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Vision Paper

A China-EU Strategic Partnership on Knowledge for Growth and Development

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Contents

1. Knowledge for growth and development – a common goal for China and the European Union.....	4
2. Development challenges and S&T priorities in China.....	4
2.1. Challenges and strategies in China.....	4
2.1.1. <i>The major strategic challenges</i>	4
2.1.2. <i>Strategies in China</i>	6
2.2. S&T priorities in China	7
3. Development challenges and S&T priorities in the European Union.....	8
3.1. Challenges and strategies in the EU	8
3.1.1. <i>The major strategic challenges</i>	8
3.1.2. <i>Strategies in the European Union</i>	9
3.2. S&T priorities in the EU.....	11
4. Identifying S&T themes of common interest	14
5. Identifying common actions.....	15
5.1. Carry on a study on “China-EU Strategic Planning for S&T Cooperation ”.....	14
5.2. To develop joint policies for future technology platforms	16
5.3. Promote collaboration in big science initiatives and international advanced infrastructures	16
5.4. Further open government research programs for collaboration, in particular FP17	
5.5. To develop the links of scientific and educational institutions	17
5.6. To increase the mobility of researchers, teachers and students	18
5.7. To promote international S&T activities by industry	18

1. Knowledge for growth and development – a common goal for China and the European Union

China and the European Union are both confronted with major strategic challenges concerning growth, competitiveness and employment, regional and social cohesion as well as sustainable development. Investing in knowledge and innovation, building a knowledge-based economy can provide many answers to these challenges.

This is a strong reason for China and the European Union to build a new Partnership on Knowledge for Growth and Development, involving business, universities, research institutions, funding institutions and public administrations.

This is also the right moment to foster this Partnership: the cooperation agreement on S&T has just been renewed between China and the EU and they are both in a crucial moment of defining their next generation of S&T policies. This is exactly the purpose of the present High-level Forum on S&T Strategy.

2. Development challenges and S&T priorities in China

2.1. Challenges and strategies in China

2.1.1. The major strategic challenges

During the next 5-10 years, strategic challenges in China mainly cover three aspects.

A. The first challenge is to maintain economic growth and achieve strategic adjustment of economic structure.

In recent years, the Chinese Government has achieved significant accomplishments in the macro-control over economy. Conspicuous contradictions in economy and life have been adjusted; the national economy maintains a rapid and vigorous development with good economic returns. In 2004, for instance, the GDP increased by 9.5% over the previous year, and the total foreign trade volume grew by 35.7%, leaping from the fourth place last year to the third place in the world. The reform has reached a crucial stage in China, for many key problems of economy can

only be solved when the economy keeps a speedy development. Therefore, China has to sustain a rapid economic growth while optimize economic structure, speed up the shift of economic growth pattern, achieve strategic adjustment of economic structure in macro-control, while remove institutional barriers that may give birth to economic instabilities.

B. The second challenge is to achieve a coordinated, sound and sustainable development of society, economy and environment.

a. Three problems of agriculture, rural areas and farmers continue to slow down the modernization drive of China.

Above all, difficulties in modernization of agriculture and scale agricultural production and operation impose restrictions on productivity of rural labor. Besides, the slow growth in the income of farmers directly results in poor consumption capability in rural areas and produce negative impacts on economic growth through its influence on the growth in aggregate demand. Finally, the task of developing social undertakings in rural areas is monumental. More painstaking efforts are required to make compulsory education universal, and to develop systems of public health care and old-age pensions in rural areas.

b. The issue of employment becomes more severe.

Structure of population as well as its changes, the specific stage of economic development all contribute to unemployment - the long-term issue in the modernization drive of China. Unemployment is not only a problem for the least educated, but also for the well educated.

c. Restriction imposed by the shortage in strategic resources is growing

With an enormous demand for resources to satisfy growing population and economic development, the contradiction between population and land is increasingly intensified. Resources of forest and grassland continue to decrease, and desertification, decrease of soil fertility, soil pollution and grassland degeneration are becoming more prominent. The severe shortage in water resources in the north of China urgently calls for a reasonable distribution of water resources within the country. Besides, as the pollution of water resources is serious in China, pollution abatement is in need of more investment. The expanding gap between petroleum supply and demand gives rise to the dependence upon international petroleum market.

