded to the South Valley University and Helwan Engineering Faculty at Mataria. As for the fifth prize, went to the Zaqaziq Engineering Team.

• A seminar on technological marketing was held for the most important research outputs of the applied and marketable projects. The third forum was held in April 2018 to present the research outputs resulting from the initiatives and projects funded and supervised by the Academy of Scientific Research and Technology to meet some of the challenges facing the industry in cooperation with University of Assiut, Zewail University of Science and Technology, Beni Suef University, the Agricultural Research Center and the National Institute of Oceanography and Fisheries, in the presence of industry, trade and Scientific media figures and concerned authorities.



• Technological marketing for 19 technological outputs (research / innovation) is expected to achieve direct and indirect revenues and achieve savings in the balance of payments in the fields of industrial, service, environmental and agricultural production fields, such as:

- Water purification plant using direct single stage and two stage filtration
- Establishing a low-cost integrated water purification plant

- Small diameter pipes as an alternative to conventional sanitation
- Developed systems for the production of charcoal (thermal greenhouses for the production of charcoal)
- Manufacturing of an independent solar water desalination unit
- Manufacturing a mobile solar reverse osmosis station to desalinate water wells
- High-efficiency, high pressure pump production combined with solar water desalination unit
- Production of high quality spare parts for power station service
- Production of gears of high-strength flexible cast iron
- Production of spare parts for Egyptian railway wagons
- Water cooling, cost effective device
- Electromechanical system for automatic fire extinguishing for vehicles
- Dehumidification device of welding wire used in oil companies
- Alarm sensor and high sensitivity protection for alarm and fire resistance
- Medical bed that prevents the formation of bedsores
- Manufacture of petroleum condensates associated with natural gases and crude oil in petroleum refining units
- Agricultural fertilizers derived from algae and seaweed
- Rice strains tolerant of drought and water scarcity (rice with saline tolerance gene transferred to it)
- Production of special asphalt mixtures used in the maintenance of thermal expansion joints of metal bridges and the maintenance of civil and military corridors
- **Application of oil dispersion technology in the Suez Canal Authority**
 - The innovation program was launched with funding of one project up to a maximum of 3 million pounds per project. The program aims to support the researchers with the necessary funding for applied projects, which are characterized by innovation, uniqueness and modernity in all fields. Innovation programs are primarily aimed at linking scientific research with industry.
 - The program for supporting the research and technological development (two courses) was launched: within the program, each project is funded with a maximum of 200 thousand pounds. The program supports small projects, whether basic research to complete the master's or doctorate theses characterized by the development of a technological component or manufacturing a prototype or verifying an innovative idea. The successful projects are qualified for more funding through the fund different programs. This project contributes

to supporting and promoting the development of innovations by providing the researcher with the required funding in small projects in a short time.

- Many courses of *Ostaz* or “Professor “ program for each factory (6 courses): This program aims at linking scientific research to the industry by providing the necessary support to allow researchers from universities or research centers to study an existing problem in an industrial institution and offer solutions. The program was developed to include the cooperation of the Fund With the Ministry of Military Production by including the challenges facing the military production plants and put them before the research community to diagnose and find practical and innovative solutions.
- Several courses of the Resettlement Program (2 courses) were introduced: The resettlement program aims to confront the brain migration through the support of Egyptian scientists who obtained PhD degrees from abroad ,and did not exceed forty years, with a maximum of EGP 2 million for the project for a period of three years
- The Basic and Applied Research Support Program has been launched: through the program, one project is funded with a maximum of EGP 2 million per project. Through this program, the Fund for Science and Technological Development funds basic research projects with a maximum of EGP 1 million per project in all scientific fields: Agriculture - Chemistry - Physics and Mathematics - Geology and Mineral Resources - Space and Remote Sensing - Food - Biology - Water - Water Desalination - Information and Communication Technology - Social Sciences and Humanities - Transport - Engineering - Energy - Electronics - Biotechnology - Environment- Medicine- Pharmacy- Nanotechnology- Fish & Fisheries - Environmental sciences.
- The grant was launched in the field of pollution r abatement: In accordance with the instructions of His Excellency the President of the Republic at the First Conference for the Empowerment of the Egyptians, the Fund, in cooperation with the Ministry of Environment, determined the national priorities in the field of environmental conservation and reducing the rates of pollution that need solutions by scientific research. The Fund then raised these issues for consideration in the framework of the grant in the field of pollution abatement.
- A Program to meet the needs of the community: The program aims to provide the required funding for research projects that researchers provide to serve the industry, given that it is required to apply for this program that the idea of research shall be required by an industrial body. Through this program, the Fund supports projects with a maximum of EGP 3 million for two years.
- The National Challenges Program was launched. The program aims at providing the required funding for the research projects that the researchers provide to solve and address national challenges. The program requires that the idea of research is required by a national entity that will identify the national challenges. Through this program, the Fund supports projects with a maximum of EGP 3 million for two years.

Energy:

- The Academy implemented the largest EU-supported research and applied development project in a non-EU member city in the city of Burj Al Arab (MATS project) in the field of solar energy and water desalination with a budget of 9.5 million euros, of which only 2.4 million euros were incurred by Egypt. The project has been stalled since 2009 ,and the actual work began only a year ago. It is the largest research and development center in North Africa and produces 1 megawatt of electricity and 250 cubic meters of desalinated water.
- A pilot station for small units of solar power stations in Belbis (SEKEM farm) was developed, constructed and operated with the support of the European Union
- An approach for directing the sunlight to illuminate narrow streets and alleys was invented and some of these innovations were highlighted by international journals such as Newsweek.



Water:

- Establishing a national alliance to enhance the local manufacturing in the desalination industry with an annual funding of 10 million Egyptian pounds.
- Local manufacturing of a movable solar-empowered desalination plant with the capacity of 21 cubic meters.
- Some new and innovative technologies in the field of water desalination with membranes at low temperatures (52° C) have been developed, which will reduce the cost of water desalination. There are great efforts and promising results in the filed on local manufacturing of desalination membranes and high voltage pumps, which are the key components in the desalination industry. These innovations are being registered and applied on a pilot basis in preparation of marketing.





Agriculture and Food:

- Local development of wheat storage technology (plastic silos), which reduce waste to 2%, do not use chemical materials in fumigation and have higher quality and storage cost of 30% less than metal silos and incomparable capital construction investments.
- Increasing the wheat productivity in experimental fields to 24 ardebs per acre, through national campaigns of the Academy. The rice productivity has been increased by way of developing new hybrids by 30% and the irrigation water has been saved by not less than 20%.
- The “Egyptian Encyclopedia of Wild Medicinal Plants” was issued as the first encyclopedia in Egypt, with the support of the Academy and in cooperation with the National Research Center and the Agricultural Research Center and in partnership with universities, institutes and research centers. The encyclopedia includes a series of issues containing available information (both published and unpublished) on wild medicinal plants in Egypt in order to make the maximum use of them, as well as collect and document the heritage knowledge of wild medicinal plants and launch a database of wild medicinal plants in Egypt. The encyclopedia issues will also include the DNA signatures of existing wild medicinal plants that have been collected, through the use of DNA barcoding technology, with the aim of making reference signatures using the latest technologies to preserve and document the wealth of Egypt.
- Financing the national project to promote the productivity and marketing of hybrid rice, which resulted in increase of productivity by 1.5 tons/acre, compared to the best local types with a total of 250 thousand-375 thousand tons of unmilled rice.
- Manufacturing of a cart for the transport and weighing of agricultural crops with local components of 80%.



International Cooperation:

- The efforts to return Egypt to Africa have started to pay off, as Egypt is the current Head of African Union Office for Science and Innovation in its current session. Egypt annually awards three prizes to young African researchers, offers important training programs in the fields of epidemic disease, diagnosis and foundries and participates actively in the African Observatory of Science, Technology and Innovation. Egypt is also a founding member of the Africa Innovation Network in Epidemiology Diagnosis. The Theodore Blahars Research Institute was selected as an African center of excellence in this field.
- Implementing a project funded by the European Union “Institutional twinning to build the capacities of the National Institute of Standards for consistency with the European system and achieve the international recognition of measurement standards and standards certificates.”
- International cooperation projects have been supported with about 200 million Egyptian pounds with different countries of the world.
- An agreement was signed for the incorporation of the Egyptian-Chinese Center for Technology Transfer between the Chinese Ministry of Scientific Research and the Egyptian Ministry of Scientific Research. Through this agreement, 11 young researchers were trained in China in the fields of science policies, technology, entrepreneurship, energy, agriculture, internet of things and water. Furthermore, three workshops were held in Egypt to allow Egyptian to learn about the new technologies in China and create opportunities of cooperation in the field of electronics, modern agriculture, water, irrigation, intelligent transportation and medicinal plants. China was also represented in the Cairo International Exhibition for Innovation as a guest of honor and introduced new technologies from 13 research institutions.
- The European Union announced that the Academy of Scientific Research and Technology is the national contact point for health research programs, science to serve the society, researchers’ transportation programs from and to Europe, and raise the capacities of researchers.
- Raising international cooperative capacities, entering into scientific partnerships with international consultancy firms, and cooperating with more than 150 scientific institutions in different countries. The European Commission in Belgium announced that in 2016 the Academy became the largest Egyptian body in terms of competitiveness of European projects related to science and technology for the third year in a row.



- Agreeing on the building the first stage of solar cells and solar modules labs with a total cost of 1.8 million dollars in Qaraman Island in Sohag.

- Within the framework of scientific and technological cooperation between the Academy and the Czech Academy of Sciences, contracts were entered into in relation to 15 research projects from 13 research bodies over the last five years, of which 5 projects were contracted early in this year. The funding per project was increased to 100 thousand Egyptian pounds per year instead of 40 thousand Egyptian pounds per year.
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- Within the framework of cooperation between the Academy and the Chinese Academy of Sciences, 9 researchers projects were contracted, whose implementation has started since the beginning of the current year. The funding per project was increased to 100 thousand Egyptian pounds per year instead of 30 thousand Egyptian pounds per year.
 - Within the framework of cooperation between the Academy and the Indian Science and Technology Department, 18 research projects are being implemented, all of which will be completed in the coming August at the latest. Each project is allocated a funding amount of 100 thousand Egyptian pounds per year.
 - Within the framework of scientific and technological cooperation between the Academy and the Hungarian Academy of Sciences, 11 research projects were contracted over the last five years, of which 3 starting from the previous year. Furthermore, the funding per project was increased to 100 thousand Egyptian pounds per year based on the resolution issued by the Academy's Board in this regards.
 - Within the framework of cooperation between the Academy and the National Academy of Sciences of Belarus, 5 research projects were contracted during the past year. The funding per project is 20 thousand dollars per year.
 - Within the program of visit exchange between the Academy and the Polish Academy of Sciences, 52 Polish archeology researchers and experts were received in Egypt over the past six years, of whom 14 were received over the last year. On the other hand, the visits allocated to Egyptian researchers to travel to Poland are 15 months (classified as long visits) and 15 weeks (short visits) per year.
 - Within the program of visit exchange between the Academy and the Czech Academy of Sciences, 9 researchers were received in Egypt during the last five years. On the other hand, the visits allocated to Egyptian researchers to travel to the Czech Republic are 10 weeks per year, which were reduced to 6 weeks only starting from the current year.
 - Within the framework of scientific and technological cooperation between the Academy and the Bulgarian Academy of Sciences, during the last five years 8 projects were completed, within a funding amount of 30,000 Egyptian pounds per project per year. 13 projects are being implemented, with a funding amount of 30,000 Egyptian pounds per project.
 - Within the framework of the Egyptian-French Scientific Cooperation Program "IMHOTEP", during the last five years 22 projects were completed, with a funding amount of 100,000 Egyptian pounds per project per year. 30 projects are being implemented, with a funding amount of 100,000 per project. The Academy's website announced the commencement to receive new research proposals for 2020/2021.
 - The Egyptian-Japanese Partnership Project (9th Session): the evaluation project by the Egyptian and Japanese sides was completed and the two sides approved financing 2 joint research projects and 2 joint workshops.
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- Program of the Egyptian-British Agreement Newton-Mosharafa: the evaluation process by the Egyptian and British sides were completed and both sides approved financing:
- Eight scholarships under the Pioneers of Innovation Program.
- 20 joint research projects (within the framework of the Fourth and Fifth Sessions)
- 5 projects under the Cultural Heritage Preservation Program.
- Egyptian-Spanish Partnership Program: the Egyptian and Spanish sides completed the evaluation process and approved financing 4 joint research projects.
- Egyptian-German Partnership for Travel Grants (10th Session of Cooperation): the Egyptian and German sides completed the evaluation process and approved financing 6 travel grants for 6 research teams.
- Egyptian-French Partnership Program (Travel Grants): the Egyptian and French sides completed the evaluation process and approved financing 18 research projects.
- Egyptian-Chinese Partnership Program (1st Session): the Egyptian and Chinese sides completed the evaluation process and approved financing 9 research projects.
- Europe-Africa Scholarship Program (Leap-Agri): the evaluation process was completed and it was approved to jointly finance 2 joint research projects in the food and agriculture field.

