



Science Bulletin

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National Science Council, ROC

The Sixth National Conference on Science and Technology

This year's Sixth National Conference on Science and Technology had the theme of "using science and technology to lead the nation into the knowledge economy age." After four discussions over a period of three days, the close to 1,500 sci-tech leaders in attendance thoroughly debated this theme and proposed many concrete recommendations.

This conference resulted in plans that will enable science and technology in the ROC to catch up to the level of the world's developed nations within ten years; that will promote academic research and transform Taiwan into a research hotbed of the Asia-Pacific region; that will make Taiwan into an Asia-Pacific center of high-tech industry R&D, manufacturing, and services; and will realize the vision of an island of science and the humanities containing clusters of high-tech industries.

As defined by the conference, the six overall goals of sci-tech development in the ROC are to: strengthen the knowledge innovation system, boost the competitive advantage of industry, improve and enrich citizens' quality of life, promote the country's sustainable development, and strengthen the sci-tech foundation of the country's autonomous defense capability. Under these goals, which represent responses to international trends and the needs of national development, were drafted nine specific sci-tech development strategies aimed at transforming Taiwan into a green silicon island. These goals and strategies will become the supreme guiding principles of the government's sci-tech development efforts over the

next four years.

In comparison with other countries, Taiwan invests relatively little on science and technology. In light of this fact, Executive Yuan Premier Chang Chun-hsiung proclaimed in his speech at the close of the conference that the government would do its utmost to insure that the sci-tech R&D budget grows at a stable rate of 10% annually. In addition, the government will continue to encourage R&D investment on the part of private companies by offering tax incentives and research subsidies. Premier Chang expressed his hope that the country's R&D spending will surpass 3% of GDP by 2010.

The conference reaffirmed that the pursuit of academic excellence must be stressed in future academic research. This will entail the development of research universities and academic research institutions meeting the highest international standards, as well as the training and cultivation of world-class researchers. To achieve these goals, future spending on basic research will be gradually increased to 15% from the current 11%.

The conference selected biological and biomedical technology, advanced materials science and chemical technology, energy and environmental technology, information and software, telecommunications systems technology, micro electro-mechanical technology, and precision machinery as the focal areas of industrial technology development over the next four years. To encourage the establishment of high-tech companies and make Taiwan a haven for high-tech entrepreneurs, the government will continue to improve financial incentive measures and legal safeguards



The opening ceremony for the Sixth National Conference on Science and Technology



Executive Yuan Premier Chang Chun-hsiung speaking at the conference's closing ceremony.

for intellectual property rights. At the same time, science and technology will be used to assist the upgrading of conventional industries. Within the next four years the country's science-based industrial parks will catalyze the formation of high-tech industrial clusters in northern, central, and southern Taiwan, establishing the basic framework for a green silicon island.

In the areas of sustainable development and public welfare, it was felt

by those in attendance that because biotechnology and computer technology will have a profound impact on ethics and the social structure, relevant organizations should respond at the earliest possible date by giving rein to the moderating role of the humanities and fostering the creation of a harmonious society.

To apply science and technology to the betterment of citizens' quality of life, in such areas as "environmental protection," "energy technology," "water resources and marine resource technology," "medical science and technology," "applications of nuclear medicine," "agricultural technology," "transportation technology," "development of construction technology," and "disaster prevention technology," conference participants offered

concrete suggestions for the directions and salient points of the government's future efforts.

With regard to the training, recruiting, and utilization of sci-tech personnel, because the country is still lacking in individuals with creative ability, and because industry urgently requires high-tech employees, but finds it difficult to obtain qualified manpower when it is needed, Premier Chang called upon government agencies to propose short-term response measures and long-term training programs.

Besides placing greater emphasis on sci-tech education in the country's schools, the Executive Yuan also expressed a commitment to promoting sci-tech education for everyday life. Major goals will include helping citi-

zens understand sci-tech, better use sci-tech, participate in sci-tech activities, and bringing sci-tech education to elementary and junior high school students.

Premier Chang finally requested that the National Science Council, Executive Yuan, in conjunction with other government agencies, make a detailed study of the consensus established at the conference and submit a "National Science and Technology Development Plan" to the Executive Yuan for approval before the end of March. This plan will then serve as the basis for a "National Science and Technology Development Program" guiding the realization of the recommendations of the National Conference on Science and Technology.