C. The third challenge is to enhance the capabilities of independent innovation.

China has made significant achievements in science and technology. The S&T human resources reached 32 million with R&D personnel numbered about 1.05 million person year, ranking the first and second

places in the world respectively. In 2002, China became the fifth largest producer of S&T publications; and its R&D in some aspects of specific areas such as biotechnology, nanotechnology and space technology ranked the first in the world. Nevertheless, the capabilities of technological innovation in general and independent innovation in particular are weak, and restraints on enhancing the capabilities are manifold. The capabilities are low in the aspects of insufficient supply of key technologies, small number of patents, poor quality of research, lack of top talents and S&T expenditure and so on. The restraints on enhancing the capabilities include the longstanding impacts of planned system, the path dependence of extensive growth pattern, small-lot production and the trammels of ways of thinking.

2.1.2. Strategies in China

Against this background, three main strategic priorities should be underlined:

A. Setting the strategic objectives of building a well-off society in an all-around way

The strategic objectives of building a well-off society in an all-around way defined by the Chinese Government refer to that in about two decades, China is to maintain economic development at a higher speed, increase per capita GDP to more than US\$3,000 and make reasonable economic structure, all-around development of economy, politics and culture come true. The proportion of urban population will exceed 50%, and people of China will enjoy a better-off life.

B. Underscoring the scientific and sustainable approach to development

The essence of scientific and sustainable approach to development put forward by the Chinese Government is to focus on people and comprehensive coordination and constantly promote economic and social progress and overall development of people. In response, China should make overall plans to balance the development between rural & urban and between different regions, and to coordinate economic growth and social advancement, harmony between man and nature, domestic development and opening up. The scientific and sustainable approach further specifies the key issues concerning to the ways of development in China.

C. Formulating China's national long and medium term science and technology planning

The China's national long and medium term science and technology planning being formulated now highlights its role of vanguard and strategic

and overall significance. Centering on the enhancement of the capabilities of independent innovation, it makes an overall plan for the development of science and technology for next fifteen to twenty years covering key issues of national economy and social development.

2.2. S&T priorities in China

The main priorities adopted for S&T are:

A. Energy, water resources and environmental protection. Priorities should be given to the development of energy efficient technology, clean coal technology, nuclear energy, renewable energy, water conservation, seawater desalination and environmental protection. China should develop cyclic economy by technological innovation, so as to change the way from resources consumption to resources saving, and from ignoring environment to be environmentally friendly.

B. Information technology. Breakthroughs are to be achieved to enhance competitiveness in the market and promote the development of comprehensive communication system and modern services in key technologies in the fields of network communication, chip design and manufacturing, high performance computer, system software, intelligent information processing, multimedia technology and information security as well.

C. Biotechnology. More support should be offered to research, development and application of biotechnology to make breakthroughs in the development and application of biotechnology and expedite science and technology development in agriculture and health.

D. Information technology, new material technology and advanced manufacturing technology. Complete set of equipment, high-tech equipment, new generation of green manufacturing process and equipment, and using information technology to propel manufacturing should be highlighted to enhance the capabilities of independent innovation of manufacturing of China in an all-round way.

E. Technology integration. Technologies used to develop urbanization and modern comprehensive communication technology and so on are to be integrated to raise the quality of life of the residents.

3. Development challenges and S&T priorities in the European Union

3.1. Challenges and strategies in the EU

3.1.1. The major strategic challenges

The European Union is engaged in a process of regional integration with three main goals:

- A. Increasing prosperity by renewing its development model;
- B. Enlargement and the political re-organisation with the European Constitution;
- C. Enhancing the contribution of Europe to improve global governance.

