

# Roadmap for EU - China S&T cooperation

## 1. CHINA AS A PARTNER OF THE EU

Since the establishment of diplomatic relations between the EU and China in 1975, China has undergone a tremendous economic, social and technological development. EU-China relations were upgraded to a Comprehensive Strategic Partnership in 2013 and now span a wide range of areas diversifying the relationship from its initial economic focus.

### Economic Outlook

China is the world's third largest economy after the EU and the US, having overtaken Japan in 2011. In 2013 China overtook the US as the second biggest trader after the EU. China produced 13.43% of the 2014 world GDP versus 20.9% for the EU. However, its GDP per capita is still relatively low at 46,652 CNY or 6,664 EUR in 2014. China has been the world's fastest growing major economy, with consistent growth rates of around 10% over the past 30 years. In 2015, however, China's GDP growth was officially at 6.9%, down from 7.4% in 2014.

EU is China's biggest trading partner with total trade (in goods) of €466.8bn in 2014. China is EU's second biggest trading partner after the US. The EU is one of the top-five sources of foreign direct investment (FDI) to China. EU FDI stocks in China (€144.2bn in 2014) remain much larger than China's FDI stocks in the EU (€20.7bn). The total FDI flows from China into EU28 were €7.7bn in 2014, whereas FDI flows from EU28 into China were €9.2bn. The share of the EU in total FDI inflows into China stays steady at around 20%.

### Latest EU-CHINA Summit

The 17th EU-China Summit took place on 29 June 2015 in Brussels, coinciding with the 40th anniversary of EU-China relations. The main outcomes include the climate change declaration, the agreement on the way forward on migration and mobility, the launch of the Connectivity Platform and of the Legal Affairs Dialogue, and the commitment from China to step up investment in the EU (via EFSI).

The Summit provided the occasion also for EU and China leaders to reaffirm the importance of cooperation in the area of research and innovation as a driver for economic and social development and a key element of EU-China relations. Three research and innovation related documents were signed at the Summit notably: i) a Joint Statement on the Renewal of the EU-China Science and Technology Agreement; ii) an Implementing Arrangement between the European Research Council and the National Natural Science Foundation of China to promote cooperation on frontier research; and a collaborative research arrangement between the European Commission Joint Research Centre and the Chinese Academy of Science Institute of Remote Sensing and Digital Earth.

In addition, leaders committed to ensure reciprocal access to respective research and innovation funding programmes; and to set up a new Co-Funding Mechanism based on Horizon 2020 on the EU side and relevant research and innovation funding programmes on the Chinese side in order to support joint research and innovation projects in strategic areas of common interest.

#### EU-CHINA non-S&T cooperation agreements

EU-China relations are guided by the annual Summit and the high level dialogues underpinning it such as the High-Level Strategic Dialogue launched in 2010, the annual High-Level Economic and Trade Dialogue launched in 2010, the High-Level People-to-People Dialogue established in 2013, and the High Level Innovation Cooperation Dialogue inaugurated in 2013.

The EU-China 2020 Agenda for Strategic Co-operation, adopted at the 2013 Summit, is currently the defining document for the bilateral relationship. Addressing the broad headings of peace and security, prosperity and sustainable development and people-to-people exchanges, it contains extensive reference to the pivotal role of research and innovation cooperation in the overall EU-China relations.

#### *EU-CHINA S&T cooperation agreements and ICD*

EU-China scientific cooperation is governed by a Science & Technology Cooperation Agreement signed in December 1998 and renewed for the third time in December 2014. The implementation of the Agreement is overseen by a Joint Steering Committee which last met on 30 October 2015 in Beijing.

The importance of China as a key partner country has been confirmed by the Commission decision to set up a dedicated High Level Innovation Cooperation Dialogue (ICD) through a joint declaration signed in September 2012 by Commissioner Geoghegan Quinn and Chinese Minister WAN Gang. The ICD has the ambition of raising the level and intensity of research and innovation relations with China by providing a forum for discussion respective innovation policies and systems, addressing framework conditions and launching new joint R&I initiatives.

In addition an Agreement between the European Atomic Energy Community (Euratom) and the Government of the People's Republic of China for R&D Cooperation in the Peaceful Uses of Nuclear Energy (RD-PUNE) is in place since August 2008. China and Euratom are participating in an inter-governmental multilateral agreement on fission-related research, are partners of the ITER multilateral cooperation project on fusion research and participate, within the Generation IV international Forum, in the research and development activities of the Sodium Fast Reactor and the Very-High Temperature Reactor.

## R&I landscape in CHINA

China's STI capabilities are on a sharply upward trend. China's R&D expenditure reached 1.3 trillion RMB (ca. 186 billion EUR) in 2014, with an increase of 12.4% from 2013, equivalent to 2.05% of GDP<sup>1</sup>. It accounts now for 11.7% of world's total R&D expenditure (it was 1.7% in 2000).

Most of the R&D spending goes into experimental development and applied research (84.6% and 10.7% respectively) with only 4.7% invested in basic research. The business sector is responsible for 77.3% of the total R&D spending while universities and government-funded research institutions accounted for 6.9% and 14.8% respectively<sup>2</sup>. In 2014, the total government spending in R&D amounted to 254.2 billion RMB. It is projected to reach 275.7 billion RMB in 2015, marking an increase of 12.3%.

