White Paper on Science and Technology

Using intelligent technology to create a prosperous society and achieve sustainable growth.

2015-2018

Ministry of Science and Technology
Republic of China (Taiwan)
February, 2016

White Paper on Science and Technology

(2015-2018)

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科技部

Ministry of Science and Technology, Republic of China (Taiwan)

Science and technology (S&T) have always been important drivers of progress in human society and civilization. In recent years, S&T have played key roles in globalization, biomedical research, environmental conservation, energy development, industrial development and transition, and land conservation. As the economy, society, and culture rapidly evolve and develop, new issues and challenges will confront us. For instance, we now face such challenges as bridging the gap between technology and the humanities, understanding the spread of and control of emergent diseases, food shortages, Internet security and behavioral norms, national security and management of the nation's territory, and global warming and the impact of climate change. All of these are shared challenges facing the world, and both national governments and international organizations are striving to use innovative and translational approaches involving S&T to find and implement effective solutions.

In accordance with the *Fundamental Science and Technology Act*, the Republic of China (ROC) Government drafts a "National Science and Technology Development Plan" once every four years in order to promote the development of S&T. Furthermore, in response to the rapid development of S&T and demand for applications, the Government drafts a "White Paper on Science and Technology" two years after the issuance of each Development Plan to elaborate on the Government's scientific and technological development vision, implementation strategies, and current situation.

The *White Paper on Science and Technology (2015-2018)* Consultative Committee was interdisciplinary, cross-sectoral, and had a broad-based representation across the S&T research continuum. The Committee was formed on the basis of providing assistance with regard to the collection of data, analysis of pressing issues, and furthermore making recommendations for formulating of a vision, goals, and strategies. The *White Paper on Science and Technology (2015-2018)* begins by examining Taiwan's current S&T policies and implementation frameworks. This White Paper also analyzes global S&T development trends and illuminates critical S&T issues faced by Taiwan and the world. This White Paper suggests that S&T innovation and the transferable capacity of researchers are essential to

tackle with economic and environmental resilience, achieve the integration of industrial capabilities, accelerate the industrialization of emerging technologies, strengthen citizen participation mechanisms, enhance openness, transparency, and efficiency of policy-making, and thereby create a prosperous, sustainable society.

The *White Paper on Science and Technology (2015-2018)* (The White Paper) ultimately proposes a vision for Taiwan. This vision is to build a sustainable and prosperous society with intelligent science and technology. To fulfill this vision, the White Paper proposes the following eight major strategies, which seek to achieve four goals: transform research innovations; build a sustainable green energy environment; generate value added for the industrial technology; and establish a prosperous and diverse society.

The White Paper's eight major strategies are as follow:

Strategy 1: Focus on cutting-edge S&T fields; creating a value for excellence

Strategy 2: Bridge the gap between the supply and demand for skilled human resources; advancing S&T entrepreneurial environment

Strategy 3: Establish Taiwan as a global leader in green technology; creating a low-carbon intelligent society

Strategy 4: Implement effective sustainable development mechanisms; making economic growth compatible with environmental enhancement

Strategy 5: Establish S&T intellectual property portfolios; strengthening momentum for industry innovation

Strategy 6: Accelerate intelligent industrial upgrading; developing prioritized emerging industries

Strategy 7: Build a prosperous and vibrant society by providing safety and security; promoting smart and healthy living

Strategy 8: Build a diverse and inclusive society; implementing sustainable rural-urban development

Following approval by the Executive Yuan, the White Paper became the blueprint for the promotion of S&T research and development in Taiwan for 2015 to 2018.

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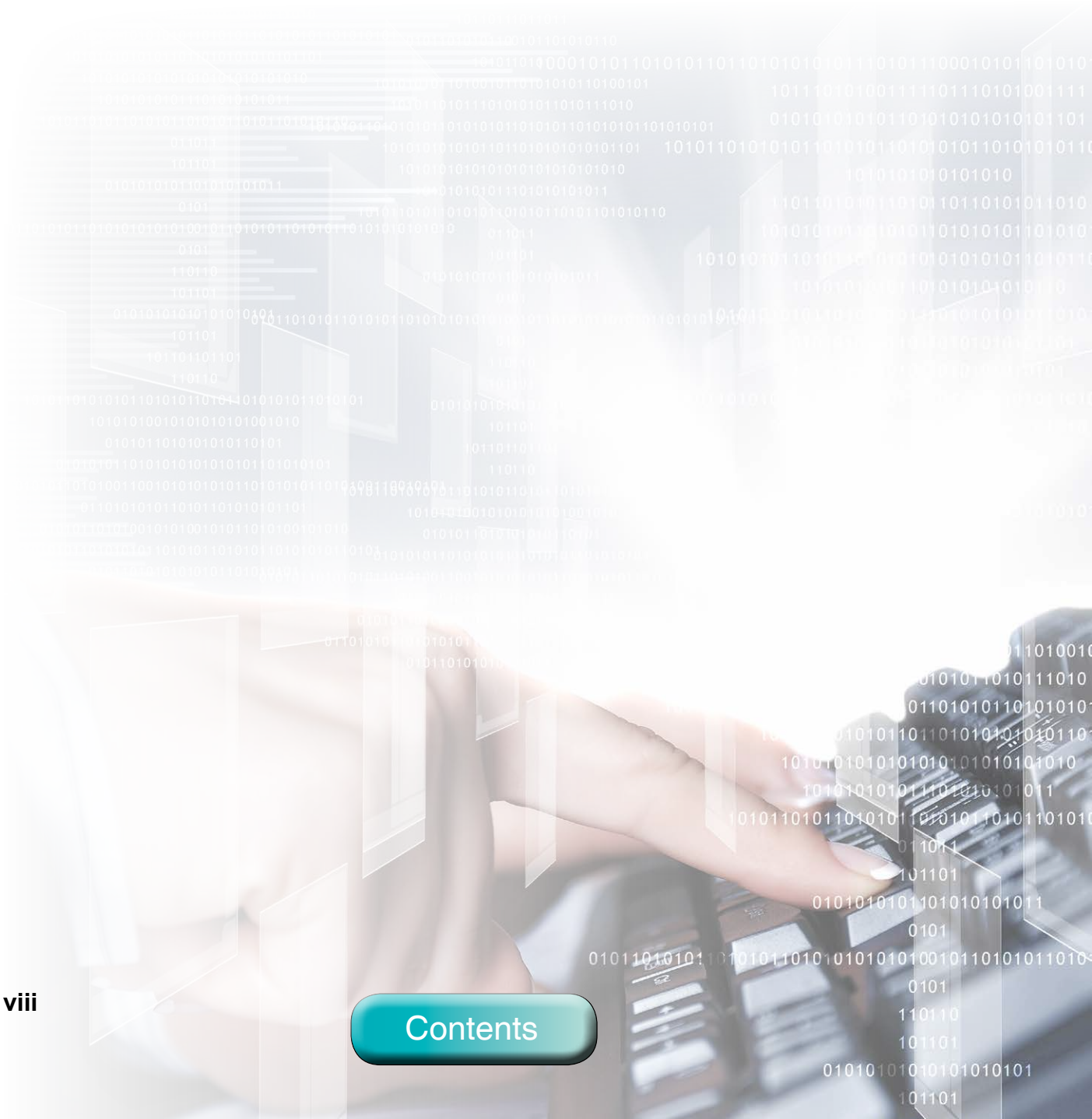
List of Abbreviations

The following table describes the significance of various abbreviations used throughout the white paper.

Abbreviations	Meaning
ICT	Information and Communications Technology
S&T	Science and Technology
R&D	Research and Development



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Comparative Table of Central Government Agencies' Abbreviations and Full Names

The following table describes the significance of various abbreviations used throughout the white paper.

Abbreviations	Full Name
AEC	Atomic Energy Council, Executive Yuan
BOST	Board of Science and Technology, Executive Yuan
CIP	Council of Indigenous Peoples
COA	Council of Agriculture, Executive Yuan
CSPTC	Civil Service Protection and Training Commission
DGPA	Directorate-General of Personnel Administration, Executive Yuan
EPA	Environmental Protection Administration, Executive Yuan
GEC	Gender Equality Committee of the Executive Yuan
NDC	National Development Council
NPM	National Palace Museum
MAC	Mainland Affairs Council, Executive Yuan
MND	Ministry of National Defense
MOC	Ministry of Culture
MOE	Ministry of Education
MOEA	Ministry of Economic Affairs
MOF	Ministry of Finance
MOHW	Ministry of Health and Welfare
MOI	Ministry of the Interior
MOJ	Ministry of Justice
MOL	Ministry of Labor
MOST	Ministry of Science and Technology
MOTC	Ministry of Transportation and Communications
NCC	National Communications Commission
OCAC	Overseas Community Affairs Council, Republic of China (Taiwan)
PCC	Public Construction Commission, Executive Yuan

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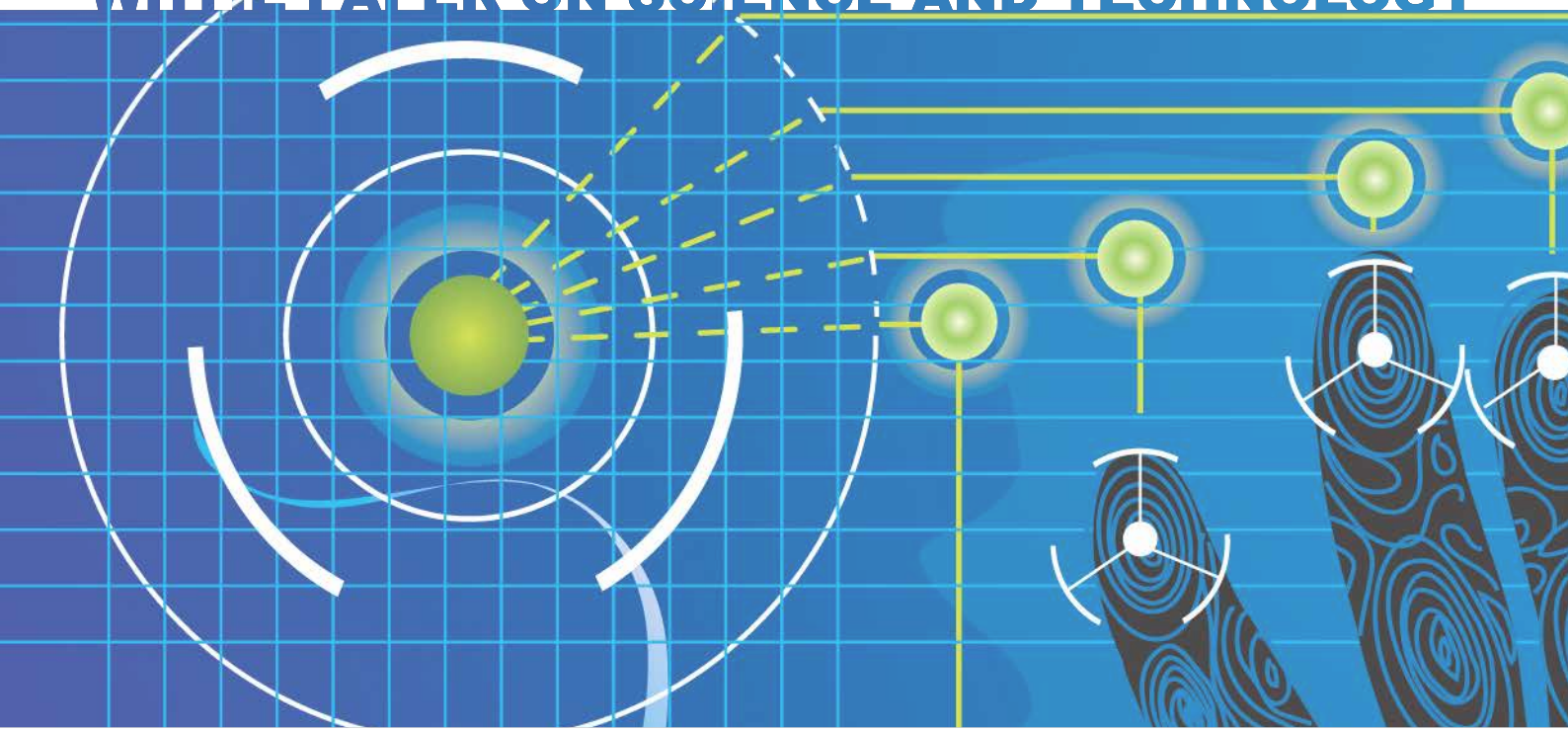

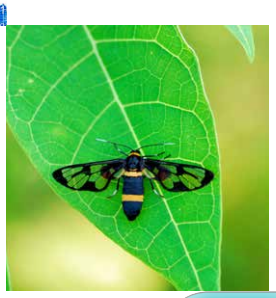

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Chapter 1
Introduction

Globalization and flourishing science and technology (S&T) have completely transformed human life, and novel scientific and technological breakthroughs are being transmitted and transformed into applications faster than ever. Nevertheless apart from raising quality of life, S&T have also given rise to many problematic issues, such as conflicts between S&T development and environmental conservation, the spread and control of emerging diseases, increasingly varied methods of Internet crime, and the ethical, legal, and social implications of biotechnology and bioscience. All of these issues are taxing the administrative capabilities of national governments worldwide. Apart from being unable to stand apart from common international issues and challenges, Taiwan also faces many extremely vital policy issues derived from its unique geographical, social, and political attributes. In accordance with the *Fundamental Science and Technology Act* and in order to continue the development of S&T and promote social progress, every four years the Government maps out its prospective S&T vision, policy directions, and strategies addressing relevant issues and development trends.

The previous version of the *White Paper on Science and Technology (2011-2014)* proposed future plans which had four dimensions: scientific research, the environment, industry, and society. The chief goal in scientific research was the pursuit of excellence in academic research and its strategic focal points. This included the improvement of mechanisms for the recruitment, employment, training, and retention of S&T manpower, establishment of an excellent academic research environment, and formation of a knowledge innovation system featuring intensive academia-industry interaction. The chief goal in the environmental dimension was the establishment of environmental protection and sustainable development thinking, and its strategic focal points included the development of innovative sustainable energy science and technology, the establishment of a green low-carbon environment, the promotion of land restoration, and the balanced conservation and utilization of marine and terrestrial resources. The main goal in the industry dimension was the promotion of industrial S&T innovation, and its strategic focal points included the establishment of global innovation centers, the development of high-tech industry innovation corridors, the promotion of emerging intelligent industries, and the enhancement of the biotech industry's output value. The main goal in the societal dimension was to create a safe and contented living environment for citizens, and strategic focal areas include responding to global climate change, enhancing

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disaster-prevention research and development (R&D) capabilities, and boosting the country's intelligence soft power through the fusion of the humanities with technological development.

Held in December 2011, the 9th National Science and Technology Conference referred to the vision of the *White Paper on Science and Technology (2011-2014*) in addressing the seven goals of how to raise Taiwan's academic and research status, how to strategize intellectual property arrangement, how to promote sustainable development, how to bridge academic research and industrial application, how to advance top-down S&T projects, how to promote innovation in S&T industry, and how to address Taiwan's human resource crisis in S&T fields. The conference's conclusions were then used to formulate core strategies and measures of the National Science and Technology Development Plan.

In recent years, Taiwan has adopted the vision of "becoming a global leader in green energy technology and innovative, intelligent living" as a developmental goal. As a result, government agencies and organizations have jointly striven to commit high levels of R&D funding to the development of green energy S&T and intelligent living technologies. Nevertheless, in the face of a highly volatile global situation and constant stream of new challenges, continual adjustment is the best means of maintaining advantages.

The *White Paper on Science and Technology (2015-2018)* incorporates cross-sectoral perspectives, and addresses the various challenges currently faced by Taiwan in four major dimensions examined above. The Government is committed to the manpower linkage between industry and academia, promotion of green energy S&T and energy development, and strengthening intellectual property portfolios. This White Paper also reflected efforts to explore emerging issues that risk falling through the cracks of the current S&T policy regime. These issues include, but are not limited to, the following: Taiwan's aging society, emerging infectious diseases, water resource utilization and management, food and environmental safety, promotion of innovative startups and easing of legal constraints on entrepreneurship, early investment in and incubation of scientific startups, intelligent S&T research and development, and industrial upgrading to intelligent technologies.

Based on the previous version *White Paper (2011-2014)*, this version of the *White Paper (2015-2018)* further strengthened attention to intelligent S&T and green energy S&T applications, sought to realize intelligent S&T in the form of applications relevant to people's lives, and employed green energy S&T as a pathway to achieve a sustainable, environmentally-friendly home in Taiwan. With the clear-cut goals, feasible and effective strategies, and existing strengths, Taiwan is looking forward to enhancing its international

reputation on scientific innovation, increasing industrial added value, and stimulating economic growth and creating an environmentally-sustainable, delightful society.

Promoting areas of scientific research where Taiwan is outperforming; making Taiwan a threefold hub of creativity, innovation, and entrepreneurship

The Government aims to bring together the best interdisciplinary talents as well as incorporating cross-sectoral perspectives. The Government has extended its effort to forge links with domestic and international S&T innovation and R&D resources. These efforts have been made by the Government to enhance the country's overall competitive advantage, promote economic prosperity, create an affluent, secure society, and develop a sustainable, intelligent environment.

Thus far, Taiwan's innovative scientific research has achieved outstanding results in such areas as networked communications, biomedicine/biotechnology, green energy technology, renewable energy, auto electronics, and nanometer S&T. While setting to move into the next phase, researchers in Taiwan also seeks ways of mitigating the ecological impacts of climate change, enhancing the mobile broadband infrastructure, deploying fiber-optic networks, using S&T in practical, everyday applications, preventing emerging diseases, and performing ecological restoration.

Taiwan is focusing on its areas of strengths and providing the vital technologies needed for industrial development, while helping emerging high-tech industries establish forward-looking S&T mechanisms. The country revises and drafts laws and regulations in attempts to promote S&T entrepreneurship, disseminate scientific research results internationally as well as translating these results into specific product opportunities. Further attempts have been made to establish cooperative networks facilitating knowledge transfer, create research manpower cultivation mechanisms, and use scientific research results to support cultural creativity industries. All these attempts are to establish Taiwan as a threefold hub of creativity, innovation, and entrepreneurship.

Implementing green energy development projects by promoting harmony between economic growth and environmental resilience

With the ultimate aim of increasing energy self-sufficiency, forward-looking strategies are in place for strengthening Taiwan's renewable energy R&D capabilities and, simultaneously, developing alternative forms of green energy. R&D projects have been conducted to achieve

this aim, and have already achieved promising preliminary results in the following areas: renewable energy, clean coal, energy storage technologies, and smart grid technology. Researchers are currently encouraged to continue focusing on areas where Taiwan possesses advantages and has the potential to be a key global player, while the Government has been establishing mechanisms that facilitate interdisciplinary collaboration between industry and universities. Furthermore, the drafting of laws and regulations concerning renewable energy development and greenhouse gas reduction will help achieve synergy among energy conservation, carbon reduction, and economic development.

Achieving compatibility between industrial development and the ecological environment has become a central focus for environmental sustainability. Taiwan is currently performing integrated policy planning in the areas of green energy competitiveness, land resource conservation and land remediation, sustainable utilization of soil and water resources, low-carbon ecological cities, smart community security protection networks, software disaster prevention and hardware disaster mitigation technologies, green energy-intensive industries, renewable energy, and energy conservation/carbon reduction technologies. Taiwan hopes to gradually establish a trade-off model that takes both energy security and sustainable development into consideration, which will enable Taiwan to transform itself from an energy importing country into a green clean energy technology exporting country.

Strengthening industrial innovation; promoting an intelligent industrial economy

With the increasing intensity of competition in global markets, profit margins for many high-tech products have been slashed to the bone. For Taiwanese businesses at all stages of involvement in global markets, strengthening their long-term competitiveness in the high-tech environment depends on the enhancement of technological cutting-edge R&D capabilities.

The Government's strategies to support and facilitate cutting-edge industrial innovation are essential to accelerate sustainable growth of Taiwanese industry. This necessitates a whole government approach toward the intellectual property landscape and improving investment environment for innovation. This was at the heart of *The White Paper (2011-2014)*.

Taiwan has been a vital global player in the information and communications technology (ICT) industry, while being very much committed to strengthening its R&D capacity. However, the global competition in ICT grows increasingly fierce, which has left Taiwan no alternative but to explore the possibility of transcending industry boundaries. The immediate

challenge for Taiwan is to continue its current high performance in ICT while fulfilling its future potential. To push forward industrial innovation, upgrading, and the value-adding, Taiwan is prepared to exploit the advantages of the ICT industry and to establish innovative applications services that incorporates interdisciplinary integration. Its strategic direction was set out with corresponding action points that detail the plan of employing cloud computing and big data to integrate the capabilities of the cultural creativity, biotech pharmaceutical, medical, agricultural, and environmental protection industries. Additionally, these action points also include promoting the fusion of emerging technologies and industries and facilitating industrial transformation and upgrading.

Building a secure, healthy living environment and promoting the balanced development of the nation

Taiwan has suffered from an inexhaustible number of typhoons, earthquakes, and other natural disasters. The security of people's lives and property, thus, has always preoccupied policymakers. Moreover, citizens of Taiwan remain alarmed and have expressed concern following a series of major food safety issues and outbreaks of various infectious diseases.

The public's health, safety, and security matter for a nation's global competitiveness. Governments across the world prioritize safeguarding the public's lives and property and the Taiwan's government makes no exception. The Government's primary strategy toward developing a safe, secure and prosperous society is to promote the application of intelligent S&T coupled with effective legal and regulatory systems.

Furthermore, inherent differences in resources and socioeconomic conditions in different areas of Taiwan have led imbalances in regional development. A decreasing birthrate and aging population have also caused imbalances in the country's demographic outlook. The Government has prepared to reduce the current imbalances. Plans have been mapped out to accomplish balanced national development, vibrant regional economies and even distribution of wealth. To achieve these goals, the Government must shoulder the mission of employing digital social development and balanced urban-rural development to create an environment in which elderly and persons living in remote areas can grow and receive respect.


MEDICAL
Health Care
Doctor
Hospital
Pharmacist
Nurse
Dentist
First Aid
Surgeon
Emergency

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Chapter 2
Current Science and Technology Development in Taiwan

Section 1
The Development System, Mission, and Policy Formation Mechanism of S&T

I. S&T Organization of the Government

The Executive Yuan established the "National Long-Term Science Development Committee" in 1959 in order to bear responsibility for the promotion of science in Taiwan. After many years of organizational changes and reforms[1], Taiwan's S&T development system and S&T policy formation mechanisms were gradually improved. In order to better confirm Taiwan's S&T development strategies and principles, the *Fundamental Science and Technology Act* was introduced in 1999, and it continues to form a major basis for S&T development.

Taiwan's S&T development organizational system can be divided into S&T promotion organizations, implementation organizations, and planning and assessment system. S&T policy promotion organizations include the Ministry of Science and Technology (MOST), Board of Science and Technology, Executive Yuan (BOST), and other relevant agencies and units. The chief mission of the MOST is to promote nationwide S&T development, support academic research, and develop the country's science parks. The chief mission of the BOST is

[1] Reorganization of the Science and Technology Advisory Group as the BOST; the reorganization Central Personnel Administration, Executive Yuan as the Directorate-General of Personnel Administration, Executive Yuan (DGPA); the merger of the Council for Cultural Affairs and Government Information Office as the MOC; the reorganization of the Department of Health, Executive Yuan as the MOHW; the inclusion of the National Council on Physical Fitness and Sports(NCPFS) in the MOE; the merger of the CEPD and Research, Development and Evaluation Commission, Executive Yuan (RDEC) as the NDC; the reorganization of the Council of Labor Affairs, Executive Yuan as the MOL; and the reorganization of the National Science Council, Executive Yuan as the MOST (these changes have been listed in their sequential order); unless otherwise noted, the current names of government agencies are employed in the text.

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to review the country's S&T vision and departmental blueprint, determine the government's overall policy goals, and carry out interdepartmental division of labor and coordination. Other promoting organizations and units include the Ministry of the Interior (MOI), Ministry of Economic Affairs (MOEA), Ministry of Transportation and Communications (MOTC), Ministry of Education (MOE), Ministry of National Defense (MND), Ministry of Labor (MOL), Ministry of Health and Welfare (MOHW), Environmental Protection Administration, Executive Yuan (EPA), Atomic Energy Council, Executive Yuan (AEC), Council of Agriculture, Executive Yuan (COA), and National Communications Commission (NCC). Each of these agencies or units relies on its S&T budget to implement the government's S&T development policies, and the Minister without Portfolio in charge of Science and Technology bears responsibility for interdepartmental coordination, as shown in Fig. 1.

Taiwan's S&T policies are chiefly implemented by four types of organizations, namely the Academia Sinica, various universities, nonprofit research organizations, and public and private enterprises. Of these, the Academia Sinica and universities chiefly conduct basic and applied research, nonprofit research organizations mainly conduct applied research, and public and private enterprises mostly engage in R&D with commercial potential.

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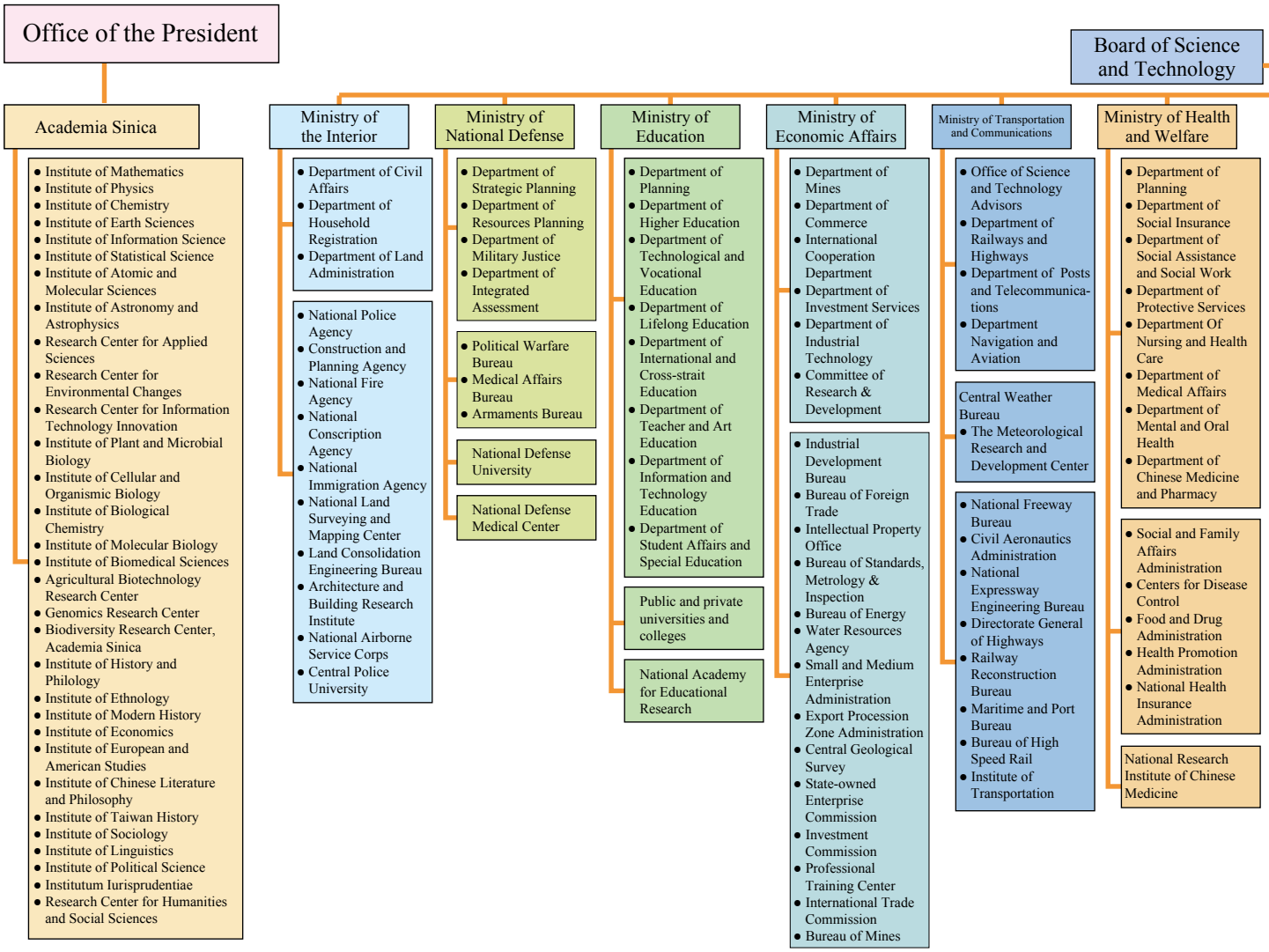
Taiwan's S&T planning and assessment system includes S&T project planning and review, implementation and control, and results evaluation portions. S&T project planning and review involves the drafting of various types of annual projects and mid-/long-term projects, implementation and control focuses on ensuring that project proposals are implemented as planned, and the evaluation of results seeks to assess implementation results and provide feedback to the project as a reference for revisions.

The government employs various major conferences, including the National Science and Technology Conference, Executive Yuan Strategy Review Board Meeting on Industry (Strategy Review Board Meeting for Industrial Science and Technology, Executive Yuan), Science and Technology Advisory Board Meetings of the Executive Yuan (Science and Technology Advisory Board Meeting of Executive Yuan), Science and Technology Development Advisory Conference, and the National Industrial Development Conference, to achieve a consensus concerning S&T policy directions.



Organizations connected with the development of science and technology

Ministry of the Interior

Taiwan Architecture & Building Center

Central Engineering Consultant and Research Corp

Taiwan Construction Research Institute

Ministry of National Defense

National Chung-Shan Institute of Science & Technology

National Defense Industrial Development Foundation

Ministry of Economic Affairs

China Grain Products Research & Development Institute

Industrial Technology Research Institute

- ITRI Southern Region Campus
- ITRI Central Region Campus
- Biomedical Technology and Device Research Laboratories
- Green Energy and Environment Research Laboratories
- Display Technology Center
- Material and Chemical Research Laboratories
- Mechanical and Systems Research Laboratories
- Information & Communications Research Laboratories
- Electronics and Optoelectronics Research Laboratories
- Center for Measurement Standards
- Service Systems Technology Center
- Cloud Computing Center for Mobile Applications
- Industrial Economics and Knowledge Center
- Computational Intelligence Technology Center
- ITRI College
- Knowledge-based Economy and Competitiveness Center
- Technology Transfer Center

Chung-Hwa Institute for Economic Research

Commerce Development Research Institute

Institute for Information Industry

- Smart Network System Institute
- Innovative DigiTech-Enabled Applications & Services Institute
- Data Analytics Technology & Applications
- CyberTrust Technology Institut
- Digital Education Institute
- Market Intelligence & Consulting Institute
- Science & Technology Law Institute

Automotive Research & Testing Center

Precision Machinery Research & Development Center

The Pharmaceutical Industry Technology and Development Center

Plastics Industry Development Center

Metal Industries Research & Development Center

Stone & Resource Industry R&D Center

Printing Technology Research Institute

Footwear & Recreation Technology Research Institute

Taiwan Accreditation Foundation

Cycling & Health Tech Industry R&D Center

Development Center for Biotechnology

Patent Search Center

Taiwan Development & Research Academia of Economics & Technology

Asia Pacific Intellectual Property Association

China Productivity Center

Food Industry Research and Development Institute

United Ship Design & Development Center

Ship and Ocean Industries R&D Center

Taiwan Electric Research & Testing Center

Taiwan Electrical and Mechanical Engineering Services, Inc.

Electronics Testing Center

Sinotech Engineering Consultants Inc.

Taiwan Geographic Information System Center

CTCI (China Technical Consultants Inc.) Foundation

Taiwan Textile Research Institute

Taiwan Textile Federation

Tze Chiang Foundation of Science and Technology

Fig. 1 Taiwan's Government S&T Organization System and Research Organizations

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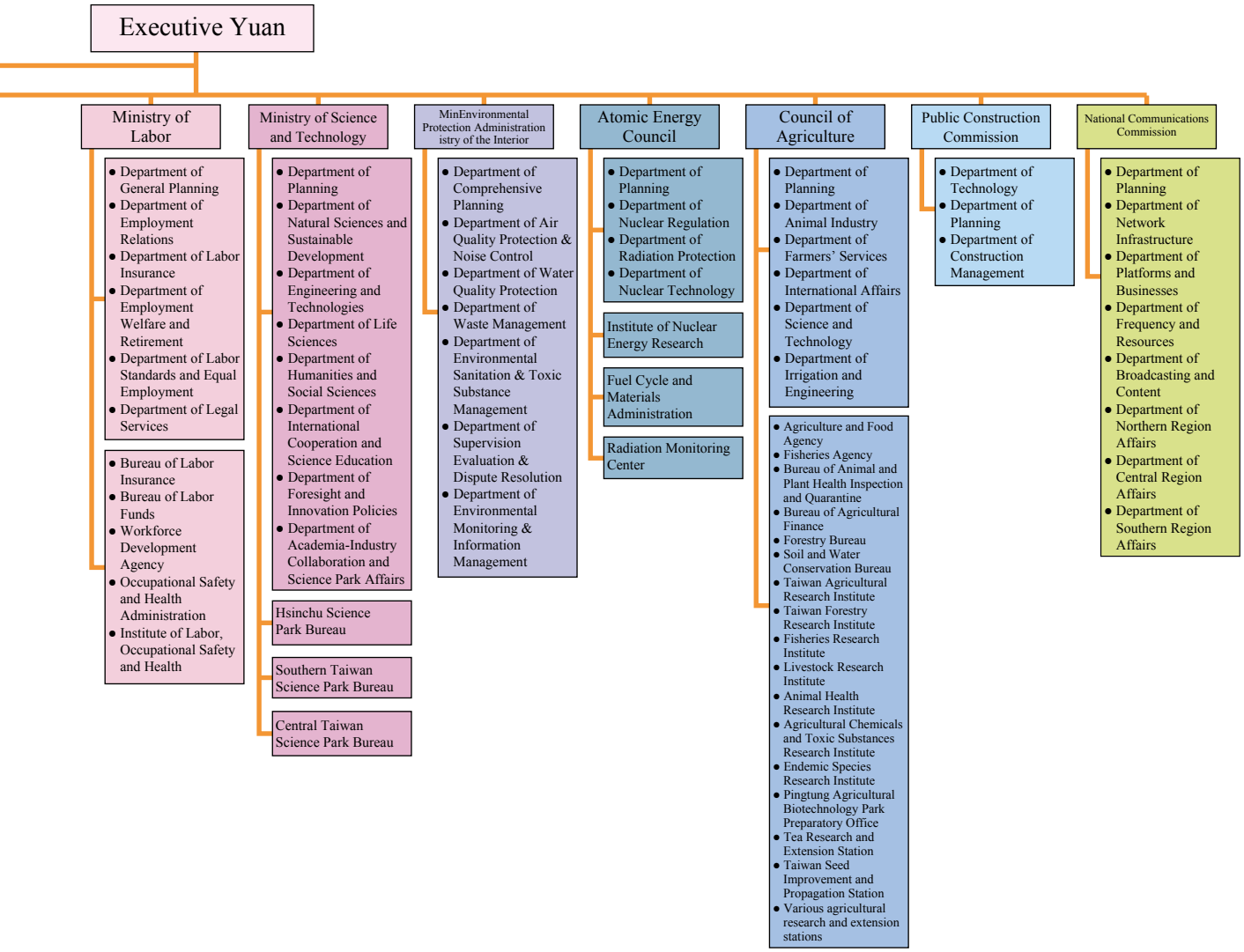

Ministry of Transportation and Communications

Taiwan Network Information Center

Vehicle Safety Certification Center

Taiwan Telecommunications Association

China Engineering Consultants Incorporated

Ministry of Health and Welfare

National Health Research Institutes

Center for Drug Evaluation

Ministry of Science and Technology

National Synchrotron Radiation Research Center

National Applied Research Laboratories

- National Chip Implementation Center
- Instrument Technology Research Center
- National Center for High-Performance Computing
- National Center for Research on Earthquake Engineering
- National Nano Device Laboratories
- National Laboratory Animal Center
- National Space Organization
- Science & Technology Policy Research and Information Center
- Taiwan Ocean Research Institute
- Taiwan Typhoon and Flood Research Institute

Photonics Industry & Technology Development Association

National Science and Technology Center for Disaster Reduction

Council of Agriculture

Taiwan Agricultural Mechanization Research & Development Center

Taiwan Banana Research Institute

Taiwan Fisheries and Marine Technology Consultants, Inc.

Agricultural Technology Research Institute

- Aquatic Technology Laboratories
- Plant Technology Laboratories
- Animal Technology Institute

Agricultural Engineering Research Center

National Communications Commission

Telecom Technology Center

Other

Taiwan Institute of Economic Research

Taiwan Research Institute

Taiwan Rubber Research & Testing Center

Asia-Pacific Science and Technology Association

Taipei Institute of Pathology

Food and Fertilizer Technology Center for the Asian and Pacific Region

World Vegetable Center

Yen Tjing Ling Industrial Development Foundation

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II. The S&T Development System after Organizational Restructuring of the Executive Yuan

In order to enhance the government's administrative efficiency, the Executive Yuan adopted the revised *Basic Code Governing Central Administrative Agencies Organizations, Organizational Act of the Executive Yuan, the revised Provisional Act for Adjustment of Functions and Organizations of the Executive Yuan, and the Act Governing the Total Number of Personnel Headcounts of Central Government Agencie*s on January 12, 2010. And in order to better integrate S&T development undertakings and perform overall planning of S&T development policies, the Executive Yuan established the BOST on January 1, 2012.

The BOST is a coordinating organization at the level of the Executive Yuan, with the premier serving as chairperson, and the Minister without Portfolio in charge of Science and Technology and the head of the S&T competent authority as the deputy chairpersons. Members of the Board include the heads of central government agencies with S&T-related responsibilities, and representatives of industry, academia, and research organizations. The BOST consists of six units, namely the policy coordination unit, the human resources/industry/legal unit, the biology/defense/medicine/agriculture unit, the information/communications/optoelectronics unit, the scientific and technological services unit, and the administrative unit. The chief missions of the Board are: (1) reviewing the country's S&T development policies, (2) allocating the country's S&T resources, (3) reviewing and supervising major S&T development programs, (4) coordinating, integrating, and promoting interagency S&T development matters, (5) organizing and holding major S&T strategic planning conferences, and (6) handling of other S&T-related matters assigned by the Executive Yuan (see Fig. 2).

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Chairperson: Executive Yuan premier

Deputy Chairpersons: Minister without Portfolio in charge of Science and Technology, head of the S&T competent authority

Members: Heads of central government agencies with S&T-related responsibilities

Mission:

1. Reviewing the country's S&T development policies,
2. Allocating the country's S&T resources
3. Reviewing and supervising major S&T development programs
4. Coordinating, integrating, and promoting interagency S&T development matters
5. Organizing and holding major S&T strategic planning conferences
6. Handling of other S&T-related matters assigned by the Executive Yuan

Staff:

1. The Board of Science & Technology has one executive secretary; this position shall be filled by a suitable candidate designated by the chairperson.
2. The Board shall have internal groups to handle various tasks; the required personnel shall be transferred from other agencies, and may be hired when necessary.

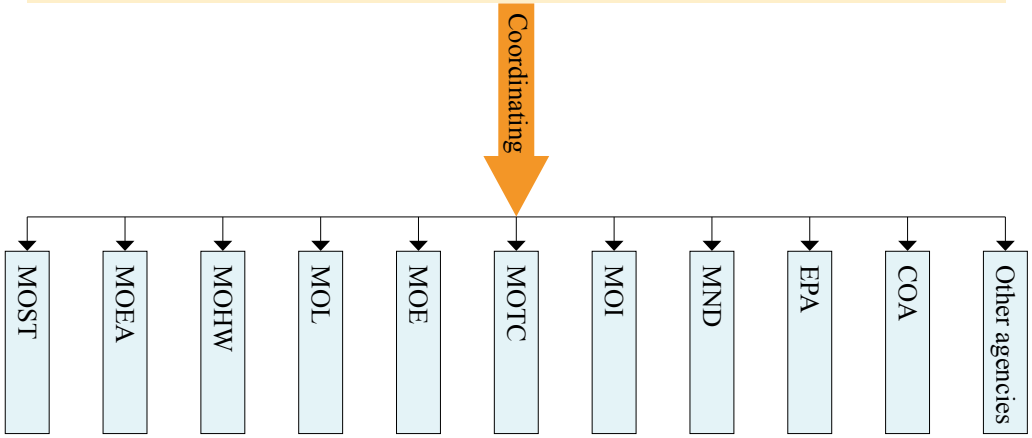

Fig. 2 Missions and Duties of the Board of Science and Technology

Source: Adapted from the BOST website (http://www.bost.ey.gov.tw/cp.aspx?n=1CB31DF183066B41)

The MOST was formally established on March 3, 2014, and was endowed with the following duties and powers:

1. Formulation of the country's S&T development policies.
2. Drafting, coordination, and assessment of government S&T development programs; review of the S&T budget.
3. Promotion of basic and applied S&T research.
4. Promotion of major S&T R&D programs and support for academic research.
5. Drafting, promotion, and management of forward-looking industrial technology R&D policies; technology assessment.
6. Development of science parks.
7. Management of National Science and Technology Development Fund.
8. Other S&T development matters.

There are eight departments under the MOST, namely the Department of Planning, Department of Natural Sciences and Sustainable Development, Department of Engineering and Technologies, Department of Life Sciences, Department of Humanities and Social Sciences, Department of International Cooperation and Science Education, Department of Foresight and Innovation Policies, and Department of Academia-Industry Collaboration and Science Park Affairs, as well as organizations and institutions including the Hsinchu Science Park Administration, Southern Taiwan Science Park Administration, Central Taiwan Science Park Administration, National Science and Technology Center for Disaster Reduction, National Applied Research Laboratories, and National Synchrotron Radiation Research Center. These units jointly implement the Ministry's mission and services (see Fig. 3).