Notwithstanding, several difficult challenges are being faced by the European Union to meet these goals:

- A. Globalisation and stronger competition by more diversified poles in the world economy are calling for a major redeployment of the European economy to new areas of investment and employment, with an intensification of the innovation and the restructuring process in many European regions;
- B. The economic performance of the EU remains quite disappointing: averaging only 2.2% per year for the EU25 between 1995 and 2004, even if relevant differences exist among Member States, with the new ones performing better given their catching-up process. Between 1999 and 2003, the total employment in EU 15 increased by 6.5 million people, but more 22 million should be created by 2010 to make the best use of the European human resources;
- C. The European growth potential remains hindered by a quite low increasing trend of productivity as well as of the employed population. Moreover, the demographic projections are forecasting a fall in the total population by 2020, leading to the risk of major imbalances in the social protection and health systems;

- D. Besides ageing societies, there are other trends which are clearly not sustainable such as the issues of climate change and energy use, management of natural resources, land use and transport, threats to public health as well as poverty and social exclusion;
- E. The recent enlargement of the European Union from 15 to 25 Member States and subsequently to 27, presents an unprecedented challenge for the competitiveness and internal cohesion of the Union. The gap in the per capita GDP between the 10% of the population living in the most prosperous regions and the same percentage living in the least ones has more than doubled;
- F. Finally, the current imbalances at world level regarding economic, social, environmental, security and political issues call for a better global governance and underline the greater responsibility to be taken by the European Union.

3.1.2. Strategies in the European Union

In the year 2000, with a European Council taking place in Lisbon, the European Union adopted an overall strategy to build a more competitive knowledge economy, capable of sustainable economic growth with more and better jobs, greater social cohesion and respect for the environment. The central idea of this strategy is that knowledge is now the key resource of nations, companies and people and that new competitive factors should be build based on knowledge and innovation in order to sustain the European social model. This one should also be reformed and put more in line with a knowledge-based society. Against this background, the priorities of the Lisbon strategy are threefold:

- A. Fostering knowledge for growth by ambitious policies of research, innovation, education and training;
- B. Improving the attractiveness of the European economy to invest and to work, by deepening the single market, improving the business environment and expanding the European infrastructures;
- C. Creating more and better jobs, investing in people, modernising the European social model and combating social exclusion

More recently, in the European Council of March 2005, the Lisbon strategy was refocused on growth and jobs and coupled with a more growth-friendly Pact for fiscal policies, defining a new framework for the policy-mix to be adapted by each Member State according to its specificities.

Lisbon strategy

Integrated guidelines for growth and jobs (2005-2008)

Macroeconomic guidelines

- (1) To secure economic stability.
- (2) To safeguard economic sustainability.
- (3) To promote an efficient allocation of resources.
- (4) To promote greater coherence between macroeconomic and structural policies.
- (5) To ensure that wage developments contribute to macroeconomic stability and growth.
- (6) To contribute to a dynamic and well-functioning EMU.

Microeconomic guidelines

- (7) To increase and improve investment in R&D.
- (8) To facilitate innovation and the take up of ICT.
- (9) To encourage the sustainable use of resources and strengthen the synergies between environmental protection and growth.
- (10) To contribute to a strong industrial base.
- (11) To extend and deepen the internal market, including services.
- (12) To ensure open and competitive markets.
- (13) To create a more attractive business environment.
- (14) To promote a more entrepreneurial culture and create a supportive environment for SMEs.
- (15) To expand and improve European infrastructure and complete agreed priority cross-border projects.

Employment guidelines

- (16) To implement employment policies aimed at achieving full employment, improving quality and productivity at work, and strengthening social and territorial cohesion.
- (17) To promote a lifecycle approach to work.
- (18) To ensure inclusive labour markets for job-seekers and disadvantaged people.
- (19) To improve matching of labour market needs.
- (20) To promote flexibility combined with employment security and reduce labour market segmentation.
- (21) To ensure employment-friendly wage and other labour cost developments.
- (22) To expand and improve investment in human capital.

(23) To adapt education and training systems in response to new competence requirements.
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In the meantime, the cohesion policy of the European Union is being renewed to be more in line with the Lisbon strategy, putting a stronger focus on the growth-enhancing factors which are behind a successful catching-up process, namely innovation, R&D, human resources, physical and knowledge infrastructures and environmental quality.

