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Recent STI Achievements in China

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- 13th Five-Year Plan for National Technological Innovation Engineering Projects Promulgated
- 13th Five-Year Plan for STI against Climate Change Promulgated
- 13th Five-Year Plan for National Basic Research Promulgated

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Recent STI Achievements in China

The National Science, Technology and Innovation (STI) Conference, the biennial meeting of Chinese Academy of Sciences (CAS) and Chinese Academy of Engineering (CAE) members and the 9th representatives' meeting of China Association for Science and Technology (CAST) were convened simultaneously from May 30 to 31, 2016. General Secretary Xi Jinping called upon the whole Party and people to build China into a power of S&T in the world. Over the past one year, various localities and departments have carried forward the philosophy of the meetings, and made outstanding achievements by giving full play to the role of STI in leading and underpinning economic and social development. The undertaking of science and technology development has entered a new phase. Here is the review of the S&T achievements over the previous year in China.

In May 2017, **Jiaolong submersible** made its second dive

It realized an in-depth on-site investigation for the Mariana Trench at 4,000 meters below sea level, gaining an initial understanding of the world of the Challenger Deep at 4,811 meters under the sea.

Recent STI Achievements in China

In May 2017,
the test exploitation of **flammable ice** was successfully conducted.

China became the world's first country to realize stable gas production through exploiting flammable ice at sea.

From May 10 to 18, a total of 120,000 cubic meters of natural gas with 99.5% of CH_4 concentration has been produced.

In May 2017,
the domestically-made large aircraft C919 made its first flight.

With complete IPR, C919 is our main-trunk civil plane manufactured in line with the latest international airworthiness standards.

The titanium alloy components made by 3D printing were applied for the first time, and many major technical breakthroughs were realized in the process of research and design.

Recent STI Achievements in China

In May 2017, **quantum computer** was born.

The world's first quantum computer excelling traditional computers was born. It is, in a real sense, a product made in China.

The sampling speed is at least 24,000 times faster than similar international experiments, and the operating speed 10 to 100 times faster than mankind's first vacuum-tube computer and the first transistor computer.

In April 2017, **Tianzhou 1** and Tiangong 2 accomplished automated rendezvous and docking

Tiangong 2 completed the rendezvous and docking with cargo spacecraft for the first time. Tianzhou 1 and Tiangong 2 entered the phase of assembly flight, conducted in-orbit propellant supply and made multiple experiments (tests) on space application and technologies.

Recent STI Achievements in China

In February 2017, **Tianhe 1** was in full operation.

It serves as a platform for space & aeronautics, climate & meteorology, and new energy materials. It has over 1,400 online tasks each day, which is a scale hard for the European and American supercomputing centers to reach.

In October 2016, Shenzhou 11 and Tiangong 2 accomplished **automated rendezvous and docking.**

It enabled Chinese astronauts to stay in orbit for a medium period of time and carry out space science and application missions in line with international scientific frontier and high & new tech development.

Recent STI Achievements in China

In September 2016,
the world's largest single-dish radio telescope, or **FAST**, was put into operation.

With a collecting area equal to the size of 30 football fields, it has 6,670 strands of steel cables and 4,450 reflecting panels.

The innovation is forming a 300m-aperture instant parabolic dish through spherical crown reflector at the direction of the radio power, which will be convenient to track the movement of the celestial body. Compared with Arecibo, the comprehensive performance has been enhanced by about ten times.

In August 2016,
China successfully launched Mozi, the world's first **quantum scientific experimental satellite.**

China used the Long March 2 carrier rocket to send the world's first quantum scientific experimental satellite into the universe.

This has enabled China to realize for the first time quantum communication between satellite and earth, forming a heaven-earth integrated quantum confidential communication and scientific experimental system.

Recent STI Achievements in China

From June to August 2016, the **Haidou** unmanned diving machine made a record diving depth.

It made a record deep dive for China's unmanned diving machines.

China became the third country capable of realizing unmanned diving into 10,000-meter undersea, next to Japan and the US.

In June 2016, Sunway Taihulight, the world's fastest **supercomputer** made in China, was born.

It won the champion in the TOP500 list of the world's supercomputers.

Its computing capacity in one minute is equal to the 7.2 billion people on earth using calculators calculating for 32 years constantly at the same time.

All the core system components were made in China.