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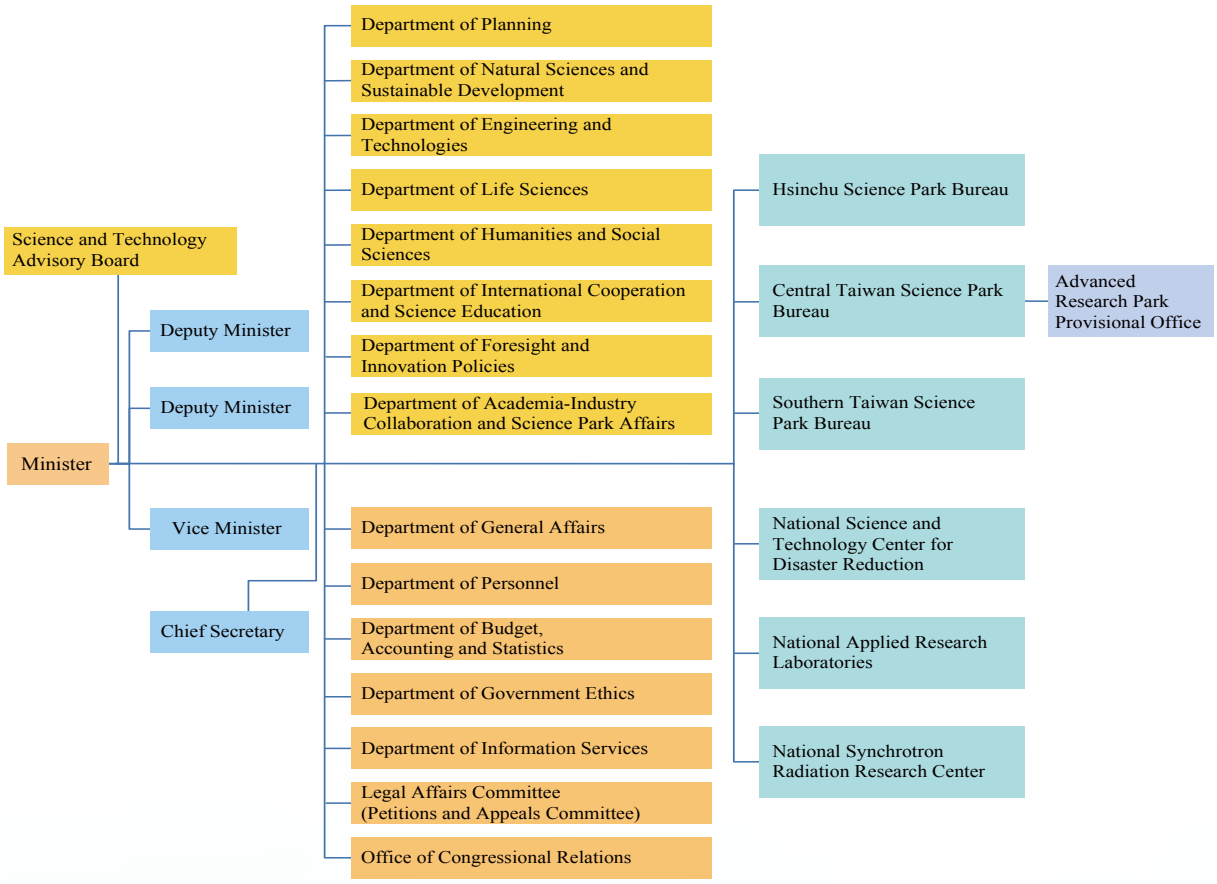

Fig. 3 Organization of the Ministry of Science and Technology

Source: Adapted from the MOST website (http://www.most.gov.tw/ct.aspx?xItem=12529&CtNode=1137&mp=1)

Taiwan's S&T development expenditures encompass three major categories: basic scientific research, applied S&T research, and technology development and industrialization. Funding for basic scientific research and applied S&T research is chiefly derived from the MOST budget, while funding for technology development and industrialization is obtained from the budgets of other S&T-related agencies. The recipients of the three types of S&T funding largely consist of public and private universities, research organizations and institutes affiliated with the government, and public and private enterprises. Applicants must direct funding applications to the agency with responsibility for the category of the proposed expenditures (see Fig. 4).

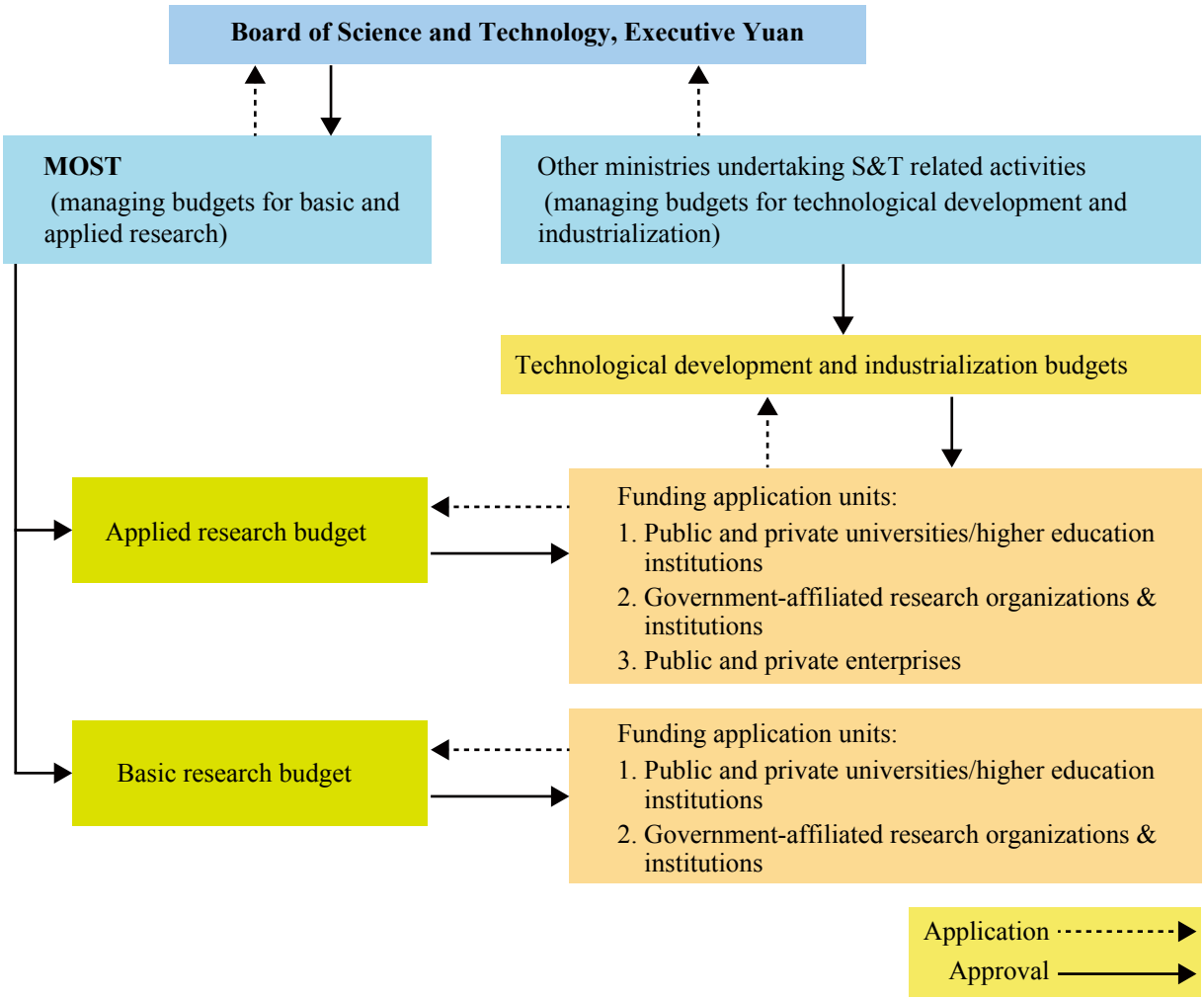

Figure 4 Government S&T Funding Allocation and Processes

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Use of social media and participation in online communities has already become a major part of life. Due to openness of the internet information can be rapidly transmitted, transformed, and used within online communities. In the face of the instantaneous transmission of information and spread of social media, how to quickly respond to social challenges and issues of public concern has become an important matter for the government of Taiwan. If the government can keep up with current trends and effectively address infrastructure challenges with innovations, this will be an opportunity to boost quality of administration. While respecting the human rights and right to privacy enshrined in the Constitution and law, proper use of ICT and social networking to establish information platforms and mechanisms, establish links between the public sector, private sector, citizens' groups, and the general public, and jointly resolve the challenges faced by the country and society, and thereby increasing the openness, transparency, and efficiency of policy drafting, will establish new pathways for policy formation , and make Taiwan a model of citizen participation and "Electronic Democracy."

III. Major Domestic S&T-Related Conferences

A. National Science and Technology Conference

According to the *Fundamental Science and Technology Act* entered into force in 1999, the Executive Yuan shall hold the National Science and Technology Conference once every four years, which shall serve as an important forum for the discussion and drafting of domestic S&T policies. After approval by the Executive Yuan, the "National Science and Technology Development Plan" drafted in the wake of this conference will serve as the basis for S&T development by relevant government agencies and units.

Held in 2012, the 9th National Science and Technology Conference had a theme of "Addressing Taiwan's Technological Transformation," and discussed the following seven issues : "how to boost Taiwan's academic research status," "how to strengthen Taiwan's intellectual property portfolio," "how to promote Taiwan's sustainable development," "how to connect upstream academic research with downstream industry," "how to best implement top-down S&T projects," "how to boost the innovative energy of Taiwan's high-tech (information and communications) industry," and "how to address Taiwan's high-tech human resource crisis."

On the basis of the conference's conclusions, the MOST drafted the National Science and Technology Development Plan (2013-2016) with seven objectives, 27 strategies, and 58 important measures for implementation by relevant agencies and units (see Table 19 for a list of the conference's objectives and strategic focal points).

B. Science and Technology Advisory Board Meetings of the Executive Yuan

The Science and Technology Advisory Board Meetings of the Executive Yuan have been held every year since 1980, and had been held 31 times as of 2011. The meetings are intended to provide opportunities for discussion of the country's S&T development and promotion. The Premier listens to policy or strategy recommendations from S&T advisors, and decides whether such recommendations should be included in the country's S&T administrative focal points.

The advisory board meeting held in September 2011 focused on the topic - "a new S&T outlook in the wake of transformation and forward leaps," and discussed the two

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issues: "S&T policy formation and governance" and "S&T research & development and industrial applications." Discussion among the advisors and experts in attendance led to the following major conclusions:

In terms of S&T policy formation and governance:

1. Planning and drafting of S&T policies: After government reorganization, the Executive Yuan's BOST should serve as a platform for integration of the ideas and plans of domestic policy think tanks and agencies, and should cooperate closely with the MOST in drafting the country's S&T policies every four years.
2. Allocation of S&T resources: The S&T budget should be closely linked with S&T policies, and a certain percentage of the S&T budget must be allocated to the planning and implementation of time-sensitive policies (innovative R&D, forward-looking industrial technologies, and the conclusions of strategy review board meetings). Budget review should be linked with project termination planning.
3. Management of S&T administrative performance: All agencies should determine short-/mid-/long-term national visions and quantitative/qualitative targets. Based on these short-/mid-/long-term national visions, agencies should incorporate quantitative economic benefit indicators and intangible/qualitative targets in their assessments. S&T administrative performance considerations should be tightly coupled with budget allocation; agencies' discretionary budgets should be reduced during the subsequent year when performance assessment indicates unsatisfactory results.

In terms of S&T research & development and industrial applications:

1. Manpower training should be linked with societal needs and the development of industrial technology. Apart from production sites, the government shall also provide appropriate mechanisms in order to encourage universities to connect R&D results with industrial applications.
2. In order to make the most of the government's research resources and help industry carry out groundbreaking or early technology R&D, the government should rely on interagency negotiation mechanisms to formulate policy objectives, promotion mechanisms, and effectiveness assessment approaches addressing major S&T issues.

3. National S&T programs should connect up-, mid-, and downstream research and support industrial development.
4. Science parks should be encouraged to evolve into regional innovation systems and startup enterprise parks.
5. R&D of agricultural technology should seek to effectively resolve bottlenecks faced by industries; and to ensure that research comes with market value. The results should be ready for further industrial applications.

C. Strategy Review Board Meeting for Industrial Science and Technology, Executive Yuan

Starting in 1992 and 1997, the Executive Yuan respectively held "the Executive Yuan's Strategy Review Board (SRB) meetings for electronics, information, telecommunications and biotechnology." The government hoped to rely on the recommendations of these meetings to accelerate the development of Taiwan's electronics/information and biotechnology industries. In 2002, to ensure that the issues discussed at these meetings were relevant to industrial development, the two meetings were merged into the "Strategy Review Board Meeting for Industrial Science and Technology, Executive Yuan" as a forum for collecting industrial S&T recommendations from various quarters. Furthermore, in accordance with the country's overall industrial S&T development needs, the Strategy Review Board Meeting for Industrial Science and Technology, Executive Yuan is held annually, and focuses on a key technological industry. Meetings in the last three years included:

1. Conference on Open Data Applications in Taiwan

   In light of the growing importance attached to value-added applications of open data in the international community, in order to promote value-added applications of government data, the BOST held the " Conference on Open Data Applications in Taiwan" in January 2012. The scope of this meeting included such topics as "Taiwan Open Data-Advantage and Challenge," "Open Data Movement around the Global," "U.S. Open Data Status and Case Study," "Experience, Business Model and Case Study of Open Data in UK," "Value-Added Open Government-Challenge and Strategy," "Status and Future Development of Value-added Applications on NGIS," "Innovative Services and Prospects of Transportation Information to Citizens," and "Experience Sharing

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by Enterprise." The results of discussion will contribute to Taiwan's vision and future promotion strategies. The conference resolutions included:

(1) Make optimal use of many important databases compiled in Taiwan in the past, develop value-added applications, and embrace the trend with suitable business models and diverse digital content.

(2) Central government agencies, local governments, and private companies should cooperate with one another to select superior value-added data applications, establish a value-added information service chain, develop new business models, and thereby stimulate the growth of Taiwan's innovation economy.

(3) Promote emerging industries, employ competitive strategies, and align all stakeholders in order to jointly create an innovation-oriented economy.

2. Conference on Geospatial Information Applications in Taiwan

In order to integrate the promotion of cloud applications and open data strategies, the BOST held the "Conference on Geospatial Information Applications in Taiwan" in July 2013. This meeting included lectures on the subjects of "NGIS Application and Industry Promotion," "Government Open Data Plan and Status," and "Value-added Application of Government Open Data," and panel discussions on the four topics of smart living, real estate transactions, tourism, and disaster management. The meeting helped enhance promotion of the development of Taiwan's geographical and geospatial information industries. The conclusions of this meeting were:

(1) In order to expand the range of geospatial information system applications and achieve synergy, further efforts must be made to couple government and private resources in the promotion of information system applications.

(2) Provide ample funding to relevant agencies to promote the development of geospatial information industry. Relevant funding should be provided from the national geographical information system budget of the CEPD.

(3) Companies in the geospatial information industry should make effective use of existing resources in the form of the "Cloud Computing Application and Industrial Development Program" and government open data to assist their development. Companies should also take advantage of innovative

application models to enhance their competitiveness and find business opportunities.

3. 5G Development Strategic Review Board Meeting

In order to promote the development of a 5G industry at an early date and extend the advantage enjoyed by Taiwan's information and communications industry, the BOST, National Science Council (NSC), and MOEA held the "2014 5G Development Strategic Review Board Meeting" in January 2014. This conference included reports on "Taiwan 5G Development Vision," "Recommendation for 5G Development," "The 5G Current Development and Trend," and "China IMT2020 Planning," and conducted in-depth explorations of the issues: "5G Technology explore and Research, and Talent cultivation," "5G Environment Building and Industry Technology Enhancement," and "5G Industry Chain Integration and Government Assistance Strategy." The main conclusions of this meeting, which sought to develop strategies for next-generation communications development, were as follows:

"5G Technology explore and Research, and Talent cultivation":

(1) Vision: In the future, Taiwan's voice and industrial capacity will carry weight in efforts to shape 5G or next-generation communications systems. Innovative next-generation communications technology R&D will stimulate growth of this industry and bring new opportunities.

(2) Objective: Boosting local companies' mastery of key 5G technologies; promotion of essential platforms for all technological generations.

(3) Control of R&D on core technologies; identifying key entry points for key intellectual property.

(4) Establishment of a service platform based on chip system technology (based on the "Incubation Platform for Mobile Devices").

"5G Environment Building and Industry Technology Enhancement":

After reviewing the characteristics and needs of Taiwan's industry, and projecting the future scenarios of applications, focus efforts on specific fields and seek to lead global trends in specific subareas.

(1) Focusing on needs of industry, develop common 5G R&D platforms,

establish an experimental network, and integrate the capabilities of industry, academia, and the research community in order to deeply root autonomous 5G communications technology and intellectual property portfolios in Taiwan, including the establishment of effective patents, which will ensure that the domestic industry is not blocked from expanding into international markets.

(2) Virtual integration of Taiwan's industry, academia, and the research community for the purpose of involvement in joint international R&D, and the consolidation of Taiwan's key role in the global 5G ecosystem.

(3) Promotion of the establishment of a "Taiwan Communications Standard Alliance" led by industry; establishment of regional standards in an effort to become a key third party involved in the drafting standards in specific areas of communications.

(4) Accelerating deployment of an experimental environment enabling the extension of 4G (LTE/LTE-A) to 5G, and helping the domestic industry to perform 4G interoperability testing and formulate future 5G R&D needs. However, relevant details will depend on the achievement of a consensus in the industry.

"5G Industry Chain Integration and Government Assistance Strategy":

(1) The leading countries have already embarked on 5G R&D and acquisition of patent portfolios. The strategy for the development of Taiwan's 5G industry should be based on very broad perspective of the market. It is recommended that the government provides long-term resources and supports the efforts of industry, academia, and research organizations to participate in the drafting of international standards, lets a nonprofit organization establish a cooperation platform and sharing mechanism for industry and academic institutions, promotes active cooperation with leading international manufacturers in broad-based alliance, to acquire intellectual property portfolios at an early stage via participation in the drafting of standards.

(2) An effective domestic experimental testing environment will be established in order to promote the development of the 4G and 5G industries, and domestic firms provided with an interoperability testing platform through

cooperation with domestic telecom operators; this will allow verification of innovative service models and refinement of international service capabilities.

(3) Spectrum planning should be based on a long-term policy blueprint in compliance with international norms and the state of industry development. Furthermore, bandwidth should not be allocated in too dispersed a fashion. Taiwan's 4G-FDD licenses have already been determined, and the confirmation of TDD policy should be expedited (the US, Mainland China, and Japan currently use Band 41) in order to facilitate 5G spectrum development plans. There should be sufficient time for operators between announcement and license issuance. In addition, a single agency should be assigned for spectrum planning and license issuance. The issuance of licenses should take into consideration economies of scale.

(4) It is recommended that the government creates incentives encouraging telecom operators to use domestic equipment and service solutions as a first choice, and helps domestic operators establish a successful track record in the domestic market in order to facilitate their entry into overseas markets.

(5) The domestic information and communications industry gained a global scope at an early date, some relevant technologies are keeping pace with the highest international level, and Taiwan's academic institutions have plentiful R&D capabilities. Therefore, current academic-industry collaboration mechanism needs to be improved - key domestic university courses, projects, and papers should be closely linked with domestic industry at an early date. In addition, the promotion of professors should be based on not only on publication of journal articles, but also on output of major patents.

(6) "Expensing employee bonus policy": The current policy has caused domestic industry to lose its most important tool for attracting manpower and caused senior personnel to lose an entrepreneurship incentive, and caused the loss of highly-skilled personnel. The government should therefore quickly formulate appropriate measures that can encourage entrepreneurial investment and boost economic development momentum.

D. Executive Yuan Bio Taiwan Committee (BTC) Conference

The Executive Yuan established the Bio Taiwan Committee (BTC) in accordance with the conclusions of the 2004 Strategy Review Board Meeting for Industrial Science and Technology, Executive Yuan which bears responsibility for planning the country's biotechnology industrial policy, investment strategies, vision and development as guidelines for the promotion of biotech industry. The BTC met six times from 2005 to 2013.

The 2013 BTC conference focused on "innovative biomedical products and services; advancing toward healthy intelligent living," with issues such as "integration of medical management capabilities, development of healthcare industries," "development of innovative and intelligent medical equipment," and "biotech new drug niches and development strategies." The specialist committee members made the following recommendations concerning how the medical management services industry can boom the medical materials, pharmaceutical, and ICT industries, and help realize the vision of "healthy intelligent living":

In terms of innovative intelligent medical equipment:

1. In conjunction with innovation incubation and bridging services, the government should draft short-/mid-/long-term industrial development strategies and product positioning plans.
2. Encouraging outstanding clinical testing and research centers to promote the development of innovative medical materials. Large enterprises, SMEs, and startups should be encouraged to develop differentiated business models.
3. The biotech industry should make good use of Taiwan's superior ICT superiority to develop integrated, individualized consumer electronics products responding to the need for individualized medicine and long-term care, and build up healthcare service models to drive the development and sale of innovative intelligent medical equipment and products.

In terms of protection of biotech new drug R&D intellectual property and establishment of IP portfolios:

1. Strengthen establishment and protection of key technologies and the strategy of IP portfolios; make active efforts to honor cross-Strait pharmaceutical and healthcare agreements.

2. Seek mutual recognition of clinical trials conducted in accordance with international regulations and standards; it is recommended that an interagency advisory committee be established to accomplish this task.

3. On a basis of biosimilar drugs, domestic industry, academia, and research organizations should be encouraged to accumulate protein drug development capabilities and experience, gradually strengthen antibody engineering technology, and develop biotech "bio-better" drugs, with an ultimate goal of accelerating the development of innovative biotech "bio-novel" drugs.

E. Science and Technology Development Advisory Conference

In order to provide an advisory mechanism for the formulation of S&T development strategies and major S&T R&D programs, the NSC issued the *Guidelines for the Establishment of the Science and Technology Development Advisory Conference* in March 2012, and convened the first session of the Science and Technology Development Advisory Conference in August of the same year. This session sought ways of linking upstream academic research with downstream industry, and focused its attention on the three major topics of "how to best connect upstream academic research with downstream industry," "how to promote top-down S&T programs," and "how to address Taiwan's S&T manpower crisis." The second session, which was held in December 2013, discussed the topics of "international S&T cooperation and manpower interchange strategies" and "the promotion strategies of an innovation ecosystem," and listened to the two keynote reports "Analysis of Ph.D.-grade S&T Manpower in Taiwan" and "Current State of Taiwan's Innovation Ecosystem." This session produced the following five conclusions:

1. The innovation ecosystem is a holistic system encompassing a wide range of participants affecting one another. The government should play a major role in this system, especially at early stages of the innovation process.

2. Innovative manpower is one of the most important factors contributing to a successful innovation ecosystem. As a result, attracting international talents being able to boost added value is a key task at the current moment.

3. The government should address and take prompt steps to resolve the current problem of an excessive number of universities, reformulate R&D resource allocation mechanisms, and establish innovation capabilities to respond to the

fast-changing high-tech industry circumstances.

4. The government should emphasize strategies geared toward future market directions, and establish mechanisms encouraging the formation of promising emerging industries.

5. Revise regulations restricting establishment and management of startups by university professors. A DARPA project management model should frequently be employed for the management of goal-oriented projects. Entrepreneurs should be given more opportunities to participate in S&T policy decisions.

In September 2014, the MOST issued the revised *Guidelines for the Establishment of the Science and Technology Development Advisory Conference*. Apart from providing clear instructions for composition, hiring methods, members' period of appointment, and duties and powers of the committee, the revised *Guidelines* also call for the establishment of an "Academic Research Advisory Conference" and "Academic-Industry Cooperation Promotion Advisory Conference" geared to furthering S&T development strategies with the following missions:

1. Academic Research Advisory Conference:

   (1) Discussion of academic R&D policies and funding mechanisms.

   (2) Discussion of support of international academic frontier research strategies and fields.

   (3) Other consultancy concerning academic research matters.

2. Academic-Industry Cooperation Promotion Advisory Conference:

   (1) Discussion of promotion of academic-industry linkage strategies and funding mechanisms.

   (2) Discussion of promotion of forward-looking industrial technology R&D strategies.

   (3) Other consultancy concerning promotion of academic-industry cooperation.

F. National Industrial Development Conference

In response to the changes in the times and globalcircumstances, the government has begun convening the triennial "National Industrial Development Conference" and" National Commercial Development Conference" in order to direct greater

attention to industrial development issues of concern to industry and commerce. The first National Industrial Development Conference, which was held in December 2012, addressed the topic of "optimized transformation of the industrial structure; rebuilding engines of economic growth," and discussed the common issues of "promoting value-added innovation in industry" and "establishing a superior investment environment." This conference proposed industrial development strategies and specific approaches addressing the six subtopics of "accelerating promotion of emerging industries," "reinventing manufacturing as a service," "specialization of traditional industry," "technologization of service industry," "globalization of service industry," and "enhancing export competitiveness." The consensus views reached by this conference are summarized below in terms of three initiatives:

1. Optimization of the investment environment:

   (1) Appropriate deregulation of labor laws and regulations and continued review of migrant worker policies in order to make up shortages of primary-level manpower when needed.

   (2) Strengthening of assistance for academic-industry collaboration, and promoting a specialized curriculum for academic-industry technicians in order to boost training of basic technical human resource by Recruit white-collar professionals allowing mainland Chinese staff at multinational firms to visit Taiwan, and reduction or elimination of income tax on foreign professional personnel in Taiwan, and actively.

   (3) Promote transformation and vitality of industrial parks by making better use of idle industrial land and examine the possibility of providing volume allowance incentives in urban industrial areas.

   (4) Draft a water source development program for industrial areas, strengthen industrial water conservation assistance, determine the feasibility of water development programs for areas with insufficient water, and adopt other measures to conserve industrial water and develop new water sources.

   (5) Establish concise and neutral EIA mechanisms by drafting clear review standards to enhance the efficiency of reviews, and re-examining the composition of EIA review committees.

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2. Optimization of the industry structure:

The government should accelerate promotion of emerging industries, do its utmost to boost R&D capabilities, encourage industrial integration to increase value, encourage the establishment of local features in traditional industries, and increase the momentum of industrial transformation.

3. Optimization of trade conditions:

The government will seek to strengthen the competitiveness of Taiwan's export by widening overseas channels, burnishing the country's brand image, and promoting industrial alliances aimed at reducing trading costs and risk.

Section 2
Resource Inputs and the Results & Benefits on S&T Development

I. Expenditure

1. Central Government S&T Budget of All Agencies and Units (S&T Development Project Budget)

Taiwan's government S&T budget grew at an average annual rate of 2.93% from 2011 to 2014, and increase from TWD 90.7 billion to TWD 93.82 billion during this period. The budget's annual growth rate in 2014 was 2.93% (Table 1).

Table 1 Central Government S&T Budget

Units: TWD million

Agency	2011	2012	2013	2014
MOST	36,729	37,487	38,357	38,876
National Science and Technology Development Fund*	3,309	5,391	5,105	3,079
MOEA	27,970	27,143	25,594	26,347
Academia Sinica	10,303	10,600	10,737	11,268
MOHW	4,328	4,047	3,899	4,027
COA	3,643	3,628	3,356	3,624
MOE	1,521	1,423	1,348	1,631
AEC	950	973	899	848
MOTC	779	842	790	1,307
MOI	283	270	252	669
MOL	256	252	240	214
MOJ	82	82	77	153
RDEC	73	68	51	450
CEPD	65	59	54	51
Executive Yuan	67	60	42	65
EPA	60	60	53	87
Hakka Affairs Council	36	37	14	12
MAC	13	11	11	10
NPM	41	44	15	20
GIO	61	61	-	-
Academia Historica	21	20	-	-
NCPFS	22	21	-	-
PCC	12	9	8	8
CIP	14	11	-	85

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Agency	2011	2012	2013	2014
OCAC	9	10	-	-
DGPA	7	7	18	56
MOC	47	102	149	643
MOF	-	-	-	287
CSPTC	-	4	4	4
Total	90,701	92,722	91,073	93,821
Annual growth rate	-1.86%	2.18%	-1.81%	2.93%

Source: Government S&T Development Project Review Working Group, MOST.
* The National Commission for Science And Technology Development Fund (interagency S&T project portion).

2. Analysis of National R&D Expenditure

Taiwan's total national R&D funding has continued to grow during the recent four years. Taiwan's R&D expenditure as a share of GDP grew steadily from 2.83% in 2009 to 2.94% in 2012 (Table 2), which is less than the corresponding figures of South Korea, Israel, Finland, Sweden, Japan, and Germany (Fig. 5).

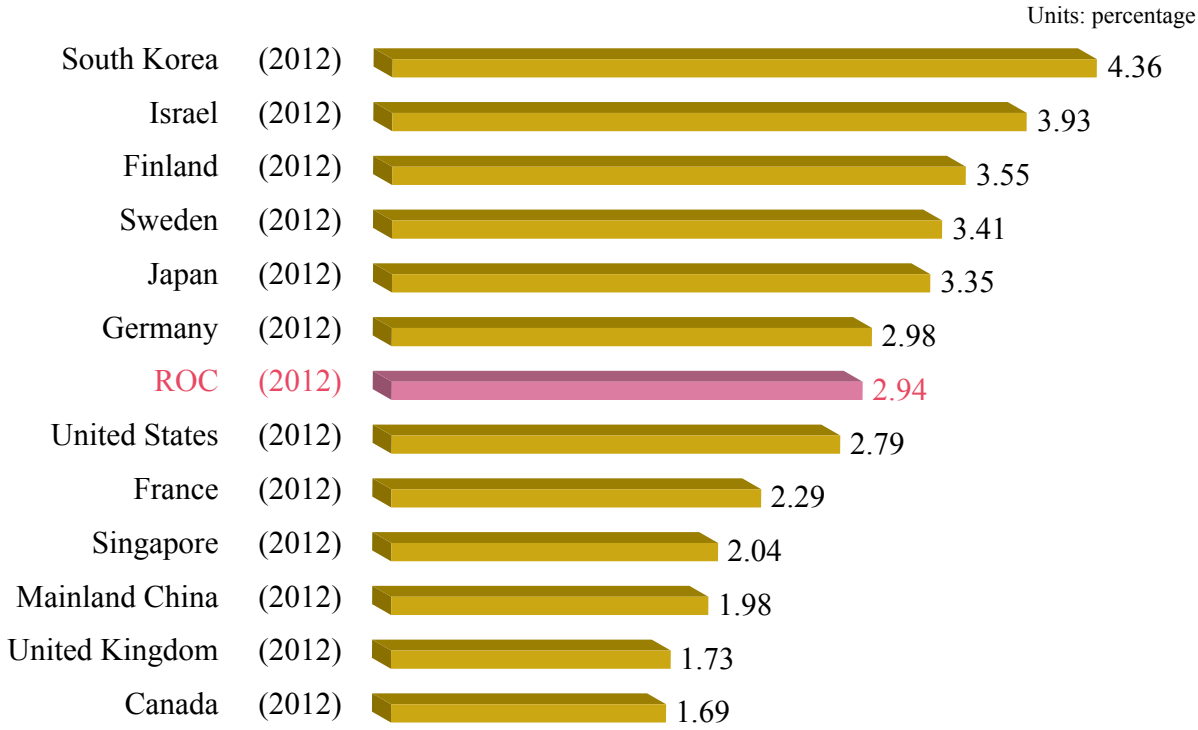

Fig. 5 Various Countries' R&D Expenditures as a Share of GDP

Source: 1. ROC: Indicators of Science and Technology, 2014, MOST.
2. Other countries: Main Science and Technology Indicators, MSTI, November 2014, OECD.

Looking at R&D expenditure from the perspective of implementing sectors, the business enterprise sector has been the most important implementing sector during the most recent four years, followed by the government, higher education, and private nonprofit sectors. The business enterprise sector's R&D expenditures rose steadily from TWD 282.5 billion in 2010 to TWD 343.5 billion in 2013. In contrast, the government's R&D expenditures peaked at TWD 63.02 billion in 2010, and subsequently fell steadily to TWD 60.99 billion in 2013 (Table 2).

Table 2 Taiwan's R&D Expenditures ─ By Implementing Sector

Units: TWD million

Item	2010	2011	2012	2013
National R&D expenditures	394,960	413,293	431,296	454,891
Growth rate (%)	7.6	4.6	4.4	5.5
Share of GDP (%)	2.80	2.89	2.94	2.99
Implementing sectors				
Business enterprise sector	282,546	300,358	319,906	343,456
Government sector	63,020	62,546	61,172	60,993
Higher education sector	47,970	48,978	48,898	48,987
Private nonprofit sector	1,424	1,410	1,321	1,455

Source: Indicators of Science and Technology, 2014, MOST.

Note: The Directorate General of Budget, Accounting & Statistics recompiled GDP, GNP, and NI figures for past years in accordance with accounting standards in the UN's System of National Accounts 2008 (2008 SNA) starting in November 2014, and relevant indicators have therefore been revised. National R&D expenditure as a share of GDP has also been retroactively revised.

(1) Sources of national R&D expenditures: The amount contributed by the business enterprise sector and its relative share rose steadily during the most recent four years. The business enterprise sector accounts for an average of roughly 70% of national R&D expenditures, and its share rose to 75.5% in 2013. In contrast, government R&D expenditures as a share of all national R&D expenditures fell from 27.5% in 2010 to 23.5% in 2013 (Table 3).

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Table 3 Taiwan's R&D Expenditures ─ By Source

Units: TWD million

Sector \ Year	2010	2011	2012	2013
Business enterprise	281,294	299,755	319,562	343,238
(%)	(71.2)	(72.5)	(74.1)	(75.5)
Government	108,615	108,464	106,758	106,692
(%)	(27.5)	(26.2)	(24.8)	(23.5)
Higher education	3,797	3,918	3,965	3,912
(%)	(1.0)	(0.9)	(0.9)	(0.9)
Private nonprofit	1,093	1,007	791	777
(%)	(0.3)	(0.2)	(0.2)	(0.2)
Abroad	161	148	220	272
(%)	(0.0)	(0.0)	(0.1)	(0.1)
National R&D funding	394,960	413,293	431,296	454,891

Source: Indicators of Science and Technology, 2014, MOST.

(2) Types of R&D investment: Technology development accounts for the largest share, followed by applied research and then basic research. Technology development accounted for 67.5% of R&D funding in 2013, while applied research and basic research accounted for 23.2% and 9.2%. In terms of implementing sector, technology development accounted for nearly 80% of R&D expenditure in the business enterprise sector from 2010 to 2013. As for government R&D funding, the gap between applied research and technology development has gradually widened since 2010, which indicates that the government of Taiwan is placing increasing emphasis on technology development R&D. While basic research remains the chief R&D activity of the higher education sector, its relative share has decreased steadily, falling from 48.8% in 2010 to 48.3% in 2012 (Table 4).

Table 4 Taiwan's R&D Expenditures ─ By R&D Type and Implementing Sector

Units: TWD million

Implementing sector	R&D type	2010	2011	2012	2013
National	Basic research (%)	10.0%	9.7%	9.4%	9.2%
	Applied research (%)	24.7%	23.7%	23.5%	23.2%
	Experimental development (%)	65.3%	66.6%	67.1%	67.5%
	Total R&D expenditures	394,960	413,293	431,296	454,891
Business enterprise sector	Basic research (%)	0.4%	0.4%	0.4%	0.5%
	Applied research (%)	19.9%	19.8%	19.9%	19.8%
	Experimental development (%)	79.7%	79.7%	79.6%	79.8%
	Total R&D expenditures	282,546	300,358	319,906	343,456
Government sector	Basic research (%)	23.2%	23.5%	25.3%	26.9%
	Applied research (%)	34.8%	29.4%	29.4%	29.8%
	Experimental development (%)	42.0%	47.0%	45.3%	43.3%
	Total R&D expenditures	63,020	62,546	61,172	60,993
Higher education sector	Basic research (%)	48.8%	48.7%	48.3%	48.3%
	Applied research (%)	38.7%	38.9%	37.9%	38.1%
	Experimental development (%)	12.5%	12.4%	13.8%	13.6%
	Total R&D expenditures	47,970	48,978	48,898	48,987
Private nonprofit	Basic research (%)	19.2%	20.5%	17.1%	18.6%
	sector	58.2%	66.5%	68.6%	69.3%
	Experimental development (%)	22.5%	13.0%	14.3%	12.2%
	Total R&D expenditures	1,424	1,410	1,321	1,455

Source: Indicators of Science and Technology, 2014, MOST.

(3) R&D expenditures of business enterprise sector: The annual growth rate of business enterprises' R&D expenditures has remained in the range of from 6.3% to 9.77%. Business enterprises' R&D expenditures as a share of industrial added value has risen from 2.72% in 2010 to 3.09% in 2013, which indicates that Taiwan's companies are devoting increasing effort to R&D activities (Table 5).

(4) From the perspective of industry type, most business enterprise R&D funding inputs are attributable to manufacturing firms, which have accounted for an average of over 92% of the R&D expenditures of the business enterprise sector as a whole during the most recent four years. Manufacturers' share was approximately 92.08% in 2013. Service firm have accounted for 6.84% to 7.69% of the R&D expenditures of the business enterprise sector as a whole during the most recent four years. Taiwan

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high-tech industry and ICT industry have accounted for over 70% of all business enterprise sector R&D expenditures during the most recent four years. High-tech industry's R&D expenditures accounted for the largest share of all business enterprise sector R&D expenditures and reached its peak – 75.22% in 2013. The ICT industry's R&D expenditures as a share of business enterprise sector R&D expenditures has fluctuated, and reached a peak of 74.04% in 2013 (Table 5).

Table 5 R&D Expenditures of the Business Enterprise Sector

Units: TWD million

Item	2010	2011	2012	2013
Business enterprise sector R&D expenditures	282,546	300,358	319,906	343,456
Growth rate	9.77%	6.30%	6.51%	7.36%
Share of industrial added value	2.72%	2.85%	3.00%	3.09%
Manufacturing firms' R&D expenditures as a share of business enterprise sector R&D expenditures	92.44%	92.89%	92.16%	92.08%
Service industry R&D expenditures as a share of business enterprise sector R&D expenditures	7.24%	6.84%	7.56%	7.69%
High-tech industry R&D expenditures as a share of business enterprise sector R&D expenditures	73.84%	75.05%	74.88%	75.22%
ICT industry R&D expenditures as a share of business enterprise sector R&D expenditures	73.36%	73.98%	73.49%	74.04%

Source: Adapted from the Indicators of Science and Technology, 2014, MOST.
Note: The scope of high-tech industry and ICT industry is based on the OECD's definitions.

(5) R&D expenditures of higher education sector: The growth of the higher education sector's R&D expenditures has fallen during the most recent four years. After experiencing negative growth in 2012, this sector's R&D expenditures returned to positive growth with an increase of 0.18% in 2013. The higher education sector derives much of its R&D funding from the government, which has accounted for an average of over 83% of the sector's funding. Meanwhile, funding derived from the business enterprise sector gradually increased from 6.7% in 2010 to 7.8% in 2013, which indicates that academic-industry collaboration is growing in importance (Table 6).

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Table 6 R&D Expenditures of Higher Education Sector

Units: TWD million

Funding source	2010		2011		2012		2013	
	amount	%	amount	%	amount	%	amount	%
Business enterprise	3,198	6.7	3,650	7.5	3,905	8.0	3,832	7.8
Government	40,580	84.6	41,084	83.9	40,802	83.4	40,989	83.7
Higher education	3,707	7.7	3,842	7.8	3,920	8.0	3,887	7.9
Private nonprofit	397	0.8	325	0.7	202	0.4	159	0.3
Abroad	88	0.2	77	0.2	69	0.1	121	0.2
Total	47,970	100.0	48,978	100.0	48,898	100.0	48,987	100.0
Growth rate	2.45%		2.10%		-0.16%		0.18%	

Source: Indicators of Science and Technology, 2014, MOST.

II. Human Resources

1. Higher Education Manpower

During the most recent four years, the number of university students (and above) in Taiwan peaked at 1,253,866 in the 2012 academic year, and fell slightly to 1,244,314 in the 2013 academic year, which was chiefly attributable to a gradual reduction in the number of Ph.D. and master's students. The number of in-school Ph.D. students fell from 34,178 in the 2010 academic year to 31,475 in the 2013 academic year, while the number of in-school undergraduates dropped from 185,000 in the 2010 academic year to 177,305 in the 2013 academic year. With regard to distribution by course of study, persons studying S&T predominated at the undergraduate, master's, and Ph.D. program levels, and accounted for 65%, 46%, and 41% of all students at these levels. At least 40% of students at the undergraduate, master's, and Ph.D. choose to study S&T every year (Table 7).

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Table 7 Percentages of In-School Students in Taiwan at Different Academic Levels

Units: persons

Level	Course of study	2010 academic year	2011 academic year	2012 academic year	2013 academic year
Ph.D.	Humanities	16.53%	17.24%	17.89%	18.54%
	Social sciences	15.41%	15.53%	15.80%	16.42%
	Science & technology	68.06%	67.23%	66.31%	65.04%
	Total	34,178	33,686	32,731	31,475
Master's	Humanities	22.28%	21.79%	21.32%	20.98%
	Social sciences	31.72%	31.94%	32.43%	33.15%
	Science & technology	46.00%	46.27%	46.25%	45.87%
	Total	185,000	184,113	183,094	177,305
Bachelor	Humanities	17.27%	17.72%	18.11%	18.56%
	Social sciences	38.5%	39.02%	39.77%	40.23%
	Science & technology	44.23%	43.26%	42.13%	41.21%
	Total	1,021,636	1,032,985	1,038,041	1,035,534
Grand total		1,240,814	1,250,784	1,253,866	1,244,314

Source: Adapted from table of the university summary, Department of Statistics, Ministry of Education (http://www.edu.tw/pages/detail.aspx? Node=4075&Page=20046&Index=5&WID=31d75a44-efff-4c44-a075-15a9eb7aecdf).