Finally, regarding the international level, the European Union recognises that an open global economy offers new opportunities for stimulating growth, competitiveness and the redeployment of the European economy and a stronger effort is being made to reach an ambitious and balanced agreement in the WTO negotiations. Whereas the Common Foreign and Security Policy is giving priority to the promotion of peace, sustainable development and the reform of the United Nations, the external initiatives of the European Union are being extended and diversified by the trade, the monetary and the cooperation policies as well as by the external dimension of its community policies. This is exactly the case of the S&T policy.

3.2. S&T priorities in the EU

A new momentum is being created to the European S&T policy by the recent joint presentation of the Competitiveness and Innovation Programme and the 7th Framework Programme for Research, Technological Development and demonstration activities (RTD) for the period 2007-2013. They can provide a strong catalyst for the broader partnership between China and the EU on knowledge for growth and development.

The 7th FP for RTD will be organised into four specific programmes which can be used to develop this Partnership when pursuing its main four objectives:

1. The cooperation programme supporting collaborative research, joint technology initiatives, co-ordination of research programmes and international cooperation;
2. The support to investigator-driven “frontier research” by a European Research Council to be created ;
3. The support to training and career development of researchers;
4. The support to research infrastructures, research driven clusters and horizontal activities of the international cooperation.

The nine themes identified for the Cooperation programme are the following:

A. Health

Objective

Improving the health of European citizens and increasing the competitiveness of European health-related industries and businesses, while addressing global health issues including emerging epidemics. Emphasis will be put on translational research (translation of basic discoveries in clinical applications), the development and validation of new therapies, methods for health promotion and prevention, diagnostic tools and technologies, as well as sustainable and efficient healthcare systems.

Activities: Biotechnology, generic tools and technologies for human health, Translating research for human health, Optimising the delivery of health care to European citizens

B. Food, Agriculture and Biotechnology

Objective

Building a European *Knowledge Based Bio-Economy*¹² by bringing together science, industry and other stakeholders, to exploit new and emerging research opportunities that address social and economic challenges: the growing demand for safer, healthier and higher quality food and for sustainable use and production of renewable bioresources; the increasing risk of epizootic and zoonotic diseases and food related disorders; threats to the sustainability and security of agricultural and fisheries production resulting in particular from climate change; and the increasing demand for high quality food, taking into account animal welfare and rural contexts.

Activities: Sustainable production and management of biological resources from land, forest and aquatic environments; “Fork to farm”: Food, health and well being; Life sciences and biotechnology for sustainable non-food products and processes.

C. Information and Communication Technologies

Objective

To enable Europe to master and shape the future developments of Information and Communication Technologies (ICT) so that the demands of its society and economy are met. Activities will strengthen Europe’s scientific and technology base in ICT, help drive and stimulate innovation through ICT use and ensure that ICT progress is rapidly transformed into benefits for Europe’s citizens, businesses, industry and governments.

Activities: ICT Technology Pillars; Integration of Technologies; Applications Research; Future and Emerging Technologies.

D. Nanosciences, Nanotechnologies, Materials and new Production Technologies

Objective

Improve the competitiveness of European industry and ensure its transformation from a resource-intensive to a knowledge-intensive industry, by generating breakthrough knowledge for new applications at the crossroads between different technologies and disciplines.

Activities: Nanosciences, Nanotechnologies; Materials; New Production; Integration of technologies for industrial applications.

E. Energy

Objective

Transforming the current fossil-fuel based energy system into a more sustainable one based on a diverse portfolio of energy sources and carriers combined with enhanced energy efficiency, to address the pressing challenges of security of supply and climate change, whilst increasing the competitiveness of Europe's energy industries.

Activities: Hydrogen and fuel cells; Renewable electricity generation; Renewable fuel production; Renewable for heating and cooling; CO₂ capture and storage technologies for zero emission power generation; Clean coal technologies; Smart energy networks; Energy efficiency and savings; Knowledge for energy policy making.

F. Environment (including Climate Change)

Objective

Sustainable management of the environment and its resources through advancing our knowledge on the interactions between the biosphere, ecosystems and human activities, and developing new technologies, tools and services, in order to address in an integrated way global environmental issues. Emphasis will be put on prediction of climate, ecological, earth and ocean systems changes; on tools and technologies for monitoring, prevention and mitigation of environmental pressures and risks including on health, as well as for the conservation of the natural and man-made environment.

