ChinaAccess4EU

Supporting the EU access to

Chinese research & innovation programmes

Strategy Paper

for enhancing reciprocity in EU-China S&T Cooperation

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Disclaimer

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Executive Summary

Europe and China share a strategic interest in further promoting joint efforts that will augment the quantity and quality of scientific output and technological innovation in both Europe and China, especially in the face of common global challenges.

In recent years, China has made huge investments in its science and technology infrastructure in order to catch up with and ultimately to overtake the West, in an attempt to restore China's once pre-eminent position at the forefront of global invention and innovation. It has an immense talent pool, rapidly improving universities and some excellent state-of-the-art facilities, but faces many difficulties as a still developing country.

The long track record of Science and Technology (S&T) cooperation between the European Union (EU) and China has delivered fruitful results so far and offers considerable potential for the future. It is nonetheless a challenging task for policy-makers to articulate a collaboration framework under which the foreseen cooperation can always be kept on track as expected and which optimally fulfils both sides' expectations.

Chinese partners have been permitted extensive participation in the EU's framework programmes for research, up to and including the current FP7 programme which ends in 2013, and this has been highly effective in building a strong base of collaboration across the natural sciences and engineering and also across the social sciences.

In an effort to improve reciprocity and European access to Chinese funding, the ChinaAccess4EU project has studied Chinese programmes open to European participation and publicised the details of these, together with a series of case studies to identify best practices, on the web and in a series of dissemination events in Europe and in China over the past 2-3 years.

Through surveys and interviews, the ChinaAccess4EU project has also identified a series of challenges and constraints to EU-China collaboration in science and technology that need to be addressed in order to improve future collaboration between the European Union and China.

This Strategy Paper provides a succinct recapitulation of the main project findings and delivers a set of specific recommendations aimed at enhancing Science and Technology (S&T) collaboration. Although the main target audience of this Strategy Paper is EU policy makers, this

document collates practical advice which will be likewise useful to EU researchers interested in collaborating with Chinese organisations, and to Chinese policy-makers and researchers keen to develop greater reciprocity to mutual benefit.

This Strategy Paper makes three **Strategic Recommendations**, namely:

- **Create a Europe-China Research Foundation -** The creation of a Europe-China research foundation would represent the materialisation of a common vision. Such an effort should be jointly funded by the EU and China in order to provide grants supporting basic research. This Europe-China Research Foundation would improve collaboration, facilitate a truer reciprocity and help achieve commonality of interests for both sides. Both European and Chinese officials would identify the most appropriate bodies needed for administering such a program. A workable framework would be to employ the National Natural Sciences Foundation (NSFC) on the Chinese side and the European Research Council for the European side. Funding would be allocated to Chinese and European partner applicants selected by European and Chinese peer review panels. The funding schemes should be designed to allow each side to fund its own part of the collaboration in its own way in line with its own rules and practices, and its own funding culture. That way neither side would end up imposing an unwanted and unnecessary bureaucracy upon the other[2]. This recommendation is based on the information collected during the ChinaAccess4EU project, since such joint foundations/programmes funded in a reciprocal way is the tendency at the bilateral level (e.g. Netherlands, Israel, among others) and they have proven to be successful.

- **Set up a China Access Infodesk Office -** The creation of a ChinaAccess Infodesk Office in Europe would provide a central access point of information on Chinese programmes for EU research organizations and researchers and ensure the visibility and sustainability of existing EU initiatives such as ChinaAccess4EU. Similar to the China-EU Science & Technology Cooperation Promotion Office (CECO) in China, this would be a real and a virtual meeting point where interested organisations and researchers could obtain information about Chinese funding opportunities, get professional advisory services and gain insight into **critical factors for success** when considering cooperating with Chinese counterparts. At the same time, under the umbrella of this organisation funding organisations from Member States could share their experience. This would facilitate the objective of Best Practice sharing. The Infodesk Office would also raise the visibility of

[2] This has proved to be a successful international cooperation philosophy in the United Kingdom Royal Society

European research and innovation in China by providing a focal point as well as a space for everyday exchange of information and interaction. The China Access Infodesk Office would also ensure that the material gathered for the ChinaAccess4EU project would continue to remain useful to the scientific community, forming the core of its database.

- **Follow a strategy of Diversification** – It is important to go beyond Beijing and other major Chinese cities in S&T collaboration. China has many hotspots of scientific excellence (for instance in universities and research centres in the provinces of Jiangsu, Anhui and Shan'xi) and they offer considerable potential for enhancing S&T cooperation. The 34 Chinese provinces are supported by government Science and Technology Bureaus which have specific strategies and corresponding budgets to support research and development in targeted areas, creating major opportunities for collaborative projects. These regions are sometimes more eager to collaborate with the EU which could make the access easier for EU researchers than the most well-known S&T regions in China.

For the formulation of this Strategy Paper the ChinaAccess4EU partners benefited from the valuable support of external experts, who generously shared with the consortium their experience and advice. This advice, together with information gleaned in the project's surveys, has led to the production of a series of other detailed recommendations which are listed in this paper.

The ChinaAccess4EU partners offer this Strategy Paper as a reference document for EU policy-makers and researchers alike in the hope of further developing EU-China S&T collaboration in a sustainable and mutually beneficial manner.

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When mentioning the concept of reciprocity, many questions can arise. For example, does it refer to guaranteeing the same degree of involvement (e.g. in terms of total participants) and commitment (e.g. access to information, allocation of financial resources, clear participation rules, etc.) from both sides *from the beginning* or does it rather refer to only ensuring that the cooperation will *in the end* be of equal benefit to both sides?

The analysis of the issues surrounding the above forms a core part of this Strategy Paper, which will deliver a set of recommendations. But firstly it is necessary to start with a short recapitulation of most important issues shaping the European Union (EU)-China Science and Technology (S&T) cooperation in order to provide a common baseline.

After the first fruitful and successful years of scientific and technological exchange between the EU and China, Chinese officials promised to encourage the participation of European researchers in their funding programmes. In the same vein, in its "Recommendations for thematic priorities in cooperation with China", the Strategic Forum for International Cooperation (SFIC) insists on the necessity for the EU to "support its general R&I [Research and Innovation] diplomacy, and specially the improvement of framework condition for a win-win partnership in innovation with [China]."[3]

In order to provide a basis for a more reciprocal form of collaboration, it is essential first to understand how the partner thinks and how his system works. This is a pre-condition to ensure that each side comes to the negotiating table with lucidity, clear objectives and realistic demands. This Strategy Paper points out some crucial aspects of China's S&T landscape, its current situation, system and priorities that need to be taken into account in order to pave the way towards a sustainable S&T collaboration framework that matches both sides' expectations.

At this point, it is useful to recall the reasons why it is important - even indispensable - for Europe to work together with China on science.

In our interconnected world, the geography of science is changing as science becomes more global; knowledge is nowadays shared so fast and efficiently and the centre of gravity is shifting eastwards. Thus, international collaboration has become a key issue and scientists seek collaboration with those most knowledgeable in their field, wherever they are. Support measures

[3] See SFIC recommendations on thematic priorities in cooperation with China., Annex 1, p.2

for EU scientists (including social scientists) keen to collaborate with Chinese partners are therefore important in playing a facilitating role in cementing such cooperation. It should not be underestimated, however, that scientists of the United States of America (USA) are in many ways the preferred partners for Chinese organisations, because of the perceived excellence of USA universities and research centres, and Europe needs to ensure that it is not marginalised in this area.

On the other hand, China, following its rapid economic development, is now investing huge sums of money in developing its own science and technology and nowadays already has an immense talent pool and some *state-of-the-art* research facilities. This framework provides the elements for facilitating effective international cooperation, especially in fields such as energy, life sciences and food security, in which fields lie some of the key global challenges that all regions of the world are trying to tackle. Indeed, as no one can deal with these immense problems alone, the EU needs to embrace a long-term vision and common strategy for innovation and S&T collaboration with China[4] in its own self-interest.

Another reason why Europe cannot afford to ignore China as a key cooperation partner is that Europe's competitors will not, and the EU cannot afford to be left behind.

Conversely, China also has good reasons to nurture a solid S&T collaboration with Europe. Even today, China may still be considered in many aspects to be a developing country. Having the EU as a partner is part of China's development strategy. It is determined to catch up with the West, among other things by harnessing international S&T and foreign investment.

Chinese and EU leaders say they are convinced that strong collaboration in this field will be of benefit to all. But although there is a common agreement on the importance of international cooperation and the need to work together to better tackle global challenges, important national issues exert considerable influence on how decisions are taken and priorities ranked. It is therefore necessary to reconcile global and national interests in order to articulate a coherent and reciprocal collaboration between EU and China.

Nonetheless, collaboration between the EU and China has a long track record of positive results. In fact, cooperative relationships are not only well established at the political level but also at the level of individual researchers. The scientific community is very much interested and willing to gain new knowledge and expertise by interacting and collaborating with their counterparts.

[4] Halme K., Reiner R.. *Output Paper about Inno Views Policy Workshop – Innovation Bridges between China and the EU*. German Centre Shanghai. 12th October 2010, p. 12

In view of their mutual commitment to foster S&T cooperation, both the EU and China have provided a legal and organisational basis to facilitate such an engagement. To some extent, they have opened their programmes to foreign participation. For instance, the Chinese 973 programme is open to EU scientists who make joint applications with Chinese collaborators. The 863 programme allows for participation of overseas Chinese and Chinese from Hong-Kong, Macau and Taiwan. China invests in International Innovation Parks, International Joint R&D Centres, International Tech Transfer Centres and International S&T Cooperation Bases, to mention a few examples. China has also committed itself to closer collaboration with individual EU Member States, with whom joint calls are sometimes published. In this regard, this Strategy Paper emphasises some successful examples of cooperation schemes, which as models of best practice could be usefully adopted at the EU-China level on a larger scale with greater impact.

Although these initiatives are encouraging, EU-China S&T cooperation still faces several challenges, one of the most important being a lack of reciprocity in terms of the number of participants. This may be due to several different factors, such as a lack of transparency of Chinese funding programmes, the relative unavailability of information or too difficult and complex application procedures. In this regard, in future it will be crucial to leverage existing close partnerships.