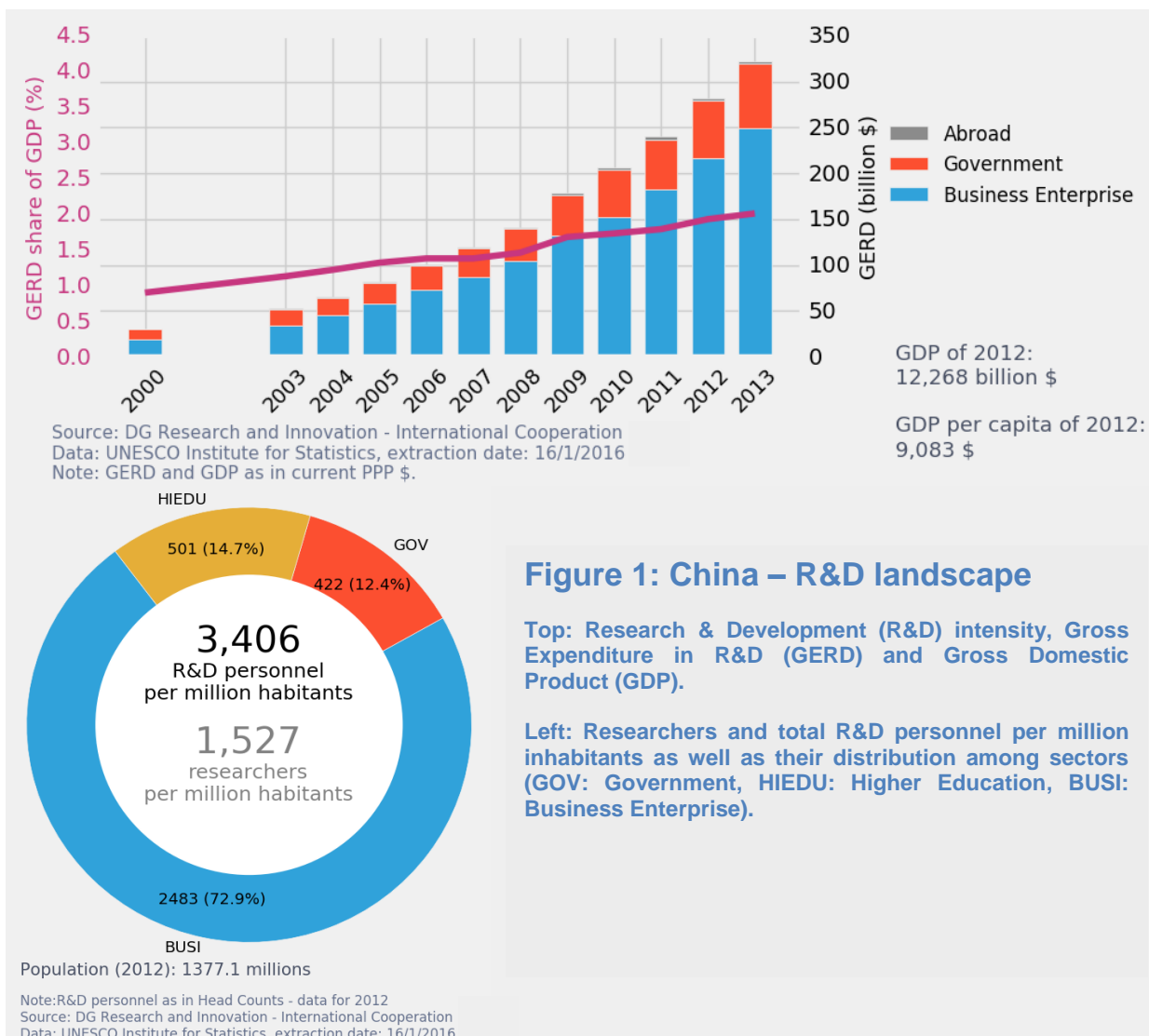
In terms of priority sectors for R&D, the 13th five-year plan (2016-2020) consolidated the leading role of S&T innovation in the innovation-driven development strategy. More emphasis will be put on basic research and development of key technologies to stimulate innovation. China intends to prioritise strategic areas such as ICT, energy technologies and materials, aviation and aerospace, biomedicine, intelligent manufacturing, deep sea/earth/space/blue technologies, as well as for addressing bottlenecks related to agriculture, urbanisation, the environment and the ageing population. Frontier research will be supported in areas such as universe evolution, structure of matters, emergence of life and brain/cognitive sciences. An important and increasing portion of the budget will be allocated to the national seed fund for investment in business start-ups in emerging industries and the national seed fund for encouraging the application of advances in science and technology.

China's R&D output has grown rapidly and the research quality is increasing, especially in hard sciences such as physics, chemistry and maths. China is now the world's second largest publisher of research and ranks 4th in the number of high-citation papers. The 2014 National Innovation Index Report showed that China's innovation capacity witnessed steady progress, ranking 19th among 40 main countries while according to the Global Competitiveness Report China 31st on overall innovation performance. The "Nature Index 2014 Global" shows that Chinese institutions, led by the Chinese Academy of Sciences, have increasingly contributed to global science. The Medium- and Long-term Plan for S&T Development 2006-2020 sets out the blueprint for China's transformation to an innovation-driven economy by 2020, with a target of 2.5% of GDP to be invested in R&D.

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<sup>1</sup> OECD Main Science and Technology Indicators for 2014

<sup>2</sup> 2014 Communique on National S&T Expenditures



Since 2015 China is reforming the National S&T Programme Management to streamline numerous state-funded scientific and technological funds. The new programme system is being restructured into five pillars, namely (i) basic research in the hands of the National Natural Science Foundation of China, (ii) Major S&T Projects, (iii) National Key R&D Programme, (iv) technology innovation instruments, and (v) special programme for infrastructures and talents. It is expected to be fully operational by 2017. Government ministries will no longer administer S&T projects directly, but will concentrate on strategic planning and framework conditions, whereas project management will be transferred to professional agencies. The two new major initiatives intended to stimulate the innovation capacity Manufacturing 2025 and the Internet+ action plan are being reinforced and increasingly integrated. They will both promote innovation in manufacturing through integration of information technology with industrialisation in a number of areas.