Euro-Mediterranean Cooperation Through ERANET Joint Activities And Beyond (ERANETMED): the evaluation process was completed and its was approved to jointly finance 3 joint research projects (in water field):

- The first project is co-implemented by researchers from: Egypt, Tunisia, Morocco and Germany
- The second project is co-implemented by researchers from: Egypt, Italy, Portugal and Morocco.
- The third project is co-implemented by researchers from: Egypt, Germany, Italy, Spain and Tunisia.
- International cooperation grants were offered through the Science and Technology Development Fund.
- The Egyptian-Japanese Cooperation Program (10th Session) was launched: through this program, joint research projects are financed through joint funding (for each joint research project, the Fund allocates a maximum funding amount of 145 thousand Egyptian pounds per year for the Egyptian researcher, in addition to 2.5 million Japanese yens per year from the other side to the Japanese researcher, with a maximum period of two years per project).
- The Egyptian-German Travel Cooperation Program (11th Session) was launched: this program provides funding for travel grants for research teams within the framework of conducting joint researches (Egyptian research team and German research team), stressing the presence of a number of young researchers in research projects. Each project is allocated (15 thousand euros per year per project), which helps create channels of communication, transfer and localization of technology (master's and doctorate degrees), provided that the maximum period of the grant is two years with funding up to 30 thousand euros from both parties.
- The Egyptian-US Cooperation Program (19th Session of Cooperation) was launched: through the partnership program, the Fund finances travel grants to the United States of America, with a maximum funding amount of 30 thousand dollars per grant to complete research activities abroad, in addition to funding joint scientific researches within 400 thousand dollars for the project (200 thousand dollars from each party).
- The Egyptian-German Cooperation Grant (5th Session) was launched: this grant provides funding for joint scientific researches, with a maximum funding amount of 200 thousand euros per project (100 thousand

euros from each party), provided that researches cover priority areas for both countries.

The International Cooperation Program between Egypt and England (British Council, 4th Session of Cooperation):

- An academic and practical training program for inventors to manage technology and market their products within the framework of converting the scientific research outputs into added value that serves the economy and society.
- The Program for Cooperation between the European and Mediterranean Countries (PRIMA) was launched: this program provides funding for research projects on a competitive basis, provided that that researchers from European and Mediterranean countries cooperate in such research projects, which must target points constituting common challenges for all participating countries, such as agriculture, food and water, and provided that each country must, within the framework of this cooperation, fund its participating researchers, knowing that this cooperation includes 19 countries.
- The Egyptian-Spanish Cooperation Program (2nd Session of Cooperation) was launched: a partnership program between the Science and Technology Development Fund and the Spanish Centre for the Development of Industrial Technology. This program provides support for joint applied projects that meet the industry needs. To apply for this program, it is required that there is cooperation between a Spanish factory, which must have a research and development unit, on the one hand, and an Egyptian research team and industry partner, on the other hand. The support provided by the Fund to the Egyptian side in these projects is up to one million Egyptian pounds.
- The Egyptian-French Cooperation Program (5th Session of Cooperation) was launched: a partnership program between the Science and Technology Development Fund and the French Institute in Egypt. This program allows travel grants to France (for a maximum period of 9 months) to complete postdoctoral scientific research.
- The Egyptian-Chinese Cooperation Program (2nd Session of Cooperation) was launched: this programs provides support for an Egyptian research team who cooperate with a Chinese research team in the implementation of a joint research project. The Fund supports the Egyptian research team with 1.7 million Egyptian pounds.
- Some meetings and workshops were held with the purposes of exchanging experiences between Egyptian and foreign researchers or exchanging experiences between the Fund team and its counterparts in international institutions in order to build the capacities of the Fund cadres. For example:
- The Egyptian-US Workshop for Researchers: the Science and Technology Development Fund organized the activities of the Egyptian-US Workshop in cooperation with the US National Academy of Sciences, within the framework of the 19th Session of the Egyptian-US Cooperation Program, which is held annually for the arbitration, evaluation and selection of scientific cooperation proposals submitted by researchers in universities and research centers and bodies, in the presence of key researchers of the projects funded by the Fund under this program.
- The workshop focused on the plans and achievements of the partnership between the Egyptian and American sides through presenting the success stories of the completed partnership projects between the two sides and the projects funded in previous Sessions 17 and 18, as well as giving the participants the opportunity to discuss their researches and research projects
- The Egyptian-British joint workshop for researchers: The Science and Technology Development

Fund (STDF) organized the activities of the Egyptian-British joint workshop within the framework of the Innovation Pioneers Program, which is funded by STDF with the British side as an academic and practical training program for inventors to manage technology and market their products within the framework of transforming the scientific research outputs into an added value, serving economy and society.

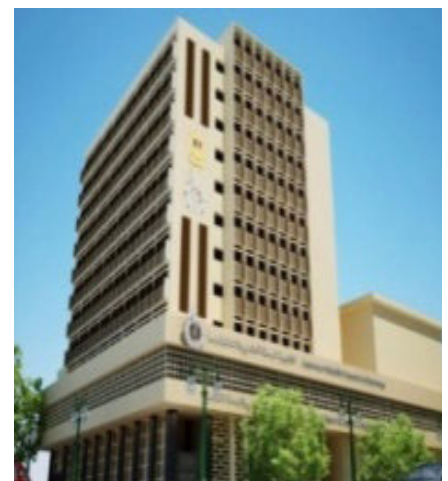


- A British-Egyptian joint workshop: In collaboration with the British side, STDF organized a workshop between a group of STDF staff and a working group from the British side to share experiences in technology management, research funding and how to monitor the outputs of research projects.



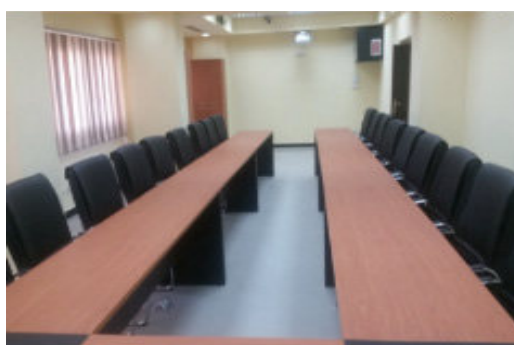
Infrastructure and Capacity Building:

- Supporting the establishment of 56 central labs with funding of EGP 240 million in universities, institutes and research centers.
- Create a center for cloud computing and significant data processing, hosting national databases and major national projects such as the Egyptian Knowledge Bank and linking Egypt to global research centers such as CERN.
- The sixth round of the grant was opened for application by the next-generation of scientists, where 170 students were granted a master's degree grant for the next-generation scientists with a total funding of EGP 6.1



million, and a monthly salary of EGP 2000 for each student. Opening the Central Laboratories Network and the Medical and Scientific Centre of Excellence at the National Research Center.

- The establishment of a laboratory for educational satellites, electronic tests and space photographs processing.
- Launching the largest development, maintenance and establishment operations in the history of the Ministry presented in establishing the electronic city at the Electronics Research Institute; and the Investment Zone in SRTA-City, in addition to developing the Academy of Scientific Research and Technology and the centers of excellence at the National Research Center; Theodor Bilharz Research Institute; and the astronomical and oil research laboratories. Some entities, such as the Academy and the National Research Center, have obtained the ISO 9001 certification. The oil and metallurgical laboratories, National Research Center and National Institute for Standards



have also been accredited.

- WIPO General Assembly in Geneva adopts and renews the Egyptian Patent Office as an international research and examination office for a period of ten years until December 2027.
- Capacity Building Program (Machines and Equipment): The program aims at supporting the infrastructure of the Egyptian centers and universities with the necessary new machines and equipment and updating, calibrating and maintaining the existing ones. The grant values at EGP 10 million for research institutions for two years. Four rounds of this program were launched, noting that two rounds of which were for the regional and emerging universities and research centers. Thus, the program aims at achieving the third axis of the Strategy related to supporting the development of infrastructure, in addition to taking into consideration the human element, within the framework of providing the necessary resources for distinguished scientists to benefit from them and transfer their experience to young researchers.
- The Young Researchers Program: This program aims at contributing to building and developing the scientific base in Egypt by supporting research projects for young researchers up to the age of forty in all scientific fields with a maximum of EGP 1.5 million for each project for a period of three years maximum.
- The Conference and Workshop Support Program was launched: The grant supports workshops to disseminate scientific information that will build the capacity of Egyptian researchers, as well as building scientific networks. One of



the objectives of this grant is to define the role of STDF, its functions and objectives, and promote programs.

- The Conference and Workshop Support Program for youth: The program is recently designed to provide young researchers up to the age of 40 years with the opportunity to support workshops to disseminate scientific information that will build the capacity of Egyptian researchers, as well as building scientific networks. This grant aims at defining the role of STDF, its functions and objectives, and promoting programs, especially among young researchers.
- The Research Support Program for youth: This program was recently designed, to provide young up to the age of 40 years with the opportunity to obtain funding for one project with a maximum of EGP 100,000. The program supports small enterprises that may be basic research to complete Master's Degree or PhD, as well as qualifying successful projects for greater funding through STDF's various programs.
- The Centers of Excellence Support Program: The program aims at supporting the development of national scientific centers of excellence based on the research and human resources available to the research institutions and within the framework of activating the axes of the national strategy of science, technology and innovation 2030. This ensures the development of Egyptian scientific schools, which has international scientific reputation proven with clear performance standards and indicators in specific fields that serve the priorities of development in the country and enable Egypt to catch up with the successive scientific revolutions in the inter-science and advanced sciences.

Scientific Networks:

- The National Specialized Scientific Networks Program is one of the initiatives of the Academy of Scientific Research and Technology. The program aims at gathering national capacities specialized in different fields in universities, institutes and research centers, operating in parallel isolated islands. This results in duplication of efforts instead of their integration, fragmentation of funding and waste of resources. The program is one of the executive mechanisms of Egypt's strategy of science, technology and innovation 2030, whose main strategic objective is to create an environment conducive to scientific research and national capacity-building. Through this program, the Academy will provide the necessary material and technical support, equivalent to EGP 1.5 million for each network to form and host some national and international practical networks to participate in the production of knowledge globally, participate in global research projects, increase the international dissemination rates, improve the rating of Egyptian scientific research institutions (universities, centers and research institutions), transfer and localize technology and grant the networks launched the following:

First: First Call Networks

A. Contracted Networks

- National Network of Nuclear Science (NNS/ASRT) was established to coordinate research institutions in Egypt and abroad, in addition to societies and bodies benefiting from research

and studies in nuclear sciences. The network includes a number of sub-networks operating in the fields of nuclear science according to international agreements and memoranda of understanding with advanced international research centers aiming at transferring the expertise, knowledge and advanced technology of Egyptian scientific communities and capacity-building. The number of participants is 11, namely Cairo University, University of Science and Technology at Zewail City, American University in Cairo, Menoufia University, Egyptian Atomic Energy Authority, Ain Shams University, Sohag University, National Information Network, Alexandria University, Fayoum University and Helwan University.

- The Egyptian Cancer Research Network was established to facilitate making multilateral scientific research, covering all regions of the Republic in cooperation with the participating universities in order to facilitate the use of the various capacities existing in these universities and scientific centers of equipment and expertise so that difficult research can be carried out by one university or one party. The network also aims at carrying out researches that need to include large numbers of patients or cover multiple areas of the Republic, modernize the infrastructure of cancer research, transfer technology among participants and identify priorities for cancer research on the national and regional level. The expected return from the network includes a healthy return on improving the health of citizens and society. The number of participants is 13, namely Alexandria Universities and Cairo University, Beni Suf University, Mansoura University, Menoufia University, Suez Canal University, Tanta Universities, Ain Shams Universities, October 6 University, Assiut University, Misr University for Science & Technology, Port Said University, and Military Medical Academy.

B. Terminated Scientific Networks

Egyptian National Network for Nanotechnology (ENNN) aiming at the following:

- Extending the membership of the network to include all universities, research centers and public and industrial institutions that develop or use nanotechnology.
- Developing a portal that contains a database of all human, material and other resources.
- Organizing a number of workshops on the potential of this technology, bringing together all employees and beneficiaries to help build the research strategy.
- Building a research strategy for microtechnologies and nanotechnologies.
- Collecting full educational resources for developers and users of this technology.
- Organizing a regular scientific conference and developing a periodical.
- It includes 6 institutions, namely Cairo University, Mansoura University, Nile University, American University in Cairo, Housing and Building National Research Center and Egyptian Petroleum Research Institute.