As detailed in the present document, the differences between the systems of both sides impose significant challenges to a more intensive cooperation. For example, staff costs are not funded by most Chinese programmes. China has a rather top-down strategy for developing science and technology while the EU follows a more bottom-up approach. Furthermore, there is much greater financial investment from the European side into programmes open to the other side's participation. Language issues and cultural differences and preconceptions still represent crucial barriers to strengthened cooperation.

The ChinaAccess4EU project has closely explored and analysed these issues and thereby helped to further a better understanding of the complex interplay in which S&T collaboration between the EU and China takes place. The project's results have thereby helped to:

a) provide a clear picture on the current status of S&T cooperation between the EU and China;

b) better understand the Chinese funding programmes;

c) raise awareness and visibility in Europe and in China among relevant stakeholders by disseminating gathered information;

d) articulate a set of concrete recommendations aimed at enhancing the future S&T cooperation between Europe and China

This document is divided into three main parts. Firstly, in order to contextualise the analysis presented, a brief *review* is provided of the history of S&T cooperation between Europe and China. The second part delivers a *diagnosis* of the current situation, emphasizing the main critical issues and challenges to be attended. The third section is devoted to *recommendations* on measures and initiatives that could be launched in order to improve the S&T collaboration between Europe and China and thus facilitate the articulation of a more sustainable and fruitful cooperation.

Chapter One - Background: Development of EU-China Science and Technology Cooperation

S&T cooperation between Europe and China has a history that dates from agreements signed bilaterally between European nations and China in the 1980s. The European Commission first set out its long-term strategy for EU-China relations in a 1995 Communication, which included the strengthening of S&T cooperation to be pursued under the 4th EU RTD Framework Programme (FP4).[5]

The formal framework for the promotion of cooperation on R&D was established with the Agreement for scientific and technological cooperation between the European Community and the Government of the People's Republic of China that was concluded in 1998, and which became a crucial starting point for more systematic and continuous collaboration in this sector.[6] The agreement, which went into effect the following year and which has remained an essential framework for collaboration since, led to a substantial growth of Chinese participation in European research programmes, including the 6th and the 7th EU RTD Framework Programmes (2002-2006 and 2007-2013 respectively). The number of Framework Programme projects with Chinese participation more than doubled between FP5 and FP6, and a report noted that although 80% of Chinese participants in FP6 were State research performers, the share of participation by Chinese industrial organisations more than doubled from FP5 to FP6.[7] The Chinese participation in FP7 has followed a similar trend, and China remains in second place among successful applications, with almost 400 participations during the period 2007-2010.[8]

The European Union and the Chinese government have repeatedly confirmed that they regard the development of cooperation in science and technology as a strategically vital component of their bilateral relations, most recently in the joint communiqué from the 14th EU-China Summit, which declared:

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[5] See *A long term policy for China-Europe relations. Communication from the Commission. COM (95) 279 final, 5 July 1995.* http://aei.pitt.edu/2784/1/2784.pdf

[6] For the text of this agreement, renewed for another five-year period at the EU-China Summit in 2008, see http://ec.europa.eu/world/agreements/prepareCreateTreatiesWorkspace/treatiesGeneralData.do?step=0&redirect=true&treatyId=342

[7] See Erik Arnold, Sylvia Schwaag Serger, Sophie Bussillet, Neil Brown. *Evaluation of Chinese participation in the EU Framework Programme* Brighton: Technopolis, 2009, p. 23. http://www.technopolis-group.com/resources/downloads/reports/893_China_FPs_Final_090307.pdf (accessed June 2012)

[8] See the *Fourth FP7 Monitoring Report* (4 August 2011), p. 30-31. http://ec.europa.eu/research/evaluations/pdf/archive/fp7_monitoring_reports/fourth_fp7_monitoring_report.pdf

> Both sides welcomed progress made and agreed to further strengthen the cooperation in the context of the Science and Technology Cooperation Agreement and to enhance the exchange of young researchers. They also agreed to engage in a broader exchange building on and ensuring synergy between existing cooperation for dealing with science and technology innovation, with a view to sharing experience on best practices and identifying areas for cooperation, in particular to promote the effective development and deployment of technology innovative solutions to major societal challenges of common interest.[9]

The detailed direction and practical implementation of this framework for cooperation has been deliberated upon by the European Commission several times, but the underlying principles have remained stable. They include the promotion of participation of Chinese research entities in projects under the EU Framework Programmes, and the reciprocal participation of European research entities in Chinese projects in similar sectors; enhancement of visits and exchanges of scientists, and the joint organization of scientific seminars, conferences, etc.[10] From a European perspective, research cooperation with China provides new and additional opportunities for building competitiveness and solving key social and economic problems, by mobilising the increasingly advanced Chinese research entities and scientists to contribute to the joint creation of relevant knowledge and innovation. From a Chinese perspective, the complementary resources of Europe and China provide a vital means of leveraging indigenous innovative capabilities, illustrated in China's EU policy paper from 2003: "The EU has a developed economy, advanced technologies and strong financial resources while China boasts steady economic growth, a huge market and an abundant labour force. There is a broad prospect for bilateral trade and economic and technological cooperation."[11]

The two sides thus share a strategic interest in further promoting joint efforts that will augment the quantity and quality of scientific output and technological innovation in both Europe and China. **Figure 1** shows a bibliometric comparison on scientific publications worldwide, in which a rise in the number of Chinese publications can be noticed. Moreover, recent bibliometric studies have demonstrated that cooperation with Chinese researchers indeed have improved the "international collaboration dividend" for scholarships published in international journals. One study noted a significant increase in average citation rates during the early 2000s for scientific publications by scholars at the Chinese Academy of Sciences that resulted from international

[9] Joint Press Communiqué of the 14th EU-China Summit (14/02/2012) http://eeas.europa.eu/delegations/china/press_corner/all_news/news/2012/20120214_01_en.htm (accessed June 2012)

[10] The history of the bilateral cooperation between EU and China is summarized and analyzed in Manfred Horvat and Nan Lundin, *Review of the Science and Technology (S&T) Cooperation between the European Community and the Government of the People's Republic of China. Final Report* Brussels, October 2008, p. 7-14. http://ec.europa.eu/research/iscp/pdf/china_eu_en.pdf (accessed June 2012)

[11] See *China's EU Policy Paper* http://www.china.org.cn/e-white/20050817/index.htm (accessed June 2012)

collaboration with scholars from UK and Germany, as was the case for collaboration with Japanese scholars.[12] Another report has confirmed a similar pattern of improved quality of internationally collaborative papers for Chinese researchers working in the field of molecular biology.[13] The benefits are mutual: collaboration also advances the demonstrated quality in terms of relatively higher citation scores for the foreign collaborators working with Chinese researchers, as indicated in a report showing that the joint publications of the top ten Australian research institutions with Chinese counterparts have overall average citation impact higher than that of all Australian publications.[14]

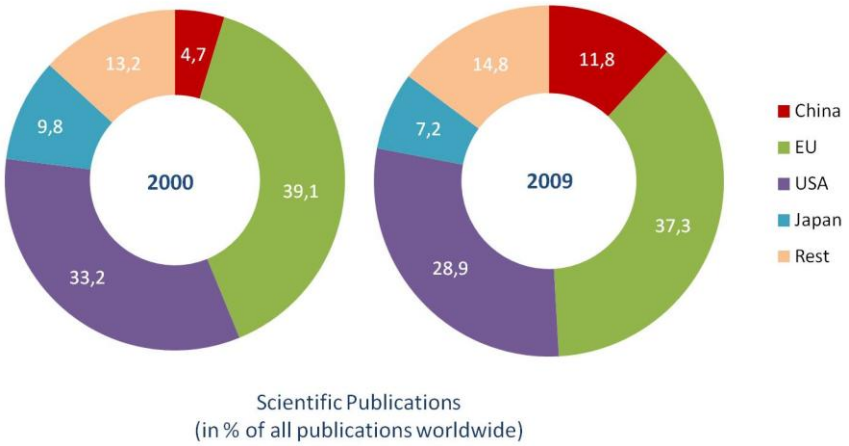

Figure 1 Scientific publications worldwide [15]

Moreover, the modalities of EU-China research collaboration have evolved since 1998, as the opportunities for collaboration were broadened and new challenges emerged in relation to the distribution of responsibilities and benefits. Consequently, a new set of guidelines for future cooperation in research and technological development (RTD) between China and Europe was adopted at a High Level Forum on S&T Policy and Development held in Beijing in May 2005.[16] The rationale for a new strategy strengthening the partnership and the RTD cooperation was based on the acceleration of China's investments in R&D and the EU's ambitious targets of

[12] David Tyfield, Yongguan Zhu and Jinghua Cao, "The importance of the 'international collaboration dividend': the case of China" *Science and Public Policy* Vol. 36, No. 9 (November 2009), p. 723-735

[13] Nan Ma and Jiangcheng Guan, "An exploratory study on collaboration profiles of Chinese publications in Molecular Biology" *Scientometrics* Vol. 65, No. 3 (2005), p. 343-355

[14] See Australian Government, Department of Industry, Innovation, Science, Research and Tertiary Education, *Science and Research Collaboration between Australia and China,* released 14 February 2012, p. 72 http://www.innovation.gov.au/SCIENCE/INTERNATIONALCOLLABORATION/ACSRF/Pages/KnowledgeExchange.aspx (accessed June 2012)

[15] Web of Science

[16] See *Joint Declaration on EU-China Research Cooperation: Building a Knowledge for Growth Pact* http://ec.europa.eu/research/iscp/pdf/eu-china-statement-2005.pdf (accessed June 2012)

R&D investments and development of the European Research Area, and the convergence of driving forces in the knowledge-based economy such as research users and creators, public and private stakeholders, intellectual property ownership and open collaboration, and small and large businesses. The new strategy included, *inter alia*, the following objectives:

- Developing joint EU-China RTD projects and large research infrastructures in key technology areas;
- Developing global scientific knowledge, through mobilizing a wide range of stakeholders from research, industry, and financial institutions in Europe and China;
- Increasing public and private investment in EU-China RTD cooperation projects;
- Mobilising all EU Member States to get critical mass and improving coordination between national and Community actions;
- Ensuring mutual interest and balance of the EU-China RTD cooperation
- Ensuring protection of IPR