Note: 1. Humanities includes education, art, literature, design, defense and national security, and other categories.

2. The social sciences include business and management, law, social service, sociology and behavioral science, mass communications, and human ecology.

3. Science & technology include natural science, mathematics and statistics, pharmaceuticals/ medicine/healthcare, engineering, computer science, architecture and urban planning, agricultural science, life sciences, transportation service, environmental protection, and veterinary medicine.

While the number of higher education graduates grew in the 2011 academic year, the number of graduates shrank during the remaining years, falling from 317,162 in the 2009 academic year to 309,333 in the 2013 academic year. Comparing the 2012 and 2011 academic years, apart from a drop in the number of persons graduating with bachelor's degrees, the number of master's and Ph.D. program graduates both increased. Ph.D. graduates increased from 3,705 in the 2009 academic year to 4,241 in the 2012 academic year, and the number of master's graduates likewise increased from 59,492 in the 2009 academic year to 60,218 in the 2012 academic year (Table 8).

Table 8 Numbers of Higher Education Graduates in Taiwan

Units: persons

Degree	Course of study	2009 academic year	2010 academic year	2011 academic year	2012 academic year
Ph.D.	Humanities	494	554	563	670
	Social sciences	513	510	567	570
	Science & technology	2,698	2,782	2,731	3,001
	Total	3,705	3,846	3,861	4,241
M.S.	Humanities	10,410	10,424	9,804	9,623
	Social sciences	18,674	18,979	19,100	19,556
	Science & technology	30,408	30,621	31,146	31,039
	Total	59,492	60,024	60,050	60,218
Bachelor's	Humanities	36,256	37,115	38,478	39,353
	Social sciences	88,133	89,229	90,428	88,839
	Science & technology	102,785	102,534	103,542	98,607
	Total	227,174	228,878	232,448	226,799
Grand total		290,371	292,748	296,359	291,258

Source: Adapted from table of the university summary, Department of Statistics, Ministry of Education (http://www.edu.tw/pages/detail.aspx? Node=4075&Page=20046&Index=5&WID=31d75a44-efff-4c44-a075-15a9eb7aecdf).

Note: 1. Humanities includes education, art, literature, design, defense and national security, and other categories.

2. The social sciences include business and management, law, social service, sociology and behavioral science, mass communications, and human ecology.

3. Science & technology include natural science, mathematics and statistics, pharmaceuticals/ medicine/healthcare, engineering, computer science, architecture and urban planning, agricultural science, life sciences, transportation service, environmental protection, and veterinary medicine.

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2. National R&D Manpower

R&D manpower chiefly consists of researchers, technicians, and supporting staff, of which researchers account for the largest share. Researchers comprised 60.2% of all R&D personnel in 2013, and accounted for over 60% in the remaining recent years. Supporting staff are the smallest category of R&D personnel, and they have been decreasing in number. While supporting staff had accounted for 5.9% of R&D personnel in 2010, their share fell to 5.2% in 2013 (Table 9).

In terms of gender, the number of female researchers and their relative share of all researchers have both displayed stable growth. The number of female researchers grew from 25,392 FTE in 2010 to 29,199 FTE in 2013, and female researchers as a share of all researchers similarly rose from 19.9% in 2010 to 20.8% in 2013 (Table 9).

Table 9 R&D Manpower in Taiwan

Units: FTE, %

Item	2010	2011	2012	2013
R&D personnel	210,678	221,371	227,976	232,879
Researchers	127,768	134,048	139,215	140,124
As share of all R&D personnel	60.6%	60.6%	61.1%	60.2%
Technicians	70,576	74,376	77,224	80,604
As share of all R&D personnel	33.5%	33.6%	33.9%	34.6%
Supporting staff	12,335	12,947	11,537	12,150
As share of all R&D personnel	5.9%	5.8%	5.1%	5.2%
Researchers per 1,000 employment	12.2	12.5	12.8	12.8
Female researchers	25,392	27,457	28,811	29,199
As share of researchers	19.9%	20.5%	20.7%	20.8%

Source: Indicators of Science and Technology, 2014, MOST.
Note: R&D manpower statistics employ FTE units (full-time equivalents), which consist of person-years, and are obtained by converting the number of persons engaging in R&D work to the number of persons engaging in that work on a full-time basis.

The number of researchers per 1,000 employment in Taiwan during 2012 was 12.8 FTE, putting Taiwan behind only Finland among the world's leading countries, and ahead of South Korea, Sweden, Japan, France, Canada, the US, Germany, United Kingdom, Russia, and Mainland China (Fig. 6).

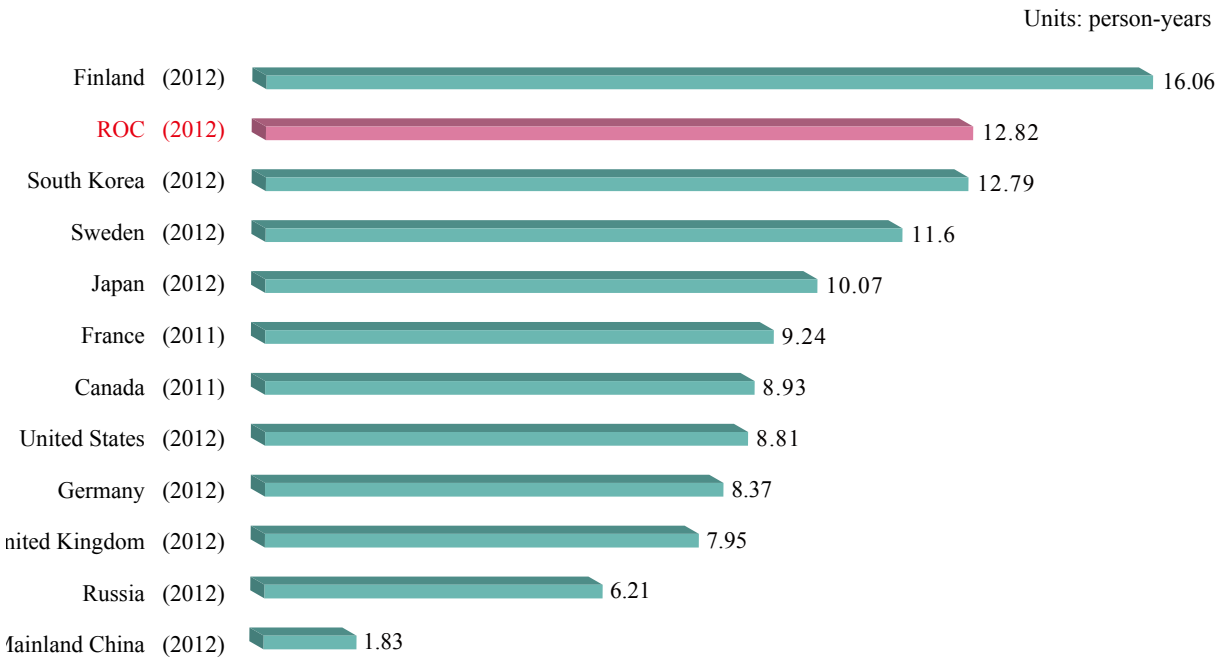

Fig. 6 Researchers per 1,000 Employment in Various Countries

Source: Main Science and Technology Indicators, November 2014, OECD.

(1) R&D manpower of different sectors: In all sectors, researchers have accounted for the largest share of R&D personnel in Taiwan during the most recent four years, followed by technicians, while supporting staff have been fewest in number (Table 10). Researchers account for the highest share of R&D personnel in the higher education sector, where their percentage of 89.6% in 2010 increased to 90.4% in 2013. The percentage of technicians among R&D personnel is highest in the business enterprise sector, where the share has risen steadily except a slight drop in 2011. Technicians accounted for 41% of R&D personnel in 2013. Researchers constitute the main category of R&D personnel in the government sector, where their share of R&D increased from 57.2% in 2010 to 59% in 2013. Among any of the sectors, the largest share of supporting staff among R&D personnel was 15% in 2013 (Table 10).

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Table 10 R&D Personnel in Taiwan ─ By Implementing Sector

Units: FTE, %

Implementing sector	Manpower category	2010	2011	2012	2013
Business enterprise sector	Researchers	54.4%	54.6%	55.2%	54.2%
	Technicians	40.0%	39.8%	40.2%	41.0%
	Supporting staff	5.6%	5.6%	4.6%	4.8%
	Total	148,047	158,833	165,492	171,960
Government sector	Researchers	57.2%	57.3%	58.0%	59.0%
	Technicians	32.2%	32.5%	32.1%	30.8%
	Supporting staff	10.6%	10.1%	10.0%	10.1%
	Total	26,439	25,645	25,246	24,727
Higher education sector	Researchers	89.6%	89.5%	90.2%	90.4%
	Technicians	7.1%	6.9%	6.4%	6.3%
	Supporting staff	3.3%	3.6%	3.4%	3.3%
	Total	35,219	35,818	36,115	35,088
Private nonprofit sector	Researchers	55.3%	55.1%	53.8%	55.4%
	Technicians	32.7%	32.4%	32. 6%	29. 6%
	Supporting staff	12.0%	12. 5%	13.6%	15.0%
	Total	973	1,075	1,122	1,104

Source: Indicators of Science and Technology, 2014, MOST.

(2) Academic qualifications of researchers: Persons holding a master's degree predominated among researchers in Taiwan, and have accounted for roughly 53% during the four most recent years. In addition, the percentage of Ph.D.-holding R&D personnel has displayed a slight growth trend, rising from 17.6% in 2010 to 18.5% in 2013. Bachelor's degree level, master's-degree level, and Ph.D. level personnel accounted for 28.2%, 53.3%, and 18.5% of R&D personnel respectively in Taiwan during 2013 (Table 11).

Table 11 Educational Level of Researchers in Taiwan

Units: FTE, %

Academic qualifications	2010	2011	2012	2013
Ph.D. holders	22,466	23,835	25,010	25,972
As share of researchers	17.6%	17.8%	18.0%	18.5%
Master's degree holders	67,935	70,640	73,367	74,658
As share of researchers	53.2%	52.7%	52.7%	53.3%
Bachelor's degree holders	37,367	39,573	40,838	39,495
As share of researchers	29.2%	29.5%	29.3%	28.2%
Total	127,768	134,048	139,215	140,124

Source: Indicators of Science and Technology, 2014, MOST.

III. Results

1. National Competitiveness:

In the World Economic Forum's (WEF) Global Competitiveness Report, 2014-2015, Taiwan ranked 14th worldwide in terms of overall competitiveness. The top five were Switzerland, Singapore, the US, Finland, and Germany. Taiwan ranked third among the Four AsianTigers, behind Singapore and Hong Kong, and ahead of Korea. Taiwan performed particularly well in the categories of "innovation" (10th), "infrastructure" (11th)," "goods market efficiency" (11th), and "higher education and training" (12th) (Table 12).

On the other hand, Taiwan performed poorly in the categories of "labor market efficiency," where it ranked 32nd, and did especially poorly in the subitems of "redundancy costs," "women in labor force," "country capacity to attract talent," and "country capacity to retain talent." Talent has always been seen as a key element in S&T innovation and national competitiveness. The WEF report also notes that the quality of human resources is closely connected with the efficiency of the labor market. How to attract superior human resources, and thereby boost competitive capability and competitive advantage, has already become a major challenge for many companies and research organizations. While Taiwan's rank improved by 2 places—rising from 48th in 2013 to 46th in 2014—in the subitem of "country capacity to attract talent", its rank in the subitem of "country capacity to retain talent" dropped by 6 places to 65th. Switzerland ranked first in both retention and attraction of manpower, and Singapore also ranked high in these two subitems, and rose to 8th and 2nd place respectively in the most recent two years. The strategies that Switzerland and Singapore use to attract manpower and the employment conditions they provide (see Appendix 2) are very much worth emulating.

Furthermore, according to the Lausanne International Institute for Management Development's (IMD) 2014 world competitiveness rankings, Taiwan had an overall rank of 13th. With regard to categories in relation to S&T capabilities, Taiwan ranked 4th and 9th in the categories of "technological infrastructure" and "scientific infrastructure" (Table 13), which indicates that Taiwan's investment in S&T has yielded tangible results. Although Taiwan performed well in overall S&T competitiveness, it still has room for improvement in specific areas. For example, in

the category of "technological infrastructure," Taiwan's rank dropped in the items of "communications technology," "internet bandwidth speed," "information technology skills", "qualified engineers," "technological cooperation," and "development and application of technology." In the category of "scientific infrastructure," Taiwan's rank likewise dropped in the items of "scientific research," "scientific research legislation," "knowledge transfer," and "innovative capacity. In addition, Taiwan also has room for improvement in the areas of green energy technology, pollution control, and sustainable development.

Table 12 National Competitiveness Rankings According to the World Economic Forum (WEF)

Assessment item	Switzerland	Singapore	USA	Finland	Germany	Japan	Hong Kong	Netherlands	UK	Sweden	Norway	**ROC**	Korea	Israel	Mainland China
Global competitiveness index	1	2	3	4	5	6	7	8	9	10	11	14	26	27	28
1. Basic requirements	4	1	33	8	11	25	3	10	24	12	6	14	20	36	28
(1) Institutions	9	3	30	2	17	11	8	10	12	13	5	27	82	43	47
(2) Infrastructure	5	2	12	19	7	6	1	4	10	22	32	11	14	34	46
(3) Macroeconomic environment	12	15	113	43	24	127	14	39	107	17	1	23	7	50	10
(4) Health and primary education	11	3	49	1	14	6	32	5	21	23	15	13	27	44	46
2. Efficiency enhancers	5	2	1	10	9	7	3	8	4	12	13	16	25	26	30
(1) Higher education and training	4	2	7	1	16	21	22	3	19	14	8	12	23	36	65
(2) Goods market efficiency	8	1	16	18	19	12	2	9	13	17	24	11	33	79	56
(3) Labor market efficiency	1	2	4	23	35	22	3	21	5	20	13	32	86	59	37
(4) Financial market development	11	2	9	5	25	16	1	37	15	12	10	18	80	20	54
(5) Technological readiness	10	7	16	11	13	20	5	9	2	3	4	30	25	15	83
(6) Market size	39	31	1	55	5	4	27	23	6	36	50	17	11	48	2
3. Innovation and sophistication factors	1	11	5	3	4	2	23	6	8	7	16	13	22	10	33
(1) Business sophistication	2	19	4	9	3	1	16	5	6	8	13	17	27	26	43
(2) Innovation	2	9	5	1	6	4	26	8	12	7	15	10	17	3	32

Source: World Economic Forum (WEF), The Global Competitiveness Report 2014-2015.

Table 13 Competitiveness Rankings According to the International Institute for Management Development (IMD)

Assessment item	USA	Switzerland	Singapore	Hong Kong	Sweden	Denmark	**ROC**	Finland	UK	Finland	Japan	Mainland China	Israel	Korea
Overall competitiveness	1	2	3	4	5	9	**13**	14	16	18	21	23	24	26
1. Economic performance	1	10	6	7	16	23	**14**	15	11	49	25	5	29	20
2. Government efficiency	22	3	4	2	10	11	**12**	18	17	13	42	34	24	26
3. Business efficiency	1	2	7	3	8	11	**17**	12	18	13	19	28	21	39
4. Infrastructure	1	2	10	21	4	3	**17**	11	14	5	7	26	15	19
(1) Basic infrastructure	4	7	14	29	10	6	**18**	2	20	11	25	8	18	26
(2) Technological infrastructure	3	7	2	1	6	9	**4**	14	18	10	17	20	12	8
(3) Scientific infrastructure	1	4	17	26	8	13	**9**	15	10	12	2	7	5	6
(4) Health and environment	18	3	24	21	1	2	**31**	16	20	5	13	54	17	28
(5) Education	23	4	2	25	7	1	**22**	17	15	3	28	39	18	31

Source: International Institute for Management Development (IMD), The World Competitiveness Yearbook 2014.

2. S&T Development Indicators

Indicators connected with S&T development results include academic journal papers, patents, e-competitiveness, and value of technological products.

(1) Academic journal papers: While the number of papers from Taiwan in journals collected by the Science Citation Index (SCI) and Engineering Index (EI) have displayed increasing trends in recent years, the number of papers in EI journals fell slightly in 2012 (Table 14). A total of 24,921 research papers by authors from Taiwan had SCI citations in 2010, and this number had grown to 27,699 by 2013. The number of research papers by authors from Taiwan cited in EI similarly grew from 20,302 in 2010 to 24,415 in 2013.

(2) Patents: Taiwan ranked 5th in terms of number of granted US invention patents in 2012, and its rank has not changed during the most recent four

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years. However, the fact that the number of patents granted to persons in Taiwan grew from 8,239 in 2010 to 11,071 in 2013 makes it clear that Taiwan has made significant progress in promoting protection of intellectual property rights (see tables 14, 15, 16). However, Taiwan's Current Impact Index (CII) fell from 0.79 in 2009 to 0.64 in 2012, which indicates that Taiwan's patents are generally cited at a low rate. Apart from number of patents, Taiwan should make greater effort on improvement of patent quality (tables 15 and 16).

Table 14 S&T Development Outputs in Taiwan

Item	2010	2011	2012	2013
Number of academic journal papers				
SCI papers	24,921	27,283	27,639	27,699
EI papers	20,302	22,819	20,729	24,415
Number of patent (excluding new design patents)				
US patents granted to applicants in Taiwan	8,239	8,781	10,646	11,071
Share of all approved US patents	3.77%	3.93%	4.23%	4.01%

Source: Adapted from the Indicators of Science and Technology, 2014, MOST.

Table 15 Number of Granted US Invention Patents and Ranking

	2010			2011			2012			2013		
	Patents	Rank	%	Patents	Rank	%	Patents	Rank	%	Patents	Rank	%
USA	107,791	1	53.1%	108,622	1	52.5%	121,026	1	52.0%	133,593	1	52.6%
Japan	44,813	2	22.1%	46,139	2	22.3%	50,677	2	21.8%	51,919	2	20.4%
Germany	12,363	3	6.1%	11,919	4	5.8%	13,835	3	5.9%	15,498	3	6.1%
South Korea	11,671	4	5.8%	12,262	3	5.9%	13,233	4	5.7%	14,548	4	5.7%
ROC	**8,239**	**5**	4.1%	**8,781**	**5**	4.2%	**10,646**	**5**	4.6%	**11,071**	**5**	4.4%
Canada	4,852	6	2.4%	5,014	6	2.4%	5,775	6	2.5%	6,547	6	2.6%
France	4,450	7	2.2%	4,532	7	2.2%	5,386	7	2.3%	6,083	7	2.4%
Mainland China	2,657	9	1.3%	3,174	9	1.5%	4,637	9	2.0%	5,928	8	2.3%
UK	4,299	8	2.1%	4,292	8	2.1%	5,211	8	2.2%	5,806	9	2.3%
Israel	1,819	10	0.9%	1,981	10	1.0%	2,474	10	1.1%	3,012	10	1.2%

Source: Adapted from the Indicators of Science and Technology, 2014, MOST.

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Table 16 Current Impact Index (CII) of Invention Patents in Leading Countries

Country	2009	2010	2011	2012
ROC	**0.79**	**0.71**	**0.68**	**0.64**
USA	1.24	1.28	1.28	1.31
Japan	0.75	0.69	0.66	0.65
Germany	0.53	0.56	0.56	0.60
France	0.56	0.57	0.59	0.59
UK	0.85	0.87	0.90	0.90
Italy	0.50	0.51	0.52	0.50
Canada	1.00	0.99	0.98	1.05
South Korea	0.81	0.74	0.70	0.64

Source: U.S. Patent and Trademark Office database, calculated by Taiwan Institute of Economic Research.

(3) E-competitiveness: According to the World Economic Forum's Global Information Technology Report, 2014, Taiwan's rank in "Networked Readiness Index (NRI) had fallen from 10th in 13th to 14th in 2014 among the 148 countries (cities/economies) included in the assessment. Since Taiwan's drop in ranking is relatively large, there is certainly room for further improvement (see Table 17).

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Table 17 Overall Networked Readiness Index Rankings

Country	2013	2014	Change in ranking
Finland	1	1	0
Singapore	2	2	0
Sweden	3	3	0
Netherlands	4	4	0
Norway	5	5	0
Switzerland	6	6	0
USA	9	7	2
Hong Kong	14	8	6
UK	7	9	-2
South Korea	11	10	1
Luxembourg	16	11	5
Germany	13	12	1
Denmark	8	13	-5
ROC	**10**	**14**	**-4**
Israel	15	15	0

Source: World Economic Forum (WEF), The Global Information Technology Report 2014.

(4) Value of technological products: In 2013, Taiwan led the world in terms of value of high-tech information and communications products, which indicates that Taiwan's ICT industry R&D inputs have yielded significant reward. See Table 18 for an overview of the government's recent support for the green energy industry and healthcare industry, as well as its promotion of the solar cell and mobility aid industries.

Table 18 Products Made in Taiwan Ranked Top Three in the World

1st in the world			2nd in the world			3rd in the world		
Item (5)	Value (USD million)/ output	Global market share %	Item (11)	Value (USD million)/ output	Global market share %	Item (8)	Value (USD million)/ output	Global market share %
Foundry	24,764.23	68.3%	IC design	14,529.87	18.6%	WLAN	43	0.8%
IC packaging & testing	12,689.59	50.8%	PNDs (personal navigation devices)	1286.73	45.3%	OLED panels	228.44	4.2%
CDs	848.4	39.6%	Large TFT LCD panels (>10")	21,052.03	23.1%	Printed circuit boards	6,905	16.4%
Spirulina	838 Tons	52.0%	Medium/ small TFT LCD panels (<10")	6,254.41	19.7%	Ball screws	223.4	14.2%
Glass fiber cloth	650.24	28.6%	TN/STN LCD panels	158.41	11.4%	TPE	323,000 tons	7.7%
			IC substrate	2,118.06	25.3%	Nylon fibers	34.3	8.3%
			Silicon solar batteries	7,070 MW	18.7%	Polyester filament	954,000 tons	3.1%
			Electrolytic copper foil	1,087	23.0%	β-carotene	42 tons	5%
			Mobility aids (electric scooter & electric wheelchairs)	127,622 units	21.3%			
			ABS	1.21 million tons	14.9%			

Source: ITIS, Department of Industrial Technology (http://www2.itis.org.tw/).

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Section 3
Major S&T Achievements and Development Plans

I. Major Government Policies

1. i-Taiwan 12 Projects

The government approved the "i-Taiwan 12 Projects" in 2009. This program calls for implementation of the following 12 high-priority infrastructure projects: " 'Aerotropolis' encompassing the Taiwan Taoyuan International Airport (TTIA)", "Efficient transportation networks", "Innovative industrial corridors", "Urban and industrial park regeneration", "Coastal regeneration", "Green forestation", "Kaohsiung port-city regeneration", "Sewer construction", "High-tech industrial clustering in central Taiwan", "Wireless broadband and digital content industries", "Farm village rejuvenation", and "Flood prevention and water management."

From 2009 to 2016, total expected investment in these projects is about TWD 4.0 trillion, of which roughly TWD 2.79 trillion will come from the government budget and TWD 1.20 trillion will take the form of private investment. In accordance with the government's division of labor and project content, implementation of individual projects will be the responsibility of the National Development Council (NDC), MOTC, MOST, COA, AEC, MOEA, Council of Indigenous Peoples (CIP), MOI, and BOST. As of 2012, government budget implementation had reached TWD 1.43 trillion, which indicated an implementation rate of 93.33%, and actual private investment had surpassed TWD 661 billion, which constituted 125.5% of the target of TWD 526 billion. Implementation of the program to date has achieved the major upgrading of the country's infrastructure, and gradually established new momentum for economic growth. The program as a whole has already significantly boosted Taiwan's competitiveness, especially in such areas as the electronic medical record, network readiness, and cultural creativity cluster, promotion of cultural creativity specialties, innovative industrial corridors, coastal regeneration, green forestation, farm village rejuvenation, and efficient transportation networks.

2. Golden Decade National Vision

Responding to changes in the political, economic, and social circumstances in

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Taiwan and abroad, in 2011 the Council for Economic Planning and Development (CEPD) joined forces with other agencies in reviewing and revising the content of various policies. After the results of this undertaking were submitted, the Executive Yuan approved the "Golden Decade National Vision" program, which has the overall goal of "prosperity, harmony, and sustainability", and contains the following eight visions:

Vision 1: A robust economy ─ An open orientation, S&T innovation, LOHAS agriculture, structural adjustment, promotion of employment, and stable commodity prices.

Vision 2: A just society ─ Equal distribution of wealth, health & security, support for children and the elderly, ethnic harmony, housing justice, and equality of the genders.

Vision 3: Clean and competent government ─ Administrative reform, performance upgrading.

Vision 4: High-quality education ─ cultural creativity, educational reforms.

Vision 5: Environmental sustainability ─ green energy & carbon reduction, an ecological homeland, disaster prevention and mitigation.

Vision 6: Well-rounded development ─ Infrastructure, sea-air transportation hub, convenient living, regional balance, a strong fiscal foundation, financial development.

Vision 7: Cross-Strait peace ─ A stable cross-Strait relationship, national security.

Vision 8: Friendly relations with the international community ─ Expanded participation, humanitarian aid, cultural interchange, tourist upgrading.

In order to implement these 31 administrative themes, the Executive Yuan has laid out the following strategies:

(1) Changing the nation's growth model focus from efficiency to openness and innovation: Innovation, openness, and structural adjustment will boost economic growth potential. Changes to taxation will improve income allocation. And the development of green technology while emphasizing environmental sustainability will create a pathway to a "golden decade."

(2) Shifting policy focus from GDP (gross domestic product) to GNH (gross

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national happiness): Because GNH emphasizes subjective impressions such as environmental quality, quality of life, and social justice, it can guide efforts to enhance people's overall contentment.

(3) Augmenting the definition of national strength to include soft and smart power in addition to hard power: The government will strive to strengthen elements of soft power and smart power, including design innovation, brand experience, comfortable living, institutional systems, mutual assistance, humanistic quality, and lifestyle of health and sustainability.

(4) Changing the model for trade expansion from self-development to strategic alliance: Adopting a strategic alliance approach in which "one partner develops technology and the other partner develops the market" can pair foreign resources with Taiwan's edge. Regional alliances will allow access to global opportunities.

This program has been included in the Four-Year National Development Plan (2013-2016). After approval by the Executive Yuan, it has been implemented by relevant agencies, and performance has been regularly reviewed.

3. Six Emerging Industries

Acting on the president's instructions, the Executive Yuan designated biotechnology, green energy, high-end agriculture, tourism, medicine and health care, and culture and creation as six key emerging industries in 2009. The government hopes to develop green energy and biotech industries with Taiwan's existing ICT and optoelectronics technology, and to further support high-end agriculture and medicine and health care industries. Meanwhile, by stimulating the development of the tourism industry, the government intends to and couple tourism and culture creation industries and thus achieve greater industrial synergy.

Starting in March 2009, the Executive Yuan successively approved Six Emerging Industries development programs, namely the "Taiwan Biotechnology Takeoff Diamond Action Plan," "Project Vanguard for Excellence in Tourism," "Green Energy Industry Program," "Platinum Program of Health Care Upgrade Initiative" "Quality Agriculture Development Program" "Creative Taiwan - Development of the Cultural and Creative Industries."

The "Taiwan Biotechnology Takeoff Diamond Action Plan" sought to increase

investment from venture capital and private investors to boost the R&D capabilities of the biotech industry, strengthen the commercialization of biotech R&D results, and reduce risk at the R&D stage. This program induced the Food and Drug Administration, DOH (now the Food and Drug Administration, MOHW) to join the Pharmaceutical Inspection Convention and Pharmaceutical Inspection Co-operation Scheme, PIC/S), which has enhance the image and competitiveness of Taiwan's pharmaceutical industry. In addition, this program has also promoted the establishment of a biotech integration and incubation center, which has helped enhance the biotech industry's ability to conduct translational research, and helped double the industry's value from TWD 130.0 billion to TWD 260.0 billion. In order to meet the needs of Taiwan's pharmaceutical and medical equipment industries, the Executive Yuan renamed the Diamond Action Plan the "Taiwan Biotech Industries Takeoff Action Plan" in 2013, with the following objections: fostering successful cases in the areas of pharmaceuticals, medical equipment, and medical management services, promoting the approval and sale of domestically-produced new drugs and medical equipment, encouraging adoption of innovative medical management services, and creating examples of Taiwan-branded solution exports.

The "Green Energy Industry Program" focuses on photovoltaic power and LED lighting industries, and designates wind power, biofuels, hydrogen energy and fuel cells, and energy information and communications as promising industries. This program expects that technological breakthroughs and development of key technologies will make Taiwan a major force in the development and production of energy technology. Relevant results are as follows:

(1) Green energy industry: The output value of the industry surged by 165% from 2008 to 2013, reaching TWD 423.3 billion in the latter year. Employees have also increased by 52,500 since 2008, and are now more than 68,250.

(2) Photovoltaic power industry: Apart from upgrading solar cell and module technologies to international levels, the government has also completed the establishment of a photovoltaic international certification laboratory, cultivated MW-grade photovoltaic power generation systems integration firms, and promoted the establishment of a third-generation solar cell technology IP portfolio.

(3) LED lighting optoelectronics industry: Achievements have included the

establishment of autonomous technological capabilities, drafting of standard specifications for lighting modules, establishment of an LED lighting testing laboratory, and promotion of the domestic LED applications market.

(4) Promising industries: On wind power generation, the program has completed development of key elements for on-land wind turbines and expanded domestic demand for wind power. On biofuel, the program has developed biofuel pyrolysis technology and realized the use of biofuels by consumers. A total of 23 firms in the hydrogen energy and fuel cell industry had received assistance and initiated 48 demonstration projects by the end of September 2013; the firms' self-made product content exceeded 90%. On energy information and communications the program had installed 24,000 high-voltage intelligent meter systems and 11,200 low-voltage intelligent meters in homes as of September 2013.

The "Project Vanguard for Excellence in Tourism" has sought to promote tourism, enhance the quality of travel in Taiwan, and increase foreign exchange income. The program drafted a regional scheme for the development of tourism in Taiwan, with northern Taiwan having the theme of "Living Taiwan," central Taiwan having the theme of " Enterprising Taiwan," southern Taiwan having the positioning of "Historicoceanic Taiwan," eastern Taiwan having the topic of "Leisurely Living Taiwan," and offshore islands having the theme of "Unique islands Taiwan." This program includes three action plans: "Project Summit," "Project Keystone," and " Project Propeller." The "Project Summit" plan takes "flagships attractions" and "international spotlight" as its themes, and adds depth to tourist activities by introducing international-class tourist attractions. The "Project Keystone" plan takes "industry re-building" and "talent cultivation" as its themes, promotes adoption of international standards by the tourism industry, and seeks to cultivate outstanding personnel. The "Project Propeller" plan emphasizes "market development" and "quality improvement," and seeks to develop new customer groups and enhance lodging quality. Since the launch of the program the number of visitors arriving in Taiwan increased from 3.85 million in 2008 to 8.02 million in 2013, while foreign exchange income from tourism increased from TWD 187 billion in 2008 to TWD 375 billion in 2013, and this foreign exchange income as a share of GDP increased from 1.47% in 2008 to 2.45% in 2013. In addition, this program further stimulated growth of the hotel industry, with cumulative investment in new hotel construction totaling TWD

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129 billion from 2008 to the first quarter of 2014, and investment in the renovation of hotel equipment totaling TWD 25.5 billion during the same period. During 2013, the average hotel occupancy rate for the year was 69.3%, and hotel revenue totaled TWD 55.0 billion.

The "Quality Agriculture Development Program" has sought to promote healthy, high-tech agriculture and appropriate LOHAS agriculture, and has taken healthy agriculture, refined agriculture, and LOHAS agriculture as its development directions. Efforts in terms of healthy agriculture have chiefly consisted of the promotion of crop health management models and the establishment of a seamless safety management system for agricultural product. Efforts in refined agriculture have chiefly consisted of development of the six key industries of agricultural biotechnology, orchids, groupers, tropical fish, plants seedlings, and livestock breeding. Efforts in LOHAS agriculture have included the development of premium agricultural products and in-depth agriculture tours. In 2013, in the area of healthy agriculture, the program had helped a cumulative total of 2,126 production-marketing groups obtain the GAP label, 2,988 growers pass organic certification, and 325 farmers obtain CAS product certification; the participating farmers generated total output value in excess of TWD 47.0 billion. In the area of refined agriculture, during 2013, the program enabled the acquisition of 37 plant variety rights and 31 patents, and facilitated 123 technology transfer cases and R&D results income of TWD 83.3 million. In addition, a total of 77 firms were authorized to stationed in the Pingtung Agricultural Biotechnology Park and make investments worth a total of TWD 7.28 billion; this park has already established an agricultural industry cluster. In LOHAS agriculture, by the end of 2013, a total of 75 recreational farming areas had been designated, and 317 recreational farms had been granted registration permits. A total of roughly 19 million people visited farming villages for tourism in 2013, which created TWD 10.0 billion in value. Furthermore, the construction and use of yacht wharves facilitated fishing excursions 8.76 million person-times, which generated value of approximately TWD 2.59 billion.

The "Creative Taiwan - Development of the Cultural and Creative Industries" chiefly includes the two main aspects - "Laying the Groundwork" and "Flagship plans." The "Laying the Groundwork" aspect encompasses the common problems faced by cultural creativity industries, and focuses on the planning and implementation of various funding initiatives, financing and venture capital mechanisms, deregulation and establishment of institutional systems, expansion and vitalization of domestic

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and foreign markets, establishment of collaborative cultural creativity platforms, and talent training. The goal is to establish an environment friendly to cultural creative industries, and thereby ensure that relevant industries receive assistance and grow. The "Flagship plans" aspect is intended to promote six major flagship industries, namely TV, movies, popular music, digital content, design, and crafts industries. The integration of interagency resources has helped create a comprehensive, favorable industry development environment, which is making Taiwan a hub for cultural creativity industries in the Asia-Pacific region. As of the end of September 2013, this plan had helped fund the establishment of 38 cultural creativity industry incubation centers, brought into being art expositions, architectural design exhibitions, and major awards with a value of TWD 3.1 billion, promoted the implementation of 74 movie projects, and assisted TV producers to participate in 27 international film and TV festivals. In addition, the plan also provided funding for 161 audio publication and flagship musical projects. In total, the plan induced TWD 26.9 billion in investment on the part of the digital content industry, producing economic benefit (including from new product development) of TWD 14.3 billion, and helped create 36,061 jobs; finally, a cumulative total of 6.74 million persons have visited Taiwan's five major creative cultural parks.

The "Platinum Program of Health Care Upgrade Initiative" consists of six major strategies aimed at putting the healthcare system on a sound basis, promoting a long-term care system and international medicine, developing a health promotion industry and Smart Taiwan medical services, and strengthening the country's sanitation and safety. This program has consolidated Taiwan's medical services brand by means of boosting core technologies. The four-year program was implemented from 2009 to 2012. As of the end of 2012, the program had established a national emergency and critical care network, ensuring that citizens across the country have access to 24-hour emergency care; expedited the establishment of electronic medical records systems at hospitals and clinics; integrated links to 207 remote healthcare organizations throughout Taiwan; completed establishment of HIS/PACS medical information systems at local health stations in 31 mountain townships and on 19 offshore islands; promoted cloud services, including value-added health data applications, which receive over a million queries annually; established a long-term care insurance mechanism and long-term care service network with a high usage rate; simplified application procedures, eased legal requirements for foreigners wishing to visit

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Taiwan, and allowed foreigners to visit Taiwan for healthcare or cosmetic surgery; and constructed a psychiatric building at Kinmen General Hospital.

4. Four Intelligent Industries

The Executive Yuan launched the "Four Intelligent Industries" program in 2010, involving cloud computing, electric vehicles, green architecture, and patent commercialization. The government hopes that the program will lay the foundation for Taiwan's long-term industrial development, and boost Taiwan's industrial added value and competitiveness in global markets.

(1) Cloud computing (Cloud Computing Applications and Industry Development Program)

In the light of opportunities and competitive advantage of Taiwan's information and communications industry in the global cloud computing market, the BOST commissioned the MOEA to submit the Cloud Computing Industry Development Program in 2010.

In 2012, after reviewing various application needs in the domestic market and global technological competition, the Executive Yuan commissioned RDEC to adapt the foregoing program in conjunction with the MOEA, especially the five sections concerning promotion of public-oriented applications, establishment of foundation for system software, efficient green energy conservation, cloud computing infrastructure, and innovative application development capabilities. The initiative was renamed the "Cloud Computing Applications and Industry Development Program" on November 15 of the same year, and it has sought to promote five types of cloud computing applications relevant to people's daily life:

a. Foods health applications: The program has established integrated service systems and platforms for agricultural produce and processed products; established platform interface and applications for food traceability and recreational farming; and instituted a health cloud service platform linked with hospitals, clinics, and healthcare organizations, for medical, healthcare, public health, and disease prevention services.

b. Police administration and traffic applications: The program established a highly-secure, highly-reliable police administration cloud, providing

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integrated information applications, mobile and video applications, and coordinated crime prevention applications; established an integrated traffic information service platform, for quality traffic information services and further development of value-added traffic and transportation services.

c. Environmental information and disaster mitigation applications: The program established a national geographical information and interagency environmental data cloud service platform, promoted applications at relevant government units, for public services; and deployed a disaster prevention and relief cloud data center that draws on the private sector's resources to provide information for disaster prevention and relief, and decision-making in emergencies.

d. Education and culture applications: The program established a digital learning cloud service platform providing resources for e-learning, research, and remote tutoring; and developed a national cultural resource base for public use to enrich their cultural life and consumption habits.

e. Integrated infrastructure: The program has introduced a flexible cloud service infrastructure, as the foundation of the government's cloud public services; developed cloud middleware and management software, and information security mechanisms to provide domestic academic researchers an R&D cloud computing environment; drafted cloud data center operation procedure to enhance reliability and service quality; and established equipment energy efficiency measurement procedures, and encouraged government units and schools to purchase or lease equipment complied with energy conservation standards.

The government hopes that the promotion of public-oriented cloud applications, through enhancing information and communications capabilities , will spin off a cloud computing industry, encourage the development of ubiquitous cloud computing applications, and make Taiwan a leading cloud applications exporter and a country where cloud services are extensively used by the government, companies, and individuals. This program seeks to achieve the following objectives by 2015:

a. Spread cloud computing concepts and applications widely in three to five industries, making a value system with 100 SMEs.

b. Encouragement of 50 large companies to establish information operation centers in Taiwan.

c. Promotion of cloud software, services, and derivative hardware output with value exceeding TWD 100 billion, while boosting the total value of cloud communications and terminal devices and cloud software and services to more than TWD 450 billion.

d. Introducing public-oriented government cloud services, and achieving service usage in excess of 10 million times.

The following is a summary of majorimplementation results so far:

a. The MOEA has successfully promoted cloud computing applications in the information and communications industry, service industries, and textile industry, enabling these three industries to save over TWD 50 billion in costs, and inducing 687 SMEs to adopt cloud computing applications.

b. The MOEA has successfully encouraged 29 companies to establish information operation centers in Taiwan.

c. Taiwan's cloud industry had an output valued at TWD 427.6 billion in 2013, and created approximately 32,000 jobs.

d. The program encouraged foreign firms, telecoms, and manufacturers to invest in cloud service. For example, Google—the world's largest cloud services company—invested TWD 18.0 billion in Taiwan to set up its largest data center in Asia, and some leading Taiwanese firms such as Hon Hai, ASUS, Inventec, and Quanta invested a total of TWD 124 billion in cloud equipment and services.

e. The MOEA promoted domestically-developed cloud data center solutions, with an integrated hardware/software strategy, intending to find opportunities in the international cloud computing market. Hopefully this can help make TWD 3.0 billion from cloud applications service exports within three years. The three companies ASUS, AIC, and Gigabyte Technology have developed cloud solution products complied with Open Compute Project (OCP) international certification standards, and the two companies Quanta and Wiwynn have received OCP certification, enabling them to establish a domestic cloud data center solution industry chain.

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f. The cloud development and testing platform promoted by the MOEA has 150 products from more than 80 firms, and is being used by vendors to test government cloud products and services. The MOTC, MOI, EPA, MOE, COA, Ministry of Culture (MOC), and National Palace Museum (NPM) have used the platform to perform design, planning, and testing of their cloud services.

g. Health cloud: The MOHW has promoted medical cloud, care cloud, healthcare cloud, and disease prevention cloud services. The medical cloud consists of an electronic medical record cloud service; thus far, 48 local health stations in isolated areas can read medical records in cloud, and 265 hospitals can exchange electronic medical records. The care cloud has facilitated management of health information for poor and near-poor households at 19 hospitals. The disease prevention cloud promotes notification of infectious diseases through electronic medical records at 18 hospitals. The healthcare cloud promotes holistic health management services; 20 open data sets have been established thus far.

h. Geographical information cloud: The MOI's information center introduced a geographical information and geospatial cloud in 2013. The Taiwan Geospatial One Stop (TGOS) alliance has 88 nodes, and has been used for more than one million times; the nationwide address locating service has been used more than 150 million times.

i. Police administration cloud: The National Police Administration, MOI expanded promotion of its M-Police service in 2013. This service allows police personnel to obtain or report law enforcement information at any time, integrates 21,599 police monitoring cameras in northern Taiwan, and thereby establishs an intelligent cloud visual processing platform.

j. Environment cloud: In 2013, the EPA issued its Environmental Instant Notification app, which is an open environmental resource data service containing approximately 640,000 data items concerning more than 70,000 controlled pollution sources, and offering 37 disaster mitigation data items to the MOI's disaster prevention and relief cloud.

k. Education cloud: In 2013, the MOE issued the "parent-child cloud assisted learning" app, and "guardian angel" software which were used for more

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than 10 million times. 40,000 persons used the MOE's e-mail service, and MOE's electronic dictionary is used 100,000 times each day.

l. Culture cloud: In 2013, the MOC issued its integrated iCulture service, which provides integrated access to information on art and cultural activities publicized on 42 public and private websites, and completed a browsing system containing 200,000 art collection information items. Mobile app has been downloaded 50,000 times and used for 300,000 queries.