Activities: Climate change, pollution and risks; Sustainable Management of Resources; Environmental Technologies; Earth observation and assessment tools.

G. Transport (including Aeronautics)

Objective

Based on technological advances, develop integrated, "greener" and "smarter" pan-European transport systems for the benefit of the citizen and society, respecting the environment and natural resources; and securing and further developing the leading role attained by the European industries in the global market.

Activities: Aeronautics and air transport; Surface transport (rail, road and waterborne); Support to the European global satellite navigation system (Galileo).

H. Socio-Economic Sciences and the Humanities

Objective

Generating an in-depth, shared understanding of complex and interrelated socioeconomic challenges Europe is confronted with, such as growth, employment and competitiveness, social cohesion and sustainability, quality of life and global interdependence, in particular with the view of providing an improved knowledge base for policies in the fields concerned.

Activities: Growth, employment and competitiveness in a knowledge society; Combining economic, social and environmental objectives in a European perspective; Major trends in society and their implications; Europe in the world: understanding changing; The citizen in the European Union; Socio-economic and scientific indicators; Foresight activities.

I. Security and Space

Objective

To develop the technologies and knowledge for building capabilities needed to ensure the security of citizens from threats such as terrorism, and crime, while respecting fundamental human rights; to ensure optimal and concerted use of available technologies to the benefit of European security, and to stimulate the co-operation of providers and users for security solutions.

Supporting a European Space Programme focusing on applications such as GMES with benefits for citizens and for the competitiveness of the European space industry. This will contribute to the development of a European Space Policy, complementing efforts by Member States and by other key players, including the European Space Agency.

Activities for Security: Protection against terrorism and crime; Security of infrastructures and utilities; Border security; Restoring security in case of crisis; Security Systems Integration and interoperability; Security and society; Security Research Co-ordination and structuring.

Activities for Space: Space-based applications at the service of the European Society; Exploration of space; RTD for strengthening space foundations.

4. Identifying S&T themes of common interest

There are many converging priorities in the Chinese and European S&T policies, providing a very sound basis to build their strategic partnership on knowledge for growth and development. After a first overview, it is possible to identify a very diversified list of general and specific themes of common interest:

- A. Environmental protection: new sources of energy, climate change, pollution and risks prevention, water supply for households and agriculture, environmental technologies, sustainable management of resources ;
- B. Information and communication technologies: communication systems and modern services for citizens, businesses, industry and public administrations, system software, e-learning, multimedia technology and information security;
- C. Food, agriculture and biotechnology: safer, healthier and higher quality food and sustainable production and management of biological resources from land, forest and aquatic environments;

- D. Transports: rail, road and waterborne transport, aeronautics and air transport, global satellite navigation system (Galileo);
- E. Urbanisation: new materials, building techniques, urban management
- F. Health: development of new therapies, methods for health promotion and prevention, diagnostic tools, the use of biotechnologies and efficient healthcare systems;
- G. Socio-economic sciences: growth and employment, knowledge-based societies and innovation systems, sustainable development, welfare systems policies, regional development, modern governance and public services, global governance and security issues, foresight activities.

Regarding more particularly the emerging technology platforms from both sides, it is also possible to identify some further possible joint platforms to be added to Galileo, ATM, GRID computing and traditional medicine such as: hydrogen energy, water supply, livestock development, building techniques, road transport, innovative medicines.

5. Identifying common actions

The China-EU Strategic Partnership on Knowledge for Growth and Development should provide the frame for a wide range of initiatives bringing together companies, universities, research institutions and other stakeholders, as well as an increasing mobility of technical staff, researchers and students. A stronger coordination of the different actions is needed and some big S&T initiatives focusing concrete development problems can play the role of catalysts.

5. 1. Carry on a study on “China-EU Strategic Planning for S&T Cooperation ”

China and the EU should jointly work out a strategic planning as a guide for the next generation of S&T cooperation based on the current and future strategic challenges and fields of common interest of China and the EU.