In short, the strategy sought to focus activities on joint RTD project initiatives and to involve a wider range of actors, including better coordination with EU member states' activities. Moreover, the declaration proposed to increase the mobility of researchers between Europe and China. The strategy led to the planning of joint institutions in the energy sector and the launching of both European and Chinese initiatives to increase the mobility of researchers and students. It also prepared for the arrangement of the China-EU Science and Technology Year in 2007, which served to advertise and promote collaboration between the two regions. The joint call for collaborative projects with funding from both European and Chinese programmes did not materialise to the extent that was envisaged, however, apparently because of the delay in preparing detailed guidelines for the administrative and financial procedures.[17]

During recent years, the development of cooperation has witnessed a further broadening of initiatives to promote research cooperation between Europe and China. On the one hand, cooperation has expanded through joint programmes between China and member states, and the pilot coordination of joint calls through the EU sponsored CO-REACH initiative in the social sciences. There has also been a significant growth of programmes for attracting European researchers to China, notably the Science & Technology Fellowship Programme China, which involves funding from both the EU and China. The EU 7th Framework Programme continues to

[17] See Manfred Horvat and Svend Remøe, Approaching China. Background report on steps towards developing strategies for S&T cooperation with China. September 2010. http://www.minedu.fi/export/sites/default/OPM/Tapahtumakalenteri/2011/05/Approaching_China_liiteet/ApproachingxChina_BackgroundxReport_rev__2_.pdf (accessed June 2012)

attract a large number of third country participants from China, and this remains a core avenue for the funding of research cooperation between Europe and China. In contrast, the success of European researchers to gain access to funding from Chinese programmes, most importantly from the 863 High Technology Programme and the 973 Basic Science Programme, appears to have been extremely limited.[18] It is within this context that experts have called for additional means to increase awareness among both European and Chinese researchers of the benefits and modalities of research collaboration and the opportunities that exist for access to funding in Europe and China.

[18] For an overview of recent developments and challenges, see Manfred Horvat and Svend Remøe, Partnering with a future superpower: Key issues of Chinese Science and Technology September 2010. http://www.minedu.fi/export/sites/default/OPM/Tapahtumakalenteri/2011/05/Approaching_China_liiteet/Chinax-xaxfuturexpartnerxforxEurope_rev.pdf (accessed June 2012)

Chapter Two - Diagnosis: Main Challenges and Critical Issues Identified

During the 30-month project period the ChinaAccess4EU consortium has evaluated a wide range of initiatives, funding programmes and instruments enabling mutual cooperation between China and the European Union in Research, and Technological Development (RTD) activities.

This strategy paper is based on information gleaned during the implementation of this wide-ranging research which included a series of surveys and detailed interviews with European Commission's officials, representatives from major Chinese funding organisations, experts and programme managers from EU member states.

This second chapter provides a general *diagnosis* of the environment shaping the cooperation relationship between both sides. This chapter furthermore identifies the **main challenges** and **most critical issues** to be considered in order to strengthen the current cooperation links between China and the EU and pave the way towards a more sustainable and fruitful collaboration relationship.

> *"I always hear that FP7 is too complicated and is quite demotivating for many Chinese. However, other Chinese organizations take part in FP7 projects because, for them, they guarantee high-quality science, which is a very positive sign."*
>
> Chief Representative of Fraunhofer Representation Office in Beijing

On the one hand, through diverse mechanisms, EU funding programmes are in many cases open - under different modalities - to the participation of Chinese organisations, and they have derived considerable benefit from these. In the 7th Framework Programme alone, between 2007 and 2010, approximately 409 Chinese organisations have benefited from EU funding. This represents a funding volume of around €28.7 million going to Chinese participants[19].

Analysing the same issue from the opposite perspective, although many Chinese funding programmes are open – at least theoretically - to Europeans for participation, there is little statistical evidence available and this provides unfortunately

> *"The S&T Agreement provides for the Chinese and European sides to open access to their programmes. Data is often requested but not provided on the participation of Europeans."*
>
> EC representative in Beijing

[19] *Op cit* Fourth FP7 Monitoring Report, pp. 30-32

only a very limited snapshot concerning Europeans' involvement in Chinese funded initiatives.

The aforementioned situation results from a complex combination of issues as detailed below.

2.1 The rapid evolution of China's education system and its research and technical development.

> *"[China] has many highly-talented, well-educated and motivated researchers with the capacity to provide sufficient manpower to perform highly time-consuming tasks"*
>
> Prof. Miguel Angel Esteban, Principal Investigator at the Guangzhou Institute of Biomedicine and Health (a branch of CAS)

China, with its rapid economic growth and fast evolution in recent years, has demonstrated an impressive ability to evolve, change and rapidly adapt according to the circumstances. This is particularly true of its education and research and development. The Chinese party-state has pursued a highly ambitious strategy in this regard, and currently regards itself as engaged in a race to become a leading innovative nation and thereby to catch up with and, ultimately, to overtake the West. In Chinese eyes, this would simply restore China to the leading global position in science and technology which the nation held in ancient times – as described in the famous multiple-volume series "Science and Civilisation in China" written by Professor Joseph Needham over several decades in the 20th century.

In recent years, for instance, the Chinese government has defined a group of 600 universities authorised to grant doctorate degrees [20]which have been allocated complementary funding to accomplish this goal. An ambitious plan called "Project 211" has served to identify the best 100 universities out of this group, which are called *universities of the 21st century,* with the aim of raising research standards to those of high-level Western universities and cultivating strategies for national and regional socio-economic development. They receive additional financial support from the government. The Chinese government has also launched "Project 985" with the objective of providing special funding to 40 universities to make them truly world-class. This fund amounts to around €6 billion yearly. An overview of China's R&D expenditure in the period 2002 to 2011 is provided in **Figure 2**.

[20] Additionally, public research institutes such as the Chines Academy of Sciences (CAS) are also authorized to grant doctorate degrees.

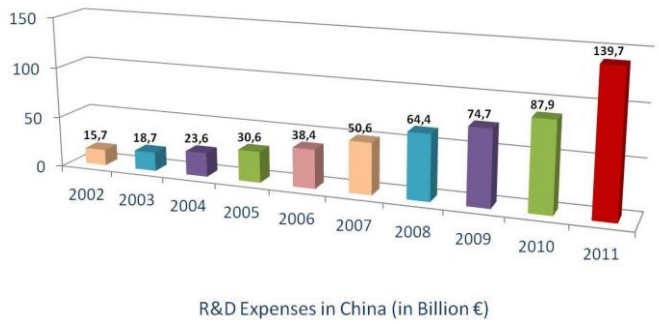

Figure 2 R&D Expenses in China [21]

The recruitment of the best overseas Chinese scientists and specialists is also a high priority for the Chinese government, which is willing to offer attractive relocation packages, which include not only access to state-of-the-art RTD infrastructures and excellent research conditions, but also very competitive salaries.[22]

Another crucial aspect to take into account when developing a vision for a constructive S&T cooperation between Europe and China is the current reform taking place in the Chinese innovation system, a point highlighted by the Strategic Forum for International Cooperation (SFIC) in its recommendations. The purpose of this reform is to "change the system from one centred on a public research system to one based on enterprises." [23]

Hence, awareness of niche areas in which the expertise and excellence of European companies may be complementary in the Chinese RTD landscape offers useful potential market entry points for such European companies. In fact, identifying concrete cooperation options would serve as an incentive to foster Chinese commitment in terms of, for instance, financial investment or in-kind contributions.

Indeed, according to the report cited above, Chinese technological capabilities "have failed to meet the country's needs in areas such as energy, water and resource utilisation, and public health and technologies related to defence are also still insufficient"[24].

It is in this constantly and rapidly evolving environment that the EU-China RTD cooperation takes place. Thus the key challenges are how best to keep track of these changes and, more importantly, to work out the best possible way to integrate these considerations when planning and structuring EU-China RTD cooperation agreements.

[21] China Science and Technology, Statistical Yearbook
[22] WirtschaftsWoche Global, Der Aufstieg des Drachen, April 2012. pp. 10-11
[23] SFIC recommendations on thematic priorities in cooperation with China., Annex 1, p 1
[24] *Ibidem* Annex 1, p. 1

2.2 Getting access to Chinese funding programmes: The challenges imposed by administrative and budgetary constraints

The **Chinese research funding landscape is diverse** and funding can be found at different levels. Hence, it is important not only to consider national programmes, but also to consider regional programmes which have much to offer and should therefore be better exploited and promoted (a good example of this is the "100 Talent Scheme" of Sichuan Province).

However, when trying to evaluate the participation of European organisations in Chinese funded initiatives the consortium faced considerable difficulties in obtaining reliable and accurate information.

One of the main findings in this regard is that Chinese government organisations for some reason do not make available any statistical data about the exact participation of foreigners in their programmes. Even the Chinese partner members of this consortium were unable to provide the necessary comprehensive statistical information. Either such information is not gathered or accessible at the national level, or the respective organizations prefer to keep such information confidential, as is often the case in China, where the concept of open government has a much lower priority than in Europe. It is therefore impossible to prove with official figures the exact level of participation of foreigners and foreign organizations in Chinese-funded research programmes. A few figures could be gathered though to allow at least a partial assessment.

> *"NSFC financially supports Chinese researchers' research and international cooperation expenditure, and for Scientists Exchange Programme, we also provide living expenses to international scientists."*
>
> Director of Planning Department, NSFC's Bureau of International Cooperation

As for the **National Natural Science Foundation of China (NSFC)**, according to the Director of the Planning Department in its Bureau of International Cooperation who was interviewed in December 2010, "no official statistical data is available for this issue". He indicated that 200 to 300 international cooperation projects were funded each year under NSFC programmes. He added that foreign partners normally come from the USA, Europe, Japan and Korea, but was unable to give further details of European participation. He noted that, "for all the projects funded by NSFC, 10 to 15% of the total budget managed by the selected applicants could be used for international cooperation".

Despite the scarcity of information, unofficial data was collected by project partners regarding three NSFC programmes. **Figure 3** displays the participation of EU countries in the NSFC International Young Scientists Programme from 2009 to the present. It was found that EU participants account for around 40% of all participants in this programme and gained a share of 39.6% of the total funding awarded since 2009.