C. Scientific Networks to be Contracted

- The National Scientific Network of the Egyptian Plumbing Industry. It aims to strengthen the links between Research Centers and universities to start joint Research programs aimed at serving the Egyptian plumbing industry, whether by enhancing the level of production or introducing new technologies to produce new products, and creating data bases containing Egyptian foundries with reasonable technological capabilities in the field of foundries, which explain the technological capabilities of such foundries, in addition to the base of scientific Research and industrial projects undertaken by the Egyptian Research and academic Bodies in this field, planning and carrying out new joint Research between the Research and academic Bodies aimed at developing modern technologies for the production of new castings on the Egyptian industry, enhancing the efficiency of the foundry workers, and making designs for technological Centers specialized in servicing small and medium foundries among those foundries known as public foundries and other.
- The Egyptian Network for Communicating Science aiming at linking various Bodies concerned with science and technology, teaching sciences scientific media and scientific communication to facilitate cooperation between them at all levels, and building the capabilities of Researchers and practitioners in the fields of scientific communication and scientific journalism through various activities and other ways. It comprises 14 participating parties.
- The National Network of Biotechnology Experts aiming at establishing cooperative Research programs, making possible the use of Research equipment and collaborating with the Researchers under the regulations governing the joint Research Centers of the network, continuously assessing the national needs in the field of scientific Research training in Biotechnology, Identifying the required national priorities in the field of technology Research, and providing scientific and administrative support for Research programs undertaken through the network to ensure its success. It includes 11 participating parties.
- The National Network of Egyptian Grassroots aiming at establishing a comprehensive database with sufficient information and data about plant samples found in Egypt, taking high-resolution and high-quality photos of samples of all species, supporting new grassroots' infrastructure through funding joint land journeys for collecting samples and regulating workshops and training courses for young Researchers. It is expected to issue scientific publications based on plant surveys and the results of the establishment of databases. It comprises 9 participating parties.

D. Renewed networks

- The Network of Nuclear Sciences NNS/ASRT has been established to coordinate between the Research Bodies in Egypt and abroad and the communities and Bodies benefiting from the Research and studies in nuclear sciences. This network comprises a number of sub-

networks that operate in the fields of nuclear science pursuant to international agreements and memoranda of understanding with advanced international Research Centers, with the aim of transferring the expertise, knowledge and advanced technology to the Egyptian scientific communities and building capabilities. It comprises 13 participating parties: Cairo University, Zewail, Zagazig, Nuclear Safety Authority of Atomic Energy Agency, Alexandria, Nuclear Materials Authority, American University, Monufia, British University, Sohag, National Network of Information, NRC, Helwan,

Second: Second Call Networks

1. National Network of Personal Medicine
2. National Network of Mathematics
3. National Network of Technological Incubators
4. National Network of Scientific Museums



Science and Community

- The Academy continued to publish the magazine of science while setting plans and mechanisms for the development of the magazine. The Academy also developed a package of new and innovative program which suits the new stage through the initiative of the President of the Republic “an Egyptian society who learns and thinks and innovates” namely The Cairo International Exhibition for Innovation, the television program “Cairo Innovates”, the 1001 invention exhibition, and the three-dimensional animation series (Al-Azhar Al-Sharif) Part one, two and three, the Noor series, and the Child University , in addition to the translation and printing of Encyclopedias and simplified scientific books with a total funding of 20 million LE.
- More than 700 innovators being students, Researchers and free categories applied to participate in the Cairo Innovation Program, second season this year, providing a new opportunity for

innovators, whether by providing preliminary models or products that have been implemented in reality in the first stage of preparation or in the advanced stage of manufacturing. This comes in an entertainment culturing and educational context through the “Cairo innovates” program, which will be soon exclusively broadcasted by Al Nahar TV channels specialized in mixing science with competitions and simplification of science.

- The Cairo International Fair for Innovation in 2018 has been launched with the participation of many Arab, African and Asian countries with unique innovations in various fields. The guest of honor of the exhibition this year will be South Africa. It was the best, greatest and largest since its first edition in 2014, as more than 6000 visitors attended, 670 Egyptian inventions participated, and 60 inventions won gold, silver and bronze medals and monetary prizes worth more than one million LE provided by the Academy and partners from industry and civil society in addition to 3 incubation awards and the award of the 101 business accelerators worth 800 thousand LE.
- A three-dimensional cartoon series entitled “Nour and the Gate of History” was produced in cooperation with the Al-Azhar Foundation. The series presents the stories of Muslim scholars in 30 episodes.
- The Mohammed bin Rashid Award for Arabic Language for the Best Technical Work serving the Arabic Language in Dubai has been won.
- Al Nour Magazine, a Magazine for children, has been developed as part of an initiative funded by the Academy.
- The event of the Fame Lab, the second season, has been organized in cooperation with the British Culture Center in Cairo. This is a competition for scientific communication, similar to the TV program “Pop Idol” where the contestants have only 3 minutes to present a scientific topic in an interesting way. The number of participants was (1779) participants, with an increase of 47% compared to the previous year, with a funding of LE 50,258. It included six local rounds in five governorates (Cairo, Alexandria, Beni Suef, Suez, El Gharbeya).
- The Falling Walls event has been organized. This is an inspiring and multidisciplinary form of talent that provides an opportunity for academic distinguished young people, businessmen and specialists from all disciplines to share their ideas by presenting them in three minutes.
- The third part of a three-dimensional animated series dealing with the history of Al-Azhar University, entitled “Al-Azhar” has been produced. It sheds light on the moderation of Al-



Azhar ,and the role of Al-Azhar being a mosque and university in a cartoon style which is interesting to the whole family. The first part was presented in the holy month of Ramadan in 2016 on Al Nahar TV channels and got the second highest viewing rate and the best animated series award. The second part was presented on the Egyptian TV and Al Nas TV channel and was translated and marketed globally in order to restore the leading role of Egypt in the Islamic world and the entry of the cartoon industry in cooperation with Al-Azhar. It won the Mohammed Bin Rashid Award for Arabic Language for the Best Technical Work serving the Arabic Language in Dubai.



- A number of events in the theater of science, one of the activities organized by the Academy to bring a meeting directly between the simplifiers of science and children from the age of 5 years to the age of 15 years, have been organized.

- (9) books simplifying science in the fields of space, food, marine sciences, cancer, immunity and ethics ... etc. and the astronomical guide for the Hijri years 1435 AH to 1438 AH and the annual seismological catalog have been published, besides the publication of a new series of children's scientific stories entitled "Reem, Karim and the Microbial World".



- 60 issues of Al-Elm Magazine have been published and the issue of March 2019 has been published recently. This is a Magazine of Simplification of Science published in cooperation with Dar Al-Tahrir for Printing and Publishing. The first issue was published in March 1976.

- The "Go Science" program has been launched to simplify the science for children aged 5-15 years. The program includes a range of activities (displaying bilateral scientific two and three-dimensional children films 3D Cinema, 2D Cinema, Science Playground, Museum of Mobile Science, the use of modern technologies such as three-dimensional images "Hologram" and incorporating them into the "Augmented Reality", interactive workshops in various sciences such as physics, biology, chemistry, and a simplified explanation of practical experiences taught in the curricula.



- The Scientific Salon of the Academy has been launched within the activities of the Egyptian Science Month - 2019. The Salon hosts famous scientific figures in various scientific fields. The first scientific salon had the honor of hosting by the Egyptian scientist Mustafa El Sayed and the Italian Astronaut Paolo Nesipoli.



- Silver Jubilee (fiftieth cycle) of the Cairo International Book Fair was held from January 23 to February 5, 2019, with a distinguished pavilion. The pavilion presented various publications of

simplified scientific books, road maps, scientific magazines, scientific encyclopedias, Al Alam magazine .. etc.

- A number of scientific encyclopedias in scientific fields such as (the Chemical and pharmacological components of Egyptian flora Encyclopedia, the Egyptian Encyclopedia of Wild Medicinal Plants, the Conservation and Sustainable Use of Medicinal Plants in Egypt) have been prepared.
- The Aquarium has been reopened to display rare marine fish at its branch of the Mediterranean Sea in the tourist area in front of Qaitbay Castle and equipped with the most modern devices.
- Bodies and individuals prizes for 2011 have been announced. The prizes totaled 34 award with a monetary value of 650,000 LE. These prizes are awarded by the national production units, ministries and scientific institutions. 29 prize were awarded to 32 winners and 5 prizes were withheld. The prizes awarded valued at about 495 thousand LE. The Academy also announced three scientific Research encouraging awards for women under the age of 45 in the fields of agriculture, food science, health and pharmaceutical sciences, water, energy and environmental sciences.



Achieving International Leadership in Science and Technology

- The Science and Technology Development Fund held many meetings and made many communications both inside and outside Egypt to monitor the progress of the work plan with many international partners under the following cooperation agreements:
 - Egyptian - Chinese Cooperation Agreement - Egyptian - Spanish Cooperation Agreement - Egyptian - French Cooperation Agreement - Egyptian - German Cooperation Agreement
 - Egyptian-British Cooperation Agreement - Egyptian-Japanese Cooperation Agreement
 - Egyptian - South African Cooperation Agreement
 - Egyptian-American Cooperation Agreement
 - Egyptian-Russian Cooperation Agreement
 - Egyptian-Italian cooperation agreement
 - Cooperation agreement between Egypt, Europe and Africa (Agr Leap)
- The Fund also organized some meetings and workshops to exchange experiences between Egyptian and foreign Researchers, or exchange experiences between the Fund's teamwork and its counterparts in international institutions with the aim of building capabilities of the cadres of the Fund.

Putting forward the grants of international cooperation

- The Egyptian-Japanese Cooperation Program (Tenth Cycle) has been put forward: Through this program, joint Research projects shall be financed with a joint funding (Each joint Research project shall be supported up to a maximum of LE 145,000 per annum given to each Egyptian Researcher by the Fund, in addition to 2.5 million Japanese Yen per annum given by the other party to each Japanese Researcher, with a maximum duration of two years per project.
- German-Egyptian Travel Cooperation Program (11th Cycle) has been put forward: This program provides funding for travel grants to a Research team as part of joint Research (an Egyptian Research team and a German Research team) with emphasizing the presence of a number of young Researchers in each Research project (€ 15,000 a year by the two Parties per project) which helps to create channels of communication and transfer and establish technology at the master's or doctorate stage , provided that the grant is awarded for a period of two years with funding of up to € 30,000 by both Parties.
- The Egyptian - American Cooperation Program (19th Cycle of Cooperation) has been put forward through the Partnership Program whereby the fund shall provide travel grants to the US of \$ 30,000 per grant to complete Research abroad, as well as funding joint scientific Research up to US \$ 400,000 per project (\$ 200,000 by each Party).
- The Egyptian-German Cooperation Grant (5th cycle): This grant shall finance joint scientific Research with funding amounting to € 200,000 per project (€ 100,000 by each Party), provided that Research shall be done in priority areas for both countries.
- The Euro-Mediterranean Cooperation Program (PRIMA) has been put forward: Through this program, Research projects shall be funded on the condition that Researchers from European and Mediterranean countries cooperate and that Research projects target points that present common challenges for all participating countries, such as agriculture, food and water. Each country should, as part of this cooperation, fund its participating Researchers, being understood that this cooperation involves 19 countries.
- The Egyptian-Spanish Cooperation Program (Second Cycle of Cooperation) has been put forward: this is a partnership program between the Science and Technological Development Fund and the Spanish Industrial Technology Development Center. Through this program, joint application projects that meet the needs of the industry shall be supported. The application to this program requires a cooperation between a factory in Spain, which owns a Research and development unit, and an Egyptian Research team and a partner from the industry. The Fund's support to the Egyptian side in these projects amounts to LE 1 million.
- The Egyptian-French Cooperation Program (The Fifth cycle of Cooperation) has been put forward: this is a Partnership Program between the Science and Technological Development Fund and the French Institute in Egypt, where the program provides travel grants to France (up to 9 months) for the completion of postdoctoral academic Research.

- The Egyptian-Chinese Cooperation Program (Second Cycle of Cooperation) has been put forward: Through this program, an Egyptian Research team shall cooperate with a Chinese Research team in the implementation of a joint Research project. The Fund supports the Research team with 1.7 million LE.