(2) Electric vehicles

The "Development Strategies for Intelligent Electric Vehicle," which was approved by the Executive Yuan in April 2010, calls for the establishment of a suitable intelligent electric vehicle development environment between 2011 and 2016. This plan includes five major development strategies, namely "Set environmental and energy efficiency standards," "Promote the Pilot Program for Intelligent Electric Vehicle Operations," "Increase incentive for consumers," "Create a sound and friendly intelligent electric vehicles environmwnt," and "Support industry development." It is hoped that the intelligent electric vehicle pilot project (2014-2016) will result in the initiation of ten intelligent electric vehicle pilot projects, puting 3,000 intelligent electric vehicles on the road, making Taiwan's a major actor in international EV industry, and promote the formation of a domestic intelligent electric vehicle industry cluster.

The following results were obtained from the first phase of the plan (2011-2013):

a. Setting environmental protection/energy conservation standards:
In order to control carbon dioxide from vehicles, the EPA issued phase 1 carbon dioxide emission standards for sedans on December 13, 2013; taking 2009 as a base year, carbon dioxide emissions from sedans must be reduced by 15% in 2015.

b. Intelligent electric vehicle pilot project promotion plan:
A total of 289 electric sedans and 11 electric buses are currently in operation, and have traveled a cumulative distance of 2.1 million kilometers. The objective has been preliminarily achieved.

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c. Incentives for EV purchases:

In accordance with the Ministry of Finance's (MOF's) 2011 revision of the *Commodity Tax Act*, all commodity tax shall be waived on those electric vehicles purchased within three years of January 28, 2011. In addition, the revision of the *Vehicle License Tax Act* that took effect on January 6, 2012 authorizes local governments to waive vehicle license tax on electric vehicles purchased within three years.

d. Establishment of an EV-friendly use environment:

In order to establish a convenient environment for EV drivers, such as charging needs, the government has promoted the establishment of charging stations in transportation and tourist travel areas in northern, central, and southern Taiwan via the pilot project.

e. Assisting the development of the EV industry:

The government provided assistance to 11 electric vehicle manufacturers, and a total of 25 types of electric vehicle obtained the MOTC's safety inspection certification. The government further helped 102 EV-related firms including raw materials, systems integration, and whole vehicle companies to improve product performance. . In addition, the government induced the Philippines and French post offices, Bollore Group, Venturi, and PSA to seek suppliers of EV and key components in Taiwan.

Following analysis of international EV development trends, and review the state of Taiwan's industrial development and vendors' capabilities, in order to continue promoting intelligent electric vehicles, including the development of innovative business models, corporate investment and an industry value chain, the Executive Yuan approved the second phase of the "Development Strategies for Intelligent Electric Vehicle" in May 2014. This phase seeks to achieve the following goals:

a. Electric buses: Entering foreign markets after fostering the industry in the domestic market.

i. Quantity: A total of 10,390 vehicles, including 10,000 highway and city bus replacement jointly promoted by the MOTC and EPA (2014-2023) and 390 buses produced in MOEA–promoted pilot projects (2014-2016).

ii. Output value: TWD 12.2 billion in total (2016).

iii. Employment: Creating more than 2,234 jobs by 2016.

iv. Localization: Boosting the value-added rate of origin of production to over 50% by 2016.

v. Energy conservation: The plan is expected to reduce diesel consumption by roughly 63.9 million liters between 2014 in 2016, thereby reducing fuel expenditures by TWD 2.03.

vi. Carbon reduction: The plan will reduce carbon dioxide emissions by a cumulative total of 44,994 tons from 2014 to 2016, roughly equivalent to 113 times the quantity of carbon dioxide absorbed by Taipei's Da-An Park each year.

b. Electric motorcycles: Entry into international markets after supporting the formation of an industry chain in the domestic market.

i. Quantity: 37,000 electric motorcycles (2014-2017).

ii. Output value: TWD 1.2 billion (2017).

iii. Job creation: Creation of an average of 500 jobs each year.

iv. Localization: Enhancing the value-added rate of origin of production to 93% by 2017.

v. Energy conservation: The plan will reduce gasoline consumption by a cumulative total 4.33 million liters from 2014 to 2017, thereby reducing fuel expenditures by roughly TWD 150 million.

vi. Carbon reduction: The plan will reduce carbon dioxide emissions by a cumulative total of 8,203 tons from 2014 to 2017, roughly equivalent to 21 times the quantity of carbon dioxide absorbed by Taipei's Da-an Forest Parks each year.

c. Electric cars: Entering global supply chains after domestic development of key parts and components.

i. Promotion of at least two types of extended-range and plug-in hybrid electric vehicles by the industry.

ii. Assistance with the development of commercial vehicles such as

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construction vehicles or vans or trucks used for public projects.

iii. Promotion of entry into international EV supply chain for five or more manufacturers of key parts and components.

iv. Localization: Enhancing the value-added rate of origin of production to 55% by 2016.

v. Promoting the development of electric vehicles to meet the needs of state-owned enterprises and the use of electric vehicles by state-owned enterprises.

(3) Patent commercialization

Having promoted the industrial application of invention patents since 2009, the Executive Yuan approved the "Program for the Promotion of Invention Patent Industrialization" in November 2013, and has provided TWD 15.72 billion in total between 2010 and 2015. The Executive Yuan's vision, objective, and strategic measures are as follows:

a. Vision:

To establish successful models of industrialization of patented technology, and make Taiwan a leading patented technology trading nation.

b. Objective:

To integrate the resources of industry, academia, and research organizations, establish a patented technology industrialization service mechanism, and promote the attainment of the licensing and transfer stages by 5,700 patented technologies between 2010 and 2015.

c. Promotion Strategies:

Strategy 1: Establishment of a patent value-adding assistance consulting center

Strategy 2: Assistance for commercialization verification services

Strategy 3: Enhancement of the functions of Taiwan's technology trading and integration service center

Strategy 4: Integration of government resources in order to promote the industrialization of patented technologies

Strategy 5: Provision of assistance or funding for the industrialization of

individuals' patented technologies

Strategy 6: Provision of enhanced assistance measures to owners of patented technologies─smaller research organizations and schools.

Strategy 7: Provision of enhanced assistance measures to owners of patented technologies─companies and individual inventors.

d. Major results as of the end of May 2014:

i. Consulting visits: 3,016 cases

ii. Business plans or verification service: 725 cases

iii. Adding of value to patented technologies: 2,392 cases

iv. Number of firms participating in academic-industry collaboration: 5,130 firms

v. Number of licensing and transfer cases: 4,676 cases

vi. Promotion of use of human resources: 40,229 persons (including new and supporting jobs, and Master's and Ph.D. students participating in relevant projects)

vii. Stimulated private investment: TWD 19.25 billion

viii. Derivative economic benefit: TWD 76.00 billion

(4) Green architecture

Among the i-Taiwan 12 Projects, wireless broadband and digital content industries are listed as priority infrastructure projects. Approved by the Executive Yuan in 2001, the "Green Building Promotion Program" was initially targeted at the public sector. This was revised as the "Challenge 2008 Six-Year National Development Plan" in 2003, and local government buildings were included. The Executive Yuan also approved the "Green Building towards Eco-City Program" in 2008, and "Intelligent Green Building Industry Program" (2010-2015) in 2010.

The vision, objective, and strategic measures of this initiative are as follows:

a. Vision:

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To develop an intelligent green building industry with applied information and communications technologies on the foundation of existing green building knowledge, and thereby achieve the policy objective of making Taiwan a low-carbon island and an international green building leader.

b. Objective:

To pair Taiwan's advanced ICT with energy-conserving/carbon-reducing green buildings, help bring an intelligent green construction industry into being, meet people's need for safety, health, convenience, and comfort, satisfy energy conservation/carbon reduction requirements, achieve a comprehensive improvement in the quality of people's living environment, and create a new industrial development niche.

c. Promotion strategies:

Strategy 1: Conduct R&D innovative technologies for enhancing industrial competitiveness.

Strategy 2: Amend laws and regulations to eliminate constraints on industrial development.

Strategy 3: Cultivate professional talents to satisfy demands of industrial development.

Strategy 4: Provide demonstrative applications to drive industrial development.

d. Major achievements:

i. Conduct R&D of innovative technologies for enhancing industrial competitiveness: The government has bid recruitment for the following projects: the "Domestic Intelligent Building Cost and Benefit Survey," and the "Output Value Survey and Develop Projection of Taiwan's Intelligent Green Construction Industry," "Intelligent Building System Integration Technology and Standard-Symbol Electronic Drawing Block Production Extension," "the Supply and Demand Survey of Key Manpower for Intelligent Green Construction Industry (intelligent architectural design and systems integration)".

ii. Amend laws and regulations to eliminate constraints on industrial development: The National Property Administration, MOF publicized

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the "National Land Bid Request and Superficies Establishment Incentive Measures for Promotion of Green Architecture" in January 2014 with immediate effect.

iii. Training professional manpower to meet the industry's development needs (Cultivate professional talents to satisfy demands of industrial development): The government held green building seminars, green building policy awareness sessions for newly-built publicly-owned buildings, and Intelligent Building Mark workshops; and offered "low-carbon community" classes in 106 rural villages and communities to promote awareness of smart green buildings.

iv. Provide demonstrative applications to drive industrial development: The government provided grants to 15 special municipality, county, and city governments for green building promotion programs; implemented 23 water conservation assistance cases, which potentially saved 2.16 million tons of water annually and reduced carbon emissions by 590 tons/year; provided clean production and green building assistance to the Southern Taiwan Science Park; and implemented an intelligent green park development plan of the Advanced Research Park Provisional Office at the Central Taiwan Science Park.

5. Ten Key Service Industries

In view of export competitiveness, employment opportunities, and development potential, the Economic Advisory Group, Office of the President recommended to target ten key service industries, including the globalization of Taiwanese cuisine, international medicine, international logistics, music and digital content, the MICE industry, urban renewal, Chinese-language e-commerce, Wimax, a funding platform for high-tech and innovative industries, and expansion of foreign student recruitment. In December 2009, the Executive Yuan established the Executive Yuan's Service Industry Promotion Task Force, which is headed by the director of the CEPD and is composed of 3-5 experts and scholars and the heads of relevant agencies, including MOEA, MOTC, MOE, DOH, Council for Cultural Affairs, Council of Labor Affairs, Financial Supervisory Commission, and COA. The Service Industry Promotion Committee is actively promoting the development of the ten key service industries.

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The following items of the Ten Key Service Industries are connected with the development of S&T:

(1) Music and digital content

The Executive Yuan formally announced the "Creative Taiwan—Creative Culture Industry Action Plan" in May 2007. This plan, which was implemented from 2007 to 2013, provided focused support to Digital Content Industry Flagship Projects drafted by the MOEA. In the plan, the government integrated the manpower and resources of various parties in order to transform Taiwan into a leader in innovative entertainment and multimedia applications. The plan consisted of hardware/software integration stimulating the growth of relevant industries; diversification of creative efforts in order to encourage investment in the cultural creativity industry; international market expansion and promotion of cross-Strait industrial interchange; and expansion of the industry's manpower training capabilities.

With regard to the industry's value output, the digital content industry generated value of TWD 730.4 billion in 2013, which represented growth of 15.2% compared with 2012. As for industry investment, the plan helped induce cumulative investment of TWD 129.6 billion from 2009 to 2013, which contains investment of foreign companies from Japan and Mainland China. The targets of investment ranged from early product R&D to establishment of global value chains. With regard to manpower training, training was provided to a cumulative total of 9,881 professional personnel from 2009 to 2013; move than 70% of trainees find their jobs. The training program effectively narrowed the gap between university and the workplace. In addition, the government also intended to cooperate with game engine platform Unity Technologies, to train world-class personnel. The government further held the Game Jam, which promoted interchange between developers in Taiwan and more than 10,000 developers in 30 countries worldwide.

(2) Chinese-language e-commerce

Approved by the Executive Yuan in October 2010, the "Chinese-language e-Commerce Development Action Plan," set in motion interagency coordination mechanisms enabling the resolution of problems connected with funds, logistics, and the mutual certification of products when

Taiwanese e-commerce firms enter Chinese-language markets. The plan's chief promotional strategies include: (1) The selection of product categories suitable for sale in Mainland China employing a selection approach looking at companies' capabilities and product quality. (2) The use of platform bridging to help Taiwanese platform firms cooperate with their counterparts in Mainland China, and establish alliances with Chinese units in order to resolve issues comprising cross-border barriers. (3) The establishment of interagency coordination mechanisms and cross-border cooperation between logistics firms in Taiwan and Mainland China. (4) The establishment of consulting and e-commerce assistance teams able to provide Taiwanese firms with consulting services.

To date, this action plan has resulted in seven Taiwan e-commerce firms engaging in bridging cooperation with Chinese and Malaysian e-commerce platforms. As of the end of September 2014, assistance had been provided to a total of 608 distinctive companies employing 12 online platforms to access cross-border e-commerce markets.

(3) International logistics

In order to enhance Taiwan's global operations capabilities, increase linkage and cooperation between the customs, port, and trade systems, and promote the development of the logistics industry, in October 2009, the Economic Advisory Group, Office of the President recommended the listing of international logistics in the Ten Key Service Industries, with the goal of making Taiwan an important logistics value-adding and supply chain resource integration hub. This initiative's chief promotional strategies consist of: (1) Strengthening the foundation of Taiwan's logistics industry, and promotion of greater economies of scale and improvement of logistics management functions among logistics-related companies. (2) Promotion of secure and efficient logistics, and encouragement of linkage and cooperation between Taiwan's logistics industry and international supply chains via participation in international information cooperation frameworks. (3) Strengthening transportation infrastructure; reliance on re-engineering of the MOTC's administrative units to establish a cooperative network with domestic and foreign transportation, for seamless sea-land-air connections. (4) Cultivation of new business opportunities in Asia-Pacific supply chain logistics, and

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reliance on trade cooperation to encourage logistics cooperation and realize fully-integrated international supply chains.

This initiative's implementation results have included the training of 972 international logistics experts, 675 of whom received certification assistance, from 2009 to 2014; the provision of assistance to 30 firms seeking to establish or optimize their multinational supply systems, as well as establish 44 new logistics operating locations, from 2011 to 2014. Furthermore, the establishment of import, transshipment forwarding, and processing centers enabled 238 domestic parts and components vendors to increase their exports; the value of outsourced logistics services totaled TWD 31.6 billion, and logistics revenue increased to TWD 1.41 billion. In 2014, efforts for consolidation of supply chains assisted the international linkage and deployment of Taiwan's logistics networks and supported Taiwanese firms' global expansion; the government provided assistance in nine demonstration system establishment cases and six academic-industry operation planning cases, which increased overseas sales of products and purchases of key components in Taiwan by TWD 1.17 billion.

(4) WiMAX (Worldwide Interoperability for Microwave Access)

WiMAX is a type of metropolitan-area network technology involving microwave and millimeter wireless signals. WiMAX's baseband system employs OFDM technology, and it makes relatively high usage of bandwidth. WiMAX enables connection with the Internet via 802.11 (WiFi) wireless hotspots, and can serve as a wireless broadband access medium in corporate and residential environments. It is considered to be a wireless extension technology that can accompany cable or DSL. In 2005, in order to create a diversified broadband access environment and promote the development of Taiwan's WiMAX industry, the Science and Technology Advisory Group, Executive Yuan convened various relevant agencies to establish the "Taiwan WiMAX Development Blueprint Working Group," which issued the "Taiwan WiMAX Development Blueprint." This blueprint sets timetables for the development of service and application platforms, technology development strategies, spectrum planning, drafting of standards, and testing and certification. Domestic firms were encouraged to engage in WiMAX-related technology and product R&D. The MOEA signed a cooperation agreement

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with chip giant Intel in October 2005; and this agreement calls on the two parties to jointly establish and promote WiMAX technologies and applications in Taiwan. Apart from funding for development of WiMAX user-end and head-end hardware via the "M-Taiwan Application Promotion Program" implemented by the Industrial Development Bureau, MOEA, the government has encouraged the use of WiMAX technology to establish "wireless broadband cities." The establishment of commercial service operating systems will make a great variety of mobile application services even more ubiquitous throughout Taiwan. In addition, the "WiMAX R&D Acceleration Program" initiated by the Department of Industrial Technology, MOEA during the same year encouraged industry to engage in development of WiMAX-related technologies, such as mobile WiMAX (802.16e) chips, mobile WiMAX (802.16e) base stations, and systems integration. The government intends to encourage industry to commit itself to WiMAX technology and product R&D, which will enable Taiwan to occupy an advantageous position in the WiMAX industry supply chain. During the first half of 2007, more than 125,000 units of WiMAX CPE equipment was shipped, earning revenue of approximately US$28.1 million.

Furthermore, in 2008, the MOEA signed technological cooperation MOUs with major international WiMAX players including Alcatel-Lucent, Motorola, NEC, Nokia Siemens Networks, NORTEL, R&S, Sprint-Nextel, and Starent. The "Third-Term Plan for National Development in the New Century (2009~2012)," which was approved by the CEPD in December 2008, called for the creation of "Intelligent Taiwan," which would be characterized by an intelligent environment with wireless broadband and digital convergence networks, and integrated, innovative government services employing ICT technology. In 2009, the Economic Advisory Group, Office of the President recommended that WiMAX be included as one of the items to be promoted in the Ten Key Service Industries. Taiwan's WiMAX-related output value reached TWD 9.0 billion in 2009, over 90% of the world's WiMAX terminal equipment was made by Taiwanese firms, and Taiwan's R&D and manufacturing capabilities had been upgraded from terminal equipment to miniature head-end base stations. With government policy assistance, technology R&D and industrial expansion over the course

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of several years has led to the formation of a complete WiMAX industry chain, which includes key parts and components manufacturers, base station equipment firms, testing firms, systems integration firms, and user-end equipment manufacturers.

The "M-Taiwan Application Promotion Program" called for the promotion of diversified WiMAX application services, many of which have already been commercialized, such as a vehicle-borne unit and active electronic seal lock system employing GPS, a wireless sensor network, and DVR digital recording technology; this system employs a WiMAX network to provide real-time positioning information and images of cargo containers (bulk cargo) during transport. WiMAX's high-bandwidth and mobility also makes it useful in police monitoring systems. For instance, monitoring equipment worn by police patrolmen can transmit images to a police command center. When used in firefighting, this type of system allows front-line firefighting personnel to use a WiMAX audiovisual transmission unit to transmit information at the scene to a command station and back-end response center. This "WiMAX audiovisual management system" helps response center personnel immediately understand the situation on the front line, enabling them to make efficient, systematic commands and deployments.

The use of applications such as YouTube, Skype, and digital TV on mobile devices is still hampered by bandwidth restrictions. WiMAX can resolve mobile bandwidth needs, and can be applied to mobile healthcare and medical applications targeting isolated villages with few medical resources. For instance, patients can transmit information concerning their current condition to doctors, and the system can also be applied to residential care for the elderly, who can use WiMAX systems to monitor their blood pressure and vital signs, etc. When an ambulance is taking a patient to the hospital, another WiMAX application enables medical personnel to view a patient's case history, and transmit the patient's current vital signs, allowing the ambulance personnel to provide even more effective first aid.

Because of changes in the global industrial ecology, in February 2014 the WiMAX Forum announced that it would join forces with the GTI (Global TD-LTE Initiative) coalition proposed by TD-LTE to promote integration of the technological blueprints for WiMAX Advanced and TDD-LTE. This

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will create a global telecommunications standard platform and promote full compatibility between future WiMAX Advanced communications products and TDD-LTE products. When the time comes, WiMAX operators will be able to share TDD-LTE market resources, and both parties can jointly introduce integrated WiMAX and TDD-LTE application services. With the approval of Broadband Wireless Access (BWA) or IMT Advanced, products can be marketed bearing both WiMAX Advanced and TDD-LTE labels to indicate compatibility with both technologies. The two main WiMAX chip vendors—Sequans Communication and GCT Semiconductor—have both introduced WiMAX/TD-LTE dual-mode chips.

At present, Japan's UQ, Korea Telecom, and SK Telecom all have around one million WiMAX users, which has induced Japan and Korea to both embark on dual-mode network research campaigns. Furthermore, telecoms in such countries as the US, India, and Malaysia have gained extensive WiMAX network deployment experience, and are also acquiring TD-LTE network expertise. Taiwan should therefore take advantage of the business opportunity brought by the technological collaboration between TD-LTE and WiMAX Advanced, and employ commercial WiMAX networks in Taiwan to provide mobile broadband and content services; with its extensive industry chain as backing, Taiwan is well-positioned to play a key role in the development of the 4G industry.

(5) Export of higher education

In June 2010, the Office of the President concluded that Taiwan's higher education enjoyed advantage export, and called for efforts to establish an internationally-appealing campus environment, perform marketing of higher education in Taiwan, and encourage outstanding international students to work for Taiwanese firms operating globally. In November of the same year, the Executive Yuan established the "Higher Education Industry Export Promotion Task Force," which is responsible for supervising the interagency drafting of an overall strategy for higher education exports and coordinating promotional efforts by various agencies.

In 2013, international students in Taiwan numbered 78,261, which represented growth of 18.53% compared with 2012. During that year, 33,206

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international students were enrolled in degree programs, and 45,055 were in non-degree programs (42.4% vs. 57.6%). By place of origin, the number of international students from Mainland China studying at the university level had increased the fastest, and numbered 25,120 in 2013 (32.1%). Students from ASEAN 10 countries numbered 20,305, and accounted for roughly one-quarter of all international students. Students from Malaysia numbered 10,374 (13%), and those from Japan numbered 5,726 (7.3%). Most international and overseas students studying in Taiwan also come from Malaysia, Vietnam, and Indonesia.

The following is a summary of the results of major tasks in the "Study-in-Taiwan Enhancement Program" (2011-2014):

a. With regard to implementation of the "University All-English Degree Program Class Inspection Plan," of the total of eight classes at six universities visited in 2013, three received high recommendations and four received recommendations. Thus far in plan implementation (2011-2013), a total of 137 degree programs at 40 universities accepted on-site inspection, of which 47 received high recommendations and 81 received recommendations.

b. Easing restrictions on international and overseas students working in Taiwan after graduation: As Taiwan needs to cultivate and retain talent, and there had been no objective assessment standards for outstanding international and overseas students, the MOL has eased regulations concerning hiring standards in Taiwan for international and overseas graduates from universities. According to the new assessment system, after July 3, 2014, all international and overseas students graduating from a university (or above) in Taiwan who wish to remain in Taiwan to work shall be assessed and scored on the eight items - educational attainment, salary, work experience, qualifications for position, Mandarin and foreign language skills, maturation experience, and in line with government industrial development policies. Those students who receive a score of more than 70 points shall be issued a work permit. The work permit quota has been 2,000 during the first year of the new system. Measures allowing graduates to stay in Taiwan for work and internships are expected to induce even more international and overseas students to study in Taiwan, and will

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enable outstanding international graduates to remain in Taiwan, where they can help boost our international competitiveness.

c. Job broker service for graduating international students: The Bureau of Foreign Trade, MOEA and Department of Investment Services, MOEA have commissioned the Taiwan External Trade Development Council (TAITRA) to hold broker sessions pairing international and overseas students in Taiwan with domestic companies. These sessions enable overseas Chinese students, foreign degree students, and Mandarin students to participate in short-term intensive training or internships provided by domestic companies, so that they can help domestic companies to expand their overseas markets. Five sessions were held in Taipei, Tainan, Taichung, Hsinchu, and Kaohsiung in 2014, and a total of 129 companies and 287 seed personnel took part in 976 interviews conducted at these events. These broker sessions were parts of the "Emerging Markets Trainees Subsidy – Emerging Markets Trade Pioneers Project." A total of 61 seed personnel began working for companies in Taiwan during 2014, and a total of 232 placements were made between 2009 and 2014.

d. Project to encourage elite students from Southeast Asia to study in Taiwan (Elite Study in Taiwan, ESIT): This project is intended to enhance interchange with major countries in Southeast Asia. Bilateral education forums between Taiwan and Indonesia, Thailand and Vietnam have been held. University lecturers and government officials from Indonesia, Thailand, and Vietnam are encouraged to study for master's or Ph.D. degrees, or attend training programs, in Taiwan with grants; a total of 645 such persons have studied in Taiwan to date.

e. In order to enhance the role of overseas Taiwan education centers and strengthen marketing of the advantages of higher education in Taiwan, the MOE provided funding to seven universities to establish nine Taiwan education centers in eight countries to promote Mandarin learning and recruit international students. These Taiwan education centers are located in Thailand (National Pingtung University of Science and Technology), Malaysia (Feng Chia University), Indonesia (National Taiwan University of Science and Technology), Vietnam (National Chi-Nan University), Mongolia (Ming Chuan University), the US (Ming Chuan University),

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Korea (Ming Chuan University) and Japan (Tamkang University). The MOE has also provided funding to National Tsinghua University for the establishment of two "Taiwan Education Center" in India. It is hoped that these institutes will effectively highlight the features and resources of individual schools, while marketing the advantages of Taiwan's higher education.

(6) A fund-raising platform for high-tech and innovative industry:

In 2009, acting in accordance with the views of the Economic Advisory Group, Office of the President, CEPD included the "Fund-Raising Platform for Hi-Tech and Innovative Firms Action Plan" among development strategies for focal service industries. In December of the same year, the Financial Supervisory Commission submitted a report concerning strategies for the development of the financial services industry at the third meeting of the Presidential Monthly Fiscal Panel. This report calls for strengthening the current advantages of Taiwan's capital market, consolidating corporate R&D capabilities, accelerating the formation of industry clusters, and establishing Taiwan as a fund-raising platform for high-tech and innovative businesses. The plan's objectives consist of: (1) Use of Taiwan's technological and fund-raising advantages to induce global high-tech and innovative enterprises to seek listing on the stock exchange or over-the-counter market in Taiwan, making Taiwan a regional fund-raising platform with industry characteristics. (2) Establishment of a capital market with ample funds, high liquidity, and international competitiveness. (3) Promotion of internationalization of the securities industry, and attraction of international technological enterprises interested in seeking listing on Taiwan's stock exchange or over-the-counter market, stimulating the development of high-tech and innovative industries in Taiwan.

From 2010 to 2013 this plan has achieved the following: In May 2013 Financial Supervisory Commission requested that the Taiwan Stock Exchange Corporation and Taipei Exchange (GreTai Securities Market) set the rules for international firms being exempt from certain review and processing procedures under the Securities and Exchange Act in special cases. With regard to market expansion, as of the end of 2013, a total of 289 high-tech and innovative enterprises had obtained listing on the stock exchange or

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over-the-counter market, listed companies has raised TWD 1.88 trillion in Taiwan, and high-tech and innovative enterprises had a market value of TWD 13.9 trillion. In conjunction with the timetable for offsetting up a Cross-Strait currency clearing mechanism, the government oversaw the Taipei Exchange's (GreTai Securities Market) establishment of a yuan-denominated bond system, which initiated the yuan bond market in Taiwan. As of the end of December 2013, Formosa Bonds with a total value of RMB 10.6 billion had been issued. In order to expand securities traders' business scope, in February 2013, the Financial Supervisory Commission allowed securities traders to buy and sell securities in the Mainland China Area both on their own behalf and under commission to professional investors. This responded to the overseas investment needs of securities traders and professional investors, and also helped securities traders to take advantage of opportunities to develop the cross-Strait financial market. As for easing restrictions on investment in Taiwan by mainland Chinese capital, in accordance with the consensus reached at the January 2013 Cross-Strait Securities and Futures Supervisory Cooperation Platform Meeting, as well as with the "Cross-Strait Agreement on Trade in Services " signed in June of the same year, the government increased the limit on investment in Taiwan by qualified mainland Chinese institutional investors approved by the China Banking Regulatory Commission and China Insurance Regulatory Commission from US$500 million to US$1 billion. To ensure that applicable accounting principles in financial statements are consistent and international standards, starting in 2013, listed and emerging stock companies have employed international financial reporting standards (IFRSs) when producing their financial statements, and the Financial Supervisory Commission will help companies with public offerings that are not listed on the stock exchange or over-the-counter market to adopt IFRSs in 2015.

6. National Science and Technology Development Plan (2013-2016)

According to the "*Fundamental Science and Technology Act*," in view of national development trends, the needs of society, and the necessity for balanced regional development, the government holds the "National Science and Technology Conference" once every four years to provide a basis for the government's blueprint

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for the development of S&T in Taiwan. In the 9th National Science and Technology Conference held in December 2012, the Executive Yuan explained the current state, overall developmental goals, strategies, and implementation directions of S&T development in Taiwan, and conducted a discussion of key issues affecting the development of S&T. The National Science and Technology Development Plan (2013-2016) was drafted on the basis of the conference's consensus and conclusions, and this plan has served as a foundation for the formulation of S&T policy and promotion of scientific and technological R&D.

The National Science and Technology Development Plan (2013-2016) includes the "current situation and review" and "overall goals, strategies and resources planning" and sets forth the following seven goals and strategic focal points:

Table 19 Goals and Implementation Strategies in the National Science and Technology Development Plan (2013-2016)

Goals	Implementation Strategies
To Raise Taiwan's Academic and Research Status	To enhance academic evaluation system; to establish academically based mechanisms for both pure research and problem solving; and to set up regulations on industrial-academic collaboration and conflict of interest.
To Strategize Intellectual Property Arrangement	To form an industrial IP protection network; to develop strategies to secure the intellectual property of the next emerging industries; to establish a mechanism of turning R&D results into emerging industries; and to construct a well-developed IP environment.
To Promote Sustainable Development	To integrate scientific assessment information, to build sustainable capacity for S&T research; to establish mechanisms for decision assessment and land-use conflict resolution; to strengthen technological innovation and its application; and to advance toward a green economy.
To Bridge Academic Research and Industrial Application	The discovery gap (from research to significant discoveries), the technology gap (from discovery to industrial strength technology), and the business gap (from technology to successful businesses).
To Advance Top-Down S&T Projects	To adjust the ways of choosing final proposals and blueprinting national S&T projects; to establish exit principles and procedures for national S&T projects; to reinforce the performance evaluation mechanism; and to adjust the formation of project topics and to link them with the up-, mid- and down-stream industries.
To Promote Innovation in S&T Industry	To create a proper distribution of the S&T budget; to establish a cooperative mode of academia responding to the questions posed by industry/ government; to introduce top international venture capital companies; and to take advantage of Taiwan's close relations with Mainland China and Japan.
To Address Taiwan's Human Resource Crisis in S&T Fields	To diversify our educational system; to incorporate market mechanism into our educational system; to develop industries related with professional training and value-added human resources; to increase Taiwan's competitiveness in brain gain.

Source: Adapted from the National Science and Technology Development Plan (2013-2016).

Following approval of the Plan by the Executive Yuan, the respective responsible authorities have drafted implementation plans for each key measure, and proposed yearly working focal points and specific indicators, as a basis for their implementation of the Plan.

7. Strategic Intellectual Property Programs: The Six Strategic Action Plans

In order to expand Taiwan's intellectual property portfolio, and advance and protect the innovations of domestic industry, in November 2012, the BOST approved the "Strategic Intellectual Property Programs," which included the "Creating and Using High-Quality Patents Action Plan," "Strengthening the Use of Cultural Content Action Plan," "Creating Excellence in Agricultural IPRs Value Action Plan," "Stimulating the Implementation (or Utilization) of Academic IPs Action Plan," " Implementing IP Circulation and Protection Mechanism Action Plan," and " Nurturing Sufficient Number and Excellent Quality of IP Practice Talents Action Plan." The government hopes that these plans will achieve the vision of accumulating a portfolio of forward-looking intellectual property, realizing the full value of intellectual property, improving protection of intellectual property, improving country's intellectual property infrastructure, and making Taiwan a power of intellectual property creation and use in Asia-Pacific.

The "Creating and Using High-Quality Patents Action Plan" established an interagency key patent portfolio task force to take charge of market analysis, patent analysis, and planning of patent portfolios. By using interagency resource to strengthen planning and creation of portfolios of patents in 25 key areas of national importance, this plan is encouraging industry, academia, and research organizations to increase their involvement in collaborative R&D. This plan is also establishing effective indicators of patent application quality in order to improve patent quality throughout industry, academia, and research organizations.

The "Strengthening the Use of Cultural Content Action Plan" has sought to establish a demonstration broker system, between the creative and utilization ends of the cultural industry, establish a platform for the leasing, digital display, and marketing of art works, promote the market value and opportunities for reuse of cultural content, expand the trading market of cultural product or content in Taiwan, Mainland China, and the Greater China area, promote the NPM Digital Value-Adding and Utilization

Plan, improve cultural content assessment methods and funds acquisition mechanisms, and establish mechanisms to prevent illegal circulation and use of cultural content or products.

The "Creating Excellence in Agricultural IPRs Value Action Plan" intended to establish intellectual property portfolios in emerging agricultural areas, promote the domestic and foreign registration and use of trademarks for agricultural products, maintain the superiority of plant varieties and actively seek foreign protection, step up negotiation concerning agricultural intellectual property, and assist in claiming intellectual property rights. This plan sought to conduct an inventory of patents connected with ten major agricultural technology and establish IP portfolios in 2014, encourage applications for over 50 patents, achieve at least 15 patent registrations, and complete over 10 technology transfer cases and investment in two start-ups.

The "Stimulating the Implementation (or Utilization) of Academic IPs Action Plan" was intended to promote the "PIONEER Grants for Frontier Technologies Development by Academia-Industry Cooperation," "Academic-Industry Technological Alliance Projects" and "Applied Research Incubation Projects." It is expected that the "PIONEER Grants for Frontier Technologies Development by Academia-Industry Cooperation" will yield at least 100 patents and over 50 derivative products; the "Academic-Industry Technological Alliance Projects" will provide funding for the establishment of 50 technological alliances, successfully promote the diffusion of technologies developed by the academic sector, and strengthen technological linkage between universities and industry; and the "Applied Research Incubation Projects "will fund academic research organizations' forward-looking research that is product oriented or has applications potential; it is expected that this plan will uncover and evaluate at least 13 promising early research efforts each year and train at least three research teams.

The goals of the "Implementing IP Circulation and Protection Mechanism Action Plan" include promotion of invention patent industrialization, reinforcement of the circulation, use, and management of industrial intellectual property, promotion of limited partnership of commercial organizations and mechanisms, expansion of channels for acquisition of intellectual property funds, strengthening of the capacity of patent search centers and shortening of invention patent review time to 22 months, establishment of a one-stop service counter and cloud knowledge base able to provide consulting service in intellectual property lawsuits, reinforcement of intellectual

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property lawsuit and response capabilities, provision of assistance to companies in establishing intellectual property risk assessment and intellectual property dispute resolution mechanisms, establishment of a business secret protection environment, and fortification of the protection of R&D results.

The "Nurturing Sufficient Number and Excellent Quality of IP Pratice Talents Action Plan" seeks to train personnel specializing in intellectual property practice by strengthening intellectual property practice faculty and courses of instruction in the higher education system, and encouraging universities to establish institutes of intellectual property. This project expects to provide professional training to practical workers 2,950 person-times, hold intellectual property skills certification examinations at least 1,750 person-times, and train at least 100 experts with patent portfolio or lawsuit analysis capabilities.

8. Green Energy and Low Carbon Master Plan

This action plan originated from the "Master plan on Energy Conservation and GHGs Emission Reduction," which was approved by the Executive Yuan in May 2010, whose action plan the "Nationally Appropriate Mitigation Actions" was subsequently approved in September 2010. This plan seeks to integrate various agencies' projects on energy conservation and carbon reduction, and thereby achieve the policy goals of specified in the "Sustainable Energy Policy Action Plans". Starting in 2011, under the management of the CEPD and in cooperation with the Bureau of Energy and MOEA, the EPA has issued an annual performance review report of the previous year's tasks. From 2010 to 2013, the "Nationally Appropriate Mitigation Actions" received approximately TWD 298 billion in funding, and conducted 909 subprojects; the plan has achieved a reduction in carbon emissions by at least 4.8 million tons annually, which represents an attainment rate of at least 120%.

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Table 20 Implementation Outputs of the "Nationally Appropriate Mitigation Actions"

Year	Subprojects	Funding (TWD million)	CO_2 reduction targets (10,000 tons)	Actual reduction (10,000 tons)	Attainment rate (%)
2010	300	1,08000	563	726	129%
2011	229	79,400	351	482	137%
2012	205	64,500	431	617	143%
2013	175	461,00	416	504	121%

Source: "Implementation of the Nationally Appropriate Mitigation Actions" website, Executive Yuan (http://www.ey.gov.tw/policy4/cp.aspx? n=960E6AF4E0D04C0A).

In conjunction with the merger of the "Steering Committee on Energy Conservation and Carbon Reduction" and "New Energy Development Action Committee" as the "Green Energy Low-Carbon Steering Committee" in May 2014, the "Nationally Appropriate Mitigation Actions" was renamed the "Green Energy and Low Carbon Master Plan," and comprised ten benchmark programs: (1) establishment of a sound and effective legal framework; (2) re-engineering of the energy system; (3) establishment of low-carbon communities and society; (4) development of a low-carbon industry structure; (5) creation of a green transportation network; (6) establishment of a new green landscape and ubiquitous green buildings; (7) enhancement of energy conservation/carbon reduction S&T capabilities; (8) promotion carbon reduction in public construction; (9) biochemical energy conservation/carbon reduction education; and (10) awareness and communication of energy conservation/ carbon reduction. The "Green Energy and Low Carbon Master Plan" set separate targets in terms of energy conservation and carbon reduction in 2014. With regard to energy conservation, the plan calls for the improvement of energy efficiency by at least 2% annually and a reduction in energy intensity by more than 20% by 2015 compared with 2005. Furthermore, the plan also seeks to rely on technological breakthroughs and relevant measures to further reduce energy intensity by more than 50% by 2025 compared with 2005. As for carbon reduction, the plan calls for reductions in nationwide CO2 emissions, and seeks to reduce emissions to the 2005 level (244 million tons) by 2020, and to the 2000 level (208 million tons) by 2025.

9. Smart Handheld Device Industry Development Strategy and Action Plan

Looking ahead to the next 10 years, smart handheld devices will be one of the most important drivers of the next wave of growth in Taiwan's information and communications industry. In order to focus the promotional efforts of industry, government, academia, and the research community, the MOEA organized the Smart Handheld Device Industry Promotion Committee in 2011, and drafted the "Smart Handheld Device Industrial Development Strategy and Action Plan." This program's vision includes: (1) establishment of a complete high added value, high-employment smart handheld device industry chain in Taiwan; (2) establishment of a diversified, vital applications service innovation environment able to enhance the added value of Taiwan's information and communications industry; and (3) collection of global resources in order to make Taiwan a world hub of smart handheld device commercialization and innovative applications. Developmental goals for 2015 include (1) promotion of at least one branded firm as an industry chain anchor which can integrate upstream parts and components manufacturers, and thereby boost the competitiveness and status of Taiwan in the smart handheld device industry; and (2) encouragement of new and additional corporate investments of over TWD 20 billion and assistance to the smart handheld device industry chain in achieving an output value of TWD 1.28 trillion, which is expected to promote the creation of 150,000 jobs in the smart handheld device terminal and parts industries.

The following five promotional strategies will be employed to enhance the competitiveness of the smart handheld device industry in order for the industry's rapid growth:

(1) Focusing of resources to fill gaps in key part and component production:

- Analysis of major international manufacturers' future products, services, and patent portfolios, and determination of key part and component gaps;
- Promotion of cooperation among domestic firms in supply chain, and integration of the R&D capabilities and resources of research organizations in order to enhance autonomy in key technologies.

(2) Promoting adoption of domestic key parts and components in system production:

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- Promotion of cooperation between system firms and domestic part and component manufacturers, establishment of procurement cases, and thereby develop models of cooperation;
- Employment of measures encouraging the domestic production of key parts and components to boost the percentage of parts, components, and equipment produced in Taiwan.

(3) Promotion of distinctive and innovative applications to create groundbreaking models in the world:

- Application services will ultimately determine the success or failure of smart handheld devices. The deep integration of application services and hardware devices can boost product added value, while also intensifying consumers' usage.
- Promotion of inter-industry cooperation among system firms will facilitate the development of technologies, business models, and applications that can be extensively tested in the domestic market. Drawing on the power of culture and lifestyle, close cooperation between industry in Taiwan and Mainland China will foster the cooperative development of Chinese-language applications services relevant to everyday life by Taiwan's system firms or telecoms and Mainland China's service providers. Finally, development models of application service can be expanded, and app stores, business models, and industry chains with distinctively Asian features can be developed in cooperation with Asian service providers.

(4) Building soft power employing open platforms:

- The competitiveness of smart handheld devices is largely determined by operating platform characteristics. In order to share the application service ecosystem, firms with operating platforms are seeking to achieve the horizontal extension of their platforms, such as extension from cell phones and tablets to PCs and TVs. Key open platform technologies play an important role in this current horizontal extension trend, and the training and cultivation of manpower can help promote open platforms.

(5) Strengthening up- and downstream linkage, stimulating industrial development:

- Taiwan's smart handheld device industry chain currently has gaps between its up- and downstream segments. Promotion of cooperation between domestic components manufacturers and system firms will consequently create a stronger industry chain. Afterwards, in accordance with consumers' needs, platforms and application services can be linked in the development of innovative terminal products, which will stimulate the development of key parts and components. Finally, firms can develop distinctive services on the basis of their control of applications platforms, which will enhance terminal value and competitiveness.

Achievements of this plan are as follows:

(1) Smart handheld devices have achieved a penetration rate of 57% in Taiwan, and have attracted corporate investment of TWD 28.1 billion. It is projected that Taiwan's smart handheld device output will have a value of TWD 1.18 trillion in 2014.

(2) Cooperation between branded system firms and upstream applications processor manufacturers stimulated growth in intelligent tablet shipments from producers in Taiwan in excess of 40% during 2013, which greatly boosted the global competitiveness and status of Taiwan's smart handheld device industry.