(Source: Xinhua Net, June 5, 2017)

13th Five-Year Plan for National Technological Innovation Engineering Projects Promulgated

In order to meet the requirements of *the 13th Five-year Plan For National Economic and Social Development, the National Innovation-driven Development Strategy and the 13th Five-year Plan for National Science, Technology and Innovation,* fulfill the missions of *the Outline of National Medium and Long-term S&T Development,* establish and improve the technical innovation system, enhance the innovation capacity and core industrial competitiveness of industries, facilitate the integration between S&T and economy, 15 governmental bodies including the Ministry of Science and Technology (MOST), National Development and Reform Commission (NDRC), Ministry of Education (MOE), Ministry of Industry and Information Technology (MIIT), Ministry of Finance (MOF), Ministry of Human Resources and Social Security, Ministry of Agriculture (MOA), the People's Bank of China (PBOC), State-owned Assets Supervision and Administration Commission (SASAC), State Administration of Taxation, Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), All-China Federation of Labor, All-China Federation of Industry and Commerce and China Development Bank jointly issued *the 13th Five-Year Plan for National Technological Innovation Engineering Projects* (hereinafter referred to as the Plan).

The general objectives of the Plan are to improve the technical innovation system where enterprises play the major role, the market plays as the guide and enterprises, universities and research institutes work with each other, markedly improve the enterprises' indigenous innovation capacity and core industrial competitiveness, basically put in place the system for translation of research findings and technical innovation, improve the innovation level of regional industrial coordination and innovation, promote the growth of new industries and new business models, and integrate S&T with economic and social development.

To reach the overall goals, the Plan formulates the following indicators:

1. By 2020, build about 20 innovative companies with world impact, with part of them ranking among world TOP100, build over 1,000 innovative pilot enterprises, realize 34 trillion yuan of turnover for hi-tech enterprises, bring about a large number of dynamic tech-based SMEs.

2. In line with optimized layout of research bases, set up about 20 national technology innovation centers with clear strategic goals, efficient and open operation and strong resource integration capacity in major industrial technologies concerning the country's future, and form a technology innovation network conducive to industrial development.

3. Increase markedly R&D input of enterprises, elevate the share of above-designated scale enterprises' R&D expenditure in turnover of major business to 1.1%, increase leading enterprises' R&D input to compare with international peers, double the enterprises' patent ownership and PCT patent applications.

[Introduction of Major Programs]

4 Further industry-university-research institute synergy with enterprises playing a major role, build a batch of strategic alliance of industrial technology innovation facilitating overall innovation capacity, set up over 300 pilot alliances, make breakthroughs in industrial key generic technologies, and formulate international and national technical standards.

5 Optimize the ecosystem for innovation and entrepreneurship, increase national technology transaction volume to 2 trillion yuan, enhance the role of science financing to technical innovation, greatly increase investment for new businesses and equity financing, and step up policy and developmental financial institutions' financing in STI within their business scope.

6 Set up a batch of demonstration bases for translation and transfer of research findings, build 50 innovative industrial clusters of international competitiveness, enhance the impact of pilot provinces and cities, and form innovation highlands for regional transformation.

7 Enhance greatly the use of global innovation resources, build a batch of enterprises' overseas R&D centers, introduce overseas high-end innovative talents, encourage major industries to go global by focusing on innovation cooperation of the Belt and Road.

The Plan formulates 7 major tasks centering on the major indicators:

(1)Take actions to cultivate leading innovative enterprises, and guide them in enhancing innovation capacity.

(2)Improve technical innovation system, and enhance core competitiveness of major industries.

(3)Develop the alliance of industrial technology innovation strategy, and facilitate coordinated innovation among enterprises, universities and research institutes.

(4) Facilitate innovation and entrepreneurship related to science and technology, and arouse the enthusiasm of small, medium and micro enterprises for innovation.

(5) Make efforts to promote translation and transfer of research findings, and enhance the major role of enterprises in translation of research findings.