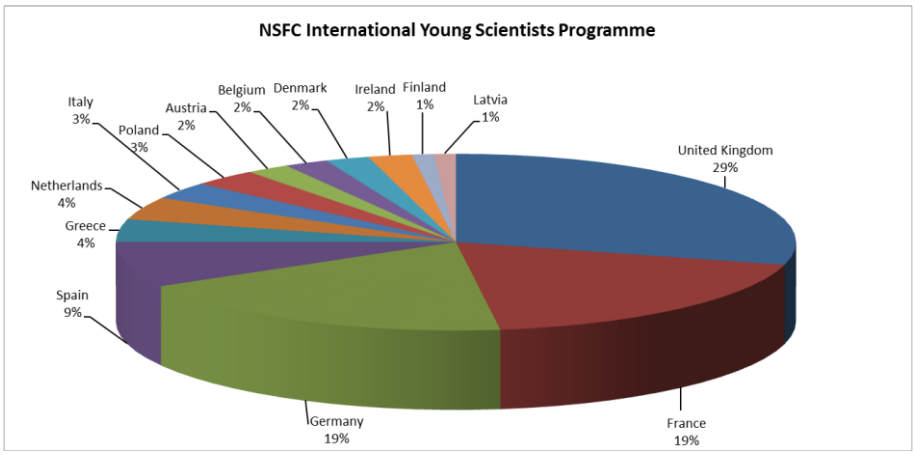

Figure 3 Participation of EU countries in NSFC International Young Scientists Programme

Concerning the **NSFC Joint Research Programme** it was found (see **Figure 4**) that during the period 2006-2011 European participants were involved in 279 projects which represented an overall funding sum (for all funded organisations) of around RMB237 million (€30 million), Moreover the annual funding for projects with European participants rose rapidly in 2010 and 2011.

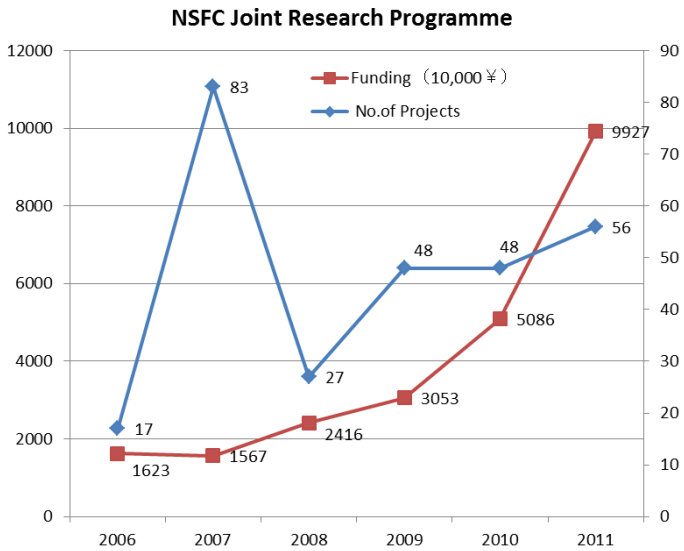

Figure 4 NSFC Joint Research Programme - EU participation

The **NSFC Exchange Visits Programme** registered European participation in around 548 projects during the period 2006-2011 (see **Figure 5**). The overall budget granted to all funded projects was approximately 95 million RMB (around 12 million Euro).

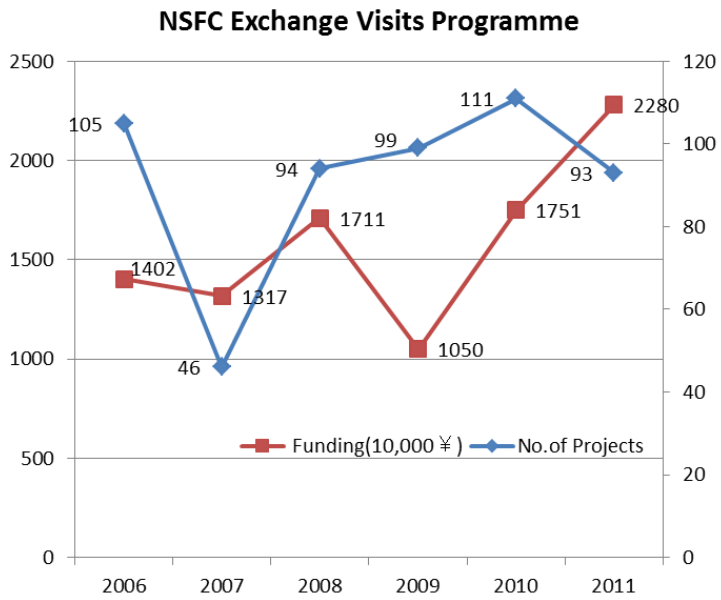

Figure 5 NSFC Exchange Visits Programme - EU participation

As for the **Chinese Ministry of Science and Technology (MoST)**, no statistics were available on how many Europeans take or have taken part in their programmes. A list of projects is made available in English online, which can be seen as an indicator of a certain willingness to open and communicate possible opportunities. However, with regard to financial issues, Article 4 of the Implementation Regulation of PRC-EU Cooperation under the Framework of National Basic Research Programme about resources clearly states that "the costs incurred by the participants for cooperative activities will not lead to any transfer of funds from one side to the other" and that "each side will provide its own research fund for the cooperative project" [25], which obviously excludes any financial investment by the Chinese side to directly support European researchers. This aspect was also pointed out by E. Arnold and his co-authors in their evaluation of Chinese participation in the EU Framework Programme in 2009, in which they noted that foreign participation in Chinese programmes was not a priority for MoST:

> "The Chinese Ministry of Science and Technology has a number of long-running funding programmes, some of which could in principle be opened up for foreign participation but this has

[25] For more details see Implementation regulation of PRC - EU Cooperation under the Framework of National Basic Research Program (DRAFT), http://www.973.gov.cn/English/AreaCoop.aspx (accessed June 2012)

not been a priority to date. As long as a sufficient supply of foreign funders are willing to pay for cooperation, it is difficult to see why MoST should redirect scarce funds towards an internationalisation effort, beyond the rather tokenistic level that currently obtains."[26]

While funds today allocated to science and technology development in China may no longer be scarce, priority is still placed understandably on funding China's own scientists, especially when foreign partners show themselves willing to fund both sides collaboration in order to support Chinese development. However many Western countries, aware of China's growing prosperity and ever more conscious of their own budgetary constraints, no longer treat China as a priority country for development aid, reciprocal funding arrangements for Chinese-foreign collaborations are increasingly possible.

Financial support is of course not the only element required in order to achieve greater and more effective reciprocity on the Chinese side. The engagement of Chinese funding organisations also needs to extend to a series of non-financial support measures such as the exchange of information, transparent terms of participation, active promotion of programmes and in-kind contribution in order to effectively foster greater international participation in Chinese funding programmes.

As for the **China Scholarship Council (CSC)**, it was only possible to identify a small number of statistics related to the participation of foreign students in their programmes in 2009. Its 2009 annual report underlined that the number of international students under the Chinese Government Scholarship Programme (one of the main CSC programmes) reached an unprecedentedly high number of 18,245, out of which 3,022 came from Europe (16.56%). Altogether, master's degree and undergraduate students represented 66% of all international students. PhD students amounted to 13%, general scholars 18% and senior scholars only 3%. It is worth noting that the figures for Chinese Government Scholarship recipients have steadily increased over the past decade or so, from 4,677 in 1997 to 18,245 in 2009[27]. In view of such an increase, although this cannot be confirmed with 100% certainty, it is reasonable to think that Europeans have also benefited from this. During the academic year 2009/2010, 16,062 international students were provided with a scholarship from this programme, of which 1,596

[26] Arnold E., Serger S., Busillet S., Brown N., Evaluation of Chinese participation in the EU Framework Programme, February 2009, p. 87
[27] China Scholarship Council Annual Report 2009, p.11-12

were Europeans. However the amount of funding they received was not indicated. The disclosure of these statistics does indicate a degree of willingness to make some Chinese programmes more visible and transparent.

Scholarship programmes are especially numerous and well promoted, and this may therefore suggest an area in which the European side may be able secure a greater financial commitment from the Chinese side to support European researchers in future.

Getting access to Chinese funding programmes involves many serious **challenges** for potential applicants. In its Work Package 1, the ChinaAccess4EU consortium identified the most critical issues and challenges hampering European participation in Chinese funded initiatives, which are listed below. This list is does not aim at screening each individual programme, but rather at showing the main commonalities identified which hinder, limit or constrain the participation of European organisations. These constraints exist for a combination of reasons – some of them are due to cultural differences, some to systemic differences, and some to historical and developmental differences.

1) **For R&D projects, the lead applicant normally must be Chinese or established in China.** Moreover, by "lead applicant", programmes normally mean individuals and not organisations, which underlines the importance of establishing one-to-one contacts between persons.

2) **A "good cooperation basis" between applicants is often a precondition for participation under the rules.** Hence, partners must be able to prove that they have already worked successfully together.

3) Generally, many **calls are officially published only a few weeks before deadline (often 3-4 weeks)**, although some regularity has been identified, i.e. calls are normally published in the same period(s) each year. Thus, potential applicants need to ensure they makes themselves aware of the calls before they are published, and be prepared in advance to promptly react once they are published:

   - ⇨ Proposal preparation has to be initiated long before call publication and "be ready for submission in the desk drawer" when the call is made official.

   - ⇨ Applicants need to keep a regular watch for calls for proposals.

- ⇨ This highlights the importance of having Chinese partners, especially those who take pains to make themselves aware of interesting programmes and priority topics in advance. Such partners can often be found among the growing ranks of ethnic Chinese academics working in European universities and research institutes, many of whom have become European citizens in recent years. These are particularly numerous in some EU countries, such as the UK.

- ⇨ It is also advantageous to have Chinese partners who are well networked in the Chinese research-funding establishment, where knowledge about future calls is often disclosed before official publication of the details on websites.

- ⇨ Where applications are required to be made in the Chinese language, it is useful to have these written by or jointly prepared with experienced Chinese partners who can put the application into the form of language most likely to be successful. This is a task that goes beyond conventional translation, as knowledge of the appropriate Chinese conventions and practices for academic applications is a major asset.