(3) Cooperation among industry chain firms with key technological capabilities has boosted the smart handheld device industry's command of technology and promoted the industry chain's development.

a. The joint development of AMOLED displays by panel and materials suppliers has successfully reached the mass production stage, and the resulting products have been adopted by system firms' supply chain, enabling the monopoly of large vendors to be overcome.

b. The government's efforts to encourage cooperation between battery suppliers and downstream branded system firms has facilitated the development of high capacity battery technology in Taiwan and greater industry chain localization.

(4) The promotion of horizontal alliances has paved the way to applications services with integrated hardware and software, promoting industrial upgrading.

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a. Education firms have collaborated with research organizations to complete the Mobile Learning education cloud application services platform and app development. More than 10,000 instructional videos and over 260,000 trainee study records have been produced, boosting the usage and "stickiness" of smart handheld devices.

b. Interdisciplinary collaboration among terminal equipment firms, systems integration firms, and hospitals has led to the joint establishment of intelligent mobile remote care demonstration cases (smart handheld terminal equipment + cloud health management platform).

(5) Competitions sponsored by the government featured a "companies pose problems, team solve problems" approach, and have helped to instill creativity and an entrepreneurial spirit while providing the smart handheld device industry with forward-looking manpower.

a. Fangcun Technology, a 3D UI vendor and communications competition champion, received investment from HTC, and led to the development of the "New One," which dramatically improved user experience, and received the Best New Cell Phone Award at the Mobile World Congress. This has enhanced HTC's soft power.

b. The award-winning communications competition team AirSig engaged in matchmaking negotiations with several potential partner firms. AirSig received a large amount of investment (US$2 million—roughly TWD 60 million) from the Hon Hai Group in September 2014.

In view of the likelihood that smart handheld devices will drive the next wave of growth in the information and communications industry, the MOEA drafted the "Smart Handheld Device Industry Development Strategy and Action Plan." Following intensive discussions between industry experts and the government at three conferences, the Executive Yuan approved this initiative, which calls for total funding from all relevant agencies of close to TWD 12.0 billion from 2011 to 2015. By forging an unbroken industry chain, the initiative is to help the smart handheld device industry chain to achieve an output value of TWD 1.28 trillion by 2015, while stimulating new corporate investment in excess of TWD 20.0 billion. Apart from the establishment of an industry chain for key parts and components, the gap between manpower supply and demand in the smart handheld device industry is critical, and manpower training

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programs will be better integrated. In addition, the adoption of applications service concepts at the early product design stages by up- and downstream firms has achieved an early-stage "Design In" advantage, and established Taiwan as a global center of smart handheld device commercialization and innovative application.

10. Renewable Energy Development Plan

The promotion of renewable energy is one of the "sustainable environment" focal points of the 2014 National Development Plan. In order to achieve the goal of reducing 2020 CO2 emissions to the 2005 level, and 2025 emissions to the 2000 level, the plan contains the policy focal points - "lending full support to the promotion of renewable energy resources," "enhancement of new energy S&T R&D capabilities, expansion of fields of development in green energy industry," "improvement of market mechanisms, laws, and institutional systems of energy conservation/carbon reduction," "acceleration of the shift toward low carbon emissions in industry, promotion of regional green energy resource integration," and "promotion of low-carbon green homeland, and encouragement of energy conservation and carbon reduction in everyday life." In addition, the plan also sets forth the following overall green energy and carbon reduction targets for the country:

(1) The country's renewable energy generating installed capacity will exceed 4,110 MW in 2014.

(2) In 2014, the green energy industry will have an output value of TWD 441 billion, and total employment in the industry will exceed 69,600 persons.

(3) In 2014, carbon dioxide emissions will be kept below 255 million tons.

(4) The promotion of a low-carbon homeland and energy conservation and carbon reduction in everyday life will reduce the public sector's power consumption by 1%, fuel oil and gasoline consumption by 1%, and water consumption by 2% compared with the previous year.

(5) An energy audit and energy conservation diagnostic service aimed at energy users with a contract power capacity in excess of 800 kW (approximately 4,620 users) will be implemented.

In order to achieve the foregoing carbon reduction objectives, the government has drafted and implemented action plans. For instance, the "Thousand Wind

Turbines Promotion Program" seeks to assist the attainment of commercial operation by planned or in-development wind power projects, develop terrestrial secondary wind farms, and provide grants promoting demonstration offshore wind farms. Furthermore, the Bureau of Energy, MOEA has embarked on the "Photovoltaic Power Overseas Market Expansion Project" and the "Millions Rooftop PVs Program," which seek to promote the installation of photovoltaic panels and the development of the industry. These projects have achieved the successful development of key materials and process technologies needed for the production of dye-sensitized solar cells, the design of prototype production machines, and the establishment of a portfolio of key patents. The technologies developed in the projects have included the production of titanium dioxide paste, the synthesis of high-efficiency light-sensitive dyes and ionic liquid, the fabrication of low-temperature platinum electrodes, an electrolyte formulation, and glue for use in packaging. The Industrial Technology Research Institute initiated third-generation solar cell R&D and production via a technology transfer agreement with the Formosa Plastics Corp. Backed by its existing core technologies, Formosa Plastics has actively begun the development of dye-sensitized solar cells, which will acceleration the development and production of solar cells that are readily customizable, available in different colors, and can generate power under low illumination conditions. It is expected that these solar cells will enter mass production in 2017, and it is preliminarily estimated that annual output will have a value exceeding TWD 30 billion.

To date, the "Millions Rooftop PVs Program" has achieved its goal of enlarging the photovoltaic market and boosting demand for photovoltaic installations. The installation goal for 2014 has been increased from 175 MW to 210 MW, and it is projected that cumulative installed capacity will reach 6,200 MW by 2030. In order to accelerate deployment of photovoltaic power systems in Taiwan, the Bureau of Energy has promoted a photovoltaic module registry system, and declared that the performance and safety of chip, film, and concentrator module products must comply with relevant requirements of the ROC national standards (CNS) or International Electrotechnical Commission (IEC) standards. Vendors may have their products listed on the "Photovoltaic Module Product Registry" website (www.tcpv.org.tw) for public reference and selection; a total of more than 2,000 photovoltaic module products had been listed on the registry as of July 2014.

11. Accelerated Promotion of Mobile Broadband Services and the Industry's Development

(1) Accelerated deployment of mobile broadband networks: The government has accelerated the deployment of a 4G network infrastructure in order to establish a ubiquitous mobile broadband environment and enable the public to use mobile broadband Internet services at any time or place. Current promotional strategies include interagency electromagnetic radiation guidance, promotion of co-constructed/co-located mobile communications stations, release of public land for the establishment of base stations, deployment of new-generation radio wave monitoring systems, and forward-looking spectrum planning.

(2) Innovative mobile broadband application services: The government will promote the accelerated development and roll-out of innovative mobile broadband services, strive to encourage a flourishing application service ecosystem, and encourage the provision of various innovative digital convergence services via 4G networks. The promotional strategies will include the establishment of 4G+ network access and applications testing environments, enrichment of 4G content services, development of advanced 4G commercial models, and establishment of ubiquitous 4G intelligent broadband applications in urban areas.

(3) Protection of consumers' rights and interests: By establishing an effective application environment, and maintaning safe and secure public use of 4G mobile broadband services, it is intended to achieve a win-win outcome between security and economics. In order to ensure information and communications security and protect the public, the government has adopted four promotional strategies of enhancing the quality of 4G online services, information security testing and certification, establishment of a sustainable environment, and provision of public welfare applications.

(4) Development of mobile broadband technology: The government will employ appropriate mechanisms to integrate the capabilities of industry, academia, and the research community, encourage domestic development of key technologies via common platforms linking industry, academia, and research organizations, and establish a portfolio of international communications

standard patents. Promotional strategies will include support for the development and application of novel mobile broadband technologies, wearable devices such as the "Incubation Platform for Mobile Devices program," and forward-looking next-generation technologies.

(5) Training of elite mobile broadband technical manpower: Enhancement of forward-looking communications instructional capabilities and establishment of a cutting-edge technological innovation research environment in order to meet the manpower needs of Taiwan's mobile broadband network industry and foster innovative mobile applications and accumulation of intellectual property portfolios. Promotional strategies will include establishment of inter-university instructional capabilities, creation of a cutting-edge technology practice and innovation environment, and promotion of international interchange and acceptance of international norms.

12. Innovation and Startups Taskforce

After discussing the subject of administrative planning concerning Internet communications and optimization, the December 18, 2014 meeting of the Executive Yuan resolved to establish the "Innovation and Startups Taskforce," in order to integrate and coordinate interagency innovative startup resources and policies, oversee innovative startup programs and major projects, enhance youth entrepreneurship skills, and optimize the innovative enterprise environment.

The Innovation and Startups Taskforce has a vision of "transforming Taiwan into the Silicon Valley in Asia-Pacific and a place where young entrepreneurs can realize their dream," and focuses on the five strategies of "creating physical and virtual entrepreneurship networks," "building an innovative startup-friendly environment," "developing clustering among innovative startups," "encouraging creative thinking and accelerating the incubation of youth startups," and "strengthening linkage to international resources." The Board is consequently engaged in planning and implementation of the following four key missions and focal points:

1. Social innovation and youth entrepreneurship: The Board will encourage youth entrepreneurship and social and corporate innovation; establish a virtual/physical integrated entrepreneurship resource platform; and provide a unified innovative startup service counter and entrepreneurship education.

2. International linkage: The Board will strengthen links with Silicon Valley and emerging markets throughout Asia-Pacific; and create channels of access to international funds, manpower, and knowledge.
3. Entrepreneurship environment: The Board will promote revision of laws governing the virtual world and startups; study relevant issues concerning laws and regulations governing innovative startup; and find ways of overcoming or easing onerous legal and regulatory restrictions.
4. Innovation ecology and environment: The Board will strive to create world-class startup clusters and help innovative startups obtain access to funds and incubation services.

13. Higher Education Innovation and Transformation Program

Higher education has always played a crucial role in the development and transmission of knowledge and the cultivation of high-skilled human resources. At the same time, higher education also bears a significant responsibility for the promotion of industrial innovation and social development. Responding to domestic and international changes such as the increasing importance of the knowledge economy and globalization, intense international competition, and a sharp decrease in the number of students caused by Taiwan's declining birth rate, higher education must urgently reposition itself and enhance its quality if it is to play a major role in strengthening Taiwan's global competitiveness.

With this background in mind, the MOE announced the "Higher Education Innovation and Transformation Program" on March 27, 2015. This program sets four objectives - "ensuring the quality of higher education," "guiding the development of high-level human resources," "boosting universities' production of knowledge," and "school closure assistance for personnel and students," and sets forth the following four strategies:

1. Promotion of high-level manpower: Establishment of training mechanisms for matchmaking intermediaries, promoting the transition of elite academic personnel to industry, and the value-added cultivation of manpower in industry, academia, and research organizations.
2. School closure assistance: The program will establish relevant assistance mechanisms, protect students' right to education, and help instructional

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personnel apply for retirement or seek employment at other schools or private organizations.

3. Reshaping the higher educational model: The program will enhance academic-industrial collaboration, international cooperation, and experimental education. In addition, the MOE will help universities to develop individual distinctive features through a two-stage process of legal and regulatory easing, which will include the stages of revision or reinterpretation of existing legal orders and administrative directives, and the inclusion of the Higher Education Innovation and Transformation Act among the accompanying measures of Higher Education Innovation and Transformation Program.
4. University cooperation and consolidation: The program is relying on the promotion of inter-school alliances, departmental adjustment, flexible use of school land, and merger of universities to integrate regional resources, provide resource support, and further adjust the scale of higher education and regional development features.

In order to implement the foregoing four strategies, MOE has drafted the following three accompanying measures:

1. Three-in-one promotional office: The Executive Yuan will organize an interagency task force to coordinate related actions by relevant agencies and legal revisions, and will establish a "Higher Education Innovation and Transformation Office" under the Ministry of Education to promote the innovative transformation of higher education, strengthen policy coordination and communication, and enhance the effectiveness of administrative assistance to schools.
2. Unified interagency coordination: To eliminate obstacles and help schools resolve problems, the government will call together agencies and local governments with relevant legal management responsibilities, provide assistance when needed in individual cases, and call on the Executive Yuan to perform coordination when necessary.
3. Drafting of a specific laws or regulations: Responding to Taiwan's declining birth rate, the MOE plans to draft a Higher Education Innovation and Transformation Act providing a legal basis for the innovative transformation of higher education, including the adjustment of higher education's business

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model, promotion of innovation in higher education, the full utilization of school resources, and enhanced competitiveness.

In January 2015, the MOE held a first working meeting, to discuss the framework and directions of the "Higher Education Innovation and Transformation Act" (draft). Collection of views from universities, colleges, and five major promotional associations began in February 2015, an interagency discussion meeting was held in March 2015, and a series of explanatory meetings was then held to explain the direction and content of the MOE's proposed law to various parties, and collect views that could be used to confirm the content of the law. It is expected that the proposed draft will be submitted to the Executive Yuan for review of its text in June 2015.

II. National Science and Technology Programs

In order to enhance the country's overall competitive advantage and respond to the economic needs of society, the government provides long-term, focused support for various national S&T programs, which rely on an interagency approach to integrate the resources of the up-, mid-, and downstream sectors and industry, government, academia, and the research community, and effectively boost R&D results through prioritized implementation.

1. Recent Programs

In 1998, the NSC proposed the first and second stages of the National Science and Technology Program for Telecommunications, which targeted wireless communications and broadband Internet. This program has not only achieved its original goals, but also lay the foundations for coordination and division of labor among industry, government, academia, and the research community in the field of telecommunications technology. The Networked Communications Program, which built on the cumulative results of the first and second stages of the National Science and Technology Program for Telecommunications, took telecommunications ICT as a basis, and encompassed the fields of communications, information, and integrated applications service technologies. This program also devoted attention to establishment of a legal and regulatory environment friendly for technology development. The program's goals include ensuring compliance with the global trend toward industrial integration and convergence, meeting the developmental needs of Taiwan's telecommunications industry.

The National Research Program for Biopharmaceuticals (the new program resulting from the merger of the National Science and Technology Program for Biotechnology and Pharmaceuticals and the National Research Program for Genomic Medicine) was launched in 2011, and was intended to strengthen mid-stream development, and achieve the industrialization of R&D results with verification and added value through pre-clinical testing and clinical trials. Many government agencies including MOST, MOEA, DOH, and the AEC are involved in this program, and various universities, the Academia Sinica, Development Center for Biotechnology, National Health Research Institute, Center for Drug Evaluation, and various medical centers and corporations are implementing it.

The National Project for Intelligent Electronics (which built on the results of the National Science and Technology Program for Systems-on-Chip) got underway in 2011. In accordance with the conclusions of the June 2009 "Taiwan Semiconductor Industry Upgrading Strategy Planning Conference," this program has the goals of supporting innovation and applications in the electronics industry, integrating IC firms, systems firms, and support systems, enhancing product added value, and promoting the growth of the electronics industry. The National Project for Intelligent Electronics was accordingly approved in 2009, and was going to be implemented from 2011 to 2015. The project's chief development item consists of "MG+4C," which refers to electronics technology in the six areas - Medicine, Green Energy, plus Computers, Communications, Consumer Electronics, and Car applications.

In line with the resolutions of various government energy conferences, National Science and Technology Program-Energy has sought to integrate resources, map out energy technology development strategies, and select areas of energy technology for future R&D campaigns. The program also hopes to achieve the following goals: (1) boosting energy autonomy, (2) reducing greenhouse gas emissions, and (3) establishing an energy industry through the allocation and adjustment of an energy technology budget. The first stage of the program was carried out from 2009 to 2013, and the second stage will continue from 2014 to 2018.

The Taiwan e-Learning and Digital Archives Program, which was completed at the end of 2012, developed the infrastructure needed for e-learning and digital archives, including the establishment of databases, education concerning usage and user information, promotion of access to the Internet, drafting of relevant laws and regulations by government units, accumulation of administrative experience, and

promotion of academic research, industrial application service capabilities, and market development.

In order to keep pace with advances in nanotechnology and create new opportunities for industry in Taiwan, the 157th meeting of the NSC committee approved the six-year (2003-2008) National Program on Nano Technology (1st stage) in June 2002. This program sought to integrate the capacities of industry, universities, and the research community for the purpose of establishing the nanometer platform technologies needed for advanced academic research and industrial applications. In addition, in order to create a high-added-value knowledge industry centered on nanotechnology IP on the results of the first stage of the program, the master planning report for the second stage of the National Program on Nano Technology (2009-2014), issued in April 2008, called for focusing of resources on the development of industrial applications to achieve the goal of "industrialization of nanotechnology." The objective of the second stage of the National Program on Nano Technology is to take advantage of R&D results to create competitive niches for industry and lay the groundwork for the next wave of high-tech industrial development. See Table 21 below for the period, funding, and participating agencies of each national S&T program.

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Table 21 Period, Funding, and Participating Agencies of National Science and Technology Programs

National S&T Program	Stage	Period	Total Funding (TWD Thousand)	Responsible Agency	Participating Agencies
Networked Communications Program (originally National Science and Technology Program for Telecommunications)	1st stage 2nd stage 3rd stage	1998-2003 2004-2008 2009-2013	10,672,934 13,350,160 11,068,000	MOST	MOEA, MOST, MOE, Department of Posts and Telecommunications, MOTC, NCC, MOHW, Chunghwa Telecom Laboratories
National Research Program for Biopharmaceuticals	1st stage	2011-2016	16,683,142	MOST	MOEA, AEC, MOHW, MOST
National Project for Intelligent Electronics	1st stage	2011-2015	12,435,000	MOST	MOEA, MOE, MOST
National Science and Technology Program-Energy	1st stage 2nd stage	2009-2013 2014-2018	30,776,000 25,366,936	MOST	MOST, MOI, MOE, MOTC, EPA, AEC, COA, MOEA
Taiwan e-Learning and Digital Archives Program	1st stage	2008-2012	8,905,530	MOST	MOE, MOEA (Industrial Development Bureau, Department of Industrial Technology), DGPA, Overseas Community Affairs Council, Republic of China, MOL, MOC, Hakka Affairs Council, CIP, MOST, NPM, Academia Historica (Taiwan Historica), National Central Library, National Museum of Natural Science, Chinese Taipei Film Archive, National Taiwan University, Academia Sinica, Taiwan Provincial Consultative Council, National Archives Administration, NDC
National Program on Nano Technology	1st stage 2nd stage	2003-2008 2009-2014	22,307,075 22,075,172	MOST	MOST, MOEA, MOE, AEC, EPA, MOHW, MOL

Source: MOST.

To date, the national S&T programs have had excellent achievements. The performance indicators shown in Table 22 reveal that the National Science and Technology Program-Energy has achieved the largest growth in academic papers, and brought about an increase in academic output from 1,656 papers in 2010 to 2,270 in 2013. However, academic papers resulting from the Taiwan e-Learning and Digital Archives Program decreased from 650 in 2010 to 451 in 2012. With regard to support for master's and Ph.D. students, taking 2013 as an example, the National Program on Nano Technology and National Science and Technology Program-Energy supported

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the education of the greatest numbers of master's and Ph.D. students (2,678 and 2,270 persons respectively). The Networked Communications Program and National Program on Nano Technology achieved the greatest growth in the number of patents (from 109 cases in 2010 to 409 in 2013 and from 326 cases in 2010 to 444 in 2013 respectively). In the case of technology transfer cases, the Networked Communications Program displayed outstanding performance, and brought about an increase in the number of 75 cases in 2010 to 101 in 2013, with technology transfer licensing fees rising to TWD 177 million in 2013. As for promotion of corporate investment, the Networked Communications Program induced investment of roughly TWD 39.2 billion between 2010 and 2013, while the National Science and Technology Program-Energy brought about an increase in investment from TWD 7.37 billion in 2010 to TWD 12.9 billion in 2013.

Table 22 Outputs of National Science and Technology Programs

Program Name	Performance Indicators	Units	2010	2011	2012	2013
Networked Communications Program	Papers published	Papers	810	775	1,237	1,002
	Master's and Ph.D. students	Persons	351	391	548	406
	Patents obtained	Cases	109	202	339	409
	Technology transfer cases	Cases	75	103	132	101
		Licensing fees (TWD thousand)	273,643	234,530	179,961	177,424
	Corporate investment	Amount (TWD thousand)	27,249,817	27,330,230	27,733,779	39,198,340
National Research Program for Biopharmaceuticals	Papers published	Papers	-	113	292	375
	Master's and Ph.D. students	Persons	-	321	529	343
	Patents obtained	Cases	-	14	29	53
	Technology transfer cases	Cases	-	25	31	25
		Licensing fees (TWD thousand)	-	2,221	24,810	34,034
	Corporate investment	Amount (TWD thousand)	-	1,606	100,500	102,642
National Project for Intelligent electronics (National Intelligent Electronics Program)	Papers published	Papers	-	1,028	1,070	1,058
	Master's and Ph.D. students	Persons	-	1,917	2,723	1,680
	Patents obtained	Cases	-	106	88	160
	Technology transfer cases	Cases	-	62	70	58
		Licensing fees (TWD thousand)	-	474,000	81,297	64,950
	Corporate investment	Amount (TWD thousand)	-	321,475,000	267,328,542	244,913,114

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Program Name	Performance Indicators	Units	2010	2011	2012	2013
National Science and Technology Program-Energy	Papers published	Papers	1,656	3,283	3,669	2,270
	Master's and Ph.D. students	Persons	2,406	2,643	2,898	2,306
	Patents obtained	Cases	452	276	401	385
	Technology transfer cases	Cases	199	292	348	216
		Licensing fees (TWD thousand)	214,039	462,228	343,010	258,075
	Corporate investment	Amount (TWD thousand)	7,369,330	11,159,007	10,316,600	12,949,586
Taiwan e-Learning and Digital Archives Program	Papers published	Papers	650	638	451	-
	Master's and Ph.D. students	Persons	518	793	262	-
	Patents obtained	Cases	9	16	6	-
	Technology transfer cases	Cases	34	32	26	-
		Licensing fees (TWD thousand)	12,884	12,201	6,632	-
	Corporate investment	Amount (TWD thousand)	449,726	606,623	196,236	-
National Program on Nano Technology	Papers published	Papers	1,474	2,088	2,216	2,016
	Master's and Ph.D. students	Persons	1,991	2,640	3,079	2,678
	Patents obtained	Cases	326	457	477	444
	Technology transfer cases	Cases	172	105	206	195
		Licensing fees (TWD thousand)	223,740	200,000	325,395	246,830
	Corporate investment	Amount (TWD thousand)	2,959,049	2,839,000	5,141,844	5,337,453

Source: MOST.

2. System Reform

The "Transition/Exit Mechanism and Actions for Improvement of National Science and Technology Programs" which was approved by the NSC in 2013, specifies reasonable, workable mechanisms for program formation, management and exit for existing and newly-established national S&T programs.

1. Program Formation

Adjustments have been made to the planning and topic request procedures for national S&T programs. In the past, a chief principal investigator was in charge of overall planning of a national program, an executive directors was hired, and project proposals requested in, which was

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effectively an "outsourcing" approach. After adjustment, each program's chief investigator and executive director bear responsibility for planning R&D focal points, and each R&D focal point is realized as an axial project; the axial projects are then announced, proposals requested, and teams selected. This approach was intended to improve the evaluation process. Furthermore, the current independent approach to program implementation facilitates better management and performance evaluation, as well as program exit or revision when needed.

Program master planning reports are recommended by MOST and the BOST and reviewed by an assessment committee composed of domestic and foreign experts. The review committees for axial projects are composed of domestic and foreign experts, scientists, and industry experts from a list of candidates submitted by the program office and the MOST unit in charge of the program, and subsequently approved by the MOST. In order to facilitate the programs' focus on mission-oriented R&D projects, industry experts must account for a certain percentage of committee members.

The executive directors of axial projects are selected by the MOST from among research projects team candidates, and approved by the program steering committee.

2. Project Management

In order to ensure the most effective management and control, chief investigators and executive directors must maintain close to full-time involvement in project management. Chief investigators should be selected by the MOST minister and Executive Yuan Minister without Portfolio in charge of Science and Technology from among individuals with expertise in relevant fields with a background of university president, Academia Sinica fellow, or senior expert or scientist. Furthermore, chief investigators shall invite experts with R&D experience in relevant fields who possess large project management experience to serve as executive directors.

In addition, formation of the steering committee has also been improved, with government representatives comprising the heads or deputy heads of important agencies and domestic and foreign experts and scientists with practical or R&D experience serving as expert committee members.

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Furthermore, corporate managers or important executives from relevant industries are invited to serve as industry representatives. The number of scientists, experts, and industry personnel on steering committees must exceed the number of government representatives.

With regard to performance evaluation, master plans and axial projects must explicitly specify performance evaluation plans, and the performance of an axial project must be consistent with the performance requirements of the master planning report. Research projects resulting from public call for proposals must be subjected to annual performance evaluation. Projects that fail to meet reasonable targets may face reduction in funding or termination when a review meeting concludes this is warranted. When a project is established, apart from explanatory content, the master plan and axial project must both contain an exit plan for a prompt exit when a program has concluded, a program achieves its goals sooner than expected, or there is a major change in circumstances during implementation, or government policy is adjusted.

3. Phase-Out Mechanism

Phase-out is a normal step after the completion of programs, and is not performed only in exceptional cases. Apart from a program's normal conclusion, or when a program receives a poor performance evaluation, phase-out may also be performed at the following times: when a program reaches its goals earlier than expected, a program performs exceptionally well, or there are major changes in assumed conditions during implementation. Exit plans for national S&T programs must be drafted during the overall planning stage, and must be submitted to the steering committee for approval. In current national S&T programs, MOST shall convene an executive director coordination meeting to explain working methods, and chief investigators shall submit exit plans one year prior to the scheduled conclusion of each program. Program funding shall decrease progressively over a three-year period during the exit process, and research funding apart from funding for core program facilities shall, as a rule, decrease to 10% by the third year after exit (for example, research funding may decrease to 50% during the first year of the exit process, to 25% during the second year, and to 10% during the third year).

Exit plans must contain the following key items: (1) how R&D capabilities established in the program can be effectively utilized, (2) how R&D results can be effectively transferred to applications and industrial uses, (3) how R&D information (databases) will be subsequently maintained, (4) how research personnel assembled for a national S&T program can be diverted to appropriate fields, (5) recommendations for subsequent liaison among relevant R&D organizations, (6) the subsequent disposition of common core instruments and facilities established for R&D purposes, (7) handling of budget following program conclusion, (8) ownership of results, and (9) design for gradual budget decreases if the program is changed to a policy program; for instance, to facilitate policy implementation, a program may be transferred to the implementing agency after three years of progressive budget decreases.

III. Major Outputs and Innovations

A. Academic Research

1. Academia Sinica:

The Academia Sinica is the country's highest academic research institution, and has a mission that encompasses research in the humanities, social sciences, and sciences, the guidance, coordination, and rewarding of academic research, and training of high-level academic research manpower. The Academia Sinica contains 24 institutes and seven research centers, as shown in Table 23.

Table 23 Organizational Structure of the Academia Sinica

	Mathematics and Physical Sciences Division	Life Sciences Division	Humanities and Social Sciences Division	Total
Institutes	8	5	11	24
Research Centers	3	3	1	7

Source: Adapted from the Academia Sinica website (http://www.sinica.edu.tw/institute.htm).

The Academia Sinica emphasizes basic research, and selects forward-looking and original research topics as the subjects of interdisciplinary team projects on the basis of its collective experience in the three major academic domains. These projects are intended to uncover promising research manpower, develop new areas of knowledge, and establish research communities with an international competitive advantage and concern for local issues. Responding to rapid changes in the global environment, the Academia Sinica has also undertaken research projects addressing scientific issues connected with sustainability in recent years. The Academia Sinica's three major project types, "topical research projects," "forward-looking projects," and "in-depth projects" are briefly described as follows: Topical research projects focus on forward-looking, representative topics selected in various research fields. Apart from researchers, prominent domestic and foreign scientists may be invited to participate, and the projects seek to train high-level academic research manpower and realize promising results. In-depth projects are intended to encourage researchers to perform long-term, original research on important issues, which will enable them to fulfill their research potential and reward outstanding research manpower within the Academia

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Sinica. Forward-looking projects seek to recruit and reward young scientists with outstanding research results and development potential. These projects focus on forward-looking research topics where Taiwan possesses a competitive advantage, and are intended to cultivate world-class research personnel. The Academia Sinica's overall project funding allocation in recent years is as shown in Table 24.

Table 24 Overall Academia Sinica Project Input Funding

Units: TWD thousand

Item	2010	2011	2012	2013	2014
General Administration	123,740	90,620	94,570	75,991	103,441
General Academic Research and Assessment	2,773,713	2,640,382	5,456,865	5,343,418	5,304,161
Research in the Natural Sciences and Humanities & Social Sciences (including Mathematics & Physical Sciences, Life Sciences, Humanities, and Social Sciences)	7,195,768	7,255,334	4,718,220	4,729,342	4,618,970
General Physical Plant and Equipment	237,232	316,581	330,299	245,677	209,768
Total	10,330,453	10,302,917	10,599,954	10,394,428	10,236,340

Source: Academia Sinica.

Note 1: Starting in 2012, personnel expenditures associated with research in the natural sciences and humanities and social sciences have been shifted to general academic research and assessment.

Note 2: Not including Academia Sinica co-sponsored projects in 2013 (Taiwan Biobank).

Note 3: Not including projects receiving MOST project funding (excluding self-arranged funding) or Academia Sinica co-sponsored projects in 2014 (National Biotechnology Research Park, Taiwan Biobank).

2. Universities:

With the aim of enhancing Taiwan's S&T R&D standards, MOST relies on funding for specific-topic research projects to encourage researchers at universities and research organizations to engage in academic research. See Table 25 for an overview of numbers and funding amounts of MOST-funded specific-topic research projects in recent years. MOST provides funding for research projects in the areas of natural science, engineering and applied science, life science, humanities and social science, and science education on an annual basis. In natural science research, starting in 2012, the number of funded projects has remained around approximately 1,650, but the total amount of funding increased by roughly TWD 617 million in 2014 compared

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with 2013. In 2014, the numbers of projects funded by MOST comprised 1,732 projects funded by the Department of Natural Sciences and Sustainable Development, 5,151 projects funded by the Department of Engineering and Technologies, 2,695 projects funded by the Department of Life Sciences, 3,648 projects funded by the Department of Humanities and Social Sciences, 509 projects funded by the Department of International Cooperation and Science Education, and 20 projects funded by the Department of Foresight and Innovation Policies.

Table 25 MOST-Funded Specific-Topic Research Projects

Units: TWD million

Item	2011		2012		2013		2014	
	Projects	Amount	Projects	Amount	Projects	Amount	Projects	Amount
Department of Natural Sciences and Sustainable Development	1,603	2,802.75	1,643	2,811.30	1,653	2,667.26	1,732	3,285.04
Department of Engineering and Technologies	5,694	4,907.28	5,719	5,244.03	5,166	4,807.71	5,151	5,640.24
Department of Life Sciences	2,252	3,266.04	2,840	4,053.84	2,893	4,214.72	2,695	3,982.78
Department of Humanities and Social Sciences	3,863	1,888.74	3,825	1,958.80	3,817	2,133.27	3,648	2,049.60
Department of International Cooperation and Science Education	563	611.31	491	599.61	523	650.53	509	676.11
Department of Foresight and Innovation Policies	0	0	0	0	0	0	20	181.51
Other	1	0.28	0	0	0	0	0	0
Total	13,976	13,476.40	14,518	14,667.58	14,052	14,473.49	13,755	15,815.28

Source: MOST Academic Statistics Database (http://statistics.most.gov.tw/was2/) (date accessed: January 9, 2015).

Note: 1. Projects funded by the Applied Science and Technology Section have been included with projects funded by the Department of Engineering and Technologies since 2009.
2. Projects funded by the Council for Sustainable Development have been included with projects funded by the Department of Natural Sciences and Sustainable Development since 2008.

3. Academic Excellence:

With the rapid development of globalization, knowledge and innovation have become important means of boosting national competitiveness, and the world's leading countries have embarked on vigorous campaigns to boost knowledge innovation and manpower training. Starting in 2006, the government provided roughly TWD 10 billion annually for the "Development Plan for World Class Universities and Research Centers of Excellence" (initial project), succeed by "Aim for the Top University Project" in 2011. These projects have helped Taiwan's finest universities to approach the standards of top-ranked international universities in terms of infrastructure, experimental instruments and equipment, and infusions of international manpower.

Major results achieved from project implementation:

(1) A significant improvement in research quality: This project achieved a significant improvement in the international competitiveness of basic academic research and specialized R&D conducted at universities. A number of schools conducted inter-university integrated research. For instance, National Tsing Hua University developed high-frequency modulated LEDs and high-efficiency power transistors, which not only resulted in the publication of favorably-reviewed papers in international journals, but also the transfer of relevant technologies to prominent domestic and foreign semiconductor manufacturers. In addition, an international research team at National Chiao Tung University successfully decoded the mechanism by which Botrytis fungus breaches plants' immune defenses; the findings of this project were published in the October 2013 issue of Science.

(2) The steady growth of academic-industry collaboration, which has become a driver of corporate innovation: In 2013, funded schools received TWD 19.2 billion for academic-industry collaboration projects, the number of patents and new varieties totaled 1,498, income derived from intellectual property totaled TWD 476 million, and universities' R&D capabilities contributed to industrial innovation and social welfare.

(3) Excellent performance in internationalization and international cooperation: In 2013, funded schools held a total of 665 international conferences, attracted 9,452 foreign scientists to visit Taiwan, and provided 4,464 students from Taiwan with financial assistance to go abroad as exchange students and 9,394 international students to obtain degrees in Taiwan. According to QS (Quacquarelli Symonds) ranking results, 11 of the schools receiving funding under this project have entered the world's top 500, and are continuing to make progress. In particular, National Taiwan University achieved a global rank of 76th in 2014. Furthermore, in the Times Higher Education 2013 ranking of university reputation, National Taiwan University ranked at the 51st-60th level, which indicated continued improvement from the previous years. Thirteen universities in Taiwan were listed in a 2014 ranking of the 100 leading universities in Asia, and National Taiwan University ranked 14th. Furthermore, seven universities in Taiwan were included in list of the world's 500 top universities issued by Shanghai Jiao Tong University, in which National Taiwan University ranked 141st.

(4) Promoting areas of expertise in order to meet the country's future development needs: In order to meet the demand of society and industry by training top-notch manpower, in line with the "Executive Yuan Program to Strengthen Development of Basic Technology Needed by Industry," this project has worked together with university departments and subjects connected with basic industrial technologies to promote the balanced cultivation of manpower and encourage research on interdisciplinary technologies through course planning, manpower training, and innovative R&D, etc.

(5) Strengthening the development of research in the humanities and social sciences: In order to strengthen the development of the humanities and social sciences in Taiwan by taking advantage of universities' areas of specialization with in-school resources, the government has adopted measures such as offering general courses in the humanities and social sciences, holding humanities talks and lectures on special topics, participation in interdisciplinary research projects, publication of academic books, and manpower training focusing on the humanities and social sciences.

(6) Excellence in teaching, training of outstanding manpower, and recruiting

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of highly-qualified international faculty: Universities receiving funding bear responsibility for training manpower, and must also undertake teaching reforms. Apart from reforming general education and responding to industry's need for manpower with versatile skills by offering interdisciplinary courses, universities must also actively engage outstanding international instructional and research personnel, and strive to create favorable campus environments. Universities receiving funding must further respond to the rising public complaints concerning poorly-performing students by striving to improve learning spaces, and also various auxiliary teaching methods to increase learning motivation. Funding of TWD 50 billion has been allocated for the second stage of this project, which will be implemented from April 2011 to December 2016; yearly funding is shown in Table 26.

Table 26 Funding Needs of the Aim for the Top University Project

Units: TWD billion

Year	2011	2012	2013	2014	2015	2016	Total
Funding Needs	100	75	100	85	75	65	500
Product Period	4/1/2011 ~ 3/31/2012	4/1/2012 ~ 12/31/2012	1/1/2013 ~ 12/31/2013	1/1/2014 ~ 12/31/2014	1/1/2015 ~ 12/31/2015	1/1/2016 ~ 12/31/2016	6 years

Source: MOE Aim for the Top University Project.

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B. Development and Transformation of Taiwan's Science Parks

Taiwan's science parks are drivers of high-tech development, and core parks have been established in the northern, central, and southern parts of the country in accordance with national industrial development policy. The science parks now form the nuclei of three major industry clusters: In northern Taiwan, the Hsinchu Science Park comprises six parks located at Hsinchu (Hsinchu Science Park, Hsinchu Biomedical Park), Jhunan, Tongluo, Longtan, and Yilan. The Central Taiwan Science Park consists of five campuses located at Taichung, Huwei, Houli, Erlin, and Advanced Research Park. The Southern Taiwan Science Park has Tainan and Kaohsiung campuses. As of the end of March 2014, a total of 509, 166, and 187 firms had taken occupancy of the Hsinchu, Central Taiwan, and Southern Taiwan Science Parks; working personnel numbered 151,282 (including 3,070 Ph.D. holders and 41,225 master's holders), 31,252 (including 227 Ph.D. holders and 6,106 master's holders), and 70,459 (including 627 Ph.D. holders and 13,127 master's holders). Each park has its own specific developmental goals and points of emphasis (see Table 27). Fig. 7 shows the parks' annual operating revenue; while the global financial crisis in 2009 caused the parks' revenue to decline, the parks' total revenue has nearly doubled from 2003 to 2012.

Table 27 Overview of the Hsinchu, Central Taiwan, and Southern Taiwan Science Park

	Hsinchu Science Park	Central Taiwan Science Park	Southern Taiwan Science Park
Campuses	Hsinchu, Jhunan, Tongluo, Longtan, Hsinchu Biomedical, Yilan (6 campuses)	Taichung, Huwei, Houli, Erlin, and Advanced Research Park (5 campuses)	Tainan & Kaohsiung (2 campuses)
Area	1,348 hectares	1,708 hectares	1,613 hectares
Industry Clusters	Integrated circuits, computer and peripheral, communications, optoelectronics, precision machinery, biotechnology	Nanotechnology, precision machinery, nanomaterials, biotechnology, communications, optoelectronics and integrated circuits, green energy	Integrated circuits, optoelectronics, green energy and energy conservation, biotechnology
Number of Companies	509 companies	166 companies	187 companies
Working Personnel	151,282 employees Includes 3,070 Ph.D. and 41,225 master's, who together account for 29.28% of total persons	31,252 employees Includes 227 Ph.D. and 6,106 master's, who together account for 20.26% of total persons	70,459 employees Includes 627 Ph.D. and 13,127 master's, who together account for 19.52% of total persons

	Hsinchu Science Park	Central Taiwan Science Park	Southern Taiwan Science Park
Developmental Goals and Focal Points	Developmental goals: While upholding core values of "convenience, efficiency, loyalty, integrity, and competence," the park is striving to realize a vision of "establishing a superior park investment environment and contributing to the national economy." Development focal points: 1. Continued improvement of the park's investment environment, provision of convenient, efficient service. 2. Promotion of upgrading of high-tech industries, strengthening of companies' competitiveness. 3. Establishment of a low-carbon, green energy park, creation of a sustainable development environment. 4. Strengthening of cooperation between industry, government, academia, and the research community, enhancing industry's R&D capabilities.	Developmental goals: 1. Taking high-tech industry to a new summit: The park will increase its breadth and depth by promoting the development of a raw materials industry on the basis of its existing parts and components industry; integration of the resources of industry, academia, and research organizations will boost R&D capabilities; acquisition of high added value industries will encourage R&D innovation; strengthening of cooperation with international science parks and embrace of global standards; active recruiting of overseas manpower, and training of highly qualified human resources. 2. Establishment of sustainable operation and a superior investment environment: Designing the park as a humane, eco-friendly space; providing a superior living environment and convenient everyday functions; creation of high-efficiency, user-friendly operating mechanisms; provision of efficient EIA and other administrative procedures and a stable supply of energy and other utilities. 3. Promotion of industry clusters: The park will take advantage of regional resources and peripheral industries to promote the formation of distinctive industry clusters, which will focus capabilities and boost the park's competitiveness.	Developmental goals: To become a leading Asian high-tech industry and elite manpower center, ensuring that companies have no worries and local people have hope for the future. Development focal points: 1. Development of a complete optoelectronics industry cluster. 2. Establishment of a complete integrated circuit industry supply chain, including IC design, foundry, packaging and testing, semiconductor equipment industries. 3. The park's extensive integrated circuit, optoelectronics, and solar energy firms will enable it to attract even more relevant precision machinery investment, creating even stronger industry chains in the park. 4. Promotion of a biomedical equipment industry cluster at the Kaohsiung campus. 5. Active efforts to establish a green energy, low-carbon industry cluster at the Kaohsiung campus.
Publications	HsinChu Science Park Newsletter, Hsinchu Science Park Annual Report	Central Taiwan Science Park Newsletter, Central Taiwan Science Park Annual Report, History of Central Taiwan Science Park.	Southern Taiwan Science Park Newsletter, Industrial Safety epaper, Southern Taiwan Science Park Annual Report, A History of the Park Administration, Landscaping Plants at the Southern Taiwan Science Park.

Source: Hsinchu Science Park (http://www.sipa.gov.tw/); Central Taiwan Science Park (http://www.ctsp.gov.tw); Southern Taiwan Science Park (http://www.stsipa.gov.tw/); information current as of March 3, 2014.