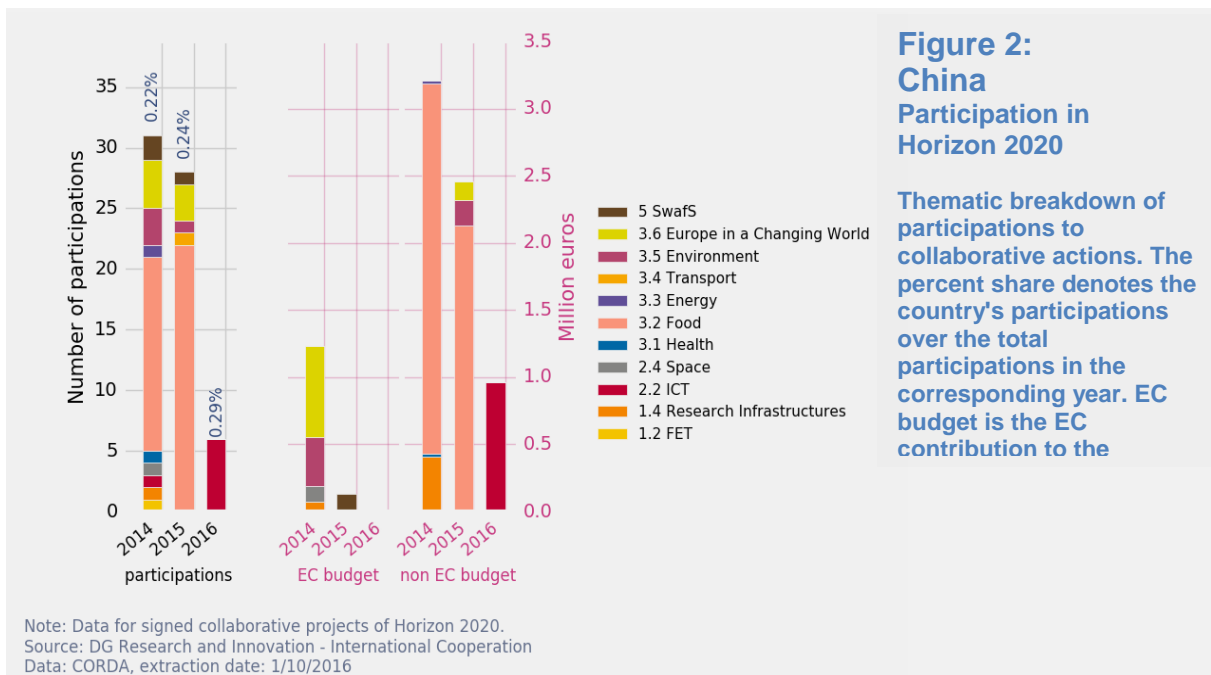
## 2. State of play of EU-CHINA S&T cooperation

### 2.1. Statistics on on-going FP7 and Horizon 2020 cooperation

In FP7, there were 383 participations of entities from China in 274 projects. The total budget of Chinese participants was 55.8 million euro of which the EU contributed 35.24 million euro. In FP7 China ranked 3rd among international partner countries<sup>3</sup> by number of participations and 4th by budget share. The success rate of Chinese applicants was 27.0% compared to 22.6% overall. The top areas in terms of EC contribution were health, environment, food, agriculture and fisheries, and biotechnology (FAB), ICT, energy and transport (including aeronautics).

Up to October 2016, under Horizon 2020, Chinese applicants are involved 418 times in 213 eligible proposals to collaborative<sup>4</sup> actions. 34 proposals were mainlisted, leading to a success rate of 16% (as compared to 15.5% for non-associated countries and 12.7% overall). Chinese entities have 65 participations in 31 signed grants, receiving 1.4 million euros from EU and contributing with 6.6 million euros. Among the Third Countries in all Horizon 2020 signed projects, China ranks 2nd in number of participations.

Compared to FP7, in Horizon 2020 there has been a sharp drop in the number of Chinese participations in the EU framework programme. This can be mainly explained by the new Horizon 2020 rules excluding China-based organisation, as well as those of other BRICS countries, from automatic funding.



<sup>3</sup> Non EU Member States /Non Associated countries

<sup>4</sup> Here referring to non bottom-up, internationally open, collaborative actions, i.e. all actions except for ERC, MSCA, actions under the SME Instrument and Access to Risk Finance.

Furthermore, with regard to the Marie Skłodowska-Curie actions (MSCA), 93 China-based researchers obtained MSCA Individual Fellowships to go to Europe and China has hosted 2 European incoming researchers, 63 were recruited in ITN or COFUND projects and 11 were seconded within RISE projects. In addition, 25 China-based entities participated in the MSCA RISE action and 6 in the ITN action.

*[On-going cooperation and main achievements so far]*

Research and innovation cooperation with China spans a wide variety of thematic areas. Through policy dialogue under the EU-China S&T Agreement several initiatives have been agreed and pursued under FP7 and more recently under Horizon 2020.

– FAB

A Flagship initiative on Food, Agriculture and Biotechnologies (FAB) was launched at the EU-China Summit in November 2013 with the signature of a Letter of Intent between the European Commission and the President of the Chinese Academy of Agricultural Sciences (CAAS). This translated into 13 WP topics dedicated to cooperation with China with a total EU budget of 76 million euro. The Chinese Academy of Agricultural Sciences contributed to the design of the topics and supplied co-funding from the Chinese side. As a result 12 joint projects have been launched in the field of animal production (genetics/nutrition and animal diseases), Integrated Pest Management (IPM), soil quality, food waste, biological contamination of crops, and sustainable use of agricultural waste, co-products and by-products. Five new topics are open in Horizon 2020 Work Programme 2016/17 in the areas of plant breeding, food safety, animal health, soil and water resources management, and urban agriculture.