The National Strategy for Biotechnology and Genetic Engineering Program

- It aims at raising the rate of return on investment spending on scientific Research over the next 15 years and using biotechnology and genetic engineering in protecting and developing national resources and maximizing their economic, social and environmental use, reflected on improving human health, increasing agricultural, livestock and industrial production, preserving the Egyptian genetic resources through the support of Egyptian Researchers who have invented products as part of previous projects and studies and have the ability to develop their bioproducts to reach its final stage of industrial production depending on the priority areas (in the light of market needs and supply and demand forces), namely: agriculture, food, health, industry, and environment.
- A number of 21 Research projects are in progress in the above mentioned areas, where the implementation rate has reached 80%. In addition, there are currently 20 Research projects in progress. The establishment of multi-purpose experimental units for biotechnology and genetic engineering is currently in progress too. The implementation of these activities has supported and strengthened the scientific base of biotechnology and genetic engineering.
- As part of the Egyptian government program to improve the quality of the Research and technological system, the project of technical support for the Research process launched by the Supreme Council of the Centers, Institutes and Research Bodies aims at coordinating the Centers, Institutes and Research Bodies to improve the responsibility of the Research Centers and Institutes in achieving the strategy of Egypt 2030, which will have the most powerful and effective impact on the building of scientific Research cadres for the Centers and Research Institutes and strategic planning for the preparation of future studies and road maps, and the transfer, adaptation and application of technology that serves the production sectors in order to develop local production and increase its competitiveness and so on.
- The Council is currently implementing the (technological map) project “design of the system of measuring the level of technological readiness”, in cooperation with the Scientific Research and Technology Academy with the aim of designing and implementing an electronic system that works on the international information network, and contains an integrated database for all the Egyptian technological resources in different specialties, technological fields and all resources consisting of the main scientific cadres, assistance, physical assets, academic and technical Research, which makes possible the measuring of the level of technological readiness of all Egyptian academic and Research Bodies. The system also includes an integrated system for the management of the current and future Research projects through the system engineering

technology. The system also facilitates the search for the cadres and physical resources necessary for the implementation of various joint Research activities. Therefore, the system's general aim is to provide the necessary information to support the decision makers in the Research projects and facilitate the follow-up of various Research activities, this contributes in making benefits through the integration of all Research Bodies (military production factories - universities - Research Centers - public or private sector companies) qualified for Research work as auxiliary Bodies and cadres to fill the deficit in various specialties through which each of them can be divided according to the qualification as well as the capacities and capabilities of each of them, managing all material resources available for Research work (raw materials, Research labs, manufacturing labs, previous Research, simulations, software) through the system, and supporting the decision-making process through a strong data which enables the decision-makers to build a realistic vision of the Research work to be carried out in as part of the focus of the work of the Egyptian Government , "Improving the quality of the Research and Technological System " .

- Participation in the preparation of the incentives for science, technology and innovation Law promulgated by the Republican Decree No. 23 of 2018.
- Completion of the draft executive regulations of the incentives for science, technology and innovation law promulgated by Law No. 23 of 2018, put forward by the Board meeting held in 19-11-2018 attended by the minister and the chairmen of the Centers, Institutes and Research Bodies of the ministry and the chairmen of the Research Centers of the other ministries, which aimed at maximizing the Research role of universities and Research Centers, motivating the higher education institutions and scientific Research to complete the innovation cycle, providing self-resources for scientific Research Bodies to promote their purposes through the exploitation of scientific Research, increasing its investment in science and technology, and improving Egypt's position in terms of innovation in the future after the application of the law.
- Currently working on the preparation of a proposal to modify the executive regulations of the Centers, Institutes and Research Bodies of the Ministry, through the introduction of a draft of an executive regulations during the meeting of the Council of Research Centers and Institutes held in 19-11-2018 in the presence of the Minister and the Chairmen of the Research Centers and Institutes of the Ministry and the heads of the Research Centers of the other Ministries to be discussed after the inclusion of the comments of each center / institute / Research body to be presented to the boards of directors of the Centers, in preparation for the presentation thereof to the Minister of Higher Education and Scientific Research to take the procedures of the enactment thereof.
- The website of the Council of Centers, Institutes and Research (www.crci.sci.eg) has been completed, and the website provided the decisions concerning the establishment of the Centers and Research Institutes as well as the executive regulations of each center / institute / Research body in accordance with the principles of transparency and integrity in all elements of the administrative system.

- In 2018, the Council published four issues of the Council of the Window (a quarterly bulletin published by the Secretariat of the Council), which aims to link the beneficiaries of Scientific Research to Scientific Research Centers, Institutes and Research Bodies and the services provided thereby electronically and made available electronically on the website of the Council.
- In 2018, the Council coordinated between the Centers and Institutes and the Ministry of Planning and Finance, this achieved many important gains for them which facilitated the provision of funding necessary to complete the current and future projects in the Centers and Institutes as it enabled the Council to transfer the savings of the investment plan from the budgets of some Centers and Institutes having surplus in their budgets to Centers and Institutes that have shortfalls in their financial allocations.
- Improving the services of the health care fund project provided to the members of the Research committee and their assistants and workers of the Centers, Institutes and Research Bodies and the expansion of coverage range, whereby the number participants in 2018 (3646 members) with an increase of 7.6% over 2017 and the number of beneficiaries of project services amounted to 500 members per month, and to facilitate participation for the members participating in the project and for those who want to participate, the registration form and all the data and information of the project have been uploaded on the website of the Council to be readily accessible so that all participants and those who want to participate can follow-up everything new about the project.
- The Consultancy, Studies and Technical, Technological Research Fund carries out a project of small production units on the land of the Fund in the 2nd industrial zone in 6th of October City. The renewal of the license of the Fund for the production of polystyrene has also been completed, and the implementation of the development of the kilns (in cooperation with the private sector companies and the Social Fund) was completed. Several cooperation protocols have been signed, such as Yest China Company, Atomic Energy Agency and Holding Company for Chemical Industries to which belong 20 companies.
- The National Research Center has provided many community-serving initiatives and projects such as: “towards a village free of hepatitis viruses” initiative, “towards healthy generations” initiative through community nutritional interferences for healthy children, and community outreach initiative to improve knowledge and skills of self-management of diabetes, the National Program of the Prevalence of Stunting Disorders, Microenterprise and Plants nutrition project and community service and training convoys.
- The National Research Center ran 49 local projects with a budget of LE 30.94 million and 9 projects with local and foreign entities with a total budget of LE 7.3 million + 18050 US dollars. As for units of a special nature, revenues have been generated out of the implementation of contracts and providing consultancy, services and analysis to service providers in the country, which amounted to a total of 27.3 million LE, and 9 contracts have been concluded with the producers, services providers and investment sector in Egypt. As for the technology transfer and marketing office, the revenues of the consultancy and implementation of contracts amounted to LE 350,000

and 5 contracts have been concluded with the investment sector in various fields, and a number of contracts have been executed with various companies, including but not limited to a contract in the field of natural extracts analysis with Al-Motahidoon for the production and importation of pharmaceutical raw materials, and a contract in the field of Extraction and production of Spirulina algae with the Egyptian Co. for the Reclamation and Cultivation of Desert Land.

- The National Research Center published 3401 scientific research papers in local and international scientific magazines. The National Research Center obtained only in 2018 21 patents from the Academy of Scientific Research and Technology. Also, 184 scientific books were written, 167 scientific missions were conducted, and 29 foreign experts were brought in.
- The city of Science & Technology Park for Electronics Research & Industry (STPERI) STPERI has been initiated and the first stage of construction of the new building of the city of new Nozha has been completed. An educational satellite of the Egyptian universities of the type (Cube sat) weighing 1 kilo gram and the space for one year has been designed and constructed. 13 Research internal projects are being carried out, of which 201 research between Scopus were published in international and local conferences and participated in 21 international workshops and with participation in 33 local and international conferences. Electronics Research Institute has participated in the alliance of supporting and deepening the component and the local product in the electronics industry. This resulted in the production of a single-face intelligent digital electric meter, developing a system for securing museums using electromagnetic waves and the manufacture of electrodes to be implanted in the brain for the treatment of epilepsy and Parkinson's Disease. The first phase of the Egyptian-Chinese Solar Laboratory has been initiated in Sohag. A data center was established in the Institute's new headquarters through the Centers of excellence funded by the Academy of Scientific Research. A cloud computing lab was also established in the Institute. There are many Research outputs of the Institute, including but not limited to, the development of a program for medical analysis, the unit of microwave used to heat the soil and eliminate the existing bacteria and insects, the development of a mobile educational mobile game using the technology of the Augmented Reality to introduce historical and archaeological information to children. The Institute also organized several training programs during the summer of 2018 for the faculties of engineering students (about 230 students from different private and governmental universities).
- The city of scientific Research and technological applications developed complete plan for the industrial area in the city of Burj al-Arab and identified the types of companies and the their meeting the environmental requirements and through the role of the city in serving the society and industry a clear plan has been started to communicate with the industry through weekly visits to at least two companies and organizing periodic meetings to raise the awareness of the community in the area of the old Burj Al-arab Municipality and agree with the old Burj Al Arab Municipality to begin solving the problem of the accumulation of solid waste using anaerobic digestion. Cooperation with the Future Society has begun to raise children's culture and awareness of the surrounding environment through workshops and seminars held by the Society. Numerous measurements and measurements were also made for samples of land, water

and plants, and for those delivered to the laboratories of the Institute by the neighboring farmers or from beetroot villages. The farmers were given the scientific guidance and solve the problems they suffer. As for construction projects within the city, the initial reception procedures of the Arid Land Research Institute building were completed. The research outputs of the city were published in 11 research papers, in the field of developing the health system. 10 international participations took place in the field of environmental protection and natural resources through attending workshops, training and participating in conferences. 14 international research have been published and 6 Research projects have been implemented in the field of communications and information technology. The city is implementing the project of producing bioethanol from cellulose waste and the project of production of nanometric zinc oxide to be used in water purification of some heavy pigments resulting from zinc oxide, in the disposal of harmful bacteria in wastewater and conducting studies to assess the environmental situation in Lake Mariout in cooperation with Alexandria Governorate.

- In the light of the directives of the State to provide service to all citizens of the Republic and given the inability of some citizens to travel to the hospital of Ophthalmology Research Institute, the Institute has organized a number of medical convoys, each consisting of sixteen members being doctors, nurses and technicians, equipped with necessary devices to provide the best medical service at an advanced level in terms of diagnosis, treatment and surgery of eye diseases, where an average 2000 citizens are examined in each convoy, and an average of 200 surgery are operated totally free for the patient. Cooperation with civil society organizations has been provided to serve the governorates of the remote governorates who are unable to pay. The patients who visited the public clinics and Specialized and diagnostic clinics amounted to 178039 patient ,and the Institute performed cornea operations from 2015 to 2018 for a number of patients being about 205 patients. Also, 11,130 operations were performed in different specialties of ophthalmology using the latest methods and latest surgical equipment. 23 physician of Egyptian university graduates were trained for six months, and 18 physician were awarded an Egyptian fellowship, 14 training courses were conducted in the field of Research, and 532 Researchers were trained in various good fields of ophthalmic Research. 8 Research projects are implemented, and 47 international and local articles were published. The installation and operation of the Prime Care program which is a mechanization project for Electronic Medical records and the preparation of the Stem Cell Laboratory in 2018 and the development of the level 8 of the Hospital (left suite for patients). and the The second conference was held under the title of “The Eighth Hospital”. Also, the 12th International Conference of the Institute was also held under the title “Blue Water (Glaucoma) under the Microscope”.
- The National Measurement and Calibration Institute provides the metrological support to promote the system of quality infrastructure and improve the quality of the Egyptian product and the quality of the tests and analyzes in different sectors in the country, the thing that has a positive impact on the Egyptian economy and the Egyptian citizen. The Institute published 71 research papers, and provided 10,700 calibration / testing services with an income of LE 16 million and 168 training services with an income of LE 385,450.

- As a result of the activities and events organized by the National Institute for Astronomical and Geophysics Research, this was reflected positively on the citizens as the scientific awareness of the citizens and their participation in the activities of monitoring the total eclipse of the moon increased during July 2018. There were an active participation and communication from the citizens for inquiry and reassurance after the occurrence of any earthquakes. In addition, the training requests from the Egyptian universities and colleges to visit the institute and attend workshops and training programs increased and as a result, 130 students were trained. There were an increase in the number of scientific consultation requests received by the Institute. The Institute published 89 research papers, participated in 31 international and local conferences, organized 3 international conferences, two workshops and a local seminar and participated in 100 scientific missions.
- The Theodore Bilharz Institute of Research participated in the activities of the National Conference for Scientific Research “Releasing the energies of Egyptians” which was organized by the Ministry of Higher Education and Scientific Research between 24-25 March 2018 with 6 posters and 2 documentary film about the achievements of the Institute and its Research plan. In addition, it participated with 14 patents in the field of health and medicine. The Institute is implementing 9 projects in the treatment program, 4 projects in the control research project and two projects in the advanced technology research program. The institute is carrying out 19 internal construction projects. It also trained 150 physicians in various disciplines and participated in 7 international workshops.
- The National Institute of Oceanography and Fisheries (NESI) has developed a creative Researcher program, which includes many programs that seek to create a new generation of creative and innovative young people through the Institute’s holding its first seminar under the title: Bring your research to 2018 held at the Bibliotheca Alexandrina from 27-28 February 2018. The Institute also placed, for the first time in six years, fingerlings of freshwater fish in the ponds of Al-Maks Applied Research Station of the Institute’s branch of the Mediterranean Sea and Northern Lakes. The maintenance of the Salsabil and the Yarmouk ships was also started in the maritime shipyard. The Extension of the aquarium in the main building and the central laboratory in Anfoushi, the institute branch in Alexandria have been replaced and renewed. The Institute also participated in 10 international conferences and 7 external and internal workshops, and held 11 training courses, 5 scientific missions, and supervised 11 scientific theses and published 30 international Research.
- The National Authority for Remote Sensing and Space Science(NARSS) is implementing 20 projects in the following fields: Water, soil, agricultural sciences, Environmental Studies, Computers and Information, Land Use, space science, geology, marine sciences, space, numeric modeling, capability building, remote sensing and geographic information systems) and 7 contractual projects for government agencies and the private sector. Also, 35 training courses were conducted for 182 trainees. It participated in 28 international conferences and published 73 research papers. The “12th International Conference of the African Organization for Remote Sensing and Environment” was also prepared and organized in conjunction with the Arab

Academy for Science, Technology and Maritime Transport.

