

PART II

PURSUING INNOVATION-DRIVEN DEVELOPMENT AND CREATING NEW STRENGTHS FOR DEVELOPMENT

Innovation must remain at the heart of China's modernization drive. We must rely on our own science and technology to provide strategic support for China's development. We must set our sights on the frontiers of global scientific and technological development and stay focused on economic development, the major needs of the country, and the lives and health of our people. We must fully implement the strategy of invigorating China through science and education, the strategy of developing a quality workforce, and the innovation-driven development strategy. We must improve China's innovation system and work quickly to boost our country's strength in science and technology.

Chapter 4 Boosting China's Strategic Science and Technology Capabilities

An action plan will be formulated to boost China's strength in science and technology. We will further refine the new nationwide mobilization system for making key technological breakthroughs in the context of the socialist market economy and enhance the overall performance of the innovation chain.

Section 1 Integrating Resources and Optimizing Distribution

We will optimize allocation within the innovation system to better meet China's strategic needs, and move faster to improve our strategic science and technology capabilities underpinned by the development of national laboratories. We will establish new national laboratories and reorganize key existing national laboratories with a focus on major fields of innovation such as quantum information, photonics, micro and nanoelectronics, network communications, artificial intelligence (AI), biomedicines, and modern energy systems, to create a well-structured and efficient laboratory system. We will improve national engineering research centers, national technology innovation hubs, and other centers of innovation. Research institutes, universities, and enterprises will be encouraged to improve their deployments of research personnel and to share resources with each other. We will support the growth of new innovative entities such as new types of research universities and institutes, and work to develop more diverse investment entities, modern management systems, market-based operation

mechanisms, and flexible personnel mechanisms.

Section 2

Promoting Original and Groundbreaking Advances in Research

We will formulate and implement strategic science plans and projects in areas that are foundational and critical to national security and development. Visionary and strategically important national science and technology projects will be launched in cutting-edge fields such as AI, quantum information, integrated circuits, life and health science, brain science, bio-breeding, space science and technology, and deep earth and deep sea research. Keeping in mind China's immediate and long-term needs, we will pool superior resources to make breakthroughs in core technologies in key fields such as the prevention and control of emerging infectious diseases and sudden outbreaks, biosafety and biosecurity risks control, medicines and medical equipment, key components, spare parts and basic materials, and oil and gas exploration and development.

Box 2 Cutting-Edge Science and Technology	
01 Next generation AI	<ul style="list-style-type: none"> ▪ Make breakthroughs in foundational and cutting-edge theories; ▪ Conduct R&D of dedicated chips; ▪ Develop deep learning frameworks and other platforms for open source algorithms; ▪ Make innovations in fields such as learning, reasoning and decision-making, images and patterns, voice and video, and natural language recognition and processing.
02 Quantum information	<ul style="list-style-type: none"> ▪ Conduct R&D of metropolitan-area, intercity, and free-space quantum communication technologies; ▪ Carry out R&D of universal quantum computer prototype and practical quantum simulators; ▪ Make breakthroughs in technology for quantum precision measurement.