– Sustainable Urbanisation

Following the commitments undertaken at the Innovation Cooperation Dialogue and the Joint Steering Committee the Commission has put together a package of actions to promote cooperation between research and innovation stakeholders from the EU and China. This includes several topics in Horizon 2020 Work Programme for 2016-17, notably: a coordination and support action to set up a platform of stakeholders, collaborative research and innovation actions on Urban Planning and on Urban Agriculture, and actions to support large scale demonstration projects on the deployment of nature-based solutions to improve urban climate resilience and water resources management (2016) and to regenerate deprived or abandoned urban areas (2017). EU Member States are also promoting R&I cooperation on Sustainable Urbanisation within the Joint Programming Initiative Urban Europe, and are developing a strategy for cooperation with China.

– Transport (including aeronautics)

Since FP6 there has been a long standing and fruitful cooperation on aviation with the Chinese Ministry of Industry and Information Technology (MIIT) through a series of jointly supported calls and coordination actions. The latest support action GRAIN 2 launched in 2013 and still on-going, allowed academia, industry and public authorities to identify common challenges and technology areas and topics of common interest. As a result a

coordinated call was launched under Horizon 2020 WP 2015, which led to the selection of four joint projects with 45 EU participants and 34 CN participants and a total EU budget of 7.3 million euro in the areas of engine noise reduction, environment-friendly structures, flow control, and additive manufacturing for aerospace applications. The Chinese partner organisations in the four projects were funded by MIIT.

China has been a partner also on surface transport. During FP7, cooperation between EU and Chinese cities has been initiated in the field of clean electric vehicles, public transport, city logistics, infrastructure and traffic management with the projects SOLUTIONS and VIAJEO PLUS.

– Energy (RD-PUNE)

Since the signature of the RD-PUNE agreement in 2008, China has become one of the principal nuclear research interlocutors for Euratom. China is a leading actor in fusion energy research, a full member party of ITER and the only country going to build a new fusion machine complementary to ITER in the next decade, the so-called Chinese Fusion Engineering Testing Reactor (CFETR). Cooperation with China on nuclear research has been intense so far. On fission research six coordinated parallel projects have been launched and Chinese entities participated in two Euratom projects under the Euratom FP7 programme. On fusion research there are 90 on-going activities, involving 13 European and 14 Chinese entities. In-kind Chinese contributions to the JET programme, as well as European contribution to the specifications of the CFETR reactor were promoted.

– Energy (non-nuclear)

With regard to non-nuclear energy, cooperation in FP7 focussed on Carbon Capture and Storage (CCS) through Chinese participation in projects on Near Zero Emission Coal (NZEC). Twinning workshops on Concentrated Solar Power were also organised with the Chinese Ministry of Science and Technology.

– Biomaterials

A joint call on Biomaterials was successfully implemented under FP7 with the National Natural Science Foundation of China (NSFC) - a leading Chinese funding agency for basic research running joint calls with a number of EU Member States. The call led to the launch of three joint projects in the areas of tissue prototyping of bio scaffolds for bone regeneration, nervous system and urethra reconstruction.

– ICT

China was the second most successful country in terms of participations in the FP7 ICT theme (after the United States) with 56 participations of Chinese organisations. Due to new funding rules in Horizon 2020 a drop in Chinese participation in ICT related projects has been registered. However, China-owned organisations based in Europe have participated actively in the ICT actions under Horizon 2020. Three actions targeting cooperation with China are included in the Horizon 2020 WP 2016/17: a coordination and support action on EU-China collaboration on future internet and two large scale PPP on 5G Research and Validation of critical technologies and systems (ICT-07-2017) and Convergent Technologies (ICT-08-2017) encouraging cooperation with several

international partner countries including China. A working group on research and innovation aspects of ICT is in place between DG CNECT and MOST to review cooperation and propose new priorities for future collaboration.

– Research Infrastructures

The strategic relevance of collaboration amongst European and Chinese Research Infrastructures has been growing over the years. This was confirmed at the 12th EU-China Joint Steering Committee Meeting in October 2015, where there was agreement on sharing information and promoting the openness of Research Infrastructures (RI).

Chinese partners were already involved in a number of Research Infrastructures listed on the European RI Roadmap produced by the European Strategy Forum on Research Infrastructures in environmental sciences (EISCAT 3D), radio-astronomy (SKA), arctic sciences (SIOS) and Energy Carbon Dioxide Capture and Storage (ECCSEL). Chinese facilities have a dialogue with European counterparts in high-energy physics, radio-astronomy, virology and bio-diversity. The topic Integrating Activities for Advanced Communities in H2020 WP 2016/17 calls for participation of international partner countries including China.

– Health

Health research is an area where the EU and China have a lot to gain from closer cooperation. There is a strong tradition of cooperation on Health both in the context of FP7 and in multilateral initiatives aimed at addressing global health challenges. Mutually beneficial cooperation between EU and Chinese organisations is taking place in the areas of rare diseases (within the International Rare Diseases Research Consortium) and of chronic diseases (in the frame of the Global Alliance for Chronic Diseases, GACD).