4) Compared to European projects, **budgets for Chinese projects tend to be very low**, which can represent an obstacle to European involvement. This is particularly due to the fact that personnel costs are not usually funded and financial support is normally restricted to travel and equipment costs.

5) Although some detailed information about individual Chinese funding programmes can now be found in English thanks to the efforts of the ChinaAccess4EU consortium[28], it remains challenging to find accurate and detailed information published in languages other than Chinese. Thus, the accessibility and transparency of Chinese programmes are limited to those who speak Chinese or those who have collaborators who speak and read Chinese or are ethnic Chinese.

6) There is often a **lack of transparency in terms of the selection procedures,** as it is not usually disclosed whether peer review is implemented or whether the successful projects are selected administratively.

[28] Fact Sheets were translated into English and compiled within the scope of Work Package 1 of ChinaAccess4EU. They are available on the project's website: http://www.access4.eu/China/502.php.

7) Apart from very few programmes which require applications in English (however usually with a project summary in Chinese, e.g. the NSFC grant for young international researchers) or require a project summary in English (e.g. the 973 Programme), **applications must be submitted in Chinese**, a requirement that can severely impede the involvement of Europeans because the translation of a European partner's contribution involves considerable specialized translation effort.

> *"Institutes submitting an application already have relations in China. But our office in Beijing also helps to find partners."*
>
> Chief Representative, Fraunhofer Representation Office in Beijing

8) In the case of fellowship programmes, it is often possible to apply directly from Europe,[29] as foreigners are sometimes the first target of those programmes (e.g. CAS Visiting Professorships for Senior International Scientists, the so- called "Visiting Professorships Programme"). However, a **pre-condition for application** is always to already have at least one contact in China, since a letter of recommendation is required.

In summary, as a result of these constraints, it is so far more common that the initiative to launch a joint project with an EU organisation under a Chinese programme comes either from a Chinese partner, or from a European fellow working in China, or from an ethnic Chinese partner working in a European university or research establishment.

Last but not least, it should not be underestimated that it is **not generally a priority for Chinese ministries to proactively promote foreign participation in their funding programmes**, and thus interested European organisations need to consider the above-mentioned constraints carefully when planning to apply for funding in China.

> *"[In China] there are multiple layers of bureaucracies, so professors need dedicated staff to handle them on their behalf."*
>
> Prof. Keith Maurice Kendrick, Full Professor at the University of Electronic Science and Technology of China in Chengdu

2.3 Not to be underestimated: Challenges imposed by intercultural differences

Although frequently appearing in the official rhetoric of both EU and Chinese representatives as an important topic, **intercultural differences** still seem to be a critical issue hampering broad collaboration.

[29] In contrast to other Chinese funding programmes where being established in China is a mandatory requirement for applicants

> *"Lack of cultural understanding by both sides can create unrealistic levels of expectation, especially by the European partners, in particular moving deadlines, funding commitments, etc."*
>
> Programme Manager (S&T Fellowship Programme)

Indeed, according to the results obtained from the analyses performed by ChinaAcces4EU, the profound implications of intercultural differences are often underestimated. This phenomenon has been identified both at the level of policy-making (involving public servants), as well as - to a lesser extent - at the level of the practical RTD collaboration (scientific community) of both regions.

Moreover, the consortium considers it important to underline the fact – as confirmed by the project's findings– that Chinese and EU officials have not only different approaches for the way the same topic has to be dealt with, but also the implementation of the day-to-day activities and related prioritisation of subjects works at different speeds.

> *"Chinese people are not used to and do not feel like being part of big consortia."*
>
> Deputy Director, NSFC's Bureau of International Cooperation

In the same vein, not only are the decision-making processes in each of the regions drastically different, but also the hierarchical structures in China, for instance, exert a massive influence on how people perceive and understand what are apparently the same issues, and consequently react and behave. As confirmed by a European programme manager based in China, the lack of cultural understanding can create unrealistic levels of expectation on either side (see text box on the left). While in Western culture researchers usually have a reasonable amount of freedom to make decisions that impact their research collaborations with foreign scientists themselves, in the more hierarchical Chinese system, permission must be sought from higher levels before final decisions can be taken. This can sometimes result in discussions at a working level being over-ruled by higher level decisions at a late stage in a negotiation process. Westerners aware of these cultural and systemic differences can therefore plan their negotiations in China more effectively than those lacking such knowledge or experience.

In this regard, the experience of two European researchers is instructive, who complained that they could not establish contact with high ranking professors because they were themselves "only" researchers. Actually, they both received a CAS fellowship followed by a research grant as Principal Investigators (PI) but only the Chinese professors received formal information. The European researchers were not even contacted.

It is therefore necessary to find ways around the cultural differences, either by a process of learning through experience, or, more efficiently perhaps, by working with Chinese partners or colleagues based in European universities and research institutes who have already acquired extensive cross-cultural experience, and can understand, articulate and explain problems across the divide as they occur. There is a growing Chinese diaspora of scientists throughout Europe, especially in the English-speaking countries, many of whom have been living in the West for a decade or two and have in many cases acquired European citizenship, moving their families here and living here on a permanent basis as fully-fledged Europeans of Chinese extraction. These migrant scientists are an extremely valuable resource and knowledge base for the European Union in forging productive collaboration with China, and a group whose potential and value is often underestimated in the EU.

Diversity is not exclusive to the EU, formed as it is by a mosaic of different countries and cultures. China is also shaped by a diverse composition of regions and ways of thinking, let alone the intricate interplay between the different decision-making levels.

The inherent challenge is thus to provide a perhaps less ambitious but instead more inclusive, conciliatory, coherent and solid approach which should take into consideration the needs, interests and priorities of the targeted audiences (e.g. scientific communities, small and medium-sized enterprises) and be aimed at delivering **tangible and fruitful results**.

2.4 Facing a paradigm change: Overcoming preconceptions and prejudices

> *"European scientists should know more about Chinese scientists and China science and research activities. We notice some European research teams which Chinese scientists are working for usually have an edge on being involved in Sino-European joint programmes. It indicates that a lack of communication is hindering the current progress of Sino-European science and research cooperation."*
>
> A Deputy Director at NSFC's Bureau of International Cooperation

Based on the surveys and interviews performed by ChinaAccess4EU, a certain mismatch on expectations and even a feeling of mistrust from both sides have been identified. This results -in many cases- from a lack of awareness of the counterpart's working culture and research environment.

It is often too easy for Europe-based colleagues to filter Chinese reality through home-country pre-conceptions and vice versa. Thorough discussion is needed, grounded in more substantive cooperation activity, involving people who are acutely aware of the potential for cross-cultural

understanding. In this regard, it is essential to make the most of the experience and knowledge of experts to be able to continuously grasp and follow the evolutions in China. In many cases those best equipped to help European researchers navigate the cross-cultural difficulties are the growing number of Chinese scientists working in European universities and research institutions who often have long experience of both systems and cultures.

An illustrative example is presented below:

> "The under-estimation of China as a valuable research destination and of the possible benefits for EU researchers to come to China is still widespread in the European academic and research world (more than in the US).[…] A key-challenge is to overcome the low profile of China as a research destination, and the lack of knowledge of China and of the quality of its research system among European researchers." [30]

A similarly misconceived aspect is related to the **protection of Intellectual Property Rights (IPR)**. Whereas many European organisations still consider the Chinese legal framework on IPR protection as a critical issue when considering collaborating with Chinese partners, Chinese counterparts mention that in many cases there is lack of knowledge among potential European cooperation partners about the efforts and mechanisms the Chinese government has initiated in the last years in order to provide legal certainty regarding IPR and to respect foreign IP.

Indeed, as stated by some EU Member States programme managers responsible for cooperation initiatives with China, such prejudices actually appear before cooperation is initiated. In practice, within the scope of a collaboration, "there is no major difficulty for sharing the intellectual property in China" as confirmed by a Spanish Professor from Guangzhou Institute of Biomedicine and Health.

Lastly, within a context of mutual interest to reinforce RTD cooperation links, with the Chinese side keen to achieve know-how and technology transfer, Chinese respondents to the survey conducted in Work Package 4 confirmed a growing wish that **China should be regarded by European organisations as a trustworthy and highly competent RTD cooperation partner**,

[30] See Vialatte P., De Soyres J., Mitchell J.. Report about Euraxess Links China Workshop on the topic of "Mobility of European researchers to China", Beijing, December 2011, p.2

and not be seen any more as merely the "factory of the world"[31]. In plain words, China is making major efforts to move from the stigma of *imitation* and to build a reputation for *innovation*.[32]

2.5 The importance of trust building

> *"NSFC encourages European scientists to join China basic research programmes, and most of our programmes are open to all countries. However, many European organisations and scientists are not clear about Chinese programmes because they have a lack of necessary information in this regard. Our advice:*
> *1. European scientists should actively build up the connection with Chinese partners so that they could be timely updated and have a better understanding of funding policy.*
> *2. Both European and Chinese organizations should strengthen the scientists' exchange and communication mechanism, so that both sides could easily confirm the common interested research areas and cooperation opportunities."*
>
> Deputy Director , NSFC's Bureau of International Cooperation

A basis for sustainable and solid collaboration and cooperation instruments going beyond the principle of reciprocity as originally asserted by both EU and Chinese officials[33] has to be provided. However, to pave the way towards the achievement of this goal, it is crucial to firstly be fully aware of essential differences in the interpretation of reciprocity by both parties. Whereas the European interpretation of "Reciprocity" relies on the idea that collaborating on equal terms means to ensure equality in both input (financial contribution, exchange of information, transparent terms of participation, active promotion of own programmes towards foreign organisations) and output (expected results), the Chinese interpretation of reciprocity rather considers it as "mutual benefit" and directly linked to output (results). In other words, it is assumed that a win-win-situation has to be guaranteed on the basis of projects' outcomes. Thus, the perspectives and related investments and expectations do not match each other.

[31] "China has to be approached as an equal partner at eye level which means that Chinese policies and programmes should be seen as equivalents to European policies and programmes […]. Such a basic approach will provide a good starting point when developing a strategic partnership in S&T and research and innovation. This, however, requires that the appropriate level of knowledge, insight and analyses of Chinese S&T policies, strategies and programmes is ensured which needs the development of a systematic approach towards strategic intelligence regarding S&T in China." (Horvat M., Remøe, S.: Approaching China: Background report on steps towards developing strategies for S&T cooperation with China. September 2010. p.8.)