- The Petroleum Research Institute has launched the National Knowledge and Technology Alliance project to maximize the added value of recycled plastic waste. The Cathode Protection Unit of the Institute has been established and a special unit of the Geophysics Laboratory in the Geophysical and Geophysics Exploration Section has been established under the name of “the Land Borings Unit”. The engineering workshops were converted into production units to assist the cathode protection unit to meet the needs of the petroleum sector for cathode protection to reduce cost and improve performance. The Institute also provided 1800 consultations to the civil / industrial society, supervised 33 doctoral and 17 master’s degrees, participated in 42 scientific missions abroad, granted 8 patents, submitted 13 patents, won 2 encouraging awards and individual awards, published 250 Scopus research, implemented 17 Research projects and concluded 6 external cooperation agreements.
- The Institute for Metallurgical Research and Development plays a role in the good exploitation of the mineral wealth in Egypt in the production of value added products (intermediate products or final products) instead of exporting it as raw materials for low prices, thus contributing to the creation of new jobs and increasing national income, as it implements 22 projects to expand local manufacturing, 18 international projects, 7 technological alliance projects and 7 projects to provide consultancy and implementing 50 internal projects funded of the Center’s budget to finance master’s and doctorate theses and young researchers. The Center also provided more than 4300 service to the Society and SMEs. The Institute participated in 15 scientific mission by attending conferences and international workshops. In addition, two international training courses were conducted in cooperation with the Ministry of Foreign Affairs for African trainees from 22 African countries and 2 courses for Sudanese students. Seven training courses were conducted for companies and factories. The summer training was provided to 310 students from Egyptian universities.

A Brief Summary of the Outcome of the Scientific Research until the End of 2018

23,6

billion LE is the volume of spending on R & D, with an increase of 22% over last year.

138491

is the number of researchers in different sectors.

0.70

is the proportion of total spending on Scientific Research as a percentage of international income.

95

is Egypt's international ranking as per Global Innovation Index 105 in 2018 compared to last year

53

is Egypt's international ranking as per the R & D sub-index of the Global Innovation Index. As Egypt moved from 54th rank in 2017 to 53th this year, as per Global Innovation Index

22018

is the number of scientific research papers published internationally in 2018 compared to 18782 in 2017, where the increase rate was 17%.

35

is Egypt's world ranking in published Scientific Research among 233 countries worldwide according to the SJR classification

<https://www.scimagojr.com/countrysearch.php?country=eg>

20

is Egypt's world ranking in scientific publishing in the field of nanotechnology, out of 106 countries in 2018

15.9%

is the percentage of increase in the research publication , according to the magazine Nature International which reported that Egypt topped the list of top countries increase in the international publication during the period from 2017 to 2018

<https://www.nature.com/articles/d415869-07841-018->

53.7%

is the percentage of internationally published research compared to foreign countries of the total internationally published research

154

is the number of patents granted to Egyptians by the end of 2018 compared to 97 by the end of 2017

1014

is the number of patent applications for Egyptians (requests)

670

is the number of innovations presented at the Cairo International Fair For innovation compared to 503 last year

536

is the number of patents for foreigners (patents) until the end of 2018 compared to 485 at the end of 2018

2000

is the number of students in the Child University Academy of Scientific Research

31

is the number of Centers of excellence and another 9 centers are under the contracting (STDF)

300

is the number of Graduation projects called during 2019

19

is the number of technological incubators compared to 17 incubators last year

45

is the number of start-up incubator companies

23

is the number of companies that graduated from incubator and operates in the market

10

is the number of technologically marketed projects

4

is the number of scientific networks
Academic Research Academy

44

is the number of Technology transfer and
marketing offices

178

is the number of energy projects since 2017 until now

756

is the number of water projects since
2017 until now

1706

is the number of health projects since 2017 until now

668

is the number of agriculture and food
projects since 2017 until now

109

Is the number of environmental projects and
protection of natural resources projects since 2017
until now

1965

is the number of technological
applications and the future sciences
projects since 2017 until now

1487

is the number of strategic industries projects since
2017 until now

200

is the number of Information,
communication and space technology
projects since 2017 until now

In the light of our reading of the previous indicators, we find that the indicators related to the inputs and outputs of science, technology and innovation (in accordance with international standards) achieve improvement varying from gradual to considerable.

Phase One

Phase one aims at “paving a motivating environment that supports distinction and innovation in scientific research, that would establish a comprehensive community development and produce new knowledge which achieves an international leadership”

- That would include the ways to face chronic problems in the Egyptian scientific research system, especially those related to its restructure. As well as determining the tasks and responsibilities, purifying, the current regulations of rigidity and obstacles, and issuing new legislations that would motivate scientific research and support innovation and technological development. In addition to reinforcing the right of research institutions and universities to establish technological incorporations. The phase also cares about the ways to provide the infrastructure and information needed to develop the performance of the scientific research entities, and setting policies needed for liberating and motivating the scientists and researchers’ movement in transitions across all Egyptian scientific research entities, including governmental, community and public universities, companies, institutes and research centers. That would lead to promoting the partnership between universities, research entities and all sectors of the society, and support the scientific research system to face the societal challenges. Besides, this phase cares about the variety of sources that finance the scientific research and finding renewable and increasing resources to pump the required financial support. In addition to determining a mechanism to distribute the budget of scientific research between the universities and their research centers as well as other research entities. This phase works on approving an evaluation of the indicators of science, technology, innovation and the return of financing the scientific research- as per the international standards- as a tool to develop and enhance the benefit of the available resources. This phase gives plenty of room to spread the culture of science, technology and innovation as well as linking the scientific research to education and everyday life activities including simplifying the natural phenomena, innovative education of science, motivating young people to innovate and embracing creative talents.

Based on the foregoing, achieving the strategic target of this phase would require fulfilling the following strategic goals:

1. Updating the system of laws, legislations and regulations governing the management and policies of scientific research process, and supporting the issues of intellectual property and professional standards.
2. Formulating an effective organizational structure to the scientific research system to determine responsibilities, tasks and interrelations among all parties concerned with scientific research.
3. Supporting and developing human resources and developing infrastructure to promote scientific research.
4. Promoting the quality of scientific research (basic research, inter- research, future research, and social research) to achieve a high level of excellence that would contribute to achieving an international and regional leadership.
5. Supporting investment in scientific research and linking it to industry, development plans and needs of the society, as well as fostering partnership with the different sectors.

6. Spreading the scientific culture in the society and linking education to scientific research to form a scientific mindset that supports scientific research and foster the culture of scientific research among students.
7. Coordinating and developing international cooperation to serve the strategic goals of the State.

1. The component of policies and legislations of science, technology and innovation

- Updating the system of laws, legislations and regulations governing the management and policies of scientific research process, and supporting the issues of intellectual property and professional standards.

2. The component of science, technology and innovation

- Planning, approving and spreading the organizational structure of science, technology and innovation system (STI) including powers and evaluating performance indicators and accountability.
- Determining strategic tendencies of each institution.
- Providing competitive reports related to the scientific research entities, which highlight strengths and weaknesses as per the rules of analyzing international data.

3. The component of supporting and developing human resources and developing infrastructure

- Developing the abilities of the senior and middle leaderships in scientific research in the field of science and technology policies, managing innovation and marketing technology.
- Restructuring the development centers and improving abilities of the academic and research personnel.
- Increasing the number of scholarships and study grants for post-graduate students and members of the academic and research personnel to universities and research centers of highly advanced international rating, along with caring about the emerging technology.
- Increasing the intense training courses and workshops to raise the level of young researchers and postgraduate students, and spreading the culture of entrepreneurship among them.
- Developing the grants of the upcoming generation of scientists in quantity and quality.
- Establishing research groups of distinctive and specialized abilities to give the opportunity to conduct distinguished research internationally (Clusters of Innovation) (COI).
- Establishing a national committee to carry on the responsibility of formulating mechanisms of partnership and integration between research excellence centers locally and internationally.

- Expanding the State Awards to include new scientific and productive sectors.
- Opening the door to the freedom of researchers to move among all universities, and research centers and institutes to implement the financed projects.
- Fostering the efficiency and effectiveness of the procedures of employing researchers to target the distinctive potentials in the research fields.
- Creating new programs to foster the emerging and private universities and encourage the leading universities to hold research partnerships with them.
- Motivating universities and centers to provide the self- financed scientific research budget on a regular basis to the ministry.
- Publishing reports of achievements and resources of all scientific departments in universities and centers and getting them accredited from the academic councils.
- Full coordination between the specialized academic councils and the public authority of scholarships to ensure sending young people in scholarships abroad to achieve the goals of the strategic plan.
- Holding quarterly meetings by the specialized academic councils for all researchers (each in his/ her field) on the Republic level and preparing scientific reports thereof.
- Establishing database of Egyptian scientists abroad with their specializations and majors to form a liaison between the Egyptian universities and the foreign ones.
- Establishing and developing research labs equipped with the latest technology and equipment, and supporting and improving the National Bank Project for Labs and Scientific Equipment.
- Supporting and promoting the role of (ESTIO) in the light of the new legislations.
- Activating and fostering the role of Technology Innovation Commercialization Office (TICO) established by the ministry.
- Developing information networks and interlinking them to universities and research centers and institutes, as well as international universities.
- Increasing support and establishing excellence centers in the Egyptian Universities as per the international standards, using the latest technology.
- Providing infrastructure services related to the network connection, computing and processing large data in the universities and research centers and institutes.
- Establishing a unified database of all equipment and large machinery purchased through governmental or non-governmental financing, and setting regulations that ensure they are available to all researchers, along with proposing a model for managing their work.
- Establishing a platform to trace and follow the execution of the government plan and performance programs, and linking them to investment expenditure.

4. The component of achieving international leadership in science and technology

- Promoting the quality of scientific research to achieve the regional and international leadership in science, technology and innovation, such as:
 - Allocating accreditations to basic, social and humanities research from the dedicated governmental financing.
 - Internationalization of local research publications including social and humanities research
- Material and moral motivation for individuals and institutions of highly influential international publications, and setting incentives for professors who have important research accomplishments.
- Increasing the participation of Egypt in some international programs that proved performance evaluation results of positive impact on the deliverables of scientific research.
- Supporting the establishment of national scientific networks specialized in basic and interrelated sciences.
- Caring about promoting the level of Egyptian scientific journals and putting them on the same level of the international journals.
- Focusing on the fields that have scholarships abroad such as modern and future sciences research and emerging technology as well as applied research and technology transfer research.
- Holding an annual or regular conference in each big country of scholarships to show the scientific results that scholars achieve in the different specializations, attended by a scientific committee of Egyptian experts and foreign professors.

5. The component of investment in scientific research and partnership

- Supporting the programs of integrating scientific research with industry and fostering the partnership.
- Establishing new financing programs in partnership with the private sector and creating new financing programs to motivate innovation.
- Amending the granting entities contracts to encourage researchers to register patents and disclosing innovation points in the research results.
- Supporting and developing the abilities of employees in the industrial technology centers in the ministry of industry and technology transfer centers in the ministry of higher education and scientific research.
- Establishing a prospecting program in the deliverables of Egyptian scientific research and embracing the promising deliverables and supporting them to be applied in cooperation with distinctive international centers in innovation and technology commercialization/ marketing.
- Creating a senior authority to supervise and coordinate the work among the granting entities in

Egypt.