– Joint Research Centre (JRC)

In line with the overall Commission strategy on international cooperation in R&I, the JRC has established an active and wide-ranging scientific cooperation with several Chinese universities and government bodies as well as in a multilateral context, to provide evidence for policy responses to common challenges including space and earth observation, disaster risk management, nuclear safety and security, food safety and security, consumer products, transport, and water. JRC signed several research arrangements with China in recent years, the latest of which with the Chinese Academy of Sciences – RADI on remote sensing and earth observation (June 2015), and the renewal of the research arrangement with the Chinese Academy for Inspection and Quarantine (October 2015). The JRC has also key role in the implementation of the RD-PUNE Agreement, the Sino-EU Panel on Land and Soil (SEPLS) and the Group on Earth Observation (GEO) and supports the EU-China-ESA trilateral dialogue.

– European Research Council (ERC)

A new Implementing Arrangement between the European Research Council (ERC) and the National Natural Science Foundation of China (NSFC) was signed at the 2015 Summit. This will stimulate collaboration in frontier research by facilitating excellence-based and bottom-up research cooperation among high-calibre Chinese and



European scientists. Through this new initiative selected Chinese researchers will be offered the possibility to undertake single (6-12 months) and long-term or multiple short term research visits (e.g. for joint experiments), becoming part of teams led by ERC grant holders in Europe.

#### – Space

Space cooperation between Europe and China is growing rapidly. Both sides welcomed the ITU (International Telecommunication Union) frequency coordination that has been achieved between Galileo and BeiDou, in January 2015, after years of work. Cooperation is also continuing through the China-Europe GNSS Technology Training and Cooperation Centre (CENC). Chinese organisations have been involved in Horizon 2020 space research projects such as COMPET (Space Science and Exploration) and in PROTECT (Space Weather and Near Earth Objects).

## **2.2. Current framework conditions for EU-CHINA S&T cooperation**

Having the right framework conditions in place is essential for EU-China STI Cooperation and for making EU and China attractive global research and innovation players. Framework conditions have been constantly improving in recent years. Funding for research and innovation in China is abundant and the ongoing reform of the Chinese STI funding system promise more transparency, quality and opening to international cooperation.

However, several research and innovation framework conditions still remain suboptimal. On IPR China has made considerable efforts both in terms of regulatory protection and enforcement. On the enforcement front, while the legal instruments are available, there is room for reducing discrepancies between provinces, and increase predictability, uniformity and quality of court decisions. The rules about technology transfer are perceived as discouraging European companies from putting further investment in R&D in China. EU-China cooperation could also benefit of more flexibility in the visa policy for scientific staff, to facilitate international mobility for scientists exchange at all levels, including experts as well as young talents.

Reciprocal access to respective STI funding programmes is being addressed in the on-going reform of the Chinese STI funding system. In 2014 the 883 programme saw the participation of EU companies in joint projects on 5G. In February 2016 the first batch of calls for proposals under the National Key R&D Programme was published and this was open to international partners for joint applications with Chinese research institutions. The agreement on reciprocal access to respective STI funding programmes opens the door to more cooperation opportunities and will be subject to close monitoring.

Finally on standardisation, most of the Chinese standardisation bodies organisms include a very limited participation of European businesses, although these organisations play an important part in R&D and innovation in China. Promoting the participation of FIEs in the Standards Definition Process could contribute to enhancing the competitiveness of China-developed technologies in the international market.

### **3. Priorities for the future in S&T cooperation**

#### **3.1. Areas of future S&T cooperation agreed at latest Joint Committee/High Level Dialogues**

In the framework of the EU-China High Level Innovation Cooperation Dialogue and Joint Steering Committee both sides reiterated the willingness to continue to reinforce the already strong links between their respective scientific communities and innovation actors. They reaffirmed their intention to work together towards open innovation systems, better access to each other's research resources and programmes, more research in strategic priority areas, and increased mobility of researchers. They agreed to deepen and scale up cooperation through initiatives in specific thematic areas as well as by creating more favourable conditions for long term cooperation notably through the setting up of a major co-funding mechanism and enhanced reciprocity in access to respective STI funding programmes.

While STI cooperation with China is bound to be continued and increased across the board, the following areas have been identified as priority ones deserving a specific effort through dedicated actions.

##### **– Food, Agriculture and Biotechnology (FAB)**

The EU and China are two of the biggest trading partners and food producers in the world, and face many similar nutrition and food security challenges. The overall challenge is to ensure sustainability of the agri-food systems catering for the needs of the growing population (especially in cities), the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs. The EU-China FAB flagship initiative in place since 2014 is to be continued and reinforced in the future through careful monitoring of the 12 joint projects launched so far, the implementation of the five ongoing call topics under WP 2016/17 and the identification of strategic priorities for WP 2018 and beyond. To this end the EU and China will continue to identify sustainable solutions for those challenges with a farm-to-fork approach. Further engagement will be sought in view of drafting future H2020 work programme taking into account joint research prioritisation exercises and encouraging even greater Chinese participation in Horizon 2020.

##### **– Sustainable Urbanisation**

Sustainable urbanisation is a major socio-economic challenge for both China and Europe and has been recognised by both sides, as well as by Member States, as a priority area for research and innovation cooperation. Future cooperation will be pursued in the short term by promoting a strong involvement of Chinese stakeholders in the Sustainable Urbanisation R&I package included in Horizon 2020 WP 2016/17 (five topics on urban planning, urban agriculture, innovative nature-based solutions for climate and water resilience in cities, nature-based solutions for inclusive urban regeneration, Belmont Forum). In the longer term support for large scale demonstration projects on the deployment of nature and cultural heritage based solutions is likely to continue with a view to address the numerous challenges that cities are facing such as air and noise pollution, human health, natural disasters, biodiversity loss, degradation of natural capital, and the ever increasing

urbanisation trends. The work of the platform of stakeholders that should be in place by the end of 2016 will be taken on board to pursue these initiatives.