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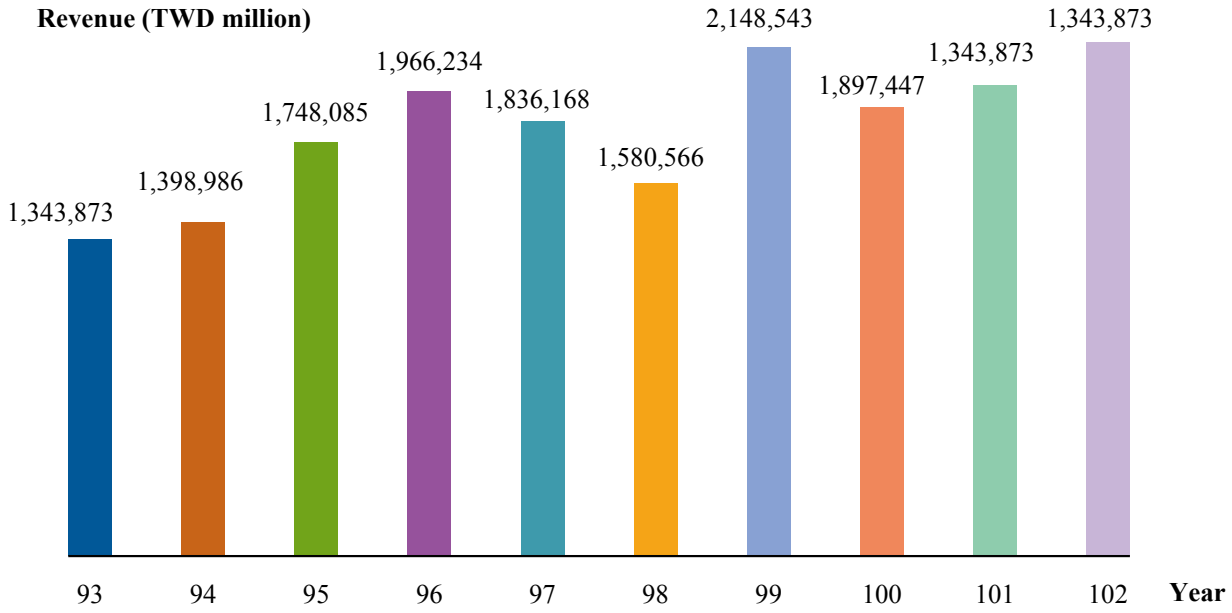

Fig. 7 Sales Revenue Trends at Three Major Science Parks

Source: Adapted from the Indicators of Science and Technology, 2014, MOST.

Note 1: Starting in 2004, revenue and number of employees have been based on data for firms at the Hsinchu, Southern Taiwan, and Central Taiwan science parks.

Note 2: Optoelectronics, precision machinery, and biotechnology revenue in 2006 was revised based on October 2013 data on the science park administration website.

In order to further develop the science parks, in conjunction with the Executive Yuan's "i-Taiwan 12 Projects" program, the government has embarked on development of a New Taipei-Taipei-Keelung-Yilan, Taoyuan-Hsinchu-Miaoli, and Taichung-Changhua-Nantou industrial innovation corridors. Apart from the existing parks at Hsinchu, Jhunan, Longtan, Taichung, Huwei, Houli, Tainan, and Kaohsiung, the government will accelerate development of the Tongluo Park, Yilan Park, Hsinchu Biomedical Park, and Advanced Research Park, and is actively upgrading the Erlin Park and recruiting high-tech firms. Furthermore, the government is enhancing park facilities and infrastructure in order to establish a superior industrial development environment, and is taking steps including strengthening of transportation facilities, improving the supply of utilities, promoting work safety and environmental protection, and enhancing building management, commercial, and information services. To ensure that the parks have a sustainable ecological living environment, the government is providing active assistance in energy conservation/carbon reduction, water conservation, power consumption, and promotion of green building projects. Furthermore, in order to advance customer-oriented government services and boost service performance and

quality, the government is selecting important service quality indicators as tools for determining areas requiring further strengthening.

In addition, government is implementing the "R&D Piloting Cooperation Projects between Industries and Academia at Science Parks," which relies on academic-industry collaboration models to encourage park firms to take advantage of the R&D capabilities of nearby academic research organizations and jointly embark on heterogeneous industrial integration and collaborative research on key technologies, while also training highly-qualified R&D personnel needed by industry, promoting transformation of the parks, accelerating the acquisition of high-added-value industries, and encouraging a shift from an efficiency-driven model to an innovation-driven model, and consequently driving the upgrade of high-tech industries.

C. Cooperation among Industry, Academia, and Research Organizations

1. MOST

The "National Science Council, Executive Yuan Implementation Guidelines for Encouragement of Private Enterprises and Academic Institutions to Engineering in Joint Research Projects," which was approved by the NSC—MOST's predecessor—on September 3, 1991, sought to pair cutting-edge applied research results at academic and research organizations with the needs of private enterprises, and help enterprises train R&D manpower by encouraging their active participation in applied research teams at academic and research organizations. The "Operating Guidelines for the Funding of Industry-Academic Collaborative Research Projects," which was approved by the NSC in December 2007, strengthened the academic-industry collaboration support system by setting forth funding models for pioneering, developmental, technological, and knowledge application academic-industry collaboration projects. In November 2012, the NSC further introduced the first stage of the "PIONEER Grants for Frontier Technologies Development by Academia-Industry Cooperation Program" ("PIONEER Grants for AIC Program"), which is aimed at companies working with advanced technologies, and approved two cases involving Taiwan Semiconductor Manufacturing Company (TSMC) and National Taiwan University, and China Steel Corporation (CSC) and National

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Cheng Kung University. Targeting academic research organizations possessing technological service capabilities, the NSC launched "Academia-Industry Technology Development Alliance Projects" ("Minor Alliance Projects") in February 2013. These projects have thus far established interdisciplinary technological platforms in the areas of cosmetics testing, optoelectronic roller printing, and low-carbon buildings. It is hoped that academic-industry alliances will boost the technological standards and product added value of Taiwan's SMEs, and the program will be a significant milestone in the history of academic-industry collaboration in Taiwan. In this regard, funding for joint academic-industry research increased from TWD 716 million in 2010 to TWD 816 million in 2013, and the number of granted patents has likewise grown steadily, rising from 65 in 2010 to 130 in 2013 (see Table 28).

Table 28 Outputs of Industry-Academic Collaborative Research Projects, 2010-2013

Item \ Year	2010	2011	2012	2013
Number of Projects (Cases)	944	868	863	842
Funding (TWD Million)	716.93	744.01	793	816
Participating Companies	954	896	883	829
Corporate Contributions (TWD Million)	301.63	349.23	347	306
Manpower Training (Master's & Ph.D. Students) (Persons)	2,057	2,037	2,179	2,081
Approved Patents (Cases)	65	75	130	130

Source: 2013 Annual Report of the National Science Council, Executive Yuan.

The NSC began implementation of the "Intellectual Property to Initial Public Offering Program" ("From IP to IPO Program") in 2013 in order to promote the industrialization of R&D results and stimulate economic growth. This program calls for the use of existing prototype development and technological testing facilities and service capabilities at science parks and national laboratories, private corporate sponsorships, assistance from entrepreneurship coaches with Silicon Valley experience, and angel investor match-up meetings to achieve successful examples of university startups.

(1) PIONEER Grants for AIC Program

The NSC and MOEA jointly launchedthe "PIONEER Grants for

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Frontier Technologies Development by Academia-Industry Cooperation Program" ("PIONEER Grants for AIC Program") in November 2012 in order to shrink the gap between academic research and industry practice, and effectively use academic research capabilities to boost industrial competitiveness. The NSC and MOEA also issued the "Implementation Guidelines for Academic-Industry Collaboration Trial Projects in Forward-Looking Technology" and "Supplemental Explanation concerning the Implementation Guidelines for Academic-Industry Collaborative Trial Projects in Forward-Looking Technology." These measures were intended to encourage companies in Taiwan to build up alliances, and join forces with universities and research organizations in line with an "industry posing questions and academic researchers providing answers" model to develop key technologies needed in next-generation products.

In these projects, a corporate alliance formulates research questions, and organizes a team with an applicant organization to jointly pursue forward-looking technology R&D. The corporate alliance must make a contribution of at least TWD 80 million annually, and at least 40% of this amount must be used to pay for research-related expenditures. The NSC and MOEA shall allocate TWD 400 million each year for the funding of approximately three university-industry collaboration projects. Two projects receiving funding under this program were approved in July 2013: "Pathfinding for 7-5 nm Semiconductor Technology Nodes Project," which is being implemented by a National Taiwan University and TSMC team and "Industry-Academic Collaborative Project on Next-Generation Steel, Green Manufacturing Process, and Innovative Applications of Products," which is being implemented by a National Cheng Kung University and CSC team. The projects got underway on August 1, 2013.

(2) Minor Alliance Projects

The NSC launched "Academic-Industry Technological Alliance Projects" (also known as "Minor Alliance Projects") on November 1, 2012 in order to help resolve the problem of insufficient R&D capabilities at Taiwan's SMEs. The projects encourage and fund the establishment of core technological R&D laboratories in universities, and promote the development of key technologies. Relevant SMEs are invited to join

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alliances with universities. In contrast with past one-on-one academic-industry collaborations, these projects pair universities' core technologies with numerous firms, achieving the goal of boosting industrial competitiveness through the use of the academic sector's technologies and resources, while also increasing academic researchers' practical experience and shrinking the gap between university and industry.

Each technological alliance participating in this program can receive up to TWD 3 million annually in funding, each project period may last up to three years, and each project may receive funding for two periods. During 2013, a total of 75 projects received funding, and total funding was close to TWD 150 million, implemented by 35 public and private universities and technical colleges and 509 companies received consulting service 1,041 times and in-plant assistance 560 times. The projects further provided practical industry experience to 1,715 university undergraduates and master's and Ph.D. students. A total of 92 academic-industry alliances received funding in 2014, including 52 led by public universities, 39 led by private universities, and one led by the Academia Sinica.

(3) Topic Selection and Incubation Fund

To promote academic-industry research cooperation and enhance the effectiveness of forward-looking industrial technology R&D, the NSC promoted the "Topic Selection and Incubation Fund" initiative, which initially took the biotech industry as a topic, and involved the search for various research projects that could result in promising products by an expert topic selection committee. It is expected that TWD 200 million will be devoted to this effort annually, and total academic-industry collaboration funding of at least TWD 600 million will be directed to early-stage forward-looking, original research on topics with commercial applications and market demand.

Approved in 2013, the "Provisional Guidelines for Funding of Applied Research Incubation Projects" call on the government to provide up to three years of funding assistance to forward-looking, original, early research that is product-oriented and has applications potential. In addition, to achieve an incubation effect and ensure that promising research results can successfully reach the market, the program has recruited individuals who are expert in

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relevant fields and possess corporate or venture capital incubation experience to join professional topic selection and assistance teams, and assess the feasibility of the industrialization of academic research results.

(4) From IP to IPO Program

To transform innovative R&D results into new enterprises, acting in accordance with relevant resolutions of the 9th National Science and Technology Conference, the NSC instructed Science & Technology Policy Research and Information Center, NARLabs to initiate the "Intellectual Property to Initial Public Offering Program" (also known as the "From IP to IPO (FITI) Program"). This program has the three short-/mid-/long-term objectives of "initiating an innovative startup trend," "directing Taiwan's bountiful innovative energies toward industry," and "passing on Taiwan's entrepreneurial spirit to new generations." The program integrates domestic and foreign incubation resources, encourages young people to boldly innovate, and introduces the substance of their innovations to the market, realizing the vision of boosting Taiwan's economy and entrepreneurial energy.

In addition to funding from the NSC, the program also receives more than TWD 20 million annually from 13 of Taiwan's leading companies. In addition, successful Chinese entrepreneurs and venture capitalists from Taiwan and Silicon Valley have been invited to serve as coaches teaching entrepreneurship courses and practical workshops. NARLabs and the three science park administrations bear responsibility for providing prototyping support, laboratory facilities, and assistance in applying for alternative service. Relevant entrepreneurial assistance resources are as shown in Table 29.

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Table 29 Overview of Entrepreneurial Assistance Resources

Entrepreneurial Assistance Resources	Content of Entrepreneurial Assistance Resources
All-round Practical Training	Creation of an immersive experience for entrepreneurial teams, provision of three-day/two-night practical training camps with far-ranging content, and holding of regular entrepreneurship talks.
Sharing of Experience by Silicon Valley Venture Capitalists	Silicon Valley venture capitalists of Chinese ancestry are recruited to provide guidance to entrepreneurial teams in Taiwan.
Entrepreneurship Coach Network	An entrepreneurship coach network with young entrepreneurs, entrepreneurship coaches in specific areas, and venture capitalists is formed.
Providing Science Park Facilities and Services for Startups	Provision of science park space and assistance.
Support from Leading Corporations	Outstanding entrepreneurial teams can receive TWD 2 million in startup funds from leading corporate teams.
Pairing with Angel Venture capitalists	Provision of fund-raising and results exhibition opportunities to entrepreneurial teams.
Provision of Minor Support	Teams are provided funding, grants, and startup funds in conjunction with MOST's incentive policies and selection mechanisms.
Technology Prototype Support System	To assist in prototype production, the prototyping centers established by the science parks and NARLabs provide space and technical and human resources.

Source: From IP to IPO Program Office, MOST.

The From IP to IPO Program has thus far assisted with the establishment of 26 startup companies in such fields as cloud services, innovation, and biotechnology. The program also helped raise TWD 74.4 million for a startup fund, and created 113 jobs (see Table 30).

Table 30 Outputs of From IP to IPO Program

Startups Established	26 (9 in cloud services, 12 in innovation, and 5 in biotechnology)
Paid-In Capital	TWD 55.6 million
Employment Opportunities Created (Cumulative Number of Employees)	113
Venture Capital Funds Raised with Assistance from the Program	TWD 74.4 million (amount voluntarily disclosed)
Cumulative Number of Startup Proposals Received	856

Source: From IP to IPO Program Office, MOST (survey results as of September 2014).

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(5) Germination Program

The government's long-term allocation of R&D funding has stimulated flourishing academic research and achieved impressive results. If commercial potential of promising research results can be uncovered and developed, this will significantly help industry in adding value. In order to help universities and research organizations in performing inventories of their existing research results, and uncover findings that can be used to promote the development of emerging industries or change existing industrial technologies, since 2011, the NSC has promoted the "Germination Program." It has funded the establishment of incubation centers by six universities. Interdisciplinary technology management teams organized by these incubation centers actively uncover original scientific results with major commercial potential, develop IP portfolios, and implement technology development and commercial development projects. This program has made a significant contribution to improving the capability of academic research organizations to move research discoveries from the laboratory to industry.

2. MOEA

In order to better accommodate industry's trends and needs, develop or acquire technologies needed by industry, and realize the transfer of technologies to industry, the Department of Industrial Technology, MOEA implemented three major policy measures, namely organization technology development programs, business innovation technology development programs, and academia technology development programs. The technology development programs are intended to strengthen industrial innovation and upgrading capabilities through the promotion of key technologies. The Executive Yuan's "Service Industry Development Plan" seeks to help service industries develop new business opportunities by transforming research organizations' technological capabilities into service industries' innovative ability. In addition, the "Strategic Service Industry Innovation and Development Program" and "Industrial Innovation Capability Platform Establishment and Extension Project" have induced professors and researchers to study service industry business models and applications.

To accelerate the technology upgrade in traditional industries and effectively boost companies' added value, technological upgrading and transformation has been included in the "Small Business Innovation Research (SBIR)" program, and the MOEA has also implemented the "Value-Added of Traditional Industries Plan" and "Local Industry Innovation Engine Plan," and established the "Platform for Alliances of Research Institutes Supporting Traditional Industries (PARTI)," Furthermore, in conjunction with the "Innovative industrial corridors" policy contained in the i-Taiwan 12 Projects initiative, R&D offices and industrial parks have been established in various locations to promote the birth of local emerging industries.

In 2013, funding for technology development programs totaled approximately TWD 14.1 billion, which accounted for roughly 78.4% of technology development funding and represented an increase of 0.31% compared with 2012. These projects resulted in a total of 2,173 patents, 869 patent applications, and 1,053 technology licensing cases, which have yielded roughly TWD 1.34 billion in technology licensing and intellectual property income, marking a sharp growth compared with 2012. In 2013, the academic sector devoted approximately TWD 537 million to technology development projects. So far the academic sector has created a cumulative total of over 3,800 patent applications and 1,400 patents. Furthermore, the transfer of patented results to industry has induced industrial investment in excess of TWD 1.6 billion, and created more than TWD 600 million in technology licensing fees. In order to stimulate innovation R&D by the business enterprise sector, the government has provided roughly TWD 18.5 billion funding, and this has induced cumulative direct or derivative corporate investment exceeding TWD 135 billion.

3. MOE

In order to boost regional collaborative performance by integrating academic-industry collaboration resources, starting in 2002, the MOE funded the establishment of six "Center for Regional Industry-Academia Collaboration" located in various parts of northern, central, and southern Taiwan. These centers are making positive impacts, with the extent of academic-industry collaboration increasing significantly and IP portfolios also expanding. Furthermore, in order to use universities' patented research

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results to help companies to engage in value-adding innovation, the MOE has established the "Networked Super Technology Licensing Office," which provides technology transfer matchmaking services. Since 2010, the MOE has also implemented the three-year "University Academic-Industry Collaboration Networked Alliance Program," which seeks maximize the overall value of intellectual property. And in order to provide customized professional curricula meeting the specific manpower needs of industry, the MOE began full-scale implementation of "industry academies" at technical colleges starting in 2014. The industry academies work together with cooperating firms to train technical personnel possessing practical skills; it is projected that at least 6,000 students will participate in practical training sponsored by this program each year.

In order to follow the example of leading countries and promote the industrialization of academic research results, the MOE has conducted a series of motivating activities such as the "High School Teacher Creativity Instruction Contest," "National High School and Vocational High School Student Special Topic and Creativity Production Competition," "University Innovative Entrepreneurship Cultivation Project," "Vocational Skills Renewal Innovative Entrepreneurship Promotion Strategy," and "Intelligent Living Innovative Entrepreneurship Incubation Platform Project," and practical assistance activities such as the "University Graduate Startup Service Program." These activities seek to use bountiful technical creativity of the academic sector to stimulate industrial development and instill entrepreneurial skills among young people, while also realizing young people's startup dreams with the help of entrepreneurship coaches and business guidance, commercialization matchmaking, fund-raising assistance, and other resources.

4. COA

The goal of the COA's cooperative projects involving industry, academia, and research organizations is to direct research to better meet the needs of industry and the market, employ academic-industry collaboration mechanisms to strengthen linkage between industry and academic researchers, support industrial technology R&D work, and assist industrial upgrading. In order to meet different categories of needs, the COA classifies instances of academic-industry collaboration as either general or policy-oriented. General academic-industry projects employ a bottom-up model, and focus on market demand.

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Companies can apply to implement various types of agricultural academic-industry collaborative projects intended to achieve the results sought by both academic and corporate participants. Policy-oriented academic-industry projects comply with top-down policy directions drafted by the COA after a survey of current agricultural technologies and actual needs. Interested companies with the necessary capabilities may submit applications for funding of the projects, which are intended to meet policy goals. Companies may submit applications for either type of project, and their cooperating partners chiefly consist of academic research organizations.

In order to strengthen cooperation among industry, government, academia, and the research community, and promote effective interaction, the COA had established a total of 14 agricultural biotechnology commercialization platforms, GMO R&D service platforms, and innovation incubation centers. In the area of agricultural biotechnology commercialization platforms, the COA established five commercialization platforms aimed at plant seedlings, aquaculture fry, safe agriculture, breeding livestock and poultry, and plant and animal molecular farming. There were 19 new technology licensing cases in 2012, which created TWD 8.07 million in licensing income. The three joint explanatory recruiting meetings held by the COA's innovation incubation centers in 2012 attracted 250 persons, induced a cumulative total of 51 firms to take up occupancy, promoted four technology licensing cases, one patent application, and two variety name registration applications. The incubation centers also induced companies to form horizontal alliances, stimulated over TWD 110 million in corporate investment, increased employment by 101 persons, cut costs by TWD 3.2 million, increased output value by TWD 11.5 million, increased corporate profit by TWD 10 million, and brought about the establishment of four startups.

In order to promote cooperation among companies, schools, and research organizations to boost the added value of agricultural R&D, the COA formally established the "Agricultural Technology Research Institute" on January 1, 2014. The COA hopes that the Institute will make value-added use of R&D results of other experimental research organizations, and help companies to undertake commercialization and industrialization. The Institute further seeks to encourage agribusinesses to add value to agriculture, strengthen

the international competitiveness of Taiwan's agricultural technology, and transform agriculture into a stable, competitive industry with a younger average age.

The Pingtung Agricultural Biotechnology Park combines value-adding with capital-intensive, and technology-intensive biotech R&D in agriculture, and is thus an excellent example of the transformation of agriculture. In conjunction with the Executive Yuan's strategy of adding value to agriculture through Free Economic Pilot Zones, the COA has been continuing to improve the park's hardware and software infrastructure and intensify occupant recruitment, as it strives to transform the park into a value-added agriculture and biotech industry cluster with a distinctive Taiwanese character. The park is expected to contain 120 agricultural biotech companies in 2018 and the value of production will reach TWD 18 billion by 2018, creating 6,000 employment opportunities.

As of June 2014, the Pingtung Agricultural Biotechnology Park contained 84 agricultural biotech firms, which had committed to total investment of approximately TWD 8.33 billion. These firms are involved in the 11 business categories of plant seedlings and their products, breeding livestock and poultry & specific pathogen-free animals and their products, aquaculture fry and aquaculture products, plant and animal pest and disease test reagents, animal vaccines, biological pesticides, biological fertilizer, high-tech Chinese herbal medicines (functional foods), plant and animal molecular farming, biotechnology services, and tropical fish for export. Firms in the park have an annual aggregate production value of close to TWD 3 billion, and have created approximately 1,150 jobs (see Table 31).

Table 31 Pingtung Agricultural Biotechnology Park, COA

Pingtung Agricultural Biotechnology Park				
Development Period	Industry Type	Developmental Goals	Total Area	Development Since 2003
2003-2013	Eleven categories: Plants seedlings and their products, breeding livestock and poultry & specific pathogen-free animals and their products, aquaculture fry and aquaculture products, plant and animal pest and disease test reagents, animal vaccines, biological pesticides, biological fertilizer, high-tech Chinese herbal medicines (functional foods), plant and animal molecular farming, biotech services, and export tropical fish.	Integration and diffusion of R&D capabilities, provision of an effective production environment and recruiting services, fusion of park amenities with improvement of the park's ecological environment, promotion of sustainable agriculture, ensuring farmers' incomes as peripheral areas become satellite agricultural production zones.	233 hectares	1. As of June 2014, a total of 84 firms had occupied the park after completing review and approval procedures, of which 67 firms had begun production; occupant firms had pledged total investment of TWD 8.33 billion. 2. In 2013, the COA promoted 35 academic-industry collaboration projects involving occupant firms, and also provided funding for 22 R&D projects. 3. The COA assisted occupant firms to participate at two international trade shows, and helped firms to increase their domestic and foreign recognition and establish marketing agent networks. 4. Eleven firms involved in tropical fish and peripheral areas obtained approval to occupy the Asia-Pacific tropical fish operations center.

Source: COA.

D. System Reform; Encouraging of Innovation

Academic research results and activities are the basis for a country's scientific development. In order to improve academic assessment standards and create a more flexible research environment, and thereby ensure that Taiwan's academic research capabilities attain the highest international standards, the government has embarked on four measures intended to reform academic assessment and assessment systems, namely elimination of results performance indicators (RPIs), promotion of innovation-oriented projects, enhancement of funding use flexibility, and establishment of academic ethical standards.

1. Elimination of results performance indicators (RPIs) as a means of assessing research projects: The NSC announced in June 2012 that various academic assessment forms would subsequently no longer use rigid scoring method to assess academic achievements, and would determine whether to approve individual cases on the basis of project content and the applicant's past performance. The NSC also announced that "indicators are intended to promote

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the pursuit of excellence, and should not impose restrictions on research and development."

2. Increasing flexibility in the use of research funding and consolidating autonomous management: In order to ensure greater flexibility in the use of research funding, the NSC revised the *Guidelines for Funding of Single-topic Research Projects by the National Science Council, Executive Yuan* and Funding Handling Principles for *Single-topic Research Projects Funded by the National Science Council, Executive Yuan* so as to broaden the discretion on the uses of research funding. Starting from July 2012, research funding regulations limiting expenditures for purposes not originally specified to "20% of incoming fund and 30% of outgoing funds" were changed to "50% of both incoming and outgoing funds." In addition, the revisions have given researchers greater discretion concerning the nature expenditures, strengthened universities' internal controls, and prescribed disciplinary measures to be taken in the event of under- and over-reporting. These revisions have sought to create a more ideal academic research environment via relaxation of unnecessary constraints and the enhancement of accountability.

3. Establishment of academic ethical standards: In order to strengthen academic ethics and integrity and remedy deficiencies of current regulations, the NSC announced the "Academic Ethics Guidelines for Researchers" and "NSC's Seven Explanatory Points concerning Academic Ethics" in February 2013. These guidelines affirm that researchers, including teachers, students, and research assistants, must uphold professional ethics and code of conduct when engaging in research work, and must avoid common problems such as fabrication, falsification and unauthorized alteration of information, inappropriate representation of the contributions of others, and multiple submissions of the same manuscript. Researchers must avoid conflict of interest throughout the stages of project application, review, and publication of results. The NSC's ethical guidelines explicitly specify principles governing acceptance of cases of violation of academic ethics, disciplinary procedures, and judgment standards.

4. Promotion of innovation-oriented projects: It is essential that academic research strive to break from existing paradigms and be free to engage in bold innovation. In light of this idea, the NSC initiated the "100-Person

Pioneering Project Trial Program" and "Free Excellence Academic Research Trial Program" in April and November of 2013; these programs encourage researchers to break through existing frameworks and propose innovative concepts.

(1) 100-Person Pioneering Project Trial Program: The goal of this program is to encourage researchers to propose boldly adventurous research directions and embark on exploring new fields of research, and applicant projects are chiefly assessed via a review of their originality. It is expected that 100 projects will receive total funding of TWD 100 million each year. Approved projects may have an implementation period of up to two years, and an assessment shall be performed after completion of the first year. Following this assessment, as a rule, at least one-half of the projects—those with the least competitiveness—shall be rejected. The amount of funding provided to projects that have passed review may be adjusted in accordance with project needs, and may be increased up to twice the funding amount of the first year. Applications for funding under this program have been accepted since April 30, 2013. A total of 158 applications have been made thus far, and 68 projects have been approved following review.

(2) Free Excellence Academic Research Trial Program: The goal of this program is to encourage academic research organizations to break unnecessary research constraints, draft groundbreaking strategies, formulate forward-looking, important topics aimed at promoting academic research excellence, and leverage external support. The program seeks to stimulate development of academic research capabilities and boost academic research organizations' research capacities and standards. A total of 46 proposals have been received since the acceptance of applications began on May 7, 2013, and four projects were approved during that year.

Section 4
Mid-Term S&T Development Objectives of Different Agencies/Organizations

The S&T development strategies and objectives of Taiwan's government agencies and organizations must be consistent with the country's overall S&T development plans, and be implemented with appropriately allocated resources in an orderly fashion over the course of successive years. The following is an overview of S&T development strategies and mid-term objectives of Taiwan's government agencies and organizations for the period of 2015-2018 (see Appendix 6 for relevant strategies and resources allocation plans).

I. Academia Sinica

The Academia Sinica is Taiwan's highest academic research agency, and has a mission that encompasses research in the humanities, social sciences, and sciences, the guidance, coordination, and rewarding of academic research, and training of high-level academic research manpower. The Academia Sinica's future S&T development goals include:

A. Planning of future scientific research directions and creation of new research paradigms: The Academia Sinica will promote R&D in the three major areas of mathematics and the physical sciences, life sciences, humanities and social sciences; encourage interdisciplinary integrated research; integrate instrument and equipment services; and share research resources.

B. Accumulation of human capital, enhancement of R&D capabilities: The Academia Sinica will recruit outstanding specialists in various fields and develop a top-notch professional lineup; establish prestigious chairs and engage outstanding individuals; establish a wide range of incentive mechanisms, such as in-depth projects intended to encourage the development of outstanding researchers from within its organization; implement forward-looking projects encouraging promising young researchers; issue publication awards to young scientists in order to recognize young scientists' in-depth research and remarkable contribution; issue academic book awards in the humanities and social sciences, and encourage humanities and social sciences scholars to publish their works and engage in intensive research of academic topics; enhance the competitiveness of higher education in Taiwan by cultivating high-caliber R&D personnel, promoting manpower training cooperation programs in partnership with

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leading American universities and research organizations, encouraging post-doctoral researchers and Ph.D. students to study overseas, and establishing of curricula for international graduate students; promote new-generation interdisciplinary science manpower training cooperation programs, and establish new models of interdisciplinary manpower training in the field of biomedical science.

C. Expansion of international cooperation, keeping up with global developments: The Academia Sinica will enhance participation in international organizations; participate in multinational collaborative projects, and engage in international interchange and cooperation; and increase cooperation agreements with academic research organizations in order to accumulate more high-level research manpower needed for Taiwan's S&T development.

D. Diffusion of research capabilities, fulfillment of social responsibilities: The Academia Sinica will draft policy recommendations, and strive to fulfill its responsibility for transmitting knowledge, enhancing the country's humane endowment, and increasing public welfare; encourage the licensing of patented technologies and protect intellectual property; participate in public service, benefit the public, and fully discharge the social responsibilities of an learned institution; promotion of ubiquitous spread of knowledge by explaining research results to the public in a straightforward way; and establish a branch of the Academia Sinica in southern Taiwan in keeping with the need for a more balanced development between the north and the south.

E. Promotion of biotechnology, pursuit of sustainable development: The Academia Sinica will actively promote development of the National Biotechnology Research Park; assist in the establishment of the Taiwan Biobank; implement innovative translational agricultural research projects, develop innovative research results, and introduce applications of agricultural biotechnology; promote new drug and vaccine development projects targeting major diseases, encourage the development of key clinical diagnostic and therapeutic technologies, and promote new drug R&D targeting major diseases.

II. Ministry of the Interior

MOI is in charge of domestic administrative affairs, and upholds administrative principles of "promoting the beneficial and eliminating the harmful for the sake of the people" and "integrity, competence, professionalism, effectiveness, and concern." Putting Taiwan's and

the public's benefit first, MOI seeks to create a happy, sustainable homeland characterized by concern for the underprivileged, intelligent energy conservation, and household safety. The MOI's future S&T development goals include:

A. Responding to climate change, global warming, and the aging society, and to promote the development of the construction industry, the MOI will promote architectural energy conservation/carbon reduction technological applications, such as smart green buildings and their materials, innovative low-carbon green building technology, the establishment of barrier-free living environments, the realization of urban disaster prevention and high-performance building fire-prevention and emergency escape designs, the establishment of steel–structure composite, multiple disaster safety assessment guidelines and restoration technologies, innovative building life-extension and durability performance research, building technology innovation and extended application projects, and the application and diffusion of building information modeling (BIM) technology, with an overall goal of enhancing environmental quality and establishing a sustainable, energy-conserving, healthy, safe, comfortable living environment.

B. Responding to disaster response needs and in order to provide fast, convenient service to remote areas, members of underprivileged groups, and persons with impaired mobility, the MOI's residential administration personnel will provide home service and thereby give the public even quicker and better services.

C. The MOI will develop modern surveying norms and promote use of modern elevation surveying methods, integrate results for national control points, develop unmanned aerial vehicle surveying techniques and vehicle-borne mobile surveying systems (MMS), improve aerial remote sensing calibration mechanisms, apply advanced aerial remote sensing and geodetic survey technologies, stay abreast of national land information, establish and maintain surveying results databases, and establish standards for three-dimensional building and road models in order to provide information concerning major projects and for use in disaster relief planning applications.

D. The MOI will establish a highly secure online authentication mechanism able to identify natural persons, ensure the security of online e-government data transmission, reduce the need for paper transcripts, simplify administrative procedures, provide superior online application services, develop manpower of innovative natural person

certificate application design, and thereby shrink the gap between urban and rural areas and promote the development of relevant industries.

E. In order to maintain judicial equality, establish a fair and just society, and promote sustainable development, the MOI will strive to enhance forensic technology capabilities, develop a new generation of detection and digital monitoring technology, integrate and improve investigation technology and service, and provide criminal judicial services.

F. Promotion of intelligent building management, completion of collection of open architectural information, provision and promotion of interagency, organizational, and public value-added applications, establishment of building information transparency, simplification of service procedures, expansion of interagency building information exchange applications, enhancement of residential information transparency, and strengthening of citizen participation.

G. Use of cloud computing technology to integrate mobile equipment and various media, adjustment of existing disaster prevention and fire safety information systems, and establishment of close coordination among the response efforts of disaster prevention and relief agencies in order to achieve the greatest degree of disaster response synergy. Furthermore, in response to the threat of earthquakes in urban areas, the MOI has drafted earthquake response measures, and strives to boost the response capabilities of businesses and the public, with the goal of making society as a whole more robust in the face of natural disasters.

H. In line with its mottos of "service first, public convenience foremost," "caring, considerate, friendly," and "professionalism, performance, and concern," the MOI will use information technology to enhance the ability of new residents to use information and make effective use of online resources, while reducing the impact of cultural differences, strengthening the cohesiveness and interaction of new resident groups, providing convenient and efficient services to foreigners, and thereby displaying the government's sincere wish to constantly improve public service.

III. Ministry of National Defense

MND is responsible for Taiwan's defense affairs. At present, Taiwan's defense philosophy, military strategy, and military readiness are all geared preventing the outbreak of war. As a consequence, the MND has built up a fighting force with superior deterrent

ability in line with its basic goals of preventing war, defending the homeland, and combating terrorism. With regard to defense technology, the MND seeks to maintain defense technology capabilities in the private sector and achieve the goal of autonomous defense. The MND's future S&T development goals include:

A. In conjunction with the armed forces' near-/mid-/long-term military capability needs, the MND is developing defense technology capabilities that can yield an advantage in innovative and asymmetric warfare, planning and promoting advanced defense technology R&D strategies, and developing forward-looking defense technology and weapons as part of its goal of autonomous defense R&D.

B. Based on the capabilities of the defense industry, the MND is integrating government and private technological resources and capabilities, acquiring key technologies from overseas, guiding the participation of domestic industry in arms R&D, production, and maintenance, encouraging the technological upgrading of industry, establishing a high-performance defense industry, and strengthening defense development.

C. In conjunction with the government's "Program to Accelerate Technological Upgrading of Traditional Industry" and other major economic stimulus policies, the MND is striving to dramatically upgrade existing defense technology R&D capabilities and stimulate economic development by helping the private sector to develop an internationally-competitive high-value defense industry in line with technology policies and industry needs. This undertaking will emphasize encouragement of innovation, pursuit of excellence, and reliance on dual-use technological platforms.

The MND's technological developmental goals include the following:

A. Integration of defense technology development mechanisms, and enhancement defense technology R&D capabilities: The interagency "Defense Technology Development Promotion Committee" organized by the MND, MOEA, and MOST will draft defense technology and industrial development integration decision-making and performance indicators, and will work with domestic industry, government, academia, and the research community to boost the standards of defense technology R&D and achieve the goal of an autonomous defense capability.

B. Establishment of a defense technology development blueprint based on future combat needs and the country's S&T capabilities:

1. The MND will employ advanced technology development processes and methods,

confirm gaps in defense technology capabilities through the use of technological capability databases after study of the armed forces' joint military capacity development needs and defense technology development trends, and establish mid-/long-term defense technology blueprints for the armed forces for inclusion in the "Ten-year Armed Forces Defense Strengthening Roadmap."

2. In accordance with defense technology trends, through MOST's "academic cooperation in defense technology" mechanism, the MND will continue to engage in basic and applied research targeting forward-looking research areas with applications potential and R&D value, and strive to develop defense technologies in partnership with domestic academic research organizations, while strengthening the country's defense technology R&D foundation.

C. Boosting industrial competitiveness in conjunction with the government's economic stimulus policies: In order to boost the economy and promote local prosperity, the MND will simultaneously promote the development of high-tech and traditional defense industries, strive to realize localization and a high degree of local retention, and seek to facilitate the creation of high added value industries as it endeavors to stimulate the economy and realize the goal of autonomous defense in line with the country's economic policies.

D. Acquisition of key foreign technologies, strengthening the autonomous technological capabilities:

1. When purchasing major weapons and equipment overseas, the MND will strive to secure technology licensing and cooperative R&D conditions, which will enable it to acquire advanced foreign technology, help industry obtain key technologies, strengthen industrial competitiveness, and create an autonomous defense industry.

2. The MND will assess the production capabilities of domestic industry, update and broaden assessment items, and select domestic production options whenever possible in view of domestic production capabilities.

3. The MND will hold regular annual exhibitions about weapons and equipment production and maintenance, as well as occasional project demonstrations, which will integrate the capabilities of domestic industry, and help industry develop competitive parts, components, and subsystem, while building a comprehensive research, development, production, and maintenance system.

IV. Ministry of Finance

MOF is in charge of Taiwan's fiscal affairs, and has responsibilities encompassing the national treasury, taxation, customs, national property, government procurement, and promotion of public participation in public construction projects. With a mission of enhancing government fiscal management performance and responding to the government's administrative needs, the MOF carries out tasks including strengthening financial management and ensuring fiscal stability, maintaining effective management of taxation and collecting sufficient tax revenue, enhancing the convenience and security of trade and realizing the economic functions of tariffs, promoting financial globalization and thereby boosting national competitiveness, maintaining sustainable management of national assets and broadening the country's financial resources, establishing a superior government procurement operating environment in compliance with international rules and norms, and actively recruiting private investment in public construction projects. The MOF's future S&T development goals include:

A. Ubiquitous Economy and Trade Network Plan ─ Advance Cargo Information Project: Establishment of work circles, drafting of working plans, promotion of an advance cargo information system; collection of relevant US, Japanese, and European Union advance cargo information laws and regulations and information on implementation methods; investigation of foreign methods, signing multinational customs cooperation and data exchange agreements; outsourced planning of an Advance Cargo Information Project and drafting of advance cargo information import/export manifests, declaration forms, and customs clearance information; outsourced deployment of relevant air/sea import/export advance cargo information systems and customs administration systems; deployment of an advance cargo information EDI/XML translation system; establishment of a sea/air import/export advance cargo information system; deployment of a risk management system under the WCO SAFE framework; design of a customs declaration plug and play system; establishment of a multinational customs information exchange system; deployment of customs administration system; seeking advance cargo information partner firms and conducting testing; seeking pre-reported customs clearance data exchange partner countries and conducting testing; implementation of sea/air import/export advance cargo information; signing multinational customs data exchange agreements.

B. Creating Intelligent Life by e-Invoices Project: Integration of different authentication

data exchange formats and promotion of the use of various e-invoice carriers; improving notification services involving various communication channels connected with e-invoices, and establishing an all-inclusive e-service encompassing purchase, prize checking, and prize awarding notification; interfacing with Customs Office review services, enhancing the integration between the e-invoice platform and other government platforms and services and achieving integration of operating procedures and information sharing; establishment of an e-invoice data export function as a basis for reporting tariffs, promotion of use of e-invoices by import/export companies, simplification of relevant manual work processes, and enhancement of customs declaration efficiency; provision of e-invoice applications to the Directorate General of Budget, Accounting & Statistics, Ministry of Audit, and other relevant government agencies for use, increasing the benefit of fully-automated government procurement services; planning of inter-unit mobile project management applications, use of Internet-connected mobile devices, synchronization of project schedule and reported progress, and establishment of an invoice platform performance alert mechanism; ensuring that the failure of individual nodes at the same time will not affect data integrity by employing a distributed storage approach on a cloud framework developed to handle large amounts of invoice data with unlimited expandability; ensuring full integration of tax procedures by simplifying linkage between the e-invoice platform and tax filing platform; deploying "data warehouse" to perform classified storage of large amounts of e-invoice data for subsequent audit; performing data mining and business intelligence analysis behind information security mechanisms, such as tax revenue analysis, economic trends analysis, and consumer behavior analysis, in order to assist relevant decision-making; and provision of cloud distributed query analysis in order to enhance the efficiency of tax personnel in investigation.

V. Ministry of Education

The MOE is in charge of educational affairs in Taiwan. In line with its vision of nurturing outstanding innovative manpower, enhancing international competitiveness, the MOE is striving to train and educate manpower, reform educational systems, and establish digital learning environments. The MOE's future S&T development goals include:

A. The MOE will strive to educate citizens in the humanities, science, and technology, and thereby cultivate forward-looking, interdisciplinary manpower. In order to achieve this objective, the MOE will implement pioneering focal S&T and interdisciplinary

training programs, strive to train the manpower needed for the development of the electronics, information and communications, software, biotechnology, and energy industries, while also making technology relevant to everyday life, helping Taiwan respond to changes in society and the environment, and training individuals with interdisciplinary expertise, the ability to innovate, and concern for society.

B. The MOE will guide universities and colleges in adopting individual features and position, employ a wider range of indicators, and accelerate the globalization of top-notch universities. By autonomously developing a multifaceted specialized university evaluation system, the MOE can induce universities to develop their own position and functions, and accordingly establish a self-assessment mechanism and a quality control system.

C. The MOE will promote models of linkage between vocational education and industry, and encourage work-integrated learning and practical innovation. The re-engineering of vocational education and establishment of mechanisms and platforms promoting cooperation among industry, government, academia, and the research community will shrink the gap between in-school education and the needs of industry, establish distinctive features at schools, boosting teachers' practical experience and teaching skills, strengthening students' hands-on abilities and employability, and promoting academic-industry collaboration with a manpower training function.

D. The MOE will place increasing emphasis on environmental sustainability education, and strive to boost students' energy conservation/carbon reduction and disaster prevention knowledge. By pairing thoroughgoing environmental and disaster prevention education with general education and professional skills training, the MOE will advance climate change and adaptation education, and create sustainable campuses. In addition, promotion of basic education in energy and energy conservation/carbon reduction will deepen the energy science curriculum and achieve the goal of training energy S&T manpower and furthering the goals of energy conservation/carbon reduction.

E. Promotion of e-learning in order to establish a fair and open educational environment promoting autonomous learning. The MOE will employ high-bandwidth network backbone and campus wireless network environment to establish educational cloud learning resources and services, and will integrate relevant cloud learning content and services to create a mobile learning environment. The MOE will also promote

elementary and middle school mobile learning, MOOCs, and digital reading classes, and incorporate autonomous online learning, as it develops a superior e-learning model.