Taiwan APCST Beamline Dedication Ceremony

On December 18, 1998, Asia and Pacific Council for Science and Technology (APCST) and Japan Synchrotron Radiation Research Institute (JASRI) signed a memorandum and an agreement concerning the SPring-8 Taiwan APCST Beamline Construction Project. After two years of collaborative efforts, the first beamline for biostructure and material research has been completed on schedule, and commissioning began. The beamline dedication ceremony will be held on December 15, 2000 at SPring-8 in Japan.

During the Taiwan APCST Beamline Dedication Ceremony, Dr. Cheng-I Weng, Chairman of National Science Council, Dr. Chien-Te Chen, Director of APCST Synchrotron Radiation Project, Mr. Yoshinori Ihara, President of JASRI, and Prof. Hiromichi Kamitsubo, Director of SPring-8, are invited to cut the ribbon and to push the start-up button. The researchers and technical personnel of both parties who have been taking part in this project are also invited to

attend the ceremony.

SPring-8 Light Source began its operation in October 1997. This third generation light source is the largest and most powerful synchrotron radiation facility in the world. Its electron energy of up to 8.0 GeV is high enough to produce powerful hard X-ray beams. In this international cooperation project, Taiwan is committed to building two hard X-ray beamlines: (1) biostructure and material research beamline and (2) inelastic X-ray scattering beamline. The light source of the biostructure and material research beamline is one of the bend magnets in SPring-8. With this beamline, the



Taiwan APCST Biostructure & Materials Research Beamline



Taiwan APCST Beamline Dedication Ceremony



From left to right: Prof. Hiromichi Kamitsubo, Director of SPring-8, Prof. Cheng-I Weng, Chairman of National Science Council, Prof. Yoshinori Ihara, President of JASRI, Prof. Chien-Te Chen, Director of APCST Synchrotron Radiation Project

scientists can conduct experiments in X-ray absorption spectroscopy, high resolution X-ray scattering, protein crystallography, and micro-beam scattering. The hard X-ray, from the inelastic X-ray scattering beamline is generated from an undulator, which has been completed and was installed in the SPring-8 storage ring at the beginning of this year. The beamline and experimental stations are currently under construction, and they are de-

signed for advanced research in highly correlated electronic systems such as high Tc super-conductors and colossal magnetic resistance materials.

Upon completion of this project, Taiwan will have control over 75% to 80% of the beam time, and the remaining 20% to 25% will be managed by SPring-8 and will be assigned to general users. Since the "Taiwan Light Source" in Hsinchu provides cutting-edge research capabilities in the

vacuum ultraviolet and soft X-ray energy regions, Taiwanese scientists will be able to conduct sophisticated experiments using the full range of synchrotron radiation available at two light sources. This research will promote local synchrotron radiation research, and it will contribute to raising the international profile of advanced research in Taiwan.

Master Plan for a "Sustainable Taiwan"

The key concept of sustainable development is that mankind's socioeconomic development must acknowledge and respect the carrying capacity of the Earth's environment, and avoid diminishing future generations' opportunities for continued development. The three-fold foundation on which sustainable development must be built is composed of economic growth, environmental protection, and social justice.

The NSC's master plan for a "Sustainable Taiwan" includes the following three core topics: (1) Sustainable Taiwan 2011, (2) Sustainable Taiwan Assessment System, and (3) Sustainable Development Information System. The master plan also calls for the project office to bear responsibility for horizontal integration of work on the three main topics, as well as the implementation of relevant international cooperation.

The Master Plan Project Office

The project office is responsible for coordinating work on the three main topics, selecting topic chairmen and a joint chairman, arranging working conferences for researchers, planning joint activities with overseas organizations performing sustainable development research, publishing a Sustainable Taiwan bulletin

(quarterly), and holding domestic conferences in connection with Sustainable Taiwan. Assistance from the project office will lend impetus to the main content of the master plan, including the compilation of environmental databases, the establishment of comprehensive sustainable development assessment indicators, and the formulation of a sustainable vision for Taiwan in 2011. The project office has also established a dedicated website carrying important information for the reference of the academic community and government agencies. This website can be found at: <http://www.gcc.ntu.edu.tw/foresight>.