– Aviation

The rapidly evolving high-tech aviation sector is of mutual interest for Europe and China and there are already numerous bilateral industrial cooperations. The second coordinated call for proposals with the Ministry of Industry and Information Technologies (MIIT) took place in 2015 and led to the launch of four joint projects in 2016. Future cooperation will involve the close monitoring of the on-going projects and the identification of priorities through stakeholders' consultation and structured policy dialogue with MIIT taking into account the findings of the ongoing GRAIN2 joint projects on green technology in aviation.

– Energy (RD-PUNE)

Future cooperation will be guided by the EC-MOST Steering Committee meeting under the R&D-PUNE Agreement. In this context a number of cooperation activities on both nuclear fission research and fusion energy research are planned or under preparation as follows:

On nuclear fission research areas, the two sides agreed to complete the last parallel project (ALISA) between Euratom and the China Atomic Energy Authority (CAEA), and increase the Chinese participation in the coming Call under the Euratom Work Programme 2016-2017. They also agreed on boosting the reciprocal participation in R&D programmes, and pooling modules of running R&D projects or programmes. Furthermore, under the Euratom WP 2016-2017 it is envisaged to exchange programmatic S&T expertise with the help of technical visits and seminars or workshops.

With regard to fusion energy research the two sides will pursue the agreed priorities under the bilateral Fusion Work Programme 2013-2020. In particular the EURO-fusion 2016 Work Plan (implementing the European Fusion Joint Programme) includes specific EU-CN actions on system codes, breeding blanket research, physics and technology of long pulse operation, heat exhaust, plasma-wall interaction and diverter optimization as proposed by the Joint Programming Working Group (JPWG) and will issue an open call for EU participation in the described activities. Furthermore, targeted collaborative actions on the new Chinese Fusion Engineering Testing Reactor (CFETR), the JET programme, education and training contribute to the development and implementation of the priorities identified.

Energy (non-nuclear)

China is a strategic partner for the EU in energy research and innovation (R&I) for a number of reasons including the size of the Chinese market, the effort made by China to increase RD&D (Research, Development and Demonstration) spending and the recent commitment taken regarding the transition to a low carbon economy. China is participating in Mission Innovation. Building on the statement DG RTD signed with MOST in 2010 and on the successful cooperation on NZEC dialogue, cooperation will be stepped up with particular regard to renewable energy and energy efficiency.

– ICT

Closer cooperation on ICT R&I with China will hinge on whether any further progress is made towards openness of the Chinese research programmes. The key points are non-discriminatory access to China's RDI programmes for foreign-owned companies, transparent information and procedures, including the scope, the requirements, the selection of the projects, as well as clear IPR rules which are in line with the global best practices. Cooperation could be enhanced through twinning EU-funded 5G-PPP projects and related China-funded 5G (mega). Following the last EU-CN ICT dialogue both sides agreed to promote twinning activities between IoT Large Scale Pilots and Megaprojects, with particular regard to Internet of Things architectures, test beds and platforms, semantic and technical interoperability, thus making full use of the knowledgebase and advantages of both regions. Joint development of international standards for the IoT business layer is also to be pursued. A Joint Declaration on Strategic Cooperation on 5G networks signed in September 2015 openly acknowledges the challenges that exist and aspires to work towards full reciprocity as well as legal and practical openness on both sides. Building on the discussion at the last EU-China ICT R&D Working Group the roadmap on reciprocal access to respective STI funding programmes agreed by the Joint Steering Committee on S&T Cooperation on 30 October 2015 is an important step in the right direction. The Commission will monitor its implementation also in the ICT sector.

– Climate and environment

Considering the aim of the Paris Conference of the Parties (COP21) for more stringent commitments to reduce global greenhouse gas emissions, both EU and China committed at the Summit and Innovation Cooperation Dialogue of June 2015 to enhance their collaboration on climate-related scientific research and technology innovation, including the development and deployment of low-carbon technologies and adaptation solutions that can contribute to international efforts to combat global warming. In the field of environment water is a priority for cooperation with China. The Commission has been supporting the China-Europe Water Platform and will continue to promote policy dialogue, joint research and business development in the water sector.

– Biomaterials and advanced materials

Biomaterials and their eventual applications into Industrial Technologies for Healthcare are a priority area for the EU and for China. China excels in materials science and there is a need to build on positive past experiences as gained from the co-ordinated Call for Proposals with the Natural Science Foundation of China in this topic from FP7 for a possible future flagship initiative. This could be a suitable starting point for international collaboration activities for a potential Industry Driven Initiative on Emerging and Strategic Technology for Healthcare (ESTHER) aligning industrial capabilities with clinical needs.

– Space research and GEO

Under the EU-ESA-China Dialogue on Space Technology Cooperation the EU and China are committed to further reinforcing research and innovation cooperation. On Satellite Navigation, the EU and China would like to enhance cooperation for civil purposes between their respective global navigation satellite systems, Galileo and Beidou. Earth Observation is also a priority for R&I cooperation. In this area the two sides will continue to cooperate by improving access to data from Chinese Earth Observation satellites and derived products, continuing the operationalization of Copernicus and China's Earth Observing program (HDEOS). In the area of Space Research under Horizon 2020 the participation of Chinese organizations is welcomed and should be further be stimulated in the future especially in science and space exploration projects of a global nature, for example, space weather, NEO (Near Earth Objects), solar system exploration and Space Science.