VI. Ministry of Justice

The MOJ is responsible for the country's legal administration, and handles tasks including prosecutorial administration, crime prevention, criminal justice, judicial protection, rehabilitation, anti-corruption, policy implementation, legal consulting, legal affairs of the Executive Yuan, and the education of judicial personnel. The MOJ'S S&T-related administrative measures consist of development of forensic and investigative technologies, judicial administration technologies, and judicial human rights technologies. The MOJ hopes to improve its judicial investigative abilities, promote social justice, and protect human rights with the assistance of its technology development projects, and thereby improve judicial work and Taiwan's image in international community. The MOJ's S&T development goals include:

A. Development of investigative technologies enabling the investigation and prosecution of major crimes; improvement of forensic quality, protection of judicial human rights, enhancement of supervision, and maintenance of national security.

B. Establishment of advanced criminal investigation capacities, raising investigative efficiency and quality; use of information technology to boost the performance of the investigative system.

C. Establishment of electronic information exchange mechanisms and integrated case analysis capabilities, strengthening the working performance of administrative organizations, and maintaining the reputation of implementing agencies.

D. In compliance with international human rights trends, raising the quality and performance of judicial prosecution and criminal policy, and protection of the basic human rights of defendants.

E. Improvement of electronic monitoring equipment, which will be used in conjunction with community correction mechanisms to resolve the problem of overcrowded prisons; development of digital convergence and positioning technology, and advanced monitoring software, in order to enhance surveillance performance, facilitate management of risk of recidivism, and maintain judicial protection rights and interests.

F. Responding to international human rights trends by boosting the disciplinary

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performance of correction agencies.

G. Improvement of forensic instruments and equipment used in forensic medicine, poisoning investigations, and criminal investigation work; use of advanced technological capabilities to advance forensic medicine, improve the quality of criminal forensic investigation work, and ensure that the correctness and reliability of forensic results meet world standards.

H. Development of various testing methods, establishment of modern standard testing operating procedures and technologies for practical needs, and resolution of forensic sample testing bottlenecks, while increasing the depth and breadth of testing.

I. In order to enhance the quality of forensic work in Taiwan, establishing forensic certification laboratories meeting international standards, and ongoing implementation of laboratory certification.

J. Establishment of genotype frequency databases for various countries, ethnic groups, and areas of Taiwan, which can be used in identification and forensic applications.

K. Strengthening integrated application of forensic resources and establishing various types of forensic databases as a reference for the promotion of crime prevention, investigation, and prosecution policies.

VII. Ministry of Economic Affairs

The MOEA is in charge of Taiwan's economic administration and economic development, and also bears responsibility for oversight of state-owned enterprises such as the Taiwan Power Company and CPC Corp. The MOEA has recently been active in promoting deregulation for economic development and optimization of Taiwan's industry structure. It has also sought to establish an attractive investment environment, participate in international trade organizations and regional economic integration initiatives, and employ innovative, open thinking to tap the country's economic potential and create a secure, stable, clean, efficient energy supply and demand system. Furthermore, in line with its developmental vision of "a vital economy, global linkage, high-value industry, sustainable resources," the MOEA strives to apply innovation and deregulation to maximizing Taiwan's growth potential and improving environmental sustainability. The MOEA's future S&T development goals include:

A. Strengthening the value of innovation and promoting industrial upgrading: The MOEA is relying on an effective patent retrieval environment and training of intellectual

property manpower to strengthen the value of innovation, and consolidate and expand industry's R&D capacities. At the same time, in order to promote industrial upgrading, the MOEA will strengthen the establishment and interconnection of basic technology and R&D environments, which will effectively promote technological R&D and upgrading, and can guide the promotion of industrial transformation.

B. Expanding Taiwan's trade domain and creating network hubs: Traditional industries have always served as the bulwark of Taiwan's economic development. By enhancing the output value and operating performance of traditional industry, the MOEA will help Taiwan enlarge its trade domain. The MOEA will help traditional industry establish differentiation and advantageous niches, allowing companies to respond to trade deregulation, and will promote innovation and globalization in industries serving the domestic market, such as the intelligent living industry. This will enlarge the domestic market and promote consumption in Taiwan and abroad.

C. Optimization of investment quantity and quality, and improvement of export capabilities: The MOEA will strengthen R&D innovation in key and emerging demand-oriented technologies, and rely on reinforced international linkage to promote the internationalization of key service industries and boost export capabilities.

D. Realizing energy conservation/carbon reduction, and cultivating a sustainable green homeland: In order to promote the effective utilization of energy and ensure environmentally-sustainable development, the MOEA will promote green energy S&T and actively deal with energy resource and environmental issues, with an ultimate goal of establishing a sustainable green homeland.

VIII. Ministry of Transportation and Communications

The MOTC is in charge of Taiwan's transportation administration and transportation industry, and has duties encompassing the four major areas of transportation, tourism, weather, and communications. The MOTC's future S&T development goals include:

A. Development of an energy conservation/carbon reduction policy decision-making support system for the transportation sector in order to provide comprehensive decision-making information and promote the effective methods of energy conservation and carbon reduction in the transportation sector, and avoid the waste of resources; establishment of an intelligent transportation system spanning Taiwan and develop intelligent transportation services; and provision of a safety, superior, free-

flowing, and energy-efficient/low-carbon sustainable transportation environment.

B. Development of disaster prevention and mitigation technology for ports, bridges, and mountain roads, and enhancing port and road transportation performance.

C. Promotion of modern marine condition observation technologies, development of new green port technologies, and establishment of silting monitoring systems for port areas and inshore waters, which will boost port operating efficiency and quality, and promote the sustainable development of Taiwan's ports.

D. Acting in concert with international development trends, the MOTC will monitor market trends and draft specific improvement proposals for the development of sea and air international transportation, and will provide decision-making support. Furthermore, the MOTC will strive to increase the safety of marine transportation, and enhance Taiwan's shipping competitiveness and shipping security.

E. Improvement of the weather monitoring and information infrastructure, development of real-time forecasting technology for extreme weather conditions, improvement of short-term climate forecasting, and provision of precisely-targeted weather information.

F. Promotion of real-time early warning of strong earthquakes, expansion of the new-generation earthquake monitoring system, and enhancement of earthquake measurement performance.

G. Strengthening of sea condition monitoring facilities and forecasting technologies, enhancement of sea condition observation and reporting capabilities.

H. Responding to spectrum resource needs, the MOTC will plan the appropriate allocation of Taiwan's spectrum resources and improve spectrum use efficiency. After assessing different planning approaches and support in the current international ecosystem in view of the need for compliance with international norms, and examining the operating condition of Taiwan's existing telecoms, the MOTC will formulate planning strategies for after the current round of licensing, and will actively monitor the state of 5G development in Taiwan and around the world. In compliance with international spectrum use trends and Taiwan's state of development, the MOTC will arrange an experimental spectrum at an early stage, which will facilitate technology R&D and testing of applications by research organizations.

I. In accordance with the "IPv6 Upgrade Promotion Program," which was approved

by the Executive Yuan on December 30, 2011, the MOTC will continue to help government agencies and organizations to complete upgrading of secondary external service systems to IPv6 in 2015, and complete upgrading of internal services to IPv6 in 2016 or later.

J. In compliance with policy needs, the MOTC will promote strategic planning in the telecommunications network and communications industry; review existing measures and propose recommendations for deregulation; gather information on and study emerging communications technologies and applications, and innovation in the telecommunications industry; draft measures to promote the establishment of broadband networks, boost communications service quality, and enhance Taiwan's international competitiveness in the area of information and communications.

IX. Ministry of Health and Welfare

The MOHW is in charge of welfare services, concern for the underprivileged, healthcare, National Health Insurance, health promotion, disease prevention and treatment, and management of food and medicines. Not only do these matters directly affect public welfare, but they are also the subject of universal public concern.

At present, the MOHW's S&T development focuses on the four major aspects of medicine, care, sanitation & safety, and health & well-being, and it is constantly establishing the common infrastructure needed for the implementation of relevant research. The MOHW will strengthen health promotion and disease prevention, improve effective treatment and health maintenance methods, establish a universal care integrated service system in order to realize the ultimate goal of universal health and welfare coverage, achieve the sustainable provision of high-quality medical service, establish superior care services, strive to ensure a safe living environment, create a healthy, happy society, and continue to strengthen infrastructure.

In order to achieve these objectives, MOHW will direct its efforts toward the following 15 S&T focal areas: "putting the welfare service system on a sound footing, caring for members of underprivileged groups," "improving the healthcare system, safeguarding the public's right to medical care," "strengthening citizens' mental health, establishing a protection network for high risk families," "creating a considerate health support environment, promoting citizen participation," "realizing disease prevention readiness, preventing disease outbreaks," "promoting international interchange and cooperation, encouraging acceptance

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of international norms," "promotion of health and welfare S&T, improvement of the policy basis," "strengthening food and drug management, protecting public health," "expanding the re-engineering of government service processes," "putting the social insurance system on a sound footing, strengthening self and mutual help mechanisms," "strengthening organizational capacities," "enhancing R&D capabilities," "instituting internal control mechanisms," "deriving greater benefit from assets, appropriately allocating government resources," and "boosting the quality of human resources and management performance."

X. Ministry of Culture

The MOC has a primary mission of nurturing and strengthening the nation's cultural power. Employing the strategies of localization, internationalization, cloud enablement, and value-increasing, the MOC will serve the people and nurture the country's cultural roots, promote Taiwan internationally and wield its soft power, and develop on the cloud, which will integrate culture and technology. The MOC will further accelerate the pairing of creative workers with investors, which will ensure that the full value of creative works is realized. Taking culture as primary and technology as secondary, the MOC will integrate its S&T development policies in both top-down and bottom-up directions, actively maintain transparency and sharing, promote citizen participation, and enhance cultural competitiveness. The MOC future S&T policy development goals include:

A. Overall planning of cultural S&T policies, strengthening policies' basis with scientific data.

B. Accumulation and integration of cultural resources; realizing open, value-added applications.

C. Promotion of innovative digital content services, encouraging the development of mobile value-added applications by the audiovisual industry.

D. Strengthening of support for the cultural creativity industry, promotion of applications and efforts to stimulate the market

In order to achieve the foregoing objectives, the MOC will take the full-scale realization of citizens' cultural rights, creation an aesthetic environment, maintenance and establishment of cultural value, and enhancing the competitiveness of creative industries as its foremost mission. It will further emphasize overall planning of cultural S&T policies, guide innovation in accordance with the needs of target customers, and promote a far-reaching fusion of culture

and technology.

With regard to the allocation of cultural resources, the MOC will use scientific data to establish cultural resource management systems, incorporate basic cultural elements and data in stages, and ensure that the allocation of resources is even fairer and more effective. At the same time, the MOC will provide integrated artistic and cultural resource services, strive to ensure that all citizens have contact with culture, and rely on S&T to accumulate local culture, promote cultural and artistic events, fulfill its responsibilities at the grassroots level, express concern for various underprivileged groups, and shrink the gap between urban and rural areas.

With regard to creation of an aesthetic environment, the MOC will strengthen use of technological applications to express culture and enhance aesthetic value, and strive to foster original, outstanding, boundary-crossing creativity and thus realize a highly creative society. With regard to establishing and maintaining cultural value, the MOC will integrate information on cultural assets, establish an artifact collection management system, and digitize collections in order to preserve their artifacts and revitalize historical memories.

In the area of enhancing the competitiveness of creative industries, the MOC will integrate and make available various types of cultural materials, provide cultural material tool boxes, and establish cultural creativity platforms. This will induce the public participation and patronage of the cultural creativity industry, and the value of cultural creativity will contribute to the nation's economic development and intensify cultural interchange with overseas. In the area of audiovisual content innovation, the MOC will guide innovative applications involving 4G mobile broadband networks, promote forward-looking 4G technologies encouraging innovative convergence, and enhancing interactive digital audiovisual content. The integration of digital convergence applications will yield novel emerging services and forms of commerce, increase the ubiquity and competitiveness of audiovisual applications, and boost the circulation and value-added applications of audiovisual content.

XI. Ministry of Labor

The MOL is in charge of national labor administration, and has a main mission of enhancing autonomous labor relations, creating an fair and just working environment, strengthening the social protections and retirement security of workers, maintaining occupational health and safety, protecting workers' health and occupational injury rights, and establishing a labor market promoting economic development. Based on the concept of the "dignity of labor," the MOL promotes various labor policies and measures intended to further

autonomy, fairness, and development, including measures intended to strengthen human resources, promote occupational health and safety, maintain humane working conditions, provide labor insurance, and foster effective industrial relations.

The MOL is currently focusing its S&T research efforts on the subject of "health and safety in nanoparticle workplace," which includes the following focal areas:

A. Research on workplace nanotechnology process exposure and epidemiology: Improvement of individual exposure assessment technology to better gauge state of exposure, and establishment of health databases for workers involved nanotechnology processes.

B. Research on nanotechnology process safety and environmental exposure control: R&D of nanotechnology process safe working technologies and particle exposure prevention measures.

C. Nanotechnology process risk management and use of nanotechnology to improve workplaces: Establishment of a hazard assessment, grading, and autonomous management technology, use of nanotechnology to improve workplaces.

XII. Ministry of Science and Technology

The MOST is responsible for planning the country's S&T development policies, overall planning, coordination, and assessment of the government's S&T development programs, review of the S&T budget, promotion of basic and applied S&T research, promotion of major S&T R&D projects, support for academic research, planning, promotion, and management of forward-looking industrial technology R&D policies, technology assessment, development of science parks, and management of the Executive Yuan National Science and Technology Fund. In order to realize the policy goals of the Golden Decade National Vision Program, MOST will promote various administrative plans and strive to continue enhancing the country's S&T competitiveness in line with the administrative vision of "acting as the country's S&T development catalyst, making full use of material resources and human talents," while seeking excellence in scientific research.

In accordance with its mission, the state of society today, and the country's future S&T development needs, MOST has set forth the following administrative objectives:

A. Strengthening review of government S&T programs, and helping government agencies to make effective use of S&T R&D resources: MOST will continue to review

and improve government S&T development program review mechanisms, simplify procedures, and enhance program and review quality.

B. Enhancing research quality, pursuit of excellence, and innovation: In order to boost the quantity and quality of academic papers, while expanding R&D capabilities, MOST will continue to draft and implement various promotional measures, and encourage outstanding scientists to engage in greater amounts of higher-quality research.

C. Strengthening academic-industry linkage in forward-looking technologies, helping industry engage in innovative development, training personnel with practical research skills, and shrinking the gap between universities and industry: Relevant methods include the promotion of demonstration cases of university-led research industrialization, strengthening academic-industry collaboration and interchange, training of industrial manpower, reliance on research organizations to spearhead academic-industry collaboration, and promotion of Academic-Industry Collaborative Projects in Forward-looking Technologies and academic-industry technology alliance collaborative projects.

D. Promotion of applied disaster prevention technologies and sustainable development: MOST will continue to implement integrated interdisciplinary applied research projects with an academic basis on disaster prevention technology, and rely on application of research results to enhance the performance of disaster prevention and mitigation work and reduce risk of catastrophic natural disasters.

E. Enhancing of industry's basic technological standards, helping industry boost its ability to compete: In the future, MOST will provide funding to universities for the establishment of basic technology R&D centers, and encourage academic researchers and domestic enterprises to direct resources toward 10 major basic technology items and engage in cooperation, which will help industry boost its competitiveness and train personnel with practical technological skills.

F. Integration of R&D capabilities, encouragement of sharing large research facilities, establishment of common biotechnology research platforms and resources, and provision of technical services and consulting. MOST will establish and promote large research facilities for common use, and will seek to derive greater benefit through the integration of research resources. Furthermore, MOST will establish common biotechnology research platforms, and promote a flourishing biotechnology industry in Taiwan.

G. MOST will strive to strike a balance between technology and the humanities, promote the ubiquitous application of technology to culture, and advance public welfare. MOST will promote the incorporation of digital technologies in research on the humanities and social sciences, and will rely on the publication and promotion of guided classics readings and humanities and social sciences research results to promote multifaceted cultural development and deepen the application of technology to culture.

H. Establishment of outstanding science parks, industrialization of R&D, and promotion of science park upgrading: Apart from providing everyday amenities, the science parks will recruit firms in clean energy, cloud computing, and biotechnology industries. At the same time, MOST will adopt an innovation-oriented approach to realize the industrialization of technology R&D results.

I. Training and recruiting S&T manpower, enhancing Taiwan's influence and competitiveness in S&T: MOST will encourage domestic research manpower to actively participate in international academic activities or conduct researches overseas, and will fund the recruiting of outstanding domestic and foreign academic S&T manpower in order to boost Taiwan's R&D.

XIII. National Development Council

The NDC is a major policy planning agency subordinate to the Executive Yuan, and is in charge of planning, designing, coordinating, reviewing, and controlling the nation's overall development. With a philosophy of "boldly innovating, courageously seeking breakthroughs, acting with vigor, and focused on efficiency," the NDC seeks to coordinate the promotion of major policies in the areas of economics, society, industry, human resources, national land use, and governance. The NDC's future S&T development goals include:

A. Research projects on national development policy issues:

1. Promotion of innovative, forward-looking, feasible, national development policies in line with the President's administrative strategy and the Executive Yuan's policy directives.
2. Strengthening the functions of the NDC as the National Policy Think Tank, especially its role in studying national development trends, drafting policies, and assessing benefits.
3. Implementation of in-depth research on topics relevant to national development

with a goal of speeding economic improvement and enhancing the country's competitive advantage.

B. E-Government Program of Taiwan 2011-2016

Responding to changes in conditions in Taiwan and abroad, and supporting government reorganization, the NDC will promote new agency information reengineering and implement the E-Government Program of Taiwan 2011-2016. The NDC will focus on promoting e-government and targeted services, will coordinate and integrate interdepartmental services from the public's perspective, develop further full-course services in order to boost administrative efficiency and provide outstanding cross-cutting service, establish a green energy sharing environment, and promote fair opportunities for participation, which will realize the vision of "service without boundaries, providing a better life to all citizens."

C. Digital Opportunity Survey Assessment Project

Taiwan has already entered the network society age. In response to the rapid development and evolution of information technology and the social environment, the government must bear responsibility for providing resources and assistance to underprivileged groups, shrinking the digital divide, and ensuring fair online opportunities. The NDC has consequently promoted the "Digital Opportunity Survey Assessment Project" in an effort to promote social fairness, social inclusivity (e-inclusion), enhance quality of life, and create digital opportunities.

XIV. Directorate-General of Personnel Administration, Executive Yuan

DGPA bears responsibility for planning, developing, and implementing the Executive Yuan's personnel policies, as well as such duties as the issuance of civil service examinations, and the appointment and dismissal, training, evaluation, compensation, and benefits of civil servants. With a vision of "building an administrative team possessing integrity and competence, providing first-rate public service," the Directorate-General's future S&T development goals include:

A. Executive Yuan Interdisciplinary S&T Management Personnel In-Service Training and Development Plan:

1. Strengthening the S&T governance and management abilities of the Executive Yuan's high-level civil servants will ultimately increase international

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competitiveness in the areas of high-tech industry and S&T innovation.

2. Strengthening the foresight, innovation, international outlook, and overall vision of Executive Yuan's high-level civil servants will improve their ability to draft policies concerning high-tech industry.
3. The Directorate-General will strive to enhance the ability of the Executive Yuan's mid-/high-level civil servants to implement policies aimed at high-tech industry.
4. Strengthening understanding of innovation and application services in high-tech industry among the Executive Yuan's mid-/high-level civil servants will enhance the government ability to assist and guide corporate technological industrialization and innovation.
5. Strengthening the ability of the Executive Yuan's mid-/high-level civil servants to engage in international negotiations concerning high-tech industry issues will help to better maintain Taiwan's rights and interests, further boost the competitiveness of relevant industries, and expand international markets.
6. Strengthening the ability of the Executive Yuan's mid-/high-level civil servants to communicate the government's "Golden Decade" vision—specifically its vision of a vital economy, policy themes of openness and S&T innovation, and strategy of reforming S&T decision-making governance mechanisms—and engage in dialog with the corporate sector concerning high-tech industry policy.
7. Harmonizing the plan with MOST's manpower training program.
8. Accelerating realization of the Golden Decade vision.

B. National Civil Service Human Resource Intelligent Information Service Plan:

1. Data aspects ─ Establishment of complete civil service career records (including data about hiring, assessment and evaluation, rewards and penalties, appointment and dismissal, qualifications review, training, transfer, compensation, benefits, attendance, insurance, and retirement, etc.).
2. Service aspects ─ Provision of civil service career cycle services. Active provision of information services concerning the rights and duties of civil service personnel throughout their careers, ensuring superior personnel services.
3. Integration aspects ─ Seamless integration of interagency information operations, ensuring that resources yield the greatest benefit and simplifying personnel affairs

services.

4. Decision-making aspects ─ Use of correct data to support personnel management strategies. Correct, valid and up-to-date data must be provided before decisions can be made or laws and regulations revised.

XV. Environmental Protection Administration, Executive Yuan

The EPA is in charge of environmental protection in Taiwan, and takes "environmental justice, optimal use of S&T, defense of intergenerational justice, responsiveness to public views, and sustainable national development" as the keynotes of its planning efforts. The EPA's future S&T development goals include:

A. Promotion of environmental education

The EPA seeks to promote citizens' understanding of the mutually interdependent relationship between the individual, society, and the environment, and rely on maintenance of the ecological balance, respect for life, environmental citizens, and environment learning communities to achieve the goal of sustainable development.

B. Putting the environmental impact assessment mechanism on a solid footing

The EPA is working to strengthen administrative and social stability of environmental impact assessment review conclusions, enhancing environmental impact assessment efficiency, and shortening the review process, and hopes to establish an assessment mechanism that takes into consideration environmental justice, social fairness, and economic development.

C. Preventing pollution, enhancing environmental quality

The EPA will continue to implement various measures to reduce and control pollution from existing pollution sources. Apart from establishing measurement techniques for fine particulate matter in the atmosphere and performing temporal and spatial analysis, the EPA will also draft control strategies.

D. Promotion of recycling and waste reduction at the source, consolidation of legislative, and strict management

The EPA will intensify efforts to reduce pollution at the source, and establish a renewable resource management information system enabling management of corporate recycling and providing a platform for information exchange, learning, and service management.

E. Strengthening research on unregulated contaminants in drinking water, enhancement of drinking water quality, and protection of citizens' health

The EPA will perform random checks for unregulated contaminants in water from representative tap water treatment plants, and compile comprehensive in drinking water.

F. Strengthening surveys and prevention of pests such as cockroaches, flies, and bed bugs, and enhancement of environmental sanitation

The EPA will investigate the types, distribution, and pesticide resistance of cockroaches, flies, and bed bugs in the Taiwan area, and establish comprehensive prevention and eradication systems.

G. Promotion of carbon footprint disclosure, encouragement of reduced carbon emissions by industry

The EPA will assess international carbon reduction policy tools based on the carbon footprint concept, compile a national-level carbon discharge database and carbon footprint calculation application system, and improve Taiwan's carbon footprint emissions management and monitoring framework.

H. Close monitoring of nationwide environmental data, investigation of the value of environmental data, and active development of environmental data applications and international interchange and cooperation

The EPA will research the characteristics of atmospheric pollution in observation zones, establish environmental data QA and QC systems, and hopes to rely on participation in international environmental monitoring networks to enhance environmental monitoring technology and achieve compliance with international norms.

XVI. National Palace Museum

The works in the NPM's collection of superb Chinese art not only has great educational research value, but also tremendous value to the cultural creativity industry. Since the NPM began implementing the National Digital Archives Program more than a decade ago, it has also embarked on "Digital Museum Projects" and " The Project for Providing a Cultural and Creative Platform for Bridging Science and Humanity / Bridging the Gap between Technology and Environmental Cultural Creativity Project " projects, completed digitization of its collection, compiled a database of collection works, and produced cultural creativity

videos and interaction devices. Looking ahead to the next few years, responding to the ubiquitous use of mobile devices, growing digital convergence, and availability of high-speed wireless communications, the NPM will make a shift from a "museum without walls" to a "mobile museum" on the basis of its digitization experience. The museum hopes to comply with the trends toward mobility, convergence, and cloud applications through the full-scale development of a mobile museum based on PCs and databases. The mobile museum will demonstrate the museum's collection, educational activities, exhibitions, and research, allowing the NPM to more effectively serve the public and fulfill its social meaning in the mobile age.

XVII. Atomic Energy Council, Executive Yuan

AEC is in charge of atomic energy matters of Taiwan, and bears responsibility for supervision of nuclear power plants, nuclear facilities, and places where radiation is used. Apart from strictly maintaining nuclear safety, preventing radiation, and performing environmental monitoring, the AEC also conducts radioactive waste management, ensuring the safety of nuclear energy applications, and actively promotes the application of atomic energy technology to civilian applications intended to enhance people's welfare. The AEC's future S&T policy development goals include:

A. With a vision of "new, professional, and innovative, ensuring nuclear safety, radiation safety, and public peace of mind," the AEC seeks to create a low-carbon society with "environmental protection, economic development, and social justice," and has consequently drafted the seven key strategies of "strengthening control technologies and response capabilities to ensure nuclear safety," "maintaining radiation safety by improving radioactive waste management and nuclear power plant decommissioning control technology," "extending clean energy technology, promoting energy-conservation and carbon-reduction," "enhancing citizens' welfare by strengthening radiation safety and the quality of radiation medicine," "realizing information transparency, enhancing public trust," "management and use of intellectual property," and "boosting professional skills in the field of nuclear energy."

B. Promoting and actively participating in international collaborative R&D projects in order to absorb international experience, promote international interchange, and extend Taiwan's nuclear safety control research results.

XVIII. Council of Agriculture, Executive Yuan

The COA is in charge of administration of agriculture, forestry, fisheries, livestock raising, and food, and strives to realize the full value of agriculture with regard to food security, the environment, culture, and landscape. The COA will rely on information/communications and green energy technology to innovatively shape the agricultural development environment, increase exports of agricultural technology, and create business opportunities and value.

In line with the "Golden Decade" national vision, the COA will take strengthening drivers of economic growth; creating jobs and realizing social justice; building a low-carbon green energy environment; accumulating cultural power; and actively recruiting and training manpower as the five cornerstones of its development policies, and will draft an agricultural S&T policy development blueprint on the basis of the industrial development strategies proposed in the Executive Yuan's "Three Industries, Four Reforms" framework (which emphasizes making the manufacturing industry service-oriented, making the services industry high-tech, globalizing the services industry, and making traditional Taiwanese industries specialty-oriented). Apart from developing agricultural technology and strengthening interdisciplinary cooperation for the purpose of improving use of resources, expanding agricultural product safety certification, and increasing adoption of international norms, the COA will employ information/communications and green energy technology to create innovations in the agricultural development environment, which will increase exports of agricultural technology and yield business opportunities and value. This will stimulate industrial upgrading and transformation, enhance the efficiency of agricultural businesses, and establish youthful, vital, highly competitive, consistently revenu generating green agriculture in Taiwan.

In order to achieve the foregoing agricultural S&T policy objectives, the COA has adopted health, efficiency, and sustainable operation as core requirements, taken the effect of agricultural development on the environment into consideration, and drafted the following mid-term agricultural science and technology R&D strategies and administrative focal points:

A. Enhancing industrial competitiveness, leading the internationalization of agriculture: Promotion of innovative R&D of agricultural technology and industrialization, establishment of a "Golden Corridor" of agricultural innovation, signing bilateral cooperation agreements or MOUs with other countries, and strengthening of international S&T research interchange.

B. Adjustment of the agricultural structure, and integration of resources to promote value-

added development: Reinforcement of agriculture IP management and utilization, enhancement of cooperation among industry, academia, and research organizations and interdisciplinary integration, establishment of an agricultural S&T decision-making support system, promotion of modern, networked agricultural produce shipment and sale operations, establishment of an "agricultural production-sale decision-making management information platform," and creation of a "Virtual Museum of Taiwan Agriculture."

C. Safeguarding food security, enhancing the safety of agricultural products: Use of agricultural S&T to improve the production environment, establishment of a safe agricultural product supply system, development of a comprehensive plant and animal disease prevention and quarantine system, expansion of applications of agricultural products in nutriceutical and biotech foods, reinforcement of superior agricultural product certification, development of advanced processing of livestock and poultry products, and enhancement of research on the management and utilization of marine fisheries resources.

D. Improving the utilization of agricultural resources, maintaining development and ecological sustainability: Promotion of water conservation and high-economic-value agricultural production, improvement of agricultural land and water management efficiency, enhancement of crop fertilizer utilization, and strengthening of environmental pollutant monitoring.

XIX. Public Construction Commission, Executive Yuan

The PCC is in charge of the planning, review, coordination, and oversight of public construction projects, and strives to improve the government procurement environment, promote online government procurement, and strengthen ethics in public construction. At the same time, the PCC supervises the project schedules and controls budget implementation in major public construction projects. The PCC's current administrative goal consists of the pursuit of efficiency, quality, and integrity in accordance with national development policies and directions. The PCC is relying on technology to promote energy conservation/carbon reduction and green, sustainable public construction, it is concerned about both environmental protection an sustainable development, and it seeks to realize sustainable public construction meeting the need for environmental conservation, social justice, and economic development. The PCC's future S&T development efforts will focus on enlargement of its public

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construction database, and ensuring that it contains more types of information needed for the development of public construction. This will meet the needs of even more users, enhance user satisfaction, promote a knowledge economy in line with international construction development trends, and help the domestic construction industry globalize and boost its competitiveness.

XX. Council of Indigenous Peoples, Executive Yuan

The CIP is in charge of matters involving indigenous citizens, and has a vision of "establishing indigenous consciousness, promoting culturally-aware, distinctive development." The CIP's future S&T policy development goals include:

A. Project to enhance indigenous citizens' information skills: With a goal of promoting the versatile application of information by indigenous citizens, and creating a global model of digital outreach, this project seeks to begin with the improvement of information infrastructure in indigenous areas, and promote ubiquitous use of basic information skills by indigenous citizens and enhance digital information learning and applications in indigenous areas. The project's four goals are to enhance and develop information skills among indigenous citizens, and boost recognition and learning of information skills; strengthen the information infrastructure, and increase the availability of public information; boost the public's information skills; and provide a wide range of information application services.

B. Project to establish satellite uplinks for digital channels at five wireless TV stations and a Public TV HiHD channel satellite: The three goals of this project are as follows: (1) Since communication rights must be considered basic human rights in today's information society, the CIP is striving to realize citizens' communication rights via promotion of ubiquitous information services and media access. (2) To ensure that all citizens enjoy necessary communications services, and effectively shrink the digital divide, the CIP has taken advantage of the rise of online services and digital convergence to make a shift from telephone service to online service involving online applications and audiovisual media. Looking ahead to the future, the CIP will strengthen the ubiquity of communications services as a means of bridging the digital divide. (3) In order to maintain human dignity and the public interest, respect the rights of underprivileged groups and individuals, safeguard freedom of speech, promote cultural diversity and cultural pluralism, and establish a more caring society,

the CIP has adopted a communications content management policy of minimal interference, and promotes self-discipline among media operators while encouraging cultural diversity and respect and care for the underprivileged.

C. Project to establish a 4G and wireless broadband environment in areas with large indigenous populations: The focal points include establishment of information equipment and facilities in indigenous areas, boosting the public's information skills and applications, and fulfilling the policy goal of bridging the digital divide. (1) The CIP will establish a dedicated promotional management unit to perform oversight, coordination, and awareness tasks. (2) The CIP will endeavor to strengthen the broadband infrastructure in indigenous areas, including increasing network bandwidth and wireless Internet coverage. (3) The CIP will provide interfaces with 4G application services in indigenous areas, boosting access to mobile medicine, e-learning, guided tourism, and online agricultural services.

XXI. Hakka Affairs Council, Executive Yuan

The Hakka Affairs Council is in charge of Hakka affairs. It has a mission of fostering the Hakka language and culture, and endeavors to serve as a global Hakka cultural research and interchange center. With a vision of "thriving Hakka households and communities," the Hakka Affairs Council has future S&T development goals that include:

A. Use of Hakka cloud services to make Taiwan a global center of Hakka culture research and interchange

The Hakka Affairs Council is planning the establishment of Hakka cloud services, and hopes to rely on resource sharing using cloud technology, on-demand access, and computing technology, and integrated, complete information access standards, to provide one-stop service via a common, shared platform architecture. This will increase the depth, breadth, and effectiveness of relevant services, promote the integration, preservation, extension, and value-added use of Hakka cultural resources, and enrich and diversify Taiwan's culture.

B. Strengthening the foundation of Hakka culture by deepening historical research materials and literature

The Hakka Affairs Council will strive to uncover and organize existing overseas historical materials, literature, and research concerning the Hakka, integrate viewpoints and discussions concerning the Hakka people and Hakka culture in Taiwan

and overseas, gradually gather data needed for Hakka research, and establish a basic Hakka cultural infrastructure.

XXII. Board of Science & Technology, Executive Yuan

BOST is in charge of managing Taiwan's S&T development policies, integrating interagency S&T development matters, and coordinating and promoting nationwide S&T development. Apart from regularly reviewing the nation's S&T vision and forward-looking blueprint, and determining the government's overall S&T administrative goals, the BOST also cooperates closely with MOST in drafting the National Science and Technology Development Plan following the National Science and Technology Conference held once every four years. In terms of organizational function, the BOST serves as the staff of the Executive Yuan premier for decision-making on S&T policies, and also acts as a platform for interagency coordination and S&T policy think tank. The Board helps assess forward-looking and key technologies, accepts and implements policy instructions from above in accordance with blueprints, conference conclusions, and staff recommendations, and accepts policy recommendations from below and coordinates promotion. The Board's future S&T development goals include:

A. Strengthening review of the country's S&T development policies and allocation of resources: To further improve the country's S&T development policies, the BOST employs a collegiate approach involving board members and the heads of agencies with S&T responsibilities to arrange and coordinate the country's S&T development matters and assist the Executive Yuan premier in formulating the country's S&T policies. The policy plans, major S&T programs, and major S&T conference resolutions drafted by various agencies and organizations may serve as important references in the BOST advisory mechanism.

B. Deepening review and control of S&T programs and interagency S&T policy negotiation mechanisms: With the minister without portfolio designated by the Executive Yuan premier serving as convener, the BOST invites experts affiliated with industry, academia, and research organizations to serve as board members, holds steering committee meetings and working conferences, and conducts review, control, and interagency coordination of S&T policy programs involving multiple agencies. The Board thus facilitates the establishment of a comprehensive S&T development consensus, and realizes the goal of interagency resource integration.

C. Planning of major S&T strategy conferences: The Board implements upper-level planning and discussion of S&T policies through integration at the Executive Yuan level, which provides a strategic basis for the drafting of interagency S&T development policies via major S&T strategy conferences, and uses this basis to formulate and propose policy plans.

XXIII. Gender Equality Committee of the Executive Yuan

In keeping with its mission of actively promoting gender equality, on January 1, 2012, the Executive Yuan established the Office of Gender Equality, and the existing task force-level Committee of Women's Rights Promotion (CWRP) was subsequently expanded as the Gender Equality Committee (GEC). The Office of Gender Equality employs a citizen participation model, and incorporates the proposals and views of experts, scholars, and the representatives of women's and gender groups in the nation's highest decision-making body for gender equality policies. Apart from serving as the GEC's staff agency, the Office of Gender Equality also bears responsibility for integrating and coordinating Taiwan's gender equality policies, overseeing the advancement of women's rights and interests by central and local government agencies, and promoting various tasks connected with gender equality, so as to ensure that the government's policies are consistent with the principle of gender equality.

In view of the fact that, prior to the Executive Yuan's reorganization, information on gender mainstreaming and promotion of women's rights was widely dispersed on the websites of various responsible agencies, and there was no integrated information service platform available for public use, and there was also no large service handling information system or database, in order to provide the public superior cross-domain service, promote public access to relevant government information, and use information technology to enhance the performance of service, the Executive Yuan drafted the "Gender Equality Database Plan," which was incorporated in the flagship plan of the NDC's "E-Government Program of Taiwan 2011-2016", and has been listed as an S&T development plan since 2014. This plan calls for the following tasks:

A. Establishment of an open gender equality information environment.

B. Strengthening of the promotion of various gender equality tasks.

C. Enhancement of the performance of gender equality administrative work.

XXIV. Civil Service Protection and Training Commission

The Civil Service Protection and Training Commission (CSPTC) is responsible for drafting, determining, and implementing policies and regulations about training and interest-protection of civil servants. It takes "safeguarding the rights and interests of civil service personnel, training superior civil officials, maintaining government integrity and competence, and enhancing national competitiveness" as its administrative objective, and uses S&T to develop training policies and improve learning methods. In order to achieve these objectives, CSPTC uses scientific learning models to guide civil service training, which is based on trial experiments. CSPTC's goals include:

A. Basic research: CSPTC will use various survey and research methods to conduct research on social problems and public service motivations, which will shed light on the cognitive gap between civil servants and citizens, and also enable CSPTC to draft social issue indicators for Taiwan, which will provide early warning of problems, and can inspire civil servants to prepare themselves mentally, reflect on the state of society, and enhance their public service motivation.

B. Applied research: CSPTC will organize an "Institute of National Civil Servant Learning Science," which will rely on experimental research to resolve relevant issues in the three areas of cognitive science, behavioral science, and scientific learning, and develop scientific learning methods. CSPTC will also promote "developmental training focused on the national vision" at the Institute of National Civil Servant Learning Science, which will employ model-oriented teaching materials, service motivation training, and civil service simulation hardware and software in its research.

C. Establishment of an industry-government-academic alliance: CSPTC will employ its training technology research results to strengthen the application of social issue indicators for Taiwan in the private sector. Apart from providing government with early warning of emerging problems, the use of these indicators will raise the private sector's risk awareness and strengthen fulfillment of social responsibilities. Furthermore, CSPTC will call on industry, government, and higher education to jointly draft the "White Paper on Training Technology," and form an industry-government-academic alliance, which will transfer the training technology developed by CSPTC to the private sector and develop a high-tech training industry, boosting the skills and qualifications of industrial manpower.

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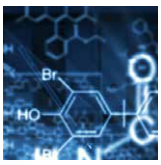

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Chapter 3
Science and Technology Development Vision and Strategies

Section 1
Vision, Goals, and Indicators

In the wake of growing international interaction and interdependence, it is essential to examine knowledge innovation, environmentally-sustainable development, enhancement of industrial value, and citizens' welfare from the perspective of globalization. Taking into consideration pressing issues faced by Taiwan and many other countries as well as the prospective roadmap for S&T innovations, Taiwan has set four goals. These goals are "to transform research innovations," "to build a sustainable green energy environment," "to add value to industrial technology," and "to establish a prosperous and diverse society." The Government is ready to do whatever is necessary to enhance the quality and quantity of scientific research, while being innovative in its approach. The Government will extend its effort to push forward the development of the green energy technology industry, create industrial added value, and increase people's convenience and welfare. All the Government's efforts are ultimately designed to create a sustainable, intelligent, and prosperous Taiwan.

I. Vision

Using intelligent technology to create a prosperous society and achieve sustainable growth.

II. Goals and Corresponding Objectives

A. Transform research innovations

1. To facilitate the early emergence of major high-tech industries: direct resources toward prioritized areas of research and promote the commercialization and industrialization of scientific research achievements.
2. To stimulate the development of domestic industry and develop genuine international competitive advantage: accelerate the commercialization of mobile

broadband in an attempt to reduce the gap between rural and urban areas.

3. To facilitate industrial upgrading: integrate diverse sources and expertise and establish cross-sector alliances involving industry, academia, and research institutions with the purpose of resolving industrial technology bottlenecks.
4. To enable the commercialization and internationalization of scientific research results: embolden research universities to play an active role in conducting R&D, promote the diversification of basic research, encourage voluntary initiatives for innovative R&D, and support the academic research sector to transform R&D results into products.

B. Build a sustainable green energy environment

1. To enhance the international competitiveness of Taiwan: establish green energy resource and energy recovery and regeneration systems and develop low-cost, diversify renewable energy systems and energy storage systems.
2. To facilitate the sustainable development of society: respond to global warming and climate change, comprehensively scrutinize the mechanism and review strategies for natural disaster prevention, promote the reuse of natural and renewable resources, and coordinate and integrate programs for environmental protection and economic development.
3. To activate first-aid and disaster relief response mechanisms in real-time: bridge an intelligent safety and disaster prevention network through a cloud-based integrated workspace to ensure that the safety and security information and technology is effectively delivered whenever needed.
4. To develop a low-carbon city aesthetic: promote interconnections between the social, economic, and environmental dimensions of sustainable urbanization, increase the share of renewable energy sources in urban and rural areas, and integrate sustainable resources across the rural-urban continuum.

C. Generate value added for the industrial technology

1. To enhance Taiwan's innovation ecosystem: refine the Government's plans that are to facilitate early stage investment in industries with high technological content, significant growth promise, and an export orientation; put venture capital mechanism on a sound footing; and expand IPR and global patent portfolios.
2. To reinforce industrial technology development and promote diffusion of

innovations: strengthen the interdisciplinary technological integration capabilities of industry, academia, and research organizations and establish the capability to tackle difficult technological challenges.

3. To enable Taiwan's S&T IP to be deployed worldwide: improve the IP legal system and IP protection measures, strengthen the training of patent personnel, revamp relevant laws and institutional systems, and effectively boost relevant service industry standards.

4. To boost industry service content and added value: promote the integration of R&D capabilities in the cultural creative, biotech pharmaceutical, medical, agricultural, and environmental protection industries, and reinforce the development of intelligent industries.

D. Establish a prosperous and diverse society

1. To create a safe, secure, comfortable, and humane living environment: apply everyday technology R&D results to meet society's diverse safety needs.

2. To improve the healthcare service network and create a senior-friendly society: develop the blueprint for localized intelligent living and care and incorporate the Government's healthcare cloud with private healthcare systems and services.

3. To cultivate superior digital citizens: take social fairness and justice as a core value in information education, promote a wide range of e-learning opportunities, and instill respect for information ethics and awareness of the importance of information security in all citizens.