[32] Kamp, M.: "Von der Imitation zur Innovation". In: Wirtschaftswoche Global. No. 1. April 2012. p.11-12.

[33] "Considering that the EU and China are currently pursuing research and technological activities, including demonstration activities, in a number of areas of common interest and that participation in each other's research and development activities on a basis of reciprocity will provide mutual benefits." *(Agreement for scientific and technological cooperation between the European Community and the Government of the People's Republic of China.* 2000.)

It is therefore more important to consider a strategy aimed at promoting a partnership on equal terms and at stimulating a *win-win situation* environment.[34]

According to ChinaAccess4EU analyses, a critical factor for a successful collaboration with Chinese organisations seems to be a solid and long-lasting relationship, which should be cemented by common objectives and a shared vision and strategy.

> *"It is crucial to give to Europeans the possibility to find key partners on Chinese side."*
>
> Director, Joint Sino-French Laboratory

This confirms the fact **that trust building is crucial** to make cooperation work and deliver fruitful results and that "developing lasting personal relationships and confidence is a precondition for stable and promising cooperative ventures."[35] Therefore, strategies based on one-off or short-life cooperation programmes are unlikely to build the needed cooperation capacity. Instead, it would be much more efficient to identify a small number of cooperation instruments, and persist with them for a longer period.

> *"Only few international scientists intend to stay a long time in China, and they do not make a long-term academic or career roadmap for their stay in China. Some international scientists lack close communication with their Chinese team, and they tend to focus on their own research at home, while dispatching less experienced students to Chinese partner's lab for study and research purposes. It is difficult for this kind of cooperation to obtain fruitful results due to the lack of concrete discussion on joint research activities [between the main responsible persons]."*
>
> Deputy Director, NSFC's Bureau of International Cooperation

Hence, longer scientific stays seem to be a very useful cooperation modality that is often highlighted by people who know China and the Chinese system. In fact, the case studies conducted within WP3 tend to prove that European researchers settled in China can not only benefit from Chinese grants more easily, but they also enable the promotion of collaboration with Europe, for instance, with former colleagues or further universities or institutions where they have had some contacts for years.[36]

At the same time it is necessary to support a wider and more diverse network of collaboration beyond major Chinese cities in which European actors can interact with their Chinese

[34] "At all levels, China's authorities and institutions are confronted with offers and requests for cooperations from all over the world. It is a common experience that only initiatives towards cooperation have a perspective for success that have clear objectives following a strategic approach oriented towards achieving a "win-win" situation and considering also the Chinese side's interests and possible benefits. Activities endowed with sufficient resources - wherever possible and appropriate following a co-funding approach – ensuring critical mass and oriented towards sustainability have more chances for success than thinly spread initiatives that are not providing the basis for developing long-term relations and mutual trust. […]As a basic requirement for policy analyses major Chinese policy documents have to be available in English." (Horvat M., Remøe, S.: *Approaching China: Background report on steps towards developing strategies for S&T cooperation with China.* September 2010. p.8.)

[35] Horvat M., Remøe, S.: Approaching China: Background report on steps towards developing strategies for S&T cooperation with China. Sept. 2010. p.8

[36] Case Studies of Prof. Miguel Angel Esteban and Prof. Keith Maurice Kendrick (ChinaAccess4EU WP3 results)

counterparts, in order to tap into regional initiatives and take advantage of China's own regional strengths and policy initiatives to favour development in the less well-off parts of the country.

Indeed, ChinaAccess4EU has detected an explicit interest from regional/local actors in China to collaborate with European partners during the project road shows organised in Beijing, Chengdu and Hangzhou in November 2011. During these meetings important stakeholders such as the Sichuan *S&T Popularising Centre* expressed their interest to embrace a much closer collaboration with European actors.

This is also confirmed by EURAXESS experts:

> "…many research institutions at the regional or provincial level in China, while not having specific schemes targeted at European researchers' mobility, may welcome foreign cooperation and provide funding opportunities for such cooperation."[37]

These regional/local actors could be considered to enlarge and deepen the collaboration horizon and, at the same time, be regarded as valuable cooperation partners to get an insight into Chinese regional/local funding opportunities with their own policy priorities.

The *Beijing Technology Exchange and Promotion Centre* (BTEC) expressed interest in further developing such collaboration opportunities during the project conference in Beijing.

Indeed, the survey carried out by ChinaAccess4EU partners within the context of WP3 confirmed that "among the tools that effectively support the development of these (regional) collaborations, international cooperation research programmes and research networks or platforms are the most efficient ones, well beyond the use of websites and the support provided by agencies."[38]

Thus, it is advisable both to promote a much more intensive networking strategy[39] in order to bring potentially interested parties together and to consider a mid- to long-term timeframe, based perhaps on a more bottom-up approach when planning and defining research priorities, instruments and participation conditions shaping the collaboration strategy. Another issue relates

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[37] *Op.cit.* Report of Euraxess Links China Workshop, p.2

[38] ChinaAccess4EU WP3 Survey Report. p.4

[39] Illustrative examples of international networking activities are France's International Research Networks Groupements de recherche internationaux (GDRI). They have no legal status and are set up for a period of four years (renewable once). They bring together laboratories from at least two countries to conduct research activities on specific topics. The funding dedicated to GDRI covers mobility expenses, information exchange, but also the organization of seminars and workshops. One significant advantage of this cooperation instrument consists in bringing together not only academicians but also stakeholders from the industry (https://dri-dae.cnrs-dir.fr/spip.php?article1140). Likewise, the Sino-Danish Network is a very good example of the kind of platforms that should be developed and exploited, giving the opportunity to students, researchers and companies from both sides to establish contact with each other (http://www.sinodanishnetwork.com). Last but not least, FinChi Innovation Center in Shanghai is a brilliant example of a platform that can be set up to enable companies, institutions and other organizations to further expand their activities in China, by coordinating information sharing and partner networking (http://www.finchi.cn /).

to the role of the EU compared to individual Member States in promoting China research collaboration. It is important for the European Union to work out how it can effectively create added value without competing with the bilateral programmes, and how it can benefit from the stronger and more successful collaborations pursued by its member states, in terms of tapping into their experience and networks, and their hard-won knowledge of what works best when dealing with China.

Finally, creating more European exposure to China at the undergraduate level (e.g. through short-term visits) could bring positive benefits as this would likely attract more European researchers to China later on. Likewise, joint-PhDs or even simple co-tutored PhDs (a supervisor in Europe and one in China when the PhD student comes over) have a positive impact and help promote more researcher mobility in partnership with China, as has been observed within schemes launched by Member States such as France and Germany.[40]

2.6 Information access and communication flow

> *"Europeans must have clear strategies that are clear for the Chinese – who do not always take the Europeans seriously. Europe needs to be strong, and to speak with one voice. The Chinese need to know what we need them to do and why. They have a lot of money to be dedicated to S&T activities, but they need to know what it will be spent for."*
>
> Programme Manager, S&T Fellowship Programme

ChinaAccess4EU has identified a multi-coloured landscape of funding instruments and executing organisations both in the EU and China. At first glance this seems to be a good sign in terms of possibilities for participants, but when analysed in more detail it turns out to be a rather complex conundrum.

From the EU side, it seems that much confusion is still present. Within the survey conducted with programme managers of Member States' funding programmes supporting collaboration with China, with regard to the level of awareness concerning funding opportunities in China, there were as many interviewees considering it "rather sufficient" as there were respondents considering it altogether "lacking" and "strongly lacking". Awareness concerning funding opportunities in China was seldom considered as "sufficient". Likewise, a large majority considered the lack of information about funding possibilities in China as the main reason to explain the low participation of European organisations in projects funded by Chinese funding organisations.

[40] *Op.cit.* Report of Euraxess Links China Workshop, p.4

At the level of information access, potentially interested EU researchers face considerable difficulties - in most of the cases - to find the required information. It is not only difficult to obtain access to information on funding opportunities in China, but it is also challenging to find points of contact to address with questions or to request support from. In this regard, there are some significant discrepancies concerning the level of support offered by the different EU Member States.[41] This project has made its best efforts to modestly contribute to ameliorating this situation by providing an English translated version of the main Chinese funding programmes. Likewise, the regular dissemination of a newsletter to numerous stakeholders in Europe as well as the organisation of information and partnering seminars definitely helped to raise awareness on research and funding opportunities in China.

Besides facilitating access to funding opportunities offered by Chinese organisations, it would be important to improve the awareness and visibility of EU support initiatives in China. Putting all information together would be a first step, providing it visibility the next one. A possible solution would be for the EU to build upon the concept of the *National Contact Points* benefiting from the existing infrastructure. This could facilitate the creation of synergies and promotion of Best Practice Sharing.

Advantage should be taken in Europe of the NCP network to provide information and help on EU support initiatives regarding China as well as on Chinese networking and funding opportunities.

Indeed, it is necessary to maximise **internal coherence at European level** as far as communication flow is concerned, since the cooperation with China is commonly seen as too fragmented.

> *"EU and Member States lack a common direction."*
>
> DLR Programme Manager (institution in charge of programmes' implementation for the German Ministry for Education and Research)

The Strategic Forum for International Cooperation (SFIC), in its *Recommendations for thematic priorities in cooperation with China*, points out the need for the EU to act "as one towards third countries to get more leverage effect than the sum of individual Member States and EU forces, and to strengthen the perception of Europe as an attractive place for researchers worldwide."

[41] A positive example in this regard is provided by the German Ministry of Science and Research has a dedicated Department" for the S&T Collaboration with China. If a researcher is looking for information, he will have the possibility to contact the Ministry he is affiliated to and will be redirected to the competent institutions.