- Issuing a regular electronic periodical bulletin for each granting entity to announce their news thereon.
- Establishing electronic platform linking granting entities on the one hand and scientific researchers, and beneficiaries of research and their results on the other hand.
- Publicity of the approval of universities to in-kind contributions, providing associations and scientific research centers with legitimate and economic consultants to improve money of contributions, donations and gifts and investing it.
- Adopting awareness programs for individuals to urge them to donate and contribute to scientific research and recognizing them for doing that.
- Granting institutes and centers of research and consultative studies broad powers to access production sites and research contracts.
- Turning theses and faculty research into specialized applied research through financing them by productive institutions.
- Determining the fees on labs, workshops and research facilities in the university that are used by the production entities in the society, and allowing to make benefit of the university slogans on products in return of fees in favor of scientific research.
- Providing the paid research services for companies, production units and civil community institutions.
- Establishing centers to transfer technology and sub branches for patents in communities and industrial cities.
- Establishing innovative communities based on some of the strategic industries.
- Establishing technology incubators and science and technology valleys in the Egyptian regions and close to the Egyptian Universities to develop the concept of cognitive economy.
- Supporting environmental (green) and smart designs to establish scientific cities and technology and science valleys to attract international investments in the field of science, technology and innovation (STI).

6. The component of scientific research, industry of education and scientific culture

- Preparing new media and cultural programs, activating and supporting programs based on the spirit of scientific competitiveness.
- Spreading the scientific research culture in schools (the stage of pre-university education), that is the universities as well as research centers and institutes would hold agreements (protocols) of cooperation and partnerships with pre-university education institutions (general and technical), targeting to spread the culture of scientific research in schools.

- Preparing programs to discover talents and supporting inventor students and researchers.
- Developing research abilities and skills of BA students.

7. The component of international cooperation

- Coordinating and developing international cooperation, through:
 - Allocating suitable accreditations for the international cooperation from the finance dedicated for scientific research.
 - Coordination among ministries and concerned entities to know about their needs with the international partnerships.
 - Determining, activating and developing the current agreements.
 - Signing new and equal partnership agreements.
 - Establishing research grant programs and grants for constructing abilities, and awards that Egypt presents for some countries especially Arab and African countries.
 - Establishing a permanent representation office of Egypt in the STI field in the European Union and African Union.
 - Connecting the strategic planning to the African and Arab goals and shared financing for research projects.
- Globalization and internationalization of STI:
 - A plan to attract companies working the field of STI to invest in Egypt.
 - A plan to attract expatriate students and post graduate students in Egypt and attracting them to complete their studies in Egypt.
 - A plan to attract international researchers and professors in the technology and scientific field to transfer their expertise and conduct their research in the Egyptian universities, research centers and institutes and companies.

Phase Two

Phase two aims at producing knowledge, transfer and localization of technology that would contribute to the societal and economic development

This phase focuses on: pushing research, development, innovation and projects of transfer and localization of technology; deepening the local manufacturing in the national industry; exploring and applying the deliverables of the Egyptian scientific research to contribute to solving the urgent problems that suppresses society. That would in the fields of energy, water, health, population, agriculture, food, environments, and strategic and capitalistic industries. The phase also tackles issues of education and national security, sustainable human, financial and administrative resources, tourism, the future of digital technology and ecommerce. This phase gives high priority to basic, future and social research as well as interrelated sciences such as nanotechnology, biotechnology and information science. It aims at establishing a strong scientific base able to produce knowledge and improve Egypt's scientific rating internationally, as well as enabling the Egyptian scientific research system to cope up with the successive scientific revolutions in interrelated and future sciences.

To sum up, the strategic goal of this phase focuses on supporting research, development, innovation, projects of transfer and development of technology with the objective of contributing to achieving the following strategic goals:

- (0-1)** Fostering the efficiency of the energy system in Egypt and searching for new sources as well as consumption smoothing.
- (0-2)** Ensuring the continuous availability of sufficient water and environmental sustainability to meet the present and future needs.
- (0-3)** Developing the health system to promote the health and luxury of citizens, and adopting a strategy with the ministries of health, environment and agriculture to get rid of causes of animals' diseases whether coming from other countries or local animals, and diseases resulted from contamination, by 2030.
- (0-4)** Treating the nutritious gap and the problem of food security, supporting the ministry of agriculture to achieve self-sufficiency of food, improving the quality of crops, treatment of pests, caring about livestock and controlling the countries' outlets that allow smuggled animals and medications.
- (0-5)** Protecting the environment and developing natural resources, as well as raising the productive efficiency of raw material and mineral wealth and supporting programs of preserving nature.
- (0-6)** Enabling technology applications, developing and building abilities in future and interrelated sciences such as nanotechnology, biotechnology and bioinformatics.
- (0-7)** Contributing to developing national industry and improving profitability through deepening local manufacturing and assisting industry to pass the current technology gap.
- (0-8)** Passing the information and digital gap, enabling information technology and communication

to build a modern and developed society and planning its future horizons.

(0-9) Supporting the education and learning system to produce a human capital able to innovate, create and achieve excellence.

(0-10) Employing and fostering the role of the media system to form and control social and ethical values of the Egyptian Society.

(0-11) Achieving sustainable administrative and financial development, focusing on the issues of investment and ecommerce, digital communities and economies.

(0-12) Innovating new scientific methods ensuring the development of the tourism sector to promote the touristic product.

(0-13) Supporting and promoting humanities and social sciences to achieve the international publication standards.

(0-14) Supporting research of applied Physical Education to contribute to promoting sports activities and enhancing citizens' health.

1. The component of Energy

- Accurate roadmap of phases and needs of energy:
 - Building a mathematic model to predict the needs of Egypt in energy, and finding ways to guarantee such resources.
 - Geological and exploration studies to search for traditional sources of energy in Egypt.
- Production of electric energy:
 - Producing electric energy from domestic and agricultural residues
 - Producing electric energy using solar cells (silicon- thin-film interfaces- third generation "nanotechnology")
- Localization and development of energy technology:
 - From biomass
 - Producing gas and biofuel from domestic and agricultural residues as well as algae.
 - Innovative local manufacturing to develop systems of generating wind energy.
 - Developing systems to generate energy from tidal power.
 - Developing systems to generate energy from under the ground.
 - Developing systems of new and renewable generic energy (solar cells- solar concentrators- wind turbines- batteries- fuel cells) to generate and store energy.

- Using seagrass to produce biofuel through the technique of anaerobic fermentation and using it in generating electricity and heat.
- Innovative projects of solar energy technology:
 - The national initiative to manufacture units of solar energy concentrators and collectors and photovoltaic cells.
- Financing projects to study the promising opportunities to apply solar energy systems on the national and individual level:
 - Producing energy and desalination using the different systems of solar energy concentrators.
 - Heating water, using systems of solar energy collectors.
 - Using solar heating systems at day and agricultural residues energy estuarine at night in water boilers in factories.
 - Applications of solar energy in airfields especially solar power.
 - Studying the benefits of solar energy technology and using it in the field of designing and operating maintenance igloos and their influence on operating airfields.
 - Studying the operation of hotels and tourist resorts using solar energy as an alternative of the traditional source of energy, based on economic standards.
- Studies of decreasing energy consumption rates:
 - Decreasing the energy consumption rates in the transportation sector in Egypt.
 - Producing energy-efficient fluorescent bulbs and LED bulbs.
 - Producing smart energy meters.
 - Studying energy transfer using smart networks.
 - Studying the evaluation of efficiency of using energy in companies, factories and institutions.
 - Applied study of consumption smoothing of energy in the energy-intensive processing industries.
 - Architectural and environmental studies for designs of low-volume consumption of energy.
- Developing technology to produce renewable energy:
 - Solar energy and biogas
 - Transforming agricultural residues and solid waste to fuel.
 - Using alternative energy in archaeological sites and museums.
- Studying the development of technology used to improve quality of fuel.
- Half-industrial production project to manufacture jet biofuel of oils used out of the process of

hydrogenation using Nano-catalysts.

- Producing biofuel of the jojoba oil and sustainable development in the countryside and desert in Egypt.
- Evaluating the environmental, social and economic influence to use the hybrid networks unconnected to the national network, Off Grid Networks, in the isolated and remote areas.
- Preparing a developed system to transfer, circulate and store coal fuel imported from Egyptians harbors until reaching factories.
- Finding new methods to reduce the content of Sulphur and vanadium in the heavy fuel oils.
- Setting a strategy to manage and recycle solid waste.

2. The component of water

- Applying techniques of environmental isotopes and radioisotopes in improving and managing underground water, supporting and developing observation and automatic operation systems of underground reservoirs.
- Using mathematic prototypes to evaluate the sustainability of underground reservoirs in the reclamation areas.
- Hydro chemical studies for qualitative evaluation of underground water and its usability.
- Benefitting from the treated wastewater in loading the mature underground reservoirs/ tanks.
- Developing rainwater collection methods for using it to discover opportunities of closing soil porosity and forming a surface rain collection system.
- Studies to determine the surface running areas and site absorption of rain and floods.
- Studying Roman reservoirs in the Northern west coast, developing them and integrating them in the agriculture system.
- Field study and modelling to preserve water behind dams of high volume capacity such as Rawafa'a and Badn Dams.
- Using remote sensing techniques to determine maps of water flowing from the upper Nile and determining the best phases to minimized the loss in the project of Jonglei channel.
- Methodological and realistic study for Congo River Project and connecting it to the Nile River.
- Follow-up study of the Nile River Basin and its tributaries in an accurate way and preparing reports of its hydrological status.
- Organizing national campaigns for consumption smoothing of water through raising awareness of the dangers of shortage of water.
- Developing wired and wireless sensors for consumption smoothing in homes, factories and in

agriculture.

- Developing different technologies for water desalination.
- Using natural bacteria with sand as a concrete material for lining water channels.
- Designing and developing mobile units for desalination of drinking water for desert areas using new and renewable energy.
- Treatment of wastewater and industrial effluents using low-cost techniques.
- Reducing the dependability of hotels on the coastal areas on drinking water network, through the optimum use of seawater desalination technologies.
- Using remote sensing in redrawing and enabling water channels sectors.

3. The component of Health and Population

- Studying the clinical nutrition influence to determine the relationship between contamination and prevalent diseases.
- Studying the economic, social and health influence of obesity and determining the rates of patients suffering from it, as per their age categories and gender and studying their relationship to malnutrition to find the pharmacotherapy and surgical therapy therefor.
- Evaluating the mechanisms to apply comprehensive health insurance and working on developing them, and conducting demographic survey for health every three years.
- Studying the reasons, patterns and rates of infection of different types of cancer in Egypt and discovering treatments therefor.
- Discovering and developing the bio-signs of the most widespread diseases in Egypt.
- Finding and developing vaccines for the most prevalent diseases in Egypt such as HCV and HBV.
- Studying causes of the chronic diseases in Egypt and their consequences and finding treatments therefor along with focusing on treatments derived from natural sources.
- Studying reasons of the increase of cesarean delivery rates and studying child health level in Egypt.
- Studying the pace of bacterial resistance to antibacterial medicines in the intensive care units in Egypt.
- Studying the effectiveness and safety of antiretroviral drugs used to treat hepatitis C.

4. The component of Agriculture and Food

- Creating technologies for food manufacturing in the scope of sustainability of security and safety of food.
- Developing and expanding as well as increasing the productivity food crops, medical and aromatic plants as well as energy plants.
- Developing the agricultural productivity of the two units of land and water and devise new categories resistant to drought and salinity.
- Developing field irrigation using various methods especially through using sensors and modern control devices.
- Expansion in aquaculture and protected agriculture.
- Using agricultural residues in fertilization and animal nutrition, etc.
- Organizing the processes of collecting agricultural crops required for agricultural manufacturing and arranging the link between the farm and factory (post-harvest operations).
- Facilitating and encouraging investments in fish farms and increasing river and sea fish types, developing and using modern technology and supporting veterinary research in this field.
- Using remote sensing systems to update maps of using lands and encouraging population attraction, and creating the suitable environment for living and facilitation access with marketing centers whether locally or abroad.
- Establishing an integrated agricultural-industrial community.
- Localization of garden crops that are more endurable against heat and drought.
- Increasing animal production through improving breeding and origins of local farm animals, developing early-maturing genes, studying genetic diversity of farming animals' original species under the different environmental circumstances in Egypt.
- Using modern technology to foster poultry reproductive capacity (artificial insemination-hatchability).
- Synthesis of different vaccinations to fight farm animals' diseases.
- Developing alternative agricultural systems that would bring about suitable income for farmers and caring about research of coverage crops.
- Studying the empowering small-scale farmers to create innovation opportunities through vocational education and guidance services, capital, credit, and insurance necessary to develop businesses.
- Agricultural extension to provide the enlightened knowledge of managing farms and ecological agriculture systems for all those working in the agricultural sector.

- Increasing cultivation of oil crops upon the Egyptian circumstances and developing technology of economic oils industry to become high quality oils in order to cut off importing them.
- Using modern techniques to establish and manage greenhouses.
- Studying the ways to delay the expiry date and reduce the damage and rottenness of crops during stages of storing, transfer and circulation (post-harvest transactions).
- Developing post-harvest technology for date palms and export crops.
- Studying the ways to benefit from low quality dates of different kinds to produce sugar therefrom.
- Developing technology of reclamation and cultivation of new lands.
- Developing agricultural mechanization systems to suit all areas of land.
- Developing statistic and future estimation systems of agricultural production.