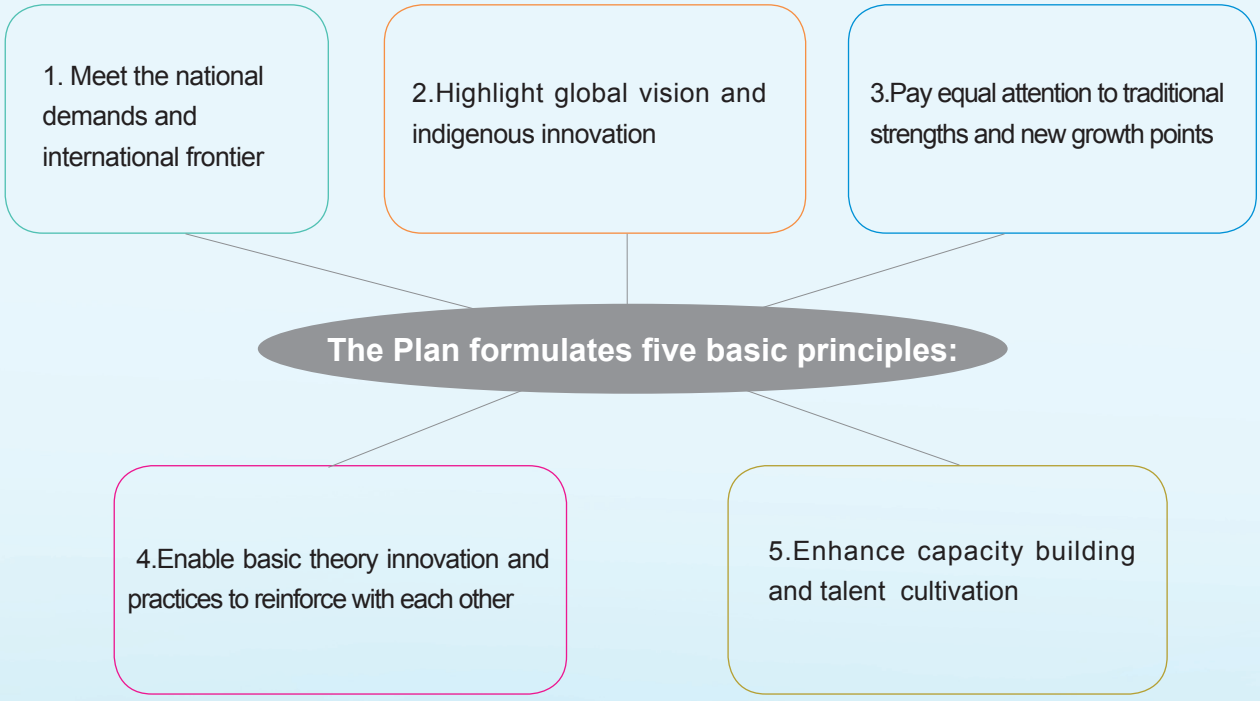
(6)Step up efforts in technical innovation, and facilitate the concentration of innovation resources in enterprises.

(7) Strengthen international innovation cooperation to fully use global innovation resources.

(Source: MOST, May 3, 2017)

13th Five-Year Plan for STI against Climate Change Promulgated

To improve the national innovation system for fighting against climate change, enhance our STI capacity to deal with climate change, consolidate the supporting role of STI in global climate governance and green & low-carbon development. Recently, MOST, Ministry of Environmental Protection (MEP) and China Meteorological Administration jointly issued *the 13th Five-Year Plan for STI against Climate Change* (hereinafter referred to as the Plan).



The overall objectives are to comprehensively enhance our S&T strengths against climate change, promote basic research in climate change, facilitate the innovation and application of mitigation and adaptation technologies, reduce the negative impact and risk of climate change, support implementation of sustainable development strategy; improve the national management and regulation system for STI concerning climate change, and put in place a new whole-chain model against climate change integrating basic research, impact and risk evaluation, mitigation and adaptation R&D and sustainable transformation strategy research.

To reach the objectives, the Plan set out the following specific goals:

Scientific goal:

Build 5 to 10 databases of global climate change and greenhouse emission of international impact; design 2 to 3 earth system model, high-resolution climate model and greenhouse emission calculation system with complete IPR and international advanced level; improve research to international top places in terms of realities, mechanisms, attribution, simulation and forecasting.

Technical goal:

Enhance the capacity against disasters; make breakthroughs in GHG emission reduction, eco-system carbon sink and CCUS in 5 to 10 major industries, improve international competitiveness in low-carbon industry, reduce 40%-45% carbon intensity by 2020 and 60% to 65% carbon intensity by around 2030.