China is one of the four co-chairs of GEO (Group on Earth Observation) together with the EU South-Africa and USA. Since 2005 GEO has been working on the implementation of a Global Earth Observation System of Systems (GEOSS). GEO has been advocating full and open access to Earth observation data worldwide, with for instance the data of the Chinese meteorological satellite Fengyun-3 being delivered freely to GEO Communities and in Europe the full and open dissemination of Copernicus data and services. GEO Ministerial Summit of November 2015 extended GEO for another 10 years for the period 2016-25 and adopted a new GEOSS strategic plan. Further collaboration with China to advance the GEOSS could take place in strategic domains such as the use of earth observation for the monitoring of urban environment and megacities and of polar region. In this context enhanced cooperation on big data could be envisaged.

– Research Infrastructures

The 12th EU-China Joint Steering Committee Meeting agreed to reinforce the dialogue on research infrastructures in order to identify future cooperation activities. To this end a dedicated workshop addressing EU-China cooperation on RI will be organised in 2016 to analyse different scientific fields such as environmental and earth sciences; life sciences including food, agriculture and biotechnologies and virology, and material and analytical facilities with a view to define future joint actions.

– Health

Cooperation might be strengthened in particular on the prevention and treatment of infectious diseases, in the context of initiatives such as the global tuberculosis vaccine. The area of traumatic brain injuries, where cooperation was already established during FP7 with some key projects, might be reinforced with the joint participation in the International Initiative for Traumatic Brain Injury.

– JRC

The Joint Research Centre acting as the European Commission's in-house science service will continue to support the implementation and development of various priority areas of research and innovation cooperation with China. The JRC intends to reinforce and extend cooperation to promising areas where scientific knowledge needs to inform policies, such as global change, air quality, human settlement analysis, land and soil degradation, land cover mapping, agricultural monitoring and digital earth science. This cooperation will help to developing joint

solutions to global challenges such as disaster risk reduction, sustainable development and urbanisation, and climate action.

Current areas of scientific and research cooperation with China will continue to be a priority, including: Space and earth observation, Disaster risk management, Agriculture and Food Security, Food and Feed safety and quality (and consumer protection), Nuclear Safety and Security, Transport and Energy, Water. JRC will continue to contribute to the Food, Agriculture and Biotechnology Flagship initiative, in particular on Land and Soil research via the EU-Sino Panel on Soil and Land. Moreover, collaboration in the area of food safety and consumer products will be enhanced following the renewal in October 2015 of the collaborative research arrangement with the Chinese Academy for Inspection and Quarantine (CAIQ).

As to new priority areas, JRC is planning to develop a partnership with the Chinese Academy of Sciences (CAS) with a focus on air quality and climate change and with the Chinese Vehicle Emission Control Centre (VECC) on transport research and vehicle emissions.

– Researchers' mobility

EU-China relations should also to be strengthened by supporting two-way mobility of researchers and academic staff. The recent agreement between the ERC and the Natural Science Foundation of China represent a valuable tool for promoting enhanced and more balanced mobility of researchers, as do the Marie Skłodowska-Curie actions (MSCA).

### **3.2. Potential new areas of future S&T cooperation proposed at latest Joint Committee/High Level Dialogue, through SFIC, or by thematic services**

While EU-China cooperation on collaborative research based on the S&T agreement in place since 1998 is long standing and spans a number of thematic areas, dialogue on innovation cooperation is very young. The high level Innovation Cooperation Dialogue inaugurated at the Summit in November 2013 already achieved concrete and important results a lot of untapped potential for future cooperation remains. Several additional areas are being considered for future cooperation such as innovation and SMEs, open innovation, innovation platforms, clusters, and promoting STI investment including through EFSI.

### **3.3. Improvements in framework conditions agreed at latest Joint Committee/High Level Dialogue**

– Co-Funding Mechanism (CFM)

At the 2015 Summit and ICD the EU and China reached a breakthrough agreement on the setting up of a Co-Funding Mechanism (CFM) for research and innovation cooperation. The guidelines for the CFM were agreed at the Joint Steering Committee meeting of October 2015 and the Chinese Ministry of Science and Technology published the first call for proposals under the new CFM in December 2015 (see [MOST call](#) Chinese version - [MOST call](#) English translation).

Under the CFM, MOST allocates 200 million RMB, or about 28 million euro on an annual basis to provide competitive funding to China-based entities participating in joint projects with European partners under Horizon 2020. The European Commission expects to continue spending over 100 million euro per year for the benefit of Europe-based entities in joint projects under H2020 with Chinese participants. The CFM will pave the way for deepened cooperation between European and Chinese research and innovation stakeholders by promoting a stronger and more balanced Chinese participation in the Horizon 2020 [topics targeting cooperation with China](#). The CFM is also open to a variety of thematic areas such as food, agriculture, biotechnology, information and communication technology, space, aviation, energy, health, transportation, water resources, energy conservation, advanced manufacturing, new materials, sustainable urbanization, young scientists exchange activities.

– Reciprocity in access to respective STI funding programmes

Progress was also made on the issue of Reciprocal Access to respective STI funding programmes with an agreement reached with MOST whereby China is to ensure access to their STI funding programmes for China-based EU owned organisations under the same terms as Chinese owned organisations. Close monitoring and fine-tuning of this agreement is envisaged.