The EU Commission should consider actively participating with the Member States in the cooperation with China, according to the SFIC [42]

As mentioned above, an urgent need to improve the communication flow among the different EU initiatives and executing bodies working in parallel on China issues has been identified. Indeed, the strong need for coordination between European initiatives with China was underlined by Horvat and Remøe in their report from 2010:

> "Taking into account the strong role of China in S&T on a global scale Europe is challenged to develop a strategy taking into account the complementary roles of EU research, joint activities of Member States and bi-lateral initiatives. A European strategy for S&T cooperation with China seems to be a must." [43]

> *"NSFC likes working with the Royal Society because we cut across all disciplines, whereas there are so many different Research Councils in the UK in each different subject area."*
>
> Senior Manager of Royal Society's International Exchanges

In line with this issue, Chinese officials often do not really know whom they should best address themselves to. To the EC? Who in the Commission? To individual Member States? Chinese officials actually expect to have direct partners at EU upper levels, but are often obliged to conduct dialogue with individual Member States in relevant areas instead. They strongly expect the European Union to organise itself to have less contact persons and enable more centralised relationships. But the EU is not yet in a position to offer this.

At the China end, the situation is sometimes almost as bad for different reasons. Access to information is challenging. Although, thanks to the efforts made by ChinaAccess4EU, the well-known national Chinese funding programmes are now publicised in English, the situation is much more complex when considering regional or local funding opportunities. Official websites often show outdated pages or less information in English than that in Chinese, and the programmes are in fact not always open to non-Chinese participants.

When considering communication flow between the different Chinese funding executing bodies (national, regional, local) the network of provincial S&T bureaus supports the exchange of available information in China. However, ChinaAccess4EU partners could not find any evidence that this information is flowing to the Chinese representative offices in Europe in order to

[42] SFIC recommendations for thematic priorities in cooperation with China. pp.1-3
[43] Horvat M., Remøe, S.: Approaching China: Background report on steps towards developing strategies for S&T cooperation with China. September 2010. p.9

improve the visibility and availability of regional and local opportunities to potentially interested European researchers.

2.7 Raising visibility of European research excellence

Based on the results of the ChinaAccess4EU survey, cooperation with Europeans is apparently not the top priority for Chinese organizations. In other words, **Europe sometimes does not appear attractive enough as a research destination for China and Chinese scientists.** It is important that steps are taken to remedy this situation.

Information campaigns or activities in China to raise awareness of Europe's research excellence and elite universities would help to counteract the apparent lack of interest among Chinese organisations in potential European cooperation partners.

However, awareness raising *in vacuo* is useless: it should occur in context of substantive opportunities for cooperation. Such opportunities should aim to overcome the perceived extra complexity of EU funding mechanisms compared with bilateral opportunities.

Some lessons could be learned from the long cooperation links between the USA and China. A key factor of US-China links is the very large number of Chinese researchers who study or work in the USA. Although many of them have stayed there and become US citizens, joining the "brain drain" of global talent attracted to work in US science and technology, currently more and more are also going back to China, which proves to be a major advantage for both countries. They bring with them their network of contacts, their knowledge about the American R&D system and community and usually continue cooperating with their American fellows.[44] Moreover, the fastest growing bilateral collaborations with China include Canada and Australia, which also have strong "sea turtle"[45] cohorts of Chinese researchers who have worked there for long periods but then returned home to China. In this regard, the EU needs to make greater use of its growing cohort of ethnic Chinese scientists

> *"Often China partnerships can be initiated through the growing number of ethnic Chinese scientists working in the UK. These can be a helpful way of overcoming barriers. But UK institutions need to be alive to the occasional risk of ethnic Chinese scientists having different personal objectives from those of their employing institution, and perhaps keen to support groups in China because of personal ties rather than academic excellence."*
>
> Former representative of UK Research Council in Beijing

[44] Arnold E., Serger S., Busillet S., Brown N.: *Evaluation of Chinese participation in the EU Framework Programme*, February 2009, p. 88
[45] The term "sea turtle", a pun in Chinese, refers to ethnic Chinese who have lived abroad for a period but then decide to return home, like turtles returning to the beach they were born on to lay their eggs

working in its universities and research institutes, and encourage more Chinese scientists to come to Europe to work. There are already a large number of ethnic Chinese scientists working in EU countries, especially in the UK and Ireland because of the English language, and China has had some success in attracting some of these back to China as "sea turtles" too.

The EU and its member states have a major opportunity to work with such ethnic Chinese scientists to stimulate greater EU-China collaboration, leveraging their cross-cultural ability and international research networks. The importance of working with this group and utilising such contacts was highlighted by many of the case studies conducted within WP3. In one such example, Dr. Florian Hudelist, a German postdoctoral researcher at the East China Normal University, was connected with a new partner research group through a Chinese professor at his University in Europe, which has a long-term collaboration with the East China Normal University. After receiving a grant from the European Science and Technology Fellowship (STF) Programme, he went on to receive an NSFC grant for young international researchers which enabled him to continue his postdoctoral research in China.

2.8 Getting SMEs on board – Integrating SMEs in future cooperation actions

> *"Scientific cooperation should be in line with the need for development coming from industry and society."*
> Swedish Executive Director, International Strategy and Networks for the Sino-Swedish Cooperation Programmes

As recalled by the SFIC, the main objectives of S&T cooperation with China are to increase Science and Technological Innovation (STI) excellence, innovation performance and the economic competitiveness of Europe. Now, reinforcing EU competitiveness "implies to back market access for European industry, to strengthen EU scientific excellence in areas where China is likely to excel and to help meet the grand challenges of our time"[46]. Chinese programmes and the EU Framework Programme have as one similar main target to improve innovation by supporting R&D activities. In this regard, Small and Medium-sized Enterprises (SMEs) have a key role to play. Their engagement in the process has to be intensively encouraged as part of a strategy of "downstream" innovation cooperation.

Hence, it is encouraging to see that officials from both sides show determination to commit themselves towards more SMEs' participation in the S&T cooperation. This willingness was

[46] SFIC recommendations on thematic priorities in cooperation with China. p.2.

> *"Generally SMEs do not know directly by themselves about these opportunities. In addition to this, more continuity is needed for developing more incisive common actions."*
>
> Coordinator of Internationalization Area at Sviluppo Lazio

confirmed in a Joint Statement in December 2010 which insisted on the importance of implementing research on new and renewable energy and innovation cooperation, "encouraging in particular SME participation". Likewise, MoST launched in 2011 the so-called EU-China SME energy saving and emission reduction research programme, which funded 18 projects which represented around 30 million RMB in funding volume.[47]

However, there is still much to do. A growing interest among Chinese SMEs to collaborate with European companies and research organisations has been identified, above all since "fundamental and applied research are small compared with the rest of the world so that the innovation system also needs to import knowledge"[48]. SMEs are key economic actors whose innovativeness should be supported to enable long-term competitiveness. Currently, their involvement in joint projects is still very low as universities and research organisations are currently the main partners in such projects. This lack of participation of SMEs has been also detected in Member States' cooperation initiatives with China.

2.9 Re-definition of key RTD priorities to reflect Chinese priorities and confront shared challenges

There is a need to re-define RTD priorities aimed at exploiting complementary strengths. Flexible approaches will be necessary and strategic choices should be made by analysing whether it would be better to choose research areas (global challenges) where China is already strong, or to reorient the collaboration towards topics or fields in which China is still lagging behind, and in which they can benefit by collaborating more closely with EU researchers.

Taking into account the latest developments in China and China's 12th five-year plan (12FYP) published in 2011, and the current situation of EU-China S&T cooperation, the Strategic Forum for International Cooperation (SFIC) identified five thematic priorities.

1. Renewable energy, energy efficiency and green technology
2. Urbanisation, dislocation and smart cities

[47] Internal MoST report, 2012.
[48] Arnold E., Serger S., Busillet S., Brown N., *Evaluation of Chinese participation in the EU Framework Programme*, February 2009. p. 12.

3. Research in health, public health and welfare policies and the life sciences
4. ICT
5. Better framework conditions for innovation

The 12th Five Year Plan prioritises key areas of science and high technology, building on the more limited initiatives implemented under 11FYP. It aspires to 'top-ranking achievements', especially in physical sciences, life sciences, space science, earth sciences and nanotechnologies.[49]

As reported by the SFIC, the analysis of China's publications shows that the country has some priorities that reflect the current priority of manufacturing and export industries. Indeed, the focus is on the physical sciences and related technologies, with material science, chemistry and physics as the dominant fields, while publications related to agricultural sciences and life sciences register the highest growth rates. Besides, the SFIC report points out that, although China is increasing its S&T capacity in all areas, it emphasizes this increase on four main fields, namely: chemistry, ICT, food science and, to a lesser extent, on life sciences.

These topics are directly in line with those which the EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, emphasized during her one-week visit to China in May 2011, when she discussed with her counterparts new ways to foster the participation of Europeans in Chinese funding programmes. She remarked that EU-China cooperation in research and innovation was key to resolving "major challenges such as food and energy security, climate change, disaster management, and nuclear safety."[50] There are clearly major advantages in encouraging collaborative research work related to these crucial challenges.

[49] Ash, R., Porter, R., Summer, T.: China, the EU and China's Twelfth Five-Year Programme. Executive Summary. ECRAN Website. http://www.euecran.eu/publications-2011/china-s-12th-five-year-programme-and-its-expected-impact-on-the-european-union 08/06/2012 (accessed June 2012)

[50] For more details see: http://newsletter.eu-in-china.com/newsletters/201105/011_en.html (accessed June 2012)

Chapter Three - Recommendations

Having provided in Chapter Two a detailed diagnosis outlining the current and most critical issues identified by ChinaAccess4EU, Chapter Three is focused on delivering specific recommendations on how these challenging subjects could be approached and dealt with.

The overarching aim of this chapter is to provide a set of useful guidelines which will help prepare EU-policy makers for negotiations on future S&T collaboration agreements with their Chinese counterparts.

Bearing in mind that the ultimate goal of ChinaAccess4EU is to enhance the participation of EU researchers in Chinese funding programmes and considering the fact that the life-cycle of one of the main EU funding instruments, the 7th Framework Programme which began in 2007 is about to conclude in 2013, it is now timely to evaluate and re-think the way in which the future S&T collaboration between the EU and China should be shaped.

For prioritisation purposes, the recommendations included in this chapter are structured under two sub-categories (see **Figure 6** below). Firstly, we list three **strategic recommendations** which should be considered as top priority. These should ideally be tackled within a short-term perspective (1 to 3 years). Secondly, we list a set of **other recommendations** which may be addressed over a mid-term perspective (3 to 5 years) in order to achieve more efficient and sustainable S&T collaboration with China.