5. Environment and Natural Resources Protection

- **Addressing the potential impacts of climate change:**
 - Developing future forecasts of potential impacts of climate change on the delta and the northern coast of Egypt, biodiversity, food productivity and the economic and social burden.
 - Developing technologies to counter the effects of climate changes.
 - Conduct studies of future forecasts of impacts of potential disasters such as earthquakes in active areas, floods, torrents and drought.
 - Establish early warning Centers for severe weather events for early warning of heavy rains, floods, dust storms, hot waves, droughts, low rainfall and low Nile water table.
- **Stimulating and supporting the green economy:**
 - Conduct an economic, technical and financial feasibility study of the green economy applications for urban, agricultural and industrial projects and develop national plans for green development.
 - Support Research and development to assist the national industry institutions in rectifying their positions to be more supportive of the environment and transformation to the green economy.
 - Develop designing green buildings and cities according to the diverse Egyptian environment.
 - Treatment of the seepage fluids.
- **Providing a clean and sustainable environment:**
 - Develop a local and effective technology to fight against all types of pollution (air, water, soil, radiation, light, noise, visual, genetic).

- Prepare and develop effective studies on environmental economics, sustainable development and economic development with an environmental dimension to integrate the ecological component and stop environmental degradation and replace it with effective environmental practices.
 - Use of microorganisms in pest control and waste recycling.
 - Proposing a system of integrated frameworks for the management and recycling of waste from the perspective of sustainable environment and the economic benefit thereof for the generation of energy (electricity - biogas. -)
 - Use biological treatment to reduce organic pollutants in the Nile and lakes and treat the liquid wastes of boats, tourist launches and river units.
 - Use safe technology for recycling or disposing of mercury wastes generated by medical devices.
 - Developing methods for recycling solid and organic waste in tourist resorts in an economic manner.
 - Improve the quality of fuel used in Egypt to reduce air pollution.
 - Treat oil-contaminated beach sands with hydrocarbon materials.
 - Discover and develop radioactive waste disposal methods in Egypt.
 - Study and review the use of coal kilns used for charcoal production with new production systems instead of traditional systems that pollute the environment and evaluate such systems.
 - Develop the numerical forecasting center for the preparation of a daily forecast for a week to be renewed on a daily basis. The forecast shall include determining the appropriate times for the burning of waste, provided that such forecast is done using the assigned numerical models.
 - Developing Monitor Network to measure the solar radiation , pollution , total and surface ozone , as well as measuring sandstorms.
- **Preserving natural resources:**
 - Study the risks and threats facing agricultural biological diversity in new reclamation areas and biodiversity in the Egyptian seas, lakes, channels and the Nile River and means of fighting against them.
 - Finance the Encyclopedia of the preservation of Natural Resources (Genetic, Animal, Microbial, Mineral and Heritage Resources).
 - Conduct a study about the types of sharks in the Egyptian marine environment (Mediterranean and Red Sea).

6. The of technological applications and future sciences focus

- Identifying national priorities out of future sciences and technology every three years (study the localization and application of future sciences and technology).
- Develop the basic capacities and researches and competitive innovations in:
 - In the field of micro-agriculture.
 - In the field of vertical agriculture.
 - In the field of energy storage.
 - In the field of liquid solar fuel
 - In the field of genome correction.
 - in the field of personal medicine
 - In the field of printers and 3D presentation media.
 - In the field of system analysis and future studies.
 - In the field of biofuel and bio-plastics.
 - In the field of wireless energy transmission.
 - In the field of flexible electronics.
 - In the field of smart scanners and robots.
 - In the field of genetic engineering applications in confronting climate changes in agriculture and food sector.
 - In the field of applications of artificial intelligence(AI) in health, education, agriculture, roads and others.
- **The use of nanotechnology:**
 - In improving Sensors and nano device in satellite design.
 - In cancer diagnosis and treatment.
 - In purification, treatment and desalination at the industrial and domestic level.
 - In the improvement and development of solar cells
 - In Heavy industries such as aircrafts and mechanical properties (metal alloys).
 - In the manufacture of safe food resistant to diseases and ills
- Invent Programmable nanodevices n the medical field to repair or detect damage and infection.

- Development of materials and compounds with nanometric dimensions having new mechanical, chemical, electronic, electrical and thermal properties used in various uses such as paints, dyes and medicines.
- Innovate nanometer devices that are highly efficient for storing large amounts of energy for long periods
- Use more environmentally friendly energy systems
- Anti-corrosion and abrasion surfaces Super hydrophobic -low effect, low friction, anti-dust, and self-cleaning

7. Strategic Industries

- **Manufacture of polymers, plastics and rubber such as:**
 - Working in manufacturing components of paints and wood glue locally.
 - Production of biodegradable plastics.
 - Production of thermo-adhesives using various materials of synthetic rubber for rubber-gluing metal surfaces such as tires used in armored vehicles.
 - Use of geopolymer as an innovative globally applied material for building materials.
 - The production of engineering polymers, i.e. polymers with exceptional mechanical properties other than those of ordinary polymers such as hardness and durability, which make it valuable in the manufacture of structural products such as gears, electronic devices and auto parts and less costly. Engineering plastics are produced in smaller quantities and tend to be used in small objects or low-volume applications (such as mechanical parts) that require certain mechanical specifications as well as lightweight.
 - The manufacture of plastic films used in smart packaging (plastic films used in the packaging of fruits and vegetables to keep them during export and cooling for long periods).
 - The production an environmentally friendly anti-bacterial coating using local raw materials.
 - The study of the use of geopolymer as an innovative globally applied material for building materials.
- **Industries based on agricultural residues, such as:**
 - Research in alternatives of natural wood (rice straw - cotton firewood - palm leaf stalk).
 - Experiment the use of agricultural wastes such as (rice straw, wood pulp, reed, etc.) In the production of pure cellulose.
 - The manufacture of nitrocellulose of local raw materials.
 - The production of ultra-soft pure silica from rice straw Fumed Silica

- Developing packages based on biologically active cellulosic materials
- Development of filters recovered from renewable natural sources such as cellulose (rice straw, cotton firewood, banana leaves (and keratin), feathers, hair) (for use in removing heavy metal ions)
- The use of fibers in the production of materials of great importance used in the chemical and military industries
- Use the product of ginning in several fields such as filter manufacture
- The production of green petrochemicals from natural sources that depend on the production thereof on natural resources such as agricultural waste.
- **Industries based on mineral resources, such as:**
 - Extraction of rare earth elements from phosphate rocks.
 - Transformation and purification of yellow uranium paste.
 - Purification of precious metals and adjust caliber in modern environment-friendly ways.
 - Improving the mechanical properties of aluminum alloys.
 - Production of silicon strips using reactors.
 - Chemical treatment of Egyptian marble.
 - Manufacturing alloys with specific properties for the manufacture of equipment and spare parts.
 - Evaluation, concentration and extraction of beryllium.
 - Processing and extraction of rare earth elements, thorium and uranium from monazite ore.
 - Extraction and concentration of vanadium oxide ore from ilmenite ores in the Eastern Desert.
 - The concentration and extraction of granite ore from the black sand for use in the processes of manufacturing marble
- **Obtaining new raw materials such as Metal Clay**
- Textile industries such as:
 - Manufacturing dyes from natural raw materials for textiles.
 - Developing processors to make fabrics acquire relative features.
 - Improving the properties of linen fabrics through the development of primary treatment processes as well as the development of final processing activities using biotechnology and nanotechnology
 - Improving the quality of wool produced in the Sinai Peninsula to maximize the utilization thereof in textile industries

- Production of insect and moth resistant fabrics
- The use of textile exhausts to increase the added and economic value of the product
- Production of local additives to raise the octane number of gasoline and improve engine performance.
- Addressing the high spillage rate of Mazut produced from Western Sahara ores.
- Treatment of waste from the thermal cracking process of EDC solvents production
- Treatment of Industrial wastewater (removal of cyanide element).
- Preparation of nanometric filters by means of electrical extruding out of cheap renewable natural sources and exploitation thereof in the purification of industrial wastewater
- Extracting the salts of magnesium, potassium and boron from the bitter liquid of Salt evaporation ponds.
- Studying the improvement of the properties of liquid fuel used in thermal generation plants and reducing its impurities.
- Enhancing the efficiency of the existing situation and maximize the return of quarries.
- Supporting the production of cotton strains with high purity to preserve the genetic purity of Egyptian cotton such as:
 - Producing new strains of Egyptian cotton resistant to pesticides
 - Multi-production, preservation and documentation of long-staple cotton varieties using the latest technologies in genetic engineering and biotechnology
 - The production of a cotton harvesting machine which is suitable for harvesting Egyptian cotton
 - The development of new strains of linen that is equivalent to the imported strains
 - The development and use of emerging technologies in agriculture and foodstuff fields.
- Incorporation of graphene as a catalyst in various industries (such as pharmaceutical industry and various medical applications) and in desalination membranes
- Conducting studies for the establishment of a data base for the national strategic industries that include the existing industries, the productive capacity of the design, the actual quality of the current products, the geographical distribution of the existing industries and the problems facing the industry
- Developing, registration and accreditation of alternative medicine methods.
- The use of nanotechnology applications in the pharmaceutical industry
- Developing silicon based industries in Egypt
- Establishment of a licensed laboratory for pharmacological equivalents

- Adopting the production of a local model of an international brand car so that the local component may not be less than 70%.
- Supporting the national project to expand the local manufacturing and promote the slogan “made in Egypt”, such as:
 - Manufacture of nitrogonidine of local raw materials.
 - Treatment of phosphodiase.
 - Treatment of ash resulting from the burning of diesel.
 - Designing molds and molds for the (plastic injection, sheet iron forming, rubber, glass and metal injection) industries.
 - Designing shoe-soles and accessories.
 - Production of high voltage circuit breakers.
 - Production of gas discharge lamps for lighting.
 - Using the dust of cement buss generated by the cement industry in complementary industries.
 - Development of the local sponge industry.
 - Preparation of nanometric mineral oxides using mechanical milling and gelatinous methods.
 - Development of Bushes and bearing shells for heavy rotary machines.
 - Production of electric arc cutting chambers for high and high voltage circuit breakers.
 - Development of automatic welding techniques for critical and high pressure steam boiler ducts.
 - The production of catalysts used in polymerization.
 - Design of induction motors used in household appliances.
 - Development of local production of prosthetic devices and biological materials
 - Supporting the production of a national center for the production of local molds and spare parts to support the financing of a national program for Egyptian industries
 - Supporting a national program to manufacture an Egyptian Tablet with proper quality and a price which is suitable for the local market
 - Development of the technology of (SAP) production
 - Production of fertilizers in a way that combines the three components of the one-granule fertilizer
 - Purification of phosphoric acid and enhancing its quality to be usable in food and medicine.
 - Recycling of bottles made of polystyrene into fibers

- Expanding the local manufacturing in energy, water, electronics, telecommunications, farm equipment and spare parts fields, such as:
- Designing and manufacturing electronic panels with special PCB control panels used in household appliances.
- Production of contactors for low and medium voltage.
- Development of thermal surface treatment technologies for parts of hot tracks in gas turbines.
- Development and production of protective devices for transformer stations, power stations and electricity transmission lines.
- Supporting projects of research, development and innovation in the following fields: Semiconductor production, integrated circuits and micro-systems - production of optical fibers used in optical cables and their accessories LED - local production of lamps - manufacturing computer- and robot-controlled machines for standard production
- Designing and manufacturing electronic sensors and control systems to feed different industries
- Manufacturing electronic equipment and supplies for the restoration of valuable materials

8. Information, Communication and Space Technology

- Research in smart security, for instance:
 - Blocking photographing printouts,
 - Blocking mobile signal during secondary stage exams,
 - Providing cyber security.
- **Internet of things(IOT) , including:**
 - Making IOT available in Arabic,
 - Providing optical character recognition (OCR) for Arabic fonts to be able to use it in exams correction process, additionally, recognizing old maps and converting them into a machine-readable format.
- **Developing the information technology infrastructure and improving the performance of wireless digital networks and remote sensing networks, for example:**
 - Block Chain and transferring value through the internet.
 - Big data analysis.
 - Making use of open source data.
 - Linked open data,
 - Addressing the noise and problems resulting from central computers' electromagnetic

waves, and all aspects of occupational risk analysis.

