BUILDING AN INNOVATIVE COUNTRY

WAN GANG, MINISTER OF SCIENCE AND TECHNOLOGY FOR THE PEOPLE'S REPUBLIC OF CHINA, OUTLINED – IN A PRESENTATION TO THE TWAS CONFERENCE – HOW CHINA HAS SO SUCCESSFULLY LINKED ITS SCIENCE AND TECHNOLOGY PROGRAMMES TO DEVELOPMENT.

As Minister of Science and Technology since 2007, with special responsibility for overseeing the Department of Development Planning, Wan Gang is well placed to give an overview of the links between science and development in China that have taken place over the last decade. Since 2003, he has also been a member (and subsequently chair) of the National Committee of the Chinese People's Political Consultative Conference (CPPCC), an advisory body which includes delegates from a range of political parties and organizations, as well as independent members. In 2007, Wan Gang was elected chairman of the China Zhi Gong Party and is the first government minister in three decades who is not a member of the Communist Party.

There follows an edited extract of Minister Wan Gang's presentation to delegates during the opening ceremony of the TWAS conference in Tianjin.

Developing countries have rich resources, big markets and large populations, with a high percentage of young people. In recent years, many developing countries have made progress in educational development, increased funding of science and technology, improved research and development (R&D) infrastructures and stimulated innovation, generally demonstrating a huge potential for scientific and technological development. As a result, developing countries are gaining increasing influence in the international science and technology community, with their role shifting from that of 'follower' to 'fellow traveller' and even 'front-runner' in certain fields.

As leaders of the world's largest developing country, the Chinese government attaches great importance to scientific and technological development and institutional reform. Over the decades, China's science and technology programmes have developed literally from scratch, gradually expanding in scale, and making important contributions to the development of the country and the improvement of people's living standards. In an effort to manage the economic volatility triggered by the international financial crisis, China's science and technology development has followed the goal of building an innovative country, and focused on addressing major scientific and technological challenges in economic and social development.

Investment in science and technology by the central government has maintained its annual growth at over 23% for five straight years, with the total R&D budget reaching USD138 billion last year.

WAN GANG: LINKING ACADEMIA AND INDUSTRY

Wan Gang began his working life in the rural Yanbian Prefecture in Jilin Province, northeastern China, close to the border with North Korea and graduated in 1978 with a bachelor's degree from Northeast Forestry University in neighbouring Heilongjiang Province. Three years later he received a Master's degree in experimental mechanics from Tongji University, Shanghai, one of the oldest and most prestigious universities in China, continuing to serve as a faculty member there until 1985.

Wan Gang then moved to Germany to read for a doctorate in engineering at the Technische Universität Clausthal*, and for the next decade worked in the research and development department of the German Audi Corporation, in charge of 'computer virtualization'. In 1996, he was promoted to technical manager of the production and technology division and his leadership and contributions were instrumental to the success of the Audi A4 car.*

Invited back to both Clausthal University of Technology and Tongji University in 1994 and 1995, he supervised a group of German doctoral candidates on a successful project on the fuel cell, a device that converts chemical energy into electricity.

In 2000, Wan Gang outlined a proposal for a new type of car which would run on clean fuel and presented this to the Chinese State Council. The proposal was then supported by the Ministry of Science and Technology, who invited him to return to China. He was appointed chief scientist and group leader in developing electric car projects for the State High-Tech Development Plan, intended to stimulate the development of homegrown advanced technologies, and thereby reduce China's dependence on expensive foreign technologies.

Wan Gang's unique blend of excellent scientific credentials together with direct experience in industry made him the ideal candidate for the post of founding dean of the New Energy Automobile Engineering Centre at his alma mater*, Tongji University, where he was also promoted from assistant president, to vice-president and then president in 2004. In 2006, he became vice-chairman of the China Zhi Gong Party and was elected its chairman in 2007. Wan Gang is now Minister of Science and Technology of the People's Republic of China.*

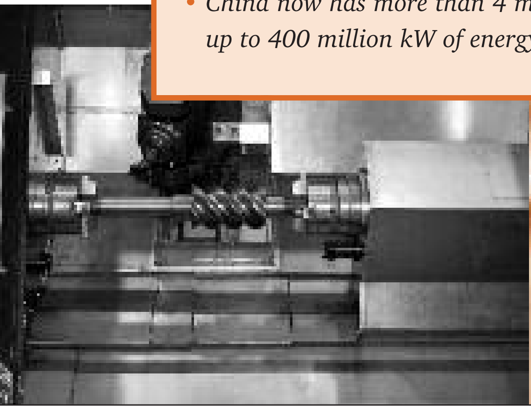
Immediately after the outbreak of the international financial crisis in 2007-8, the Chinese government identified scientific and technological innovation as one of the four key measures in its plan for countering the crisis. The modern history of human civilization shows that scientific and technological innovation has always been the most important driver for sustainable economic and social development. Thus, China has made vigorous efforts to develop strategically important new industries with the aim of boosting industrial development with technological innovation. This strategy has made important contributions to sustaining China's economic growth. Market factors now take a primary role in the allocation of scientific and technological resources, and the policy and legal environment for encouraging innovation and start-up by the business sector and scientists is improving. According to 2011 data, 74% of China's R&D investment comes from the business sector, and 73% of the R&D personnel are hired by businesses. Major progress has been made in the building of national innovation systems, and a market-oriented system for technological innovation, in which enterprises play the leading role and which combines the efforts of enterprises, universities and research institutes, is taking shape.