4. To enhance the overall development potential of urban and rural areas: incorporate the Government's urban-rural development plan into the scientific research innovation blueprint, assign clear positioning to different regions, and plan the regional distribution of high-tech industry, other industries, and agriculture.

III. Indicators

The following reference indicators have been determined in order to assess the effectiveness of Taiwan's S&T policies and thereby help achieve the country's overall vision and goals for scientific research, the environment, industry, and society.

A. Scientific research:

1. R&D expenditures as a share of GDP: In recent years, Taiwan's R&D expenditures

as a share of GDP have grown steadily, and have approached nearly 3%, which is higher than the average value for OECD countries. In the future, Taiwan will maintain R&D funding at this level, and will strive to boost the efficiency and performance of input R&D resources.

2. Average number of academic paper citations during five-year period: The target for the average number of academic paper citations during a five-year period has been set as 5.7 times for 2017.

B. The environment:

1. Energy intensity: Taiwan's energy intensity fell from 9.5 liters of oil equivalent/TWD 1,000 in 2001 to 7.44 liters of oil equivalent/TWD 1,000 in 2012. Efforts to promote energy conservation/carbon reduction and the development of renewable energy will acceleration in the future, and energy intensity is projected to fall below 7.4 liters of oil equivalent/TWD 1,000 by 2017.
2. Photovoltaic power installed capacity: It is projected that the installed photovoltaic capacity will reach 842 MW by 2015 and 2,120 MW by 2020, and a target of 6,200 MW has been set for 2030.

C. Industry:

1. Number of patents: According to OECD statistics, and assuming an average growth rate of 3%, it is projected that the number of valid patents per 100,000 population will reach 235 in 2017.
2. Corporate R&D expenditures as a share of industrial added value: Taiwan's corporate R&D expenditures as a share of industrial added value was 3.09% in 2013, which indicates that Taiwan has some room for improvement when compared with the average value of 4.13% for the eight largest OECD countries in 2012; a target of 3.30% has been set for 2017.

D. Society:

1. Broadband access in remote areas: By 2017, coverage will be improved to the point that average of 95% of existing broadband users in remote rural areas will be able to enjoy a data rate of over 12 Mbit/sec.
2. Number of persons using remote healthcare services: The number of persons using remote healthcare services will increase to at least 200,000 persons in 2017.

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Section 2
Strategies

Taiwan's science and technology development vision and goals must be achieved through the implementation of well-thought-out strategies. In response, eight major development strategies have been drafted for the four dimensions of scientific research, environment, industry, and society. Strategies in the dimension of scientific research consist of focusing on S&T strengths, creating high research value, and improving the climate for entrepreneurship. Strategies in the dimension of s environment, include strengthening the development and acquisition of green energy, establishing sustainable development mechanisms and infrastructure for Taiwan, and achieving the parallel goals of environmental sustainability and economic growth. Strategies in the dimension of industry include boosting the quality of Taiwan's IP in order to reinforce industry's innovative capabilities and providing an IP foundation for emerging industries. Furthermore, strategies in the dimension of society include establishing the use of intelligent technological applications to create a comfortable, secure, tolerant, and convenient living environment with balanced development.

Strategy 1: Focus on cutting-edge S&T fields; creating a value for excellence

Strategy 2: Bridge the gap between the supply and demand for skilled human resources; advancing S& T entrepreneurial environment

Strategy 3: Establish Taiwan as a global leader in green technology; creating a low-carbon intelligent society

Strategy 4: Implement effective sustainable development mechanisms; making economic growth compatible with environmental enhancement

Strategy 5: Establish S&T intellectual property portfolios; strengthening momentum for industry innovation

Strategy 6: Accelerate intelligent industrial upgrading; developing prioritized emerging industries

Strategy 7: Build a prosperous and vibrant society by providing safety and security; promoting smart and healthy living

Strategy 8: Build a diverse and inclusive society; implementing sustainable rural-urban development

Strategy 1: Focus on S&T strengths, creating high research value

A. Establish budget-feasible allocation mechanisms focusing on the promotion of areas where Taiwan's outperformance has been evident

1. The Government will make use of the S&T foresight planning mechanism, exploring potential future scenarios as well as S&T development trends. The Government will also fully exploit our advantages, while enabling future development of prioritized emerging high-tech industry.
2. It is unlikely that there would be a significant increase in funding for scientific research due to fiscal constraints. The use of resources, therefore, is required to be cost-effective. The S&T budget should be allocated for nation's priority areas where Taiwan has achieved competitive advantages. By adopting a top-down approach for prioritizing areas for further development, Taiwan is determined to achieve research excellence.
3. By aligning with international scientific research trends, Taiwan will establish a versatile, innovative indicator system for the assessment of scientific research results. This system will be implemented to resolve the concern that some research is considered to be too theoretical and could be possibly applied only under limited conditions.

B. Strengthen basic research, uncovering future emerging S&T needs

1. The S&T foresight results are valued when it comes to exploring potential societal demands. Academic researchers have a vital role to play in supporting the Government in responding to potential societal demands, primarily by conducting future-oriented research. They are also encouraged to help advance scientific innovation, transform their research achievement into business applications and products, and help firms to bring innovations from emerging technologies to promising markets.
2. The Government regards basic research as essential for boosting the quantity and quality of R&D output. The Government will continue to adopt a bottom-up and strength-based approach to support basic research. Researchers are simultaneously encouraged to be creative and innovative when undertaking basic research.
3. Research-led universities ought to take an active role in conducting high-quality basic research that addresses a wide range of topics, enhances autonomous R&D

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capabilities, and helps cultivate research talents with innovative R&D skills.

4. The Government will help cultivate universities' training of interdisciplinary manpower in the areas of science and technology, law, business administration, and finance. Support will be available from the Government to boost the IP knowledge and strategic IP portfolio skills of university researchers. The Government will extend its support to academia for setting up technology barricades at different stages of the R&D research process. While calling for tougher safeguards to protect research results and patent-related knowledge produced by academic scientists, the Government will offer assistance programs that could help enhance the benefit of translational applications.

C. Accelerate the next-generation broadband R&D, strengthen education and research in the areas of emerging diseases, environmental restoration, and disaster prevention, and relying on academic excellence to stimulate industrial development

1. We will accelerate the commercialization of mobile broadband in order to further domestic industry competitiveness and sustainability and to keep abreast of international developments.

2. The deployment of a mobile broadband infrastructure will include the establishment of mobile communications platforms in remote areas, which will reduce the gap between urban and rural areas and ensure that the residents of isolated areas enjoy convenience, amenities, and services.

3. The Government has always prioritized public safety and security. We will continue to invest in research that promises to safeguard the population, responds to emerging health threats, and enhances the nation's resilience to catastrophic natural hazard impacts.

4. Taiwan is one of the most vulnerable countries in the world to natural disasters and environmental hazards. The Government is committed to the promotion of widespread ecology conservation and disaster prevention education. We will also strive to coordinate rescue operations properly and develop the skills needed for recovery and reconstruction.

D. Establish market-oriented R&D strategies and academic-industry collaboration models in correspondence with the dynamics of the domestic industry structure

1. A problem-solving model for academic-industry collaboration will be created in

which academic researchers are invited to resolve questions posed by industry-government alliances. This model will also be designed to inspire university researchers to undertake early-stage R&D. Furthermore, researchers are encouraged to provide assistance in formulating a R&D roadmap that brings cutting-edge technologies to market in the hope of dispersing risks associated with industrial development.

2. Hybrid service alliances will be established to promote the transformation and upgrading of traditional industries. These alliances will contribute to resolving industrial technology bottlenecks through the coupling of resources and expertise from a variety of sources.

3. The Government will carry out regular reviews on the academic research performance framework and regulations on academic promotion. The Government will also cautiously implement and use KPIs to evaluate the extent to which its strategies and action to promote academic-industry collaboration and research on social applications have reached its goals.

Strategy 2: Bridge the gap between the supply and demand for skilled human resources; advancing S& T entrepreneurial environment

A. Improve the circulation of talent between the academic and the industrial sectors, streamlining pathways between academia and industry

1. The Government will loosen restrictions, appropriately, on university staff working with private industry. University staff is encouraged to launch startups, including jointly with their students.

2. Initiatives for work placements and internships in industry should be promoted and upheld by strengthening collaborations between academia and industry. By allowing researchers from both academia as well as industry to benefit from sharing resources, such a collaboration will create a sustainable future pipeline of graduates for industry.

3. Working together with successful entrepreneurs, the Government will provide schemes in which bring together all entrepreneurship support services including coaching and mentoring of novice entrepreneurs.

B. Emphasize the diversified development of the educational system, enhance

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commercialization knowledge and skills training, and balance academic/industrial manpower supply and demand

1. The Government will conduct regular surveys of industry's manpower needs to rejuvenate skill-training programs. On the other hand, education and training organizations will provide assistance to the Government through training the types of manpower and strengthening in-service training schemes needed by industry.
2. The Government, ministries, and private sector will work more closely together to promote knowledge transfer and student entrepreneurship by systematically reinforcing university entrepreneurship education. The Government will support university researchers to translate R&D results into products to effectively bring the fruits of scientific research to market.
3. In order to respond to demographic ageing and a falling birth rate, the Government, firstly, plans to boost female labor force participation, second, continue to support the reintegration of the elderly into the workforce, and thirdly, strategically and smartly introduce thinking machines for increasing the polarization of the labor market in Taiwan.
4. The Government intends to enhance the professional development programs of civil servants by introducing the concept of learning science, equipping civil servants with knowledge and skills that go beyond traditional disciplinary boundaries. With a broad and interdisciplinary perspective, civil servants are expected to help the Government to assess and tackle societal challenges, while providing assistance to identify appropriate strategies for economic growth and sustain Taiwan's global competitive advantage.

C. Make Taiwan the Asia-Pacific regional hub of creativity, innovation, and entrepreneurship

1. The Government has planned to create an environment where research talents find themselves fulfilling their potential. Singapore has a highly-skilled workforce and welcomes skilled global talent. In Taiwan, sound talent retention strategies have recently been implemented to recruit and retain highly-skilled foreign talents, while some initiatives have been undertaken to bring diaspora scientists back in an attempt to counter the brain drain.
2. The Government has encouraged the establishment of interdisciplinary international

entrepreneurship social networks in in order to become further integrated into the international entrepreneurship ecosystem. Schemes will be designed to encourage migrant entrepreneurs and financiers to share their experiences and knowledge with their native-born peers.

3. An integrated platform will be created to merge virtual and physical resources to boost promotion of innovative entrepreneurship and is provided as a channel for attracting start-up funds.
4. The development of well-connected innovative startup clusters is prioritized in plans to attract both funds and manpower from overseas.
5. The Government has planned to revamp the governing mechanism for the cash flow and third-party payment systems in order to encourage the development of e-commerce as well as online startups.

D. Stimulate S&T entrepreneurship, establishing schemes focusing on early stage investment

1. The reinvigoration of the "on-campus entrepreneurship" initiative that was launched to revitalize student entrepreneurship and help with anticipated problems arising from the early startup phase is fully supported by the Government.
2. The Government will review the legal and regulatory framework as well as the governing structure in order to encourage academia and research institutions establishing angel investment foundations to provide capital funding for early stage startups.
3. Following the example of the US, Japan, and Europe, the Government is set to strengthen procurement legislation and policies with an emphasis on domestic innovative products.

E. Provide multiple fund-raising channels, dispersing early investment risk

1. The Government is committed to supporting startups by providing a multi-channel fundraising mechanism. Initiatives such as the Go Incubation Board for Startup and Acceleration Firms and the GreTai Securities Market Gofunding Zone have been successfully implemented. To extend its support toward embryonic startups, the Government has been working to further expend these mechanisms.
2. The Government's support also includes the "soft economy" startups in the

knowledge and service industries. An intangible asset valuation system will be established and introduced to facilitate access to financing.

3. To stimulate early stage venture capital investments, the Government intends to provide additional support to the priority sectors by introducing various incentives and preferential support measures.

Strategy 3: Establish Taiwan as a global leader in green technology; creating a low-carbon intelligent society

A. Raising the international competitiveness of Taiwan's green energy technology to realize the nation's energy development plan

1. The Government has launched initiatives to promote the development of virtual power plants and smart grid technologies. These initiatives are aimed: firstly, to encourage the appearance of integrated customer energy management systems as well as to expand renewable energy use; secondly, to diversify renewable energy systems and energy storage systems; thirdly, to invest in a micro-grid infrastructure; fourthly, to develop grid energy storage technologies by industry and research organizations; and fifthly, to establish the lowest-cost backup capacity via the integration and application of smart grid technologies.
2. The Government is committed to the development of safe, efficient, clean energy, and carbon dioxide capture, sequestration, and reuse technology; promotion of technology demonstration projects showing how carbon emissions from power generation systems can be effectively reduced; and the development of derivative green energy products with economic value.
3. Several government plans have already been implemented to accelerate the promotion of cogeneration systems and encourage businesses and industries to establish cogeneration systems to produce power for their own use.
4. The Government will continue to develop advanced green energy technology, aiming to boost the international competitiveness of relevant firms and to incorporate coordination mechanisms when drafting administrative laws and regulations.
5. The Government has planned to enhance the photoelectric conversion efficiency of solar power systems and develop sun tracking devices. Furthermore, an action plan will be implemented in the near future to assist commercialization of patented

technologies such as solar cell epitaxy and high concentration module processes.

6. The Government intends to incorporate the wind power industry into the country's future renewable energy development policy. With the goal of making Taiwan one of the world's leading manufacturers and suppliers of large wind turbine equipment, the Government will continue with its effort to integrate the up-, mid-, and down-stream industry chain involved in wind turbine equipment production and support for the domestic development and production of wind farm equipment and components.

7. In order to reduce dependence on petroleum and other forms of primary energy, the Government has been offering a range of support to develop bio-sourced composite material technology and applications, to promote application of bio-sourced materials in high-value information and communications products, and to expand the range of applications of bio-sourced composite materials, including those used in functional bio-rubber composites.

B. Creation of an intelligent safety and disaster prevention network safeguarding the lives and safety of the citizens

1. The Government intends to bridge the linkage between monitoring and disaster relief systems established by industry, government, academia, and the research community. An innovative system will emerge covering the following fundamental elements: urban planning, weather forecasting, medical support, disaster risk management, water and soil conservation, hazard potential assessment and investigation, measurement and testing, facility safety monitoring, electronic monitoring, and communications. Furthermore, this system will be supported by cloud computing technology that identifies and reports the early warning signals, while activating management mechanisms during disasters and emergency situations.

2. Plans will be set out by government to accelerate fiber-optic access network and wireless broadband access network deployment as well as expanded pipeline deployment. The Government's plan will also include strengthening the establishment of access point and household coverage, expanding intelligent public broadband fiber-optic networks and cloud app platforms, integrating cloud technology and portable intelligent devices such as cell phones in order to provide convenient everyday services, and supporting residential health and safety.

3. To establish a national intelligent disaster prevention and relief network, firstly, the central and local government disaster prevention and relief resources will be integrated; secondly, the governing structure for disaster mitigation and relief management will be strengthened; and thirdly, the collaborative efforts among smart industry are to be encouraged.

C. Build an intelligent environment to enhance safety and security; establish the linkage between green energy supply chains and service chains.

1. To create a safety and intelligent embedded green energy environment, the Government plans to integrate economically-relevant green energy technology, research manpower, funds, and production technology. While the Government's plan will extend to establishing the linkage between green energy supply chains and service chains, other actions point toward a green and energy-intelligent economy that will include: strengthening consumer awareness of green energy technology knowledge and enhancing the standards of the green energy product certification system in order to ensure safe use by consumers.

2. The Government has committed to the establishment of safe, convenient, comfortable, high-efficiency, low-emission transportation systems. Meanwhile, many efforts have been made to facilitate the development of sustainable transportation technologies. Such technologies include, but are not limited to lightweight environmental-friendly materials, adaptive transportation control systems, diesel engine technologies, high-pressure fuel injection systems, and development of key non-petroleum-based vehicle fuels and technologies, including vehicle-efficiency technologies hydrogen and biofuel alternative motor system technologies.

D. Promote low-carbon urban aesthetics to breathe new life into urban and rural landscapes

1. The Government has been working toward integrating energy conservation/ carbon reduction initiatives and the regional and urban planning. Drawing on the Government's integrated plans, projects on the promotion of smart green buildings are being implemented to bolster the development of innovative low-carbon and near-zero energy green architectural design featuring intelligent energy conservation, green energy, low carbon emissions, health and convenience, and

recycling technologies.

2. While pushing forward the smart green buildings promotion projects, the Government is committed to facilitating the joint participation of citizens and government officials at the local level in furtherance of low-carbon urban/rural ecological environment projects.

3. The Government will conduct impact assessment, looking at the impact of rural/urban economic development on ecological balance. When extending support for the development of local renewable energy industries, the Government will take local geographical conditions and natural resources into account.

4. The Government's economic and environmental goals are designed to support coexistence. Incentives will be provided to stimulate environmental corporations to serve as "green neighbors," which aim to convince enterprises to perform as environmentally-friendly corporations or as part of environmental protection industry alliances. Environmental entrepreneurs are encouraged to serve as mediators in environmental and economic development conflicts and as major promoters of green low-carbon cities.

Strategy 4: Implement effective sustainable development mechanisms; making economic growth compatible with environmental enhancement

A. Accelerate the establishment of a sustainable development decision-making mechanism, placing greater importance on national land conservation issues

1. The Government will incorporate the concept of the ecological footprint into sustainable development decision-making mechanisms, and emphasize that policy planning should strike a balance between environmental use and environmental load.

2. Responding to global warming and climate change, the Government will perform a comprehensive review of disaster prevention mechanisms and strategies, incorporate climate change disaster risk assessment and disaster mitigation measures in EIA systems, and establish sound national land conservation compensation mechanisms and stable funding sources.

3. The Government intends to promote the concept of environmental governance. Therefore, the Government, firstly, will make immediate efforts to establish

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community-based disaster prevention networks while looking into the development and implementation of application software for natural disaster prevention as well as activities for disaster prevention, preparation, and mitigation. Secondly, the Government will continue working on providing adequate basic emergency life support facilities. Thirdly, a full review will be conducted to examine how our rural/urban development plan responds to flood emergencies. The findings of the review will provide input and insights into Government's initiative for building a flood prediction and prevention system. The aim of this system is to reduce the impact of natural disasters, protect the ecological environment, and ensure the citizens' safety and security.

4. The Government's efforts to promote sustainable development recognize that issues emerging from resource conservation on national land and delineation of national land have been increasingly critical. A full-scale investigation will be launched, looking into the potential impacts that natural disasters and hazards could make on national land conservation. The Government proposes to actively promote the establishment of national land conservation areas and strengthen the national land use classification system. This proposal will include the design and implementation of an analytical framework that quantitatively assesses the vulnerability of national lands to natural disaster risks.

5. The Government will take the necessary steps to ensure a sustainable flow of mountain resources to the citizens and promote the sustainable use of water and soil resources. Regulations will be implemented to protect the mountainsides from overdevelopment and to monitor movements of unstable hill slopes. Further actions will be taken to monitor and assess changes in coastal lands and reinforce protection of coastal lands and coast ecosystem restoration work.

6. The Government will reinforce the governance framework for the groundwater resources toward the mitigation and prevention of land subsidence disasters. Such a governance framework is expected to have impacts on reducing vulnerability of water supply systems, enhance the ability of the water supply system to respond to droughts, and strengthen water conservation and recycling. Additionally, this governance framework will facilitate river control projects, deliver effective disaster prevention projects, bolster the development of surface water and alternative water sources, promote renewable energy usage in the aquaculture industry, and reinforce forest resources.

B. Create a favorable regulatory environment and marketplace to develop an environment for green energy industry

1. The Government has been encouraging the physical exchange of resources (including energy, equipment, facilities, and materials) to stimulate industrial symbiosis. The adaptation of the industrial symbiosis concept is aimed at boosting the competitiveness of the renewable energy industry, enhancing the legal framework and market mechanisms for the green energy industry, and implementing industry standards that are consistent with international norms.
2. The Government has been putting effort into supporting energy ICT, and will continue to do so in order to boost commercial and industrial energy efficiency.
3. Initiatives will be implemented to stimulate domestic demand for green energy products while expanding the market beyond our national borders. Additionally, the Government recently has placed FDI on the policy agenda, in order to relax restrictions on foreign investment and to eliminate tariffs and other trade barriers.
4. The Government is committed to reinforcing the legal framework for patent protection of green energy technology in order to attract foreign investment, promote interest in product upgrading and innovation, and build up cross-border partnerships.

C. Integrate green energy technologies and consumer goods industries and promote a multifaceted, intelligent, and eco-friendly way of life

1. The Government will launch a green economy development program, aiming to improve the compatibility of industry with the natural environment. Facilitating the integration of green energy, green technology, and green living with the cultural creativity industry is vital to this program. Such integration will promote a multifaceted, intelligent, and eco-friendly way of life.
2. The Government intends to launch a campaign urging the fashion industry to be sustainable, in part by using eco-friendly products such as recycled polyester fiber. The Government's intention is to stimulate a diversified development of eco-friendly, smart textiles through the expansion of environmental product lines. On the other hand, the Government is encouraging Taiwan's textile industry to adopt energy conservation/carbon reduction and environmental protection concepts as well as activities in processes.

D. Reinforce Strategic Environmental Assessment (SEA), enhancing compatibility between economic growth and environmental sustainability

1. The Government will continue looking into the reinforcement of SEA, strengthen monitoring technology, and place an emphasis on assessment of health risks, energy risks, and social impact. Other efforts include increasing the sustainable use of resources, promoting the goal of zero-waste industry, and strengthening environmental standards as well as certification mark systems. Ultimately, these efforts are aimed at making environmental sustainability and economic growth more compatible.

2. The Government will reform the tax system in order to encourage innovation in green technology, while supporting further development of clean technology to boost the renewable energy sector. The Government's strategies to support emerging green technology and energy startups will be reviewed regularly to ensure that Taiwan keeps its global competitive edge in the renewable energy sector.

3. To enhance the development of the green economy, the Government is working on improving the green investment climate and monitoring the impact of financial activities and products on the ecological environment and on environmental pollution. Additionally, while the financial sector is emboldened to be part of the initiative for environmental protection and sustainable economic and social development, this sector is encouraged to increase its support for financing startups in the emerging green energy and environmental protection industries.

Strategy 5: Establish S&T intellectual property portfolios; strengthening momentum for industry innovation

A. Improving the climate for entrepreneurship as well as investment

1. Strategies will be set up by the Government to attract international venture capital firms to Taiwan's new startups. The Government also anticipates that these strategies will pave the way for Taiwan to receive international talent and for our young entrepreneurs to receive managerial advice based on the successful experiences of foreign venture capitalists. These strategies, when fully implemented, will bring together commercialization as well as technological innovation capacities to both sides, and moreover, facilitate high potential startups to obtain venture capital financing from overseas and strengthen our international

partnerships.

2. To enhance Taiwan's innovation ecosystem, the Government will continue its efforts to encourage both domestic and international venture capital firms to invest in our seed and early stage startups. Extra efforts will be made to facilitate a better linkage between high potential start-ups and international experienced venture capital firms.
3. The Government will improve SMEs' access to finance through financial institutions' and venture capital firms' capital funds programs. The Government, furthermore, will encourage venture capitalists to provide SMEs with best business practices.
4. The Government intends to strengthen venture capital operating mechanisms through the adaptation of the "Limited Partnership Act." By introducing the model of limited partnership, the Government seeks to promote the operating flexibility and organizational diversity of Taiwan's enterprises.

B. Energize the use of intellectual property by the academic sector

1. An operating model in which the Government provides funding, industry poses questions, and academic researchers answer questions will be formulated. This model aims to induce government agencies, major industry associations, and groups of companies to organize industry-government alliances. Such alliances will formulate mid-and long-term research topics aimed at expanding IP portfolios.
2. The Government will conduct inventories of existing patents held by industry, academia, and research organizations and draw on the analytical capabilities and technology R&D capacity of IP professionals in order to boost the effectiveness of patent R&D and utilization.
3. In order to disseminate IP knowledge on a broad scale, the Government will continue to provide IP education to industry, academia, and research institutions, and will concurrently offer patent courses at universities.

C. Emphasize the protection and development of early technology IP

1. The Government will bring together industry, academia, and the research community jointly to refine the patent landscape. This government-led campaign will help identify early technologies with commercial potential and enable industry to participate in R&D from early stage.

2. Reinforced training will boost the quantity and qualifications of patent personnel in industry. The cultivation of professionals with case analysis skills will help companies establish patent IP portfolios. Furthermore, practicing attorneys with practical international case experience will be recruited to participate in the operation of IP management companies.
3. The Government will put the IP legal system and IP protection measures on a sound footing, enhance the effectiveness of relevant laws and institutional systems, and boost the standards of IP-related service firms.
4. The government will put the IP legal system and IP protection measures on a sound footing, enhance the effectiveness of relevant laws and institutional systems, and boost the standards of IP-related service firms.

D. Promote global IP portfolios and foster a highly-profitable industry innovation environment

1. The provision of adequate resources and government services will encourage Taiwanese firms to engage in patent development and the effort to raise the economic value of R&D results. In order to accelerate the industrialization of patented technologies and help companies acquire the technology needed for upgrading and transformation, the Government will sponsor marketing campaigns, facilitate technology transfer, and promote matchmaking involving patented technologies.
2. The Government will provide incentives to cross-sector alliances involving industry, academia, and research institutions with the purpose of resolving the world's most pressing global challenges. Such alliances are also expected to enhance interdisciplinary technology integration and strengthen global patent portfolios.
3. The Government will take necessary action to stimulate technological innovation and commercialization in industrial sectors. These actions include offering assistance to promote the industrial application of invention patents, integrating cross-ministerial and cross-agency resources, and provide assistance to facilitate the commercialization of corporate patents, verification of commercialized technologies, and development of new products.

Strategy 6: Accelerate intelligent industrial upgrading; developing prioritized emerging industries

A. Encourage the establishment of forward-looking IP portfolios in prioritized industries, cultivation of global and regional competitive advantages

1. The Government will strive to uncover and screen domestic and foreign opportunities with commercial potential, provide assistance, including consulting and diagnostic services, to startups in prioritized industries, and offer mid- and long-term help to the owners of promising startups.
2. The Government encourages initiatives launched to strengthen interdisciplinary R&D innovation networks in prioritized fields, including the establishment of inter-field academic and interagency collaborative R&D mechanisms.
3. The Government will promote linkage among emerging industry chains, encourage industrial sectors to establish IP portfolios based on emerging research results during the early technology stage, and foster efforts to stimulate the growth of emerging industries, which will promote fusion of new technologies and emerging industries.

B. Draw on the strengths of the information and communications industry to promote corporate upgrading to intelligent technologies

1. In order to push forward innovation in intelligent industry, the Government is prepared to exploit the advantages of its ICT industry to integrate the capabilities of research institutions and firms in the fields of cultural creativity, biotech pharmaceuticals, medicine, agriculture, and environmental protection for the purpose of promoting intelligent industrial development.
2. The Government attempts to encourage the development of intelligent manufacturing as well as its related innovative applications, while establishing a cloud-based environment. The Government's attempts are made to transform Taiwan into a technology island of Internet of Things.
3. The Government will bolster initiatives that aim to integrate Internet of Things and smart services through the effective use of ICT. Ultimately, the Government's support for these initiatives is expected to drive collaboration and development across the whole Smart City value-chain, and furthermore boost industry service content and added value.

C. Uncover and develop decisive industrial technologies

1. The Government plans to refine foresight mechanisms for the S&T development and invite best interdisciplinary talents to participate in the topic selection panel.
2. Aiming for accelerating clean-energy Taiwan's industrial transformation, the Government will bring together experts from academia and private sectors to joint research campaigns, targeting basic industrial technologies with high applicability, high technical challenges, significant economic influence, and broad potential markets, thereby improving Taiwan's industrial technologies.
3. The Government welcomes initiatives that are set to embrace joint efforts of academia-industry alliances specifically in respect of curriculum development. The paramount purpose of such curriculum development is to equip students with core professional competencies aimed at meeting industry's demand for skilled manpower.
4. The Government will encourage firms to provide application services that combine hardware and software to gain a foothold in the global intelligent mobile device market. Taiwanese firms are encouraged to develop R&D projects aimed at fostering the development of technologies needed for the next-generation of intelligent mobile devices.

D. Create an intelligent industry operating environment

1. The Government plans to establish a cloud-based environment and relevant technological development applications in order to attract large business enterprises to establish information operations centers in Taiwan.
2. The Government will make full use of IT technology, aiming firstly to develop an intelligent infrastructure; secondly, to promote industrial upgrading and transformation; and thirdly, to boost production efficiency and product quality.
3. Responding to the demand for manpower that can support the upgrade of industry to intelligent technologies, the Government will actively train outstanding individuals who combine knowledge of emerging fields, an interdisciplinary, international outlook, and an ability to innovate.

Strategy 7: Build a prosperous and vibrant society by providing safety and security; promoting smart and healthy living

A. Meet society's varied safety needs, establish a humane, safe, contented environment

1. To create a friendly and healthy work environment, the Government will establish a systemic risk assessment framework for workplace health and safety hazards. The Government will follow up on the results of the assessment to develop strong workplace health and safety standards for employees.
2. In order to enhance transportation effectiveness and management performance and provide a reliable, superior transportation network, the Government has been working on establishment of intelligent transportation systems (ITS) to meet transport and travel demands. Under the Government's plan, the ITS is established to cover 9 intelligent transportation system service areas including the Advanced Traffic Management Services (ATMS) and Advanced Public Transportation Services (APTS). Such an establishment will accomplish a better connection between urban and rural transportation systems.
3. The E-Invoices system is developed by the Government to help streamline processing of transactions and provide fully transparent data. Provided in the cloud-based environment, this system establishes food production history in order to enable the early detection of emerging risks associated with food. The Government is working to ensure that the food industry can adopt this E-Invoices system.
4. Through the use of interagency data and big data analytical technology, the Government will step up efforts to establish online food traceability systems that provide early warning as well as prompt responses to food safety incidents. The health agencies of both central and local government are required to work together to maximize the effectiveness of these systems.

B. Make full use of current life safety and security R&D results, applying in all elements of consumer applications

1. The Government continues the strengthening work for public safety and protection of citizens' security. A citizen safety network will be established by employing the Internet, satellite communications, and intelligent monitoring and image identification applications.
2. The Government will establish a disaster prevention relief network. The

establishment of this network through the use of ICT will employ real-time data collection and analysis. Better use of this network has the potential to effectively reduce the threat of typhoons and earthquakes, and preserve the safety of Taiwan's residents.

3. The Government will do more to encourage private sector investment in disaster-prevention products that feature interdisciplinary technological applications. Schemes will be introduced by the Government specifically to encourage private sectors to develop integrated applications technologies that strengthen the interactivity of the disaster prevention network and enhance Taiwan's disaster prevention capabilities.

C. Use of ICT to strengthen the healthcare system, employing industry's strengths to achieve sustainable operation

1. In order to integrate the Government's Health Cloud and private healthcare clouds, the Government will draft standards for cloud big data storage, transmission, processing, and formats, with the goal of ensuring the provision of safe, confidence-inspiring, high-quality service.
2. The Government pushes forward with plans for strengthening wearable device technology and value-added healthcare service R&D. Aiming to meet the need of the elderly and the general public for dependable healthcare services, the Government will provide incentives to encourage firstly private sectors involvement in the healthcare provision system, and secondly the extensive use of physiological sensing network technology and systems.
3. The Government will set up a healthcare database-driven synthesis platform. This platform will regularly synchronize data collected from household, community, and organization healthcare networks, enabling members of the public to seamlessly move between different healthcare systems.
4. Efforts will be made to induce management personnel in the life science industry to align Taiwan's industrial technology with international needs through the commercialization and globalization of pharmaceuticals, biotechnology, and genetic technology. This, in turn, will enable the industry to attract funds, boost its rate of return on investment, and enhance its R&D capabilities.

D. Improve emerging communicable disease monitoring and risk assessment and develop

effective disease outbreak prevention strategies and technologies

1. In order to strengthen national network for preventing emerging infectious diseases, the Government will integrate the nation's communicable disease monitoring and control systems, establish a cutting-edge disease laboratory, and reinforce R&D of communicable disease monitoring and prevention technology.
2. The Government will actively promote the development of the vaccine industry, while facilitating the establishment of cross-sector alliances involving government, industry, academia, and research institutions with the purpose of enhancing the country's disease prevention capabilities and improving vaccine R&D.
3. The Government will promote to engage with cross-border communicable disease control cooperation with countries in Europe, the Americas, and Asia, aiming to will establish an emerging communicable disease prevention and control mechanism with a global perspective.

Strategy 8: Build a diverse and inclusive society; implementing sustainable rural-urban development

A. Promote pluralistic participation in fair e-learning opportunities to foster social harmony and enhance citizens' information competencies

1. Drawing on the joint efforts of individuals and the public and private sectors, the Government will make strategic use of various types of big data and open data, in conjunction with social networking, information platforms, cloud computing, social intelligence, and other relevant tools. The launch of big data and open data government initiatives aims to strengthen citizens' participation mechanisms and increase the openness, transparency, and efficiency of policy-making.
2. The Government regards social fairness and justice as core values of national education. Furthermore, to enhance equal opportunities in digital learning in urban and rural areas, the Government will employ mobile communications and various types of mobile devices to establish mobile learning environments on school campuses.
3. The Government will create a highly effective digital transmission environment, continue to promote the nation wide deployment of fiber-optic and mobile broadband networks, and boost the quantity and quality of online information available to citizens.

4. The Government will strive to instill information ethics among citizens, spread awareness of online risks and threats, and enhance public awareness and knowledge of online security laws and regulations.

B. Actively address the aging of society by promoting the creation of age-friendly cities

1. To assist seniors in the workplace and establish a considerate working environment, the Government will promote the development of senior-friendly on-the-job technologies and encourage the use of appropriate assistive equipment.
2. The Government is committed to creating and maintaining an inclusive as well as barrier-free environment. Therefore, the Government will ensure barrier-free technologies and facilities are installed in public and private spaces in order to provide high-quality dwellings and public areas and guarantee safe, thoughtful spaces for senior populations.
3. The Government will set up schemes to encourage ICT learning among senior adults, aiming to boost mobile communications product use rate and familiarity of senior population. The Government intends to provide senior adults with a digital-friendly environment where they can fully enjoy the benefits of Taiwan's information society.

C. Emphasize the balance between the environment and digital access, accomplishing a stronger integration of urban and rural development

1. The Government will conduct a survey of urban and rural manpower needs. The result of the survey will help the Government to identify strategies for manpower supply and demand supply and for the establishment of an urban and rural manpower management information system. The Government will also provide incentive policies, as appropriate, to encourage labor mobility, establish an industrial competitive advantage, and boost workers' incomes.
2. The Government will digitize art and culture educational resources to provide artistic and cultural learning opportunities to remote areas.
3. Improve Internet and communications coverage and quality in rural areas to reduce the gap between urban and rural areas.

D. Actively creating opportunities for urban and rural interaction, using S&T innovation to drive the diversified, coordinated development of urban and rural areas

1. Built upon the high visibility of the infrastructure and advancement of connectivity in urban areas, selective cities will be established as innovation hubs to gather resources and information on technological innovations from outside the region. While the concept of economic sustainability is placed at the heart of Government's urban-rural development strategy, the Government is committed to fostering better rural-urban hybridity by facilitating information and resources sharing, stimulating mutual growth, and boosting the quality of life.
2. The Government will refine the national land use plans, and assign urban and rural areas well-defined positions in response to the regional planning. The Government's regional planning will also illustrate strategies that provide support to the further development of respective industries on the one hand, and linkages between industries on the other. The Government's new approach to regional planning also intends to highlight the features of each region, while maximizing the benefit of urban-rural development.

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Section 3
The Alignment Between Eight Strategies and the Seven Major Issues at the 9th National Science and Technology Conference

While formulating development strategies in accordance with relevant domestic and foreign issues, policies, and future technology development trends, the 8 grand strategies in this version of the *White Paper on Science and Technology* also correspond to the seven major strategies drafted by the 9th National Science and Technology Conference (Table 32). Drawing on the issues and strategies discussed at the 9th National Science and Technology Conference, issue areas on which this White Paper proposes to place greater emphasis include, but are not limited to, the following: promoting areas of scientific research where Taiwan is outperforming, academic-industry R&D linkage, IP portfolios, sustainable development mechanisms, and development of prioritized emerging industries.

In addition, this version of the *White Paper on Science and Technology* also proposes S&T policies in response to social innovation. As introduced above, eight grand strategies are set out to achieve the vision of building a sustainable and prosperous society by intelligent science and technology. Focal points in alignment with these strategies include: promoting intelligent healthy living, establishment of a happy and prosperous living environment, and promoting balanced social development, realizing the use of S&T to improve citizens' lives and letting citizens recognize the efforts made by Government to realize the social value of S&T.

Table 32 The Alignment between Goals of the *National Science and Technology Development Plan (2013-2016)* and *White Paper on Science and Technology (2015-2018)*

White Paper on Science and Technology (2015-2018)		*National Science and Technology Development Plan (2013-2016)*	
Goals	Strategic Focal Points	Goals	Strategic Focal Points
To transform research innovations	• Promoting development of prioritized emerging areas • Connecting academic research industrial demand • Balancing academic/ industrial manpower supply and demand • Promoting cross-sectoral andinterdisciplinary fusion • Establishing an innovation ecosystem	To raise Taiwan's academic and research status	• Refining the academic evaluation system • Establishing mechanisms for exploring technology frontier • Establishing models of academic-industry partnerships
		To advance top-down S&T projects	• Strengthening governing structure for national S&T programs • Strengthening the performance evaluation mechanism • Adjusting projects' up-, mid-, and downstream linkage
		To promote innovation in S&T industry	• Creating a fair and transparent funding distribution system • Liberalizing the rigid background requirements of the budget reviewers • Recruiting experienced international venture capitalists with track records of outstanding performance
		To address Taiwan's human resource crisis in S&T fields	• Diversifying the education system • Enhancing professional training programs and developing a value-added training industry • Improving Taiwan's international competitiveness at recruiting global talents
To Build a sustainable green energy environment	• Developing green energy technology • Establishing an intelligent low-carbon environment • Making economic growth compatible with environmental enhancement • Adapting the industrial symbiosis concept	To promote sustainable development	• Supporting interdisciplinary earth science research • Establishing scientific sustainability assessment platforms • Revising sustainable development governance • Resolving national land utilization and environment development disputes • Promoting a green economy and sustainable development

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White Paper on Science and Technology (2015-2018)		*National Science and Technology Development Plan (2013-2016)*	
To generate value added for the industrial technology	• Strengthening patent IP portfolios • Improving the climate for entrepreneurship • Promoting industrial upgrading to intelligent technologies • stimulate the growth of emerging industries	To Strategize intellectual property arrangement	• Promoting forward-looking IP portfolios in exclsive industries • Encouraging the development of links in emerging industry chains and connection with IP • Establishing early technology angel funds • Promoting R&D on high-risk, but promising pivotal areas
		To bridge academic research and industrial application	• Funding groundbreaking research projects and supporting commercialization of early-stage R&D projects • Providing government grants to absorb risks emerged from the early-stage technology development
		To promote innovation in S&T industry	• Establishing a problem-solving oriented model for academic-industry collaboration that academic researchers are invited to resolve questions posed by industry-government alliances
To establish a prosperous and diverse society	• Creating a safe and secure society • Promoting healthcare • Pursuing inclusive growth • Realizing the sustainable development of national land	To promote sustainable development	• Revising sustainable development governance • Resolving national land utilization and environment development disputes

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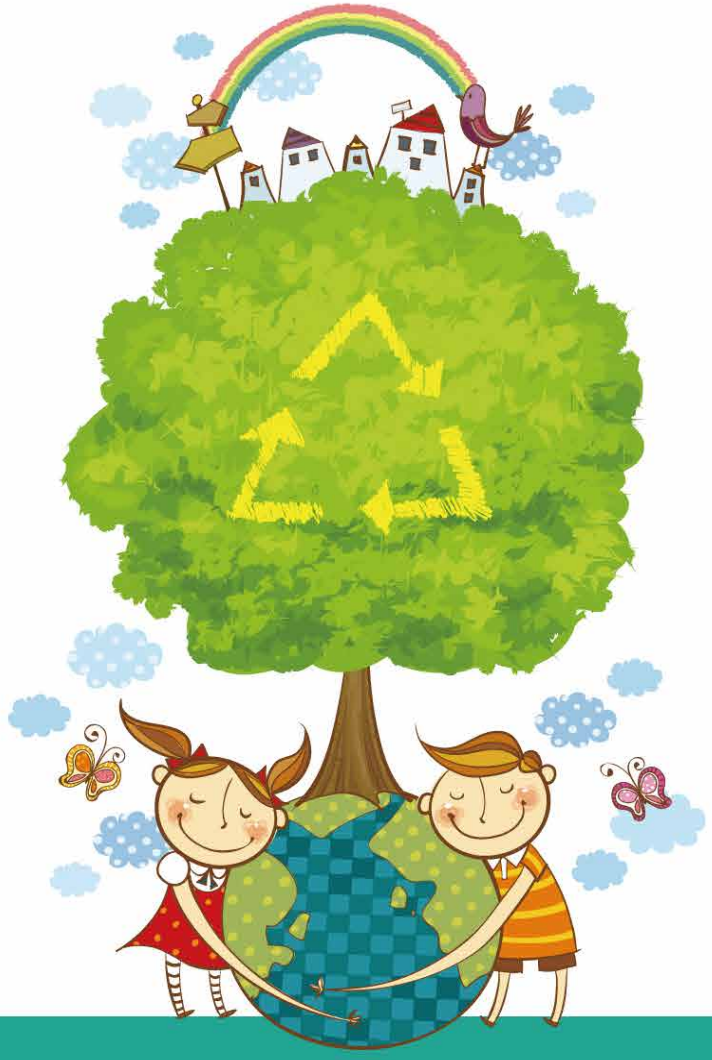

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