- The distributed architectural structure of adaptive learning based on Open EDX platform.
- Standardization of open-source designs necessary for building laptops and iPad to be used in local manufacturing process.
- 5G communication technology,
- Smart cities,
- Smart Universities,
- Research in developing smart runways,
- Applied analysis (attitude analysis).
- **Strategies of educational designs of Massive Open Online Course (MOOCS), including:**
 - Deep learning,
 - Distance and electronic education
- Computer Science and Information Technology
 - Technological applications related to managing and planning resources,
 - Cloud computing services,
 - Information networks and databases,
 - Analytical engine of Arabic texts to deduce orientations ,and foresee forthcoming events,
- **Technological development of baggage handling system such as:**
 - Using RFID; (radio frequency identification for tracking packages and passengers), Studying the corporate governance systems most appropriate to corporate sector companies subject to law no. 203.
- **Information integrity and security such as:**
 - Using satellites or any other communication system to consider the method of transferring and processing the data and information of airplane parts and components operational actual performance to avoid any technical problems that may impact airplanes safety or limit their operational maximum economic benefits,
 - Providing Biometric and using it in airports,
 - Using e-passport system in which an electronic sim is embedded.

9. Education as a National Security Matter

- Determining creative means to address the accumulated problems that have led to a poor education system,
- Contriving new forms to prepare teachers suitable for the third millennium era and developing the criteria of selection and systems of occupational training, forming and development,
- Developing curriculums and study programs at both general education and collegiate systems in an integral matrix, in addition to exploiting digital technology in education management to create excellent human

capital that can effectively contribute to sustainable development and building a knowledge-based society.

- Linking the educational process to the human and social development issues in the information and knowledge-based society and creating new forms for community involvement in directing the general education institutions.
- Disseminating the culture of research and surveys between students and providing them with the skills of scientific research and innovation.
- Integrating persons with special needs into the educational and social life and its relation to their psychological equilibrium,
- Improving the society's mental image about the technical education and its effect on the rise of student's rate joining such educational stream, besides, considering developing the technical schools capital.
- Studying the effect of student's activities on their academic achievement.
- Activating the role of technical education in small projects and entrepreneurship and its impact on developing the Egyptian economy.
- Studying the role of the civic education subject and its effect on students in raising their environmental and social awareness.

10. Mass Media, and Social Values

- Developing a means to retain the pioneering role of Egypt in the mass media field.
- Developing mass media, the concept of self-censorship, country's identity and social values as well as tackling the informative and cultural poverty.
- Developing the methods of news making and detecting the means of informational misleading.
- Modernizing religious discourse.
- Developing the scientifically oriented mass media and creating new generations of science luminaries through national well-known scientists serving as role models.
- Studying e-media and its role in forming ideas.
- Developing the media directed towards children and its means of improvement.
- Developing public discourse.
- Activating the role of mass media to confront the Fourth Generation Warfare.
- Studying mass media, the accompanying rumors, ethics of media and the social responsibility.
- Developing mass media and improving the stereotypes of women and persons with special needs alongside with the national identity.

11. Investment, Trade and Transportation

- Achieving financial and administrative sustainable development through paying special attention to the issues of commercial trade:
 - Raising efficiency and automization of governmental management in trade, marketing and sustainable development.
 - Developing the means of increasing Egyptian exports capacity of competitiveness.
 - Studying how the credit policies have been reflected to the policies of investment, production

and the standard price levels.

- Studying the capacity of stock market to contribute to financing the Egyptian economy.
- Studying the business incubators' role in increasing the Egyptian villages' productivity (a productive village and an exporting governorate).
- Supporting the role of manufacturing sectors in the national economy.
- Enhancing Small and Medium-sized Industries by creating clustered association and inserting Egypt into the global value chains.
- Considering the development of investment policies, incentives and guarantees to keep up with the investors' requirements.
- Considering the applicability of single- window system on the national level.
- **Paying attention to prospective and advanced studies to develop the trade and investment sectors:**
 - The knowledge-based economy and its investing applicability in fostering the competitiveness capacity of Arab SMEs
 - Governance of corporates and endowment funds.
 - Considering a methodology to decrease the balance of payment deficit.
 - Studying a plan for labor market as distributed among the Egyptian provinces.
 - Evaluating the level of support provided by the general financial policies to the objectives and plans of development as well as its role in boosting the Egyptian exports competitiveness capacity.
 - Studying the regional and international cartels to raise the competitiveness of the Egyptian economy.
 - Studying the international economic agreements and treaties to support the Egyptian foreign trade.
 - Methodology of estimating and quantitatively analyzing the effect of direct foreign investment on development, exports, competitiveness, productivity and employment.
 - Studying the role of direct foreign investments in addressing structural imbalances on both sectoral and regional levels and in establishing a human and social capital.
 - Financial, organizational and operational developing and restructuring of holding companies which incur losses, to help cover their expenses, and turning them into profitable companies.
 - Carrying out prospective studies to establish knowledge and smart cities on knowledge economy basis.
- **Optimizing the use of transport and port sectors:**
 - Considering increasing the ground transports and railways effectiveness and

accommodational capacity besides improving their performance efficiency.

- Studying the effect of implementing smart transportation and information technology on developing transportation in Egypt.
- Studying the effect of service level and accommodation capacity of railroads passengers on the railroads common between freight and passengers trains.
- Developing the railroads-based transportation process of both passengers and goods in addition to increasing safety factors.
- Setting and developing a comprehensive plan for river transportation and fostering its role to alleviate the pressure on roads.
- Updating and developing the comprehensive transportation plan in Egypt.
- Developing the systems of managing roads and bridges in Egypt.
- Developing the river information system for the Nile River(RIS).
- Implementing the traffic control system – electronic control (smart traffic systems).
- Developing the plans of tackling emergencies.
- Considering developing, supporting and restructuring Egypt Air to raise its competitive capacity as the policies of air transport liberalization are growingly implemented.
- Considering supporting, restructuring and empowering Cairo Airport and turning it into a HUB AIRPORT for freights, passengers and mail.
- **Raising the efficiency of logistic services.**
 - Using the modern logistic systems in the activities on Egyptian ports and on other transportation means in addition to drawing a logistic map of Egypt.
 - Using information technology for integration purposes between the different means of local transportation.
 - Specifying the procedures necessary to provide persons with special needs with accessibility in the urban areas.
 - Managing the network of Egyptian roads, and developing forms of safety assessment, and checking roads network. Reasons and results of traffic congestion should be studied and potential solutions should be determined.
 - Studying the behavior of pedestrian and their impact on traffic flow and safety problems on roads.
 - Studying the effect of codifying and digitalizing the main roads network on the efficiency and operation of traffic in Greater Cairo.
 - Developing the cold mix asphalt (CMA), and using them to maintain roads.
 - Studying the potentiality of industrial waste to improve and enhance the efficiency of hot mix asphalt

(HMA) .

- Developing the mechanical design of flexible pavement in Egypt.
- Conducting laboratory, and field studies on using Asphalt Layers and recycled and cemented foundations as a base course.
- Using the Nano wastes to reinforce the flexible and rigid pavement of roads.
- Conducting a fusibility study regarding the development and construction of *multi-storey* automatic garages within the vicinity of metro stations.
- Studying the effect of logistic centers on boosting the competitiveness capacity of Egyptian imports.
- Low airport cost needs
- Airport Master Planning
- Developing the policies of exploiting the commercial and economic usages of Egyptian airports and implementing the policies of airport city and aerotropolis in some airports.
- Observing and developing the accommodational capacity of Egyptian airports in light of air traffic potential growth as a result of the air transport liberalization policies.
- Developing and marketing the facilities and potential of Egyptian airports airfreight as well as their cargos capacity.
- Developing policies and providing aviation-training opportunities in Egypt ,and maximizing the regional and international market share for Egyptian aviation academies and centers.
- Re-planning ,and developing the Egyptian airspace to increase its capacity and air navigation.
- Carrying out a study to establish a transportation data bank.

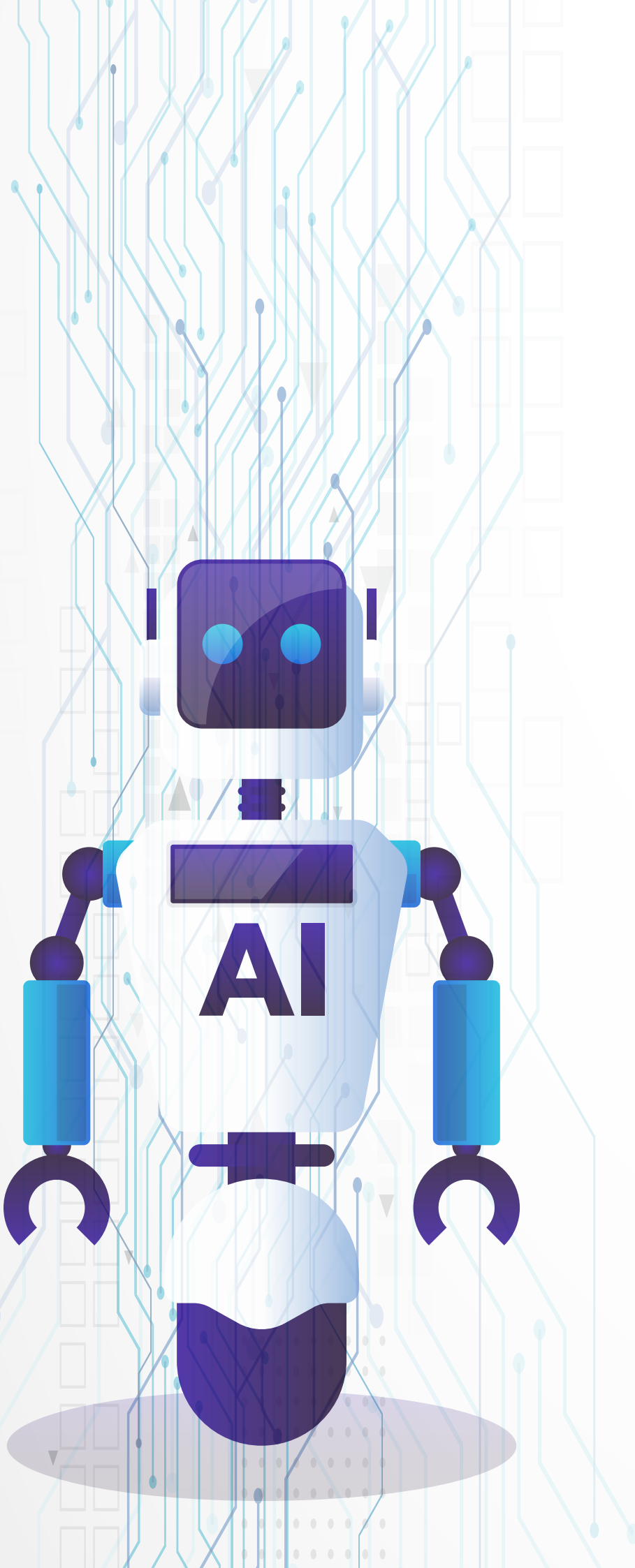
12. Tourist Industry

- Optimizing the use and means of promoting the tourism sector and its pillars in Egypt according to the international indicators of tourist attraction. Databases of various tourist investments (public and private sectors) should be created.
- Creating databases of statistics, Egyptian tourist destinations and resources and drawing a new tourist map showing the different tourist destinations and tourism patterns.
- Preparing programs to train human resources of tourism and hotels besides setting programs for developing the capabilities of local inhabitants who interact with tourism sector.
- Developing a mechanism to deal with recessions that befall the tourism and hotels sector from time to time.
- Determining criteria to define the quality of tourism sector.
- Making use of the new technology to document the monumental heritage to avoid stealing or counterfeiting either immovable or movable artefacts.

- Inventing safe methods to control the continuously growing grass in archaeological sites like camelthorns and swamp sawgrass in a way that is by no means harmful to soil.
- Raising the social and legal protection to the Egyptian antiquities.
- Developing Pharaoh's Bath (Hammam Pharaon) area and the warm sands in the southern of Sinai to use them as an exceptional tourist product.
- Studying the cultural heritage coordination for archeological areas and premises.

13. Social Sciences and Humanities

- Conducting an initial survey for the families benefiting from *Takaful and Karama* (Solidarity and Dignity) program to assess the effect of cash subsidy on families' development.
- Conducting surveys on the prevalence of drug abuse and addiction and its effect on the committing crimes. The survey should also tackle methods for facing such crimes on both social and legal levels in Egypt.
- Evaluating the penalties imposed on terrorist crimes perpetrators (carrying out an analytical study for a sample of cases) and assessing the state's role in paying compensations to the terrorist offences victims' families.
- Conducting studies on violence in society.
- Developing the means of legal and social protection for the persons with special needs.
- Studying programs for mitigating the illegal immigration and trafficking in persons..
- Studying human development for the sake of sustainable development.
- Integrating persons with special needs into the educational and social life and its relation to their psychological equilibrium,
- Developing the methods of safety, security and crisis management.
- Adopting new scientific methods in training human resources.
- Preparing a new generation of qualified cadres to manage a smart system governorates' municipalities.



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