Sustainable Taiwan 2011

"Sustainable Taiwan 2011" is an integrated project seeking opportunities to realize sustainable development in Taiwan. The project consists of an economic section, a society section, a pollution section, and a natural resources section. The project's goal is to increase knowledge of Taiwan's eco-social system, rethink the objectives of social and economic growth, and use "island sustainable development indicators" to assess various national development plans.

Research conducted by the various sections has yielded the following results thus far: The economic section has established a Taiwan 2011

system dynamics model on the basis of the T21 model of America's Millennium Institute, and has formulated three computable general equilibrium (CGE) models for water pollution, air pollution, and solid waste/soil pollution. The social section has completed a questionnaire survey of environmental groups in Taiwan and has investigated the role of social pressure in sustainable development, hoping to gain a better understanding of how social pressure can act to promote or impede sustainable development. The pollution section has collected information on environmental quality development trends overseas, as well as basic data on air quality, rivers, and soil in Taiwan. The goal of this effort is to derive and compare carrying capacity models for Taiwan's air, rivers, and soil. The natural resources section will attempt to gauge how the drafting of government policies will affect natural resources, and seeks to determine the adequacy of the response measures of various government agencies.

Sustainable Taiwan Assessment System

This project consists of a conceptual framework section, an ecological resources section, a pollution section, an economic section, a social section, an information section, and

an urban section. The project hopes to capture the conceptual essence of sustainable development from a Taiwanese perspective, and show how sustainable development dovetails with Taiwan's political, economic, social, and environmental characteristics. After taking into consideration relevant sustainable development indicator systems overseas, the project will select representative parameters as indicators, define the goals the indicator system is intended to achieve, and finally propose a comprehensive framework. The project will establish a normative system for assessing the sustainability of development in Taiwan, and this system will be used as a reference for reviewing Taiwan's direction of development.

All the sections have completed the preliminary selection of indicators, established a theoretical framework, analyzed how the indicators fit Taiwan's characteristics and how they compare with the UN's indicators, and filled out an indicator selection form for each indicator. The information section then filled out explanatory material about the indicators and items chosen by the various sections, created a database, adjusted the quality and attainability of the indicator data, performed preliminary indicator calculations, and attempted to shed light on the relationships between the various sections' indicators.

Sustainable Development Information System

This project is being jointly carried out by the pollution prevention, natural conservation section, development and information system tools section, and resource/energy utilization

section. The project is attempting to establish an environmental database, with the short-term goal of supporting the data needs of the other two core projects. The project's long-term goal is to recommend that the government establish a national environmental database management authority to perform long-term maintenance and management of vast quantities of environmental data/information.

The pollution prevention section has completed a systematic data query interface for existing environmental pollution survey data. The natural conservation section has completed the organization of data format for survey results, including data content, format, correctness or whether confirmed, circulation, and whether adequate to support sustainable development assessment system indicators. The resources/energy utilization section conducted research interchange with Columbia University concerning the topic of material flow, performed preliminary analysis of materials data on metals, industrial mineral products, and gravel in Taiwan, and examined the characteristics of this data. The database and information system tools section completed modification of the natural conservation section's explanatory data format and established an explanatory data search system based on different categories and attributes. In the case of spatially-connected information, a geographical information system (GIS) was integrated with the search system to facilitate simultaneous use.

Conclusions

The goal of the Sustainable Taiwan

master plan is to use relevant projects to establish an assessment mechanism that will enable overall sustainable development decision-making. The master plan's three core projects all have important missions: the establishment of an environmental database, the establishment of comprehensive sustainable development indicators, and the development of a sustainable vision for Taiwan in 2011. The three core projects constitute the three different components of a comprehensive decision-making mechanism, and support and complement each other. The master plan office is responsible for coordination and promoting contact between the three core projects. This project, particularly its size and degree of integration of research among the natural and social sciences, is a rarity in Taiwan's research world. Despite the difficulty and challenge of coordination and integration work, the project can set a good precedent for future interdisciplinary research in Taiwan.

Notice

- I. The Proceedings of the National Science Council, Part A: Physical Science and Engineering (ISSN 0255-6588); Part B: Life Sciences (ISSN 0255-6596); and Part C: Humanities and Social Sciences (ISSN 1018-4473) will cease publishing in the middle or at the end of 2001.
- II. The acceptance of manuscripts for publication in the above periodicals will cease on October 31 of 2000, as determined by the postmark.

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