**ANNEX:****HORIZON 2020 WORK PROGRAMME 2016-17 TOPICS EXPLICITLY ENCOURAGING COOPERATION WITH CHINA**

	<b>Topic identifier</b>	<b>Topic title</b> <i>(click topic name to follow link)</i>
<b>2016</b>	SFS-44-2016	<a href="#">Joint plant breeding programme to decrease dependency of the EU and China on protein imports</a>
	SFS-45-2016	<a href="#">Increase overall transparency of processed agro-food products</a>
	MG-3.5-2016	<a href="#">Behavioural aspects for safer transport</a>
	GV-11-2016	<a href="#">Stimulating European research and development for the implementation of future road transport technologies</a>
	SC5-11-2016	<a href="#">Supporting international cooperation activities on water</a>
	SC5-10-2016	<a href="#">Multi-stakeholder dialogue platform to promote innovation with nature to address societal challenges</a>
	ENG-GLOBALLY-08-2016/2017	<a href="#">EU-China innovation platform on sustainable urbanisation (Coordination and Support Action)</a>
	ENG-GLOBALLY-09-2016	<a href="#">Centres/Networks of European research and innovation</a>
	ICT-07-2017	<a href="#">5G PPP Research and Validation of critical technologies and systems</a>
	ICT-08-2017	<a href="#">5G PPP Convergent Technologies</a>
	ICT-37-2016	<a href="#">Collaboration on Future Internet</a>
	SCC-04-2016	<a href="#">Sustainable Urbanisation, ERA-NET-Cofund</a>
	INFRAIA-01-2016-2017	<a href="#">Integrating Activities for Advanced Communities</a>
<b>2017</b>	SC1-HCO-07-2017	<a href="#">Grant to the Global Alliance for Chronic Diseases</a>
	SFS-46-2017	<a href="#">- Alternative production system to address anti-microbial usage, animal welfare and the impact on health</a>
	SFS-47-2017	<a href="#">_Soil water resources management in the EU and China and its impact on agro-ecosystem functions</a>
	SFS-48-2017	<a href="#">Resource-efficient urban agriculture for multiple benefits – Contribution to the EU-China Urbanisation Partnership</a>
	LCE-29-2017	<a href="#">CCS in industry, including Bio-CCS</a>
	MG-3.2-2017	<a href="#">Protection of all road users in crashes</a>
	SCC-02-2016-2017	<a href="#">Demonstrating innovative nature-based solutions for climate and water resilience in cities</a>
	ENG-GLOBALLY-08-2016/2017	<a href="#">Cultural and socio-economic aspects of urban issues in China (Research and Innovation Action)</a>



**Table 1: China - Top subdisciplines by Field-Weighted Citation Impact**

Major Subdiscipline	Impact ( $\pm$ EU28)	Co-publications	Output
Materials Science: Surfaces, Coatings and Films	1.55 (0.25)	19.0%	23.72%
Energy: Renewable Energy, Sustainability and the Environment	1.96 (0.12)	23.7%	21.65%
Materials Science: Ceramics and Composites	1.56 (0.11)	17.3%	28.3%
Chemistry: Organic Chemistry	1.31 (0.11)	16.6%	21.5%
Chemistry: Analytical Chemistry	1.18 (0.05)	14.8%	23.67%
Chemistry: Physical and Theoretical Chemistry	1.24 (0.02)	18.9%	22.26%
Chemistry: General Chemistry	1.39 (-0.03)	17.7%	26.07%
Environmental Science: Environmental Chemistry	1.39 (-0.07)	22.2%	26.75%
Materials Science: General Materials Science	1.37 (-0.13)	18.5%	25.92%
Materials Science: Metals and Alloys	1.04 (-0.18)	11.2%	35.82%

Minor Subdiscipline	Impact ( $\pm$ EU28)	Co-publications	Output
Arts and Humanities: Archeology (arts and humanities)	4.18 (2.96)	63.2%	1.75%
Social Sciences: Archeology	3.02 (1.19)	57.1%	1.76%
Nursing: General Nursing	1.96 (0.73)	43.7%	1.2%
Health Professions: Complementary and Manual Therapy	1.56 (0.69)	31.9%	3.06%
Arts and Humanities: Classics	1.18 (0.62)	0.0%	0.02%
Arts and Humanities: Music	2.53 (0.62)	43.4%	1.0%
Nursing: Community and Home Care	1.16 (0.59)	80.0%	0.56%
Materials Science: Biomaterials	1.91 (0.54)	28.2%	20.38%
Arts and Humanities: Visual Arts and Performing Arts	1.8 (0.48)	33.9%	0.33%
Social Sciences: Anthropology	1.75 (0.47)	54.4%	1.08%

Social Sciences and Humanities  
Exact Sciences and Engineering  
Life Sciences

Source: DG Research and Innovation, Dir. C – International Cooperation  
Data: Elsevier SciVal; extraction date: 6/2/2016; publications' window: 2012-2014  
Note: Categorisation according to Elsevier 'All Science Journal Classification'.  
Major (minor) subdisciplines are those with a publication share  $>0.3\%$  ( $\leq 0.3\%$ )  
among the publication output of the country. For each subdiscipline: ( $\pm$ EU28)  
shows the difference with the Impact for EU28. 'Co-publications' is the share of  
international publications and 'Output' is the share in world's publications.

**Table 2: China - Top-10 technology shares in PCT patent publications**

Technology	2014 share (% change from 2010)	EU28 2014 share
<b>Digital communication</b>	32.8% (3.4%)	18.3%
<b>Telecommunications</b>	18.1% (5.8%)	16.8%
<b>Optics</b>	17.1% (14.0%)	15.2%
<b>Audio-visual technology</b>	14.5% (8.4%)	11.6%
<b>Computer technology</b>	14.1% (9.0%)	12.7%
<b>Other consumer goods</b>	12.4% (7.7%)	30.7%
<b>Semiconductors</b>	10.5% (8.4%)	15.8%
<b>Furniture, games</b>	10.0% (4.5%)	28.3%
<b>Thermal processes and apparatus</b>	9.4% (3.9%)	29.5%
<b>Electrical machinery, apparatus, energy</b>	9.0% (3.8%)	23.1%

Note: Statistics based on PCT publications by technology; total count by applicant's origin.

Source: DG Research and Innovation, Dir. C – International Cooperation

Data: WIPO, extraction date: 1/2/2016