International strategy and management goal:

Put in place economic and social development coordination mechanism against climate change, GHG management mechanism, carbon emission data reporting and checking mechanism, green economic development, low-carbon financing and transaction technology innovation mechanisms as well as low-carbon technology application and promotion mechanisms, so as to increase the efficiency of S&T management in the fight against climate change.

Capacity building goal:

Foster and cultivate a cross-discipline, cross-sector and cross-border hi-level research team, support steadily scientific research; build up our data sharing platform, technology information transfer platform, information disclosure and pubic engagement platform, increase the exchange and spreading as well as awareness in scientific data, technical information and science popularization.

The Plan sets out 10 major priorities:

- Further basic research against climate change
- Accelerate data and model R&D for basic research
- Set up a technical evaluation system on climate change
- Build risk prediction technology system
- Promote R&D, demonstration and application of mitigation technologies
- Facilitate R&D, application and demonstration of adaptation technologies
- Further strategic research on international climate change negotiation
- Further strategic research on domestic green and low-carbon transformation
- Expedite building of bases and talent teams
- Strengthen international cooperation

(Source: MOST, May 18, 2017)

13th Five-Year Plan for National Basic Research Promulgated

To implement *the Outline of National Innovation-driven Strategy* and *the13th Five-year Plan for STI and expedite basic research,* MOST worked with MOE, CAS and National Natural Science Foundation of China (NNSFC) to jointly formulate *the 13th Five-year Plan for National Basic Research* (hereinafter referred to as the Plan).

The basic principles are:

- Uphold and encourage integration of curiosity-driven research and orientation to the goals
- Focus on surpassing and leading international peers
- Take reform on systems as the core engine
- Give full play to the role of talents
- Take global vision as an important orientation

The Plan makes deployment in the development priorities and major tasks of basic research in China, including:

1. Strengthen curiosity-driven research and discipline build-up, enhance indigenous innovation, encourage new concepts, new ideas, new methods and new tools, and set up a comprehensive and balanced discipline system.

2. Organize implementation of major S&T projects of basic research, such as quantum communication and quantum computing, brain science and research.

3. Strengthen mission-oriented basic research and transformative technical research, further national goals and give full play to the strategic supporting role of basic research in areas concerning people's well-being like agriculture, energy, eco-system and health, and areas concerning industrial core competitiveness, comprehensive indigenous capacity and national security.

4. Better build national STI bases and research facilities, improve building and layout of scientific and engineering STI bases, set up national labs in major innovation areas, and facilitate a better layout and development of national key labs.

5

Build greater basic research teams, adhere to the rules of talent growth, strengthen introduction and cultivation of talents, produce and attract a batch of hi-level leading figures, young talents, experimental technicians and outstanding innovation teams with international impact.

6

Organize and strengthen major international S&T cooperation and exchange in the following areas:

1. Launch and organize international mega-science programs and engineering projects. Focus on areas of comparative advantages like mathematical astronomy, life science, earth science, energy and cross-discipline research, propose international mega-science programs and mega-science engineering projects within the next 5 to 10 years that China may initiate.

2. Participate actively in international mega-science programs and mega-science projects. Take part in joint research in international mega-science programs and mega-science projects like ITER, SKA, LHC, GEO and IODP.

3. Support bilateral and multilateral basic research. Facilitate inter-governmental cooperation in basic research, improve cooperation mechanism, and strengthen bilateral and multilateral basic research. Make national S&T programs and key labs more open to the outside. Encourage and support building of international joint labs and research centers.

4. Go global, bring in and attract overseas talents. Further international exchange of basic research personnel, recommend Chinese scientists to conduct exchange and assume posts in international academic organizations, select and send outstanding young researchers to top research institutes abroad for further studies. Focus our efforts on introducing scientists dedicated to frontier and disciplinary research and with innovation potential, support universities and research institutes in building joint research centers or innovation teams in major disciplines, and support worldly-known universities and research institutes in conducting joint research and building up joint research centers.

5. Promote internationalization of basic research activities. Encourage cooperation and exchange in international research, conduct basic research, co-author papers; research into the internationalization of basic research evaluation, build up basic research of international peer experts, invite international top-notch scientists to take part in project evaluation and conduct international peer review.

(Source: MOST, June 8, 2017)