continued

Box 2 Cutting-Edge Science and Technology	
03	<p>Integrated circuits</p> <ul style="list-style-type: none"> ▪ Conduct R&D of design tools, key equipment, and critical materials such as high-purity targets; ▪ Make breakthroughs in advanced processes and in special processes such as the insulated gate bipolar transistor (IGBT) and microelectromechanical systems (MEMS); ▪ Upgrade advanced storage technologies; ▪ Develop silicon carbide, gallium nitride, and other wide-bandgap semiconductors.
04	<p>Brain science and brain-inspired research</p> <ul style="list-style-type: none"> ▪ Conduct analysis of brain cognition principles; ▪ Carry out the drawing of the whole brain mesoscopic neural connection atlas; ▪ Conduct research on the pathogeneses of major brain diseases and possible interventions; ▪ Carry out research on the intelligence development of children and teenagers; ▪ Conduct R&D of brain-inspired computing and brain-computer interfaces.
05	<p>Gene and biotechnology</p> <ul style="list-style-type: none"> ▪ Carry out research on genomics and its applications; ▪ Make innovations in technologies such as genetic cells and genetic breeding, synthetic biology, and biomedicine; ▪ Conduct R&D of new-type vaccines, in vitro diagnostics, and antibody drugs; ▪ Develop major and new varieties in such fields as farm crops, livestock, poultry, and aquaculture farming, and agricultural micro-organisms; ▪ Conduct research on key biosafety and biosecurity technologies.
06	<p>Clinical medicine and health</p> <ul style="list-style-type: none"> ▪ Carry out basic research on the pathogeneses of cancer, cerebrovascular and cardiovascular diseases, respiratory diseases, and metabolic diseases; ▪ Conduct R&D of proactive health intervention technologies; ▪ Conduct R&D of cutting-edge technologies such as regenerative medical techniques, microbiome, and new treatments; ▪ Carry out research on key technologies for the prevention and treatment of major communicable diseases and major chronic non-communicable diseases.
07	<p>Explorations in deep space, deep earth, deep sea, and the polar regions</p> <ul style="list-style-type: none"> ▪ Carry out basic scientific research on the origin and evolution of the universe and seismic tomography; ▪ Undertake space explorations such as the orbiting of Mars and asteroid roving; ▪ Conduct R&D of new-generation heavy-lift carrier rockets and reusable space transport systems, equipment for deep earth exploration, crafts for deep sea operations, maintenance, support, and equipment experiments, and stereo observation and monitoring platforms and heavy icebreakers for polar regions; ▪ Develop the fourth phase of China's lunar exploration program, the second phase of its marine exploration program, and the second phase of its polar exploration program.

Section 3

Strengthening Basic Research

To give better play to the leading role of applied research and encourage broad explorations, we will formulate a 10-year action plan for basic research and establish a number of research centers for basic sciences. The government will increase investment in basic research and improve the structure of spending in this area, grant tax breaks to enterprises for their spending in basic research, and encourage the participation of nongovernmental capital in various ways such as donations and funds. All of this will contribute to a sustainable and steady investment mechanism that will see basic research funding accounting for over 8% of all R&D expenditure. We will improve evaluation systems and incentive mechanisms in line with the objective laws that underpin science so that basic research is evaluated over longer time frames and is pursued in a favorable atmosphere.

Section 4

Building Major Platforms for Scientific and Technological Innovation

We will support Beijing, Shanghai, and the Guangdong-Hong Kong-Macao Greater Bay Area in becoming international centers of scientific and technological innovation. Huairou in Beijing, Zhangjiang in Shanghai, Hefei in Anhui, and the Greater Bay Area will develop into comprehensive national science centers, and localities with the right conditions will receive support to grow as regional centers of scientific and technological innovation. We will better leverage the innovative role of national innovation demonstration zones, high-tech industrial development areas, and economic and technological development areas. We will use an appropriate degree of forward planning for major national science and technology infrastructure

and make such infrastructure more accessible to ensure more efficient use. We will develop natural science and technology resource libraries, national research stations (websites) for observations in the wild, and centers for scientific big data in an intensive way. We will promote the R&D and manufacturing of high-end scientific equipment. High-level national exchange platforms will be established to facilitate the sharing of research papers and scientific and technological information.

Box 3	
Major National Science and Technology Infrastructure	
01 Strategic infrastructure	<ul style="list-style-type: none"> ▪ Develop a ground-based space environment monitoring network, a high-precision ground-based time service system, a large low-speed wind tunnel, an undersea scientific observation network, space environment simulation research infrastructure, and a comprehensive research facility for fusion technology.
02 Application-based infrastructure	<ul style="list-style-type: none"> ▪ Develop a high energy photon source, a high-efficiency and low-carbon gas turbine research facility, a centrifugal hypergravity and interdisciplinary experimental facility, the China initiative accelerator driven system, and the China environment for network innovations.
03 Pioneering and groundbreaking infrastructure	<ul style="list-style-type: none"> ▪ Build the Shanghai high repetition rate XFEL and extreme light facility, a large high altitude air shower observatory, a synergetic extreme condition user facility, a deep underground and ultra-low radiation background facility for frontier physics experiments, a national precise gravity measurement facility, and a high intensity heavy-ion accelerator facility.
04 People-friendly infrastructure	<ul style="list-style-type: none"> ▪ Build a national facility for translational medicine, a multi-mode, multi-scale biomedical imaging facility, a national research facility for phenotypic and genotypic analysis of model animals, the China seismic experimental site, and the earth system science numerical simulator facility.