- Developing the strategic guideline on China-EU cooperation on S&T
- Specifying fundamental areas of China-EU cooperation on S&T

- Identifying key projects of China-EU cooperation on S&T
- Working out the mechanism of project implementation
- Offering policy recommendations to ensure China-EU cooperation on S&T

5. 2. To develop joint policies for future technology platforms

Both China and the EU promote a number of technology platforms. To introduce specific new technologies to our societies, these platform combine a number of policy actions in a suitable way. Typically these include: coordinated funding of R&D throughout different sources, regulatory actions necessary to implement new technologies, and raising significant coordinated investments for the implementation.

It seems that the way of collaboration in the technology platforms should be discussed one-by-one. This could be done by:

- defining coordinating counterparts on each side at working level, one from the government and one from the scientific community
- work out a collaboration scenario
- hold a conference on all technology platforms to discuss the collaboration scenarios, to see where we can get high-level support, and see from there how to proceed

5.3. Promote collaboration in big science initiatives and international advanced infrastructures

Big scientific and technological initiatives combines international efforts in unique world-scale facilities and demonstrations. Therefore:

- Both sides should hold early consultations about possible collaboration projects either on fundamental or on applied research and technological development
- Both sides should try to coordinate common/goals to be achieved in international fora as on environment, information society, transport, energy, etc.
- A cooperation in space can might be envisaged
- Enlarge the EU-China dialogues to include road, rail and aeronautic transport
- Collaboration on the information society should continue to be a high priority by developing R&D collaboration in all areas of pre-competitive

research, standards, applications, promoting new technologies as IPv6, GRIDS, 3G/4G and diffusing e-government capabilities

5.4. Further open government research programs for collaboration, in particular FP7

The collaboration under the Chinese and European public research programs will continue to play a special role, both at bilateral level between China and EU Member States and multilateral level, when Chinese institutions join EU projects under the Framework Programme. The Framework Programme promotes S&T collaboration within the EU. But it also provides a platform for the collaboration with China. Particular measures to go further can be:

- to improve the coordination between the different collaboration channels, including collaborative research, international cooperation, technology platforms, infrastructures and human resources
- to encourage the European partners to invite more Chinese researchers into new projects under the Framework Programme. The funding of Chinese partners from the FP6/FP7 budget should be maintained.
- China could do more to attract European partners into projects under the national high-tech and basic programmes.
- to plan joint calls with combined funding under FP6/FP7 and the Chinese programmes, especially for areas with joint policy interests and for technology platforms.

5.5. To develop the links of scientific and educational institutions

Research and high level education institutions should be encouraged to create direct links of various types, as joint PhD programs, student exchanges, or collaboration research projects, by policy measures such as:

- to collect information about joint programs, and exchange information on best practice examples
- to organise scholars meetings and workshops to define themes and initiatives of common interest
- improve procedures for joint degrees between European and Chinese universities and institutions
- provide incentives for collaboration funding schemes.
- encourage international travel in funding schemes. Authorisation requirements for attending meetings or for holding conferences in Europe or China should be reduced

5.6. To increase the mobility of researchers, teachers and students

The joint objective should be to promote a much larger scale mobility of researchers, teachers and students, with measures such as:

- to provide better information and guide about university programs
- to open national and European scholarships programs, as they largely are already
- to promote thematic workshops and fora to facilitate meeting of researchers and exchanges of ideas.
- to improve visa conditions for long-term stays and for short visits
- to introduce financing, loan schemes and work opportunities for students
- specific measures to encourage European scientists to work in Chinese institutions.

5.7. To promote international S&T activities by industry

Industrial S&T activities include investments in R&D facilities and hi tech enterprises, trade in scientific equipment and high tech components, transferring advanced technologies through licenses. These business initiatives can be fostered by better framework conditions, in particular:

- to favour common technological and regulatory standards
- to ensure protection of IPR
- to promote similar regulatory frames, regarding environment, safety, consumer protection
- to allow easy movements of prototypes and facilitate imports of new models for product launches
- to promote communication channels
- to eliminate restrictions for investment in high tech companies
- to promote better conditions for movement of capital for technology investments, technology stocks, bonds, and risk capital.