Figure 6 Strategy Paper Recommendations

The section on **other recommendations** has been structured following the graphical analogy of a pyramid (see **Figure 7**) in which **improving information and communications strategies** is expected to set the necessary foundations to build upon and is considered as a pre-condition to guarantee an efficient flow of information and adequate involvement of parties. The benefits of **following Chinese STI landscape evolution** could be then properly seized once a solid communication basis exists. Ultimately, **rethinking cooperation instruments** will be a natural consequence and this process will based on informed decisions which will consider prevailing conditions and expectations of both European and Chinese actors.

The three components of the pyramid should not be regarded as isolated items, but as rather interdependent ones which are usually closely related and should be considered in parallel.

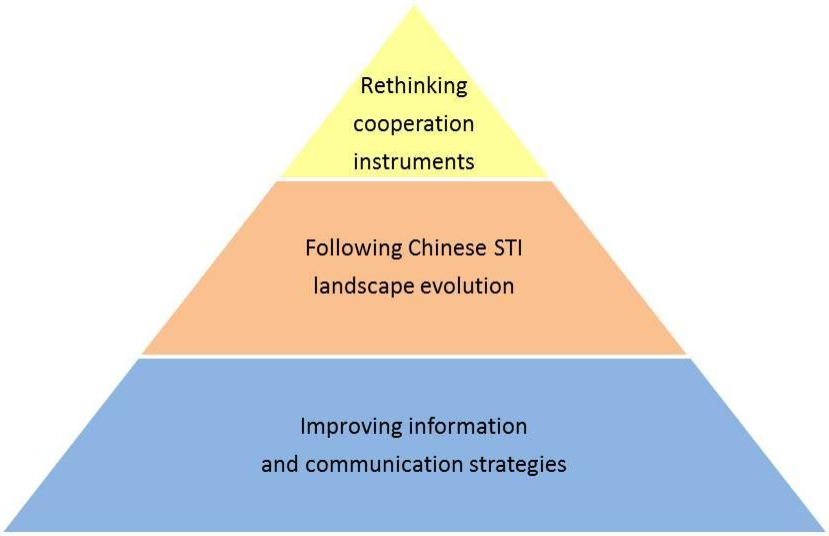

Figure 7 EU-China RTD cooperation pyramid

The bottom line of the following recommendations is to provide common ground upon which a truly solid and mutually beneficial S&T collaboration between Europe and China can be consolidated.

Finally, Chapter Three is expected to serve as *food for thought* and thus contribute to generating solutions to the critical issues mentioned in previous chapters. The recommendations should be regarded as a whole package of complementary measures which are expected to pave the way towards a more sustainable and long-term oriented S&T collaboration relationship.

3.1 Three strategic recommendations

3.1.1 Europe-China Research Foundation

The creation of a **Europe-China Research Foundation** would represent the materialisation of a common vision. Such an effort should be jointly funded by the EU and China in order to provide grants supporting basic research. This recommendation is based on the information collected during the ChinaAccess4EU project, since such joint foundations/programmes funded in a reciprocal way is the tendency at the bilateral level (e.g. Netherlands, Israel, among others) and they have proven to be successful.

This European-China research foundation would enable greater cooperation, reciprocity and a commonality of interests for both sides.

Creation of a Europe-China research foundation

- The Foundation could be administered for example on the Chinese side by the NSFC and on the European side by the ERC – European Research Council.
- Ideally, funding should be dedicated to equipment, salaries of PhD students, postdocs and technicians as well as mutual exchange of researchers.
- The funding schemes should be designed to allow each side to fund its own part of the collaboration in its own way in line with its own rules and practices, and its own funding culture. That way neither side will be imposing an unwanted bureaucracy upon the other[51].
- A most significant advantage of such a foundation would be that both sides would be in position to publish joint calls, relying on a common priority setting, hence assuring that S&T strategies and needs of both parties are taken into account.
- The duration of joint grants should be **three to five years**.

[51] This has proved to be a successful international cooperation philosophy in the United Kingdom Royal Society

- New forms of collaborations could be created or further developed within this scope. Indeed **joint labs** as well as **joint research centres** prove to be very successful structures where people from both sides really get the feeling that they are progressing in their field by developing fruitful and balanced relationships on an equal footing. One advantage of a programme aiming at the research group/laboratory level would be that proposals would show a history of working together and institutional support from the host in both China and the EU. Also, they provide a good foundation for added activity including SME attraction. They will also **foster the participation of industry research and funding** (both from European and Chinese private sectors).
- At the same time, these would be mechanisms to ensure a wider coverage of Chinese provinces and EU Member States.
- Joint research labs would also help to raise the **visibility of Europe in China**.
- Last but not least, ChinaAccess4EU surveys have identified some Best Practices in this regard, in which individual EU Member States have articulated a successful RTD collaboration relationship with China based on jointly funded programmes. In that sense, the EU should attempt to encourage the adoption of those Best Practices in its future schemes.

3.1.2 ChinaAccess Infodesk Office

Supporting the development of a **ChinaAccess Infodesk Office** would provide a valuable tool to guarantee information access and an adequate coordination of efforts with European actors interested in collaborating with China. In order to optimise already existing resources and

infrastructures, the ChinaAccess Infodesk Office could coordinate its activities with the existing National Contact Point networks, which could act (once having acquired a certification for that purpose) as multipliers at the local or regional level.

ChinaAccess Infodesk Office	• Towards the aim of providing a central information access and contact point for EU researchers on Chinese funding programmes and offering related advisory services, the creation of a **ChinaAccess Infodesk Office** in Europe would be helpful. Similar to the China-European Union Science & Technology Cooperation Promotion Office (CECO) of the Ministry of Science and Technology (MoST) in China, this would be a real and a virtual meeting point where interested organisations and researchers could obtain information about Chinese funding opportunities and on how to initiate cooperation with Chinese counterparts. At the same time, under the umbrella of this organisation funding organisations from Member States could share their experience and facilitate the sharing of Best Practices. This would raise the visibility of European research and innovation in China by providing a focal point as well as a space for everyday exchange of information and interaction. The China Access Infodesk Office would also ensure that the material gathered for the ChinaAccess4EU project would continue to remain useful to the scientific community, forming the initial core of its database. This would ensure the sustainability of existing EU initiatives such as ChinaAccess4EU • In cooperation with a Chinese institution or ministry, the office could even be in charge of developing a joint EU/Member States – China website on Science and Technological Innovation activities. Communication to NCPs should of course be

ensured.

- One of its important functions should be to provide help and information for Chinese and European scientists interested in creating collaborations.
- Possible cooperation or synergies with ECRAN (Europe China Research and Advice Network) supported by the European External Action Service should be explored.
- A call for proposals could be launched to implement this recommendation.

3.1.3 Diversification

The collaboration network with Chinese organisations should go well beyond Beijing and other major Chinese cities (Shanghai, Chengdu, Guangzhou). **Diversification** is the keyword here. Much stronger collaboration links at the regional level are necessary. Moreover, even though long-term collaboration should be the aim, it would be crucial to envisage a flexible approach in which RTD collaboration priorities can be adapted over time. This is particularly relevant when looking at the possibility of articulating a much closer collaboration with Chinese regions, where priorities and focus of cooperation can change very rapidly.

Diversification

- Going beyond Beijing and other major Chinese cities should be considered. China has many hotspots of scientific excellence (for instance in universities in the provinces of Jiangsu, Anhui and Shan'xi) and they offer considerable potential for engaging S&T cooperation. The 34 Chinese provinces count on the support of government Science and Technology Bureaus which have specific strategies and corresponding budgets to support research and development. These regions are sometimes more eager to collaborate with the EU which

could make the access easier for EU researchers than the most well-known S&T regions in China.

- As part of this diversification strategy, the European Commission should consider the synergies offered by the Chinese regional organisations recently integrated into the Europe Enterprise Network and identify key cooperation partners in specific regions. A **pilot programme** could establish an initial dialogue and cooperation modalities could then be discussed and defined.

3.2 Other recommendations

3.2.1 Improving information and communication strategies

Access to information and an adequate communication flow between the two sides are key preconditions for international collaboration. In the case of EU-China S&T collaboration, the situation is more complex due to the intricate - and sometimes limited - interplay between the different decision-making levels and actors involved. A non-exhaustive overview of the different levels and actors involved is provided below:

- ⇨ China – The actors involved are European programme operators, Chinese officials, the scientific community and EU officials located in China. As stated by some experts during the Euraxess Links China Workshop in Beijing in December 2011, "the delegation of the European Union should be more present throughout China (via regional offices in other cities than Beijing and by organising more activities outside of Beijing)." However Beijing will remain the pivot for S&T information flowing in and out in China.

- ⇨ Europe – The main actors involved are the scientific community, EU officials at different levels located in Brussels, Member States representatives and national funding organisations – whereby one should not neglect the interactions between a main funding organisation and its representations in China (e.g. DFG in Germany and its office in China are strongly interconnected and ensure a smooth work and communication flow). It should be remembered that this scientific community includes a large number of ethnic Chinese scientists working in European universities and research centres, and this group needs to be recognised for the important asset that it is, and be fully utilised.

- ⇨ EC-Europe / EC-China – The interaction at this level occurs basically among the EU officers located in Brussels and those at the EC representation in Beijing.

Communication among the above may look complex and difficult to organise, and it is. However, there is considerable potential for improvement.

On the positive side -and although not always self-evident-, there are many EU-supported initiatives on China running in parallel. Apart from these, there are a considerable number of (sometimes very successful)[52] collaboration schemes directly supported by different Member States and from which many lessons could be learned. Synergies between these different instruments and initiatives should definitely be supported in order to enable an efficient Best Practice Sharing.

On the other side, ChinaAccess4EU has identified a lack of visibility, awareness and coordination of efforts between different EU initiatives and between EU and Member States collaboration schemes.

In order to strengthen the collaboration among different European actors dealing with similar support initiatives in China, optimise the coordination of efforts with Chinese counterparts, exploit the potential offered by synergies, avoid duplication and share Best Practices, it is highly advisable to consider a series of measures aimed at favouring a much closer interaction and effective exchange of information. **Figure 8** provides a general overview of the different measures suggested according to each level.

[52] A couple of examples would be the Sino-German Research Centre in Beijing or the Newton International Fellowships Scheme