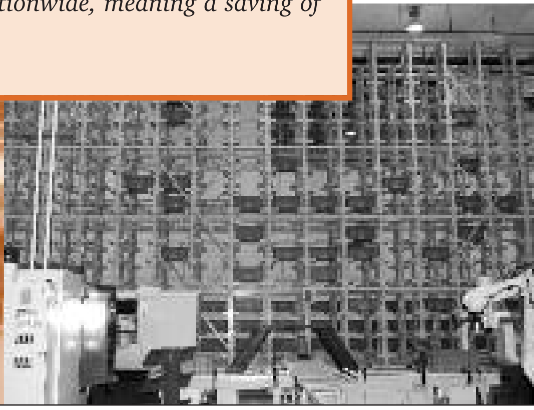
The history of human civilization shows that S&T innovation is the most important driver for sustainable economic and social development.

Indeed, a new industrial revolution spearheaded by scientific and technological innovation is in the making. Progress in information communication technologies, energy-saving and environmental technologies, bio-pharmacy, nanotechnology and the development of new energies and new materi-

CHINA: FACTS AND FIGURES

- *China has launched 16 national major science and technology programmes, made breakthroughs in a number of core technologies and supported the development of strategically important emerging industries.*
- *National high-technology parks are playing an increasingly important role in concentrating resources and leading regional development, and becoming a major engine for economic growth.*
- *Scientific and technological innovation in the agricultural sector is picking up speed. China remains a world leader in super hybrid rice technologies and has increased the proportion of high quality seeds of wheat, corn and cotton being used by Chinese farmers.*
- *China has made significant progress in manned space and moon exploration projects. In June 2012, the docking of the first manned spacecraft 'Shenzhou 9' with the space station Tiangong 1 was completed successfully. The mission's crew included the first Chinese female astronaut, Liu Yang.*
- *Also, in June 2012, China's manned deep-ocean submersible conducted a successful 7,000-metre dive.*
- *China has now produced and sold 19,000 electric vehicles nationwide, more than 14,000 of which are privately owned and used daily on the roads.*
- *China now has more than 4 million light-emitting diode (LED) lights in use nationwide, meaning a saving of up to 400 million kW of energy per year.*





als will change the development perspective, modes of economic operation, the means of production and our way of life across the globe. Such progress will also create new opportunities for developing countries to achieve economic transformation through scientific and technological innovation. Against this backdrop, many countries have adjusted their scientific and technological development strategies, improved the institutional arrangements, and devoted more energy to developing knowledge and technology intensive emerging industries so as to seize the new opportunities provided by these scientific and industrial revolutions.

CHINA'S WORLD RANKING IN SCIENCE AND TECHNOLOGY

- *The total number of full-time R&D personnel in China increased from 1.7 million in 2007 to 2.8 million in 2011, ranking first in the world.*
- *China has been ranked second in the world for three consecutive years for the number of international papers published and the quality is constantly improving.*
- *The number of patents granted in China has jumped from 68,000 in 2007 to 172,000 in 2011, ranking third in the world.*
- *China is ranked second in the world for the 'added value' of high-tech industries.*
- *According to 2011 data, 74% of China's R&D investment comes from the business sector, and 73% of the R&D personnel are hired by businesses.*

Significantly, the Chinese government is also committed to advancing international science and technology cooperation, and in particular, cooperation with other developing countries. By the end of 2011, we had signed 106 inter-governmental agreements on science and technology cooperation with 100 countries and regions and joined over 1,000 international science and technology organizations. We have also launched a number of joint projects in high-tech fields like space technology and applicable technologies for agriculture and forestry, which have yielded fruitful results. We have launched the China-Africa and the China-ASEAN (Association of South-East Asian Nations) Science and Technology Partnership Programmes. We have also joined with the United Nations to sponsor trilateral cooperation projects in other developing countries.

The Ministry of Science and Technology organizes technology training courses for developing countries on an annual basis in a wide range of areas and has published the *Applicable Technology Manual — South-South Cooperation on Science and Technology to Address Climate Change*, as well as setting up a platform for international scientific and technological cooperation on combatting climate change and achieving sustainable development.

Thus China is ready to share information on scientific and technological innovation policies and managerial experience with other developing countries, and to work with them to jointly support cooperation projects and exchange personnel, to leverage each other's strengths for mutual benefit, and to deal with the challenges facing the international community to promote common development and prosperity together.

Concluding his presentation to the TWAS conference, Wan Gang quoted a famous poet from China's Tang Dynasty: 'To enjoy a grander sight, climb to a greater height.'

"This is the most vivid expression of my expectation for the future of China's scientific and technological development," he confirmed, "and of China's cooperation with other developing countries in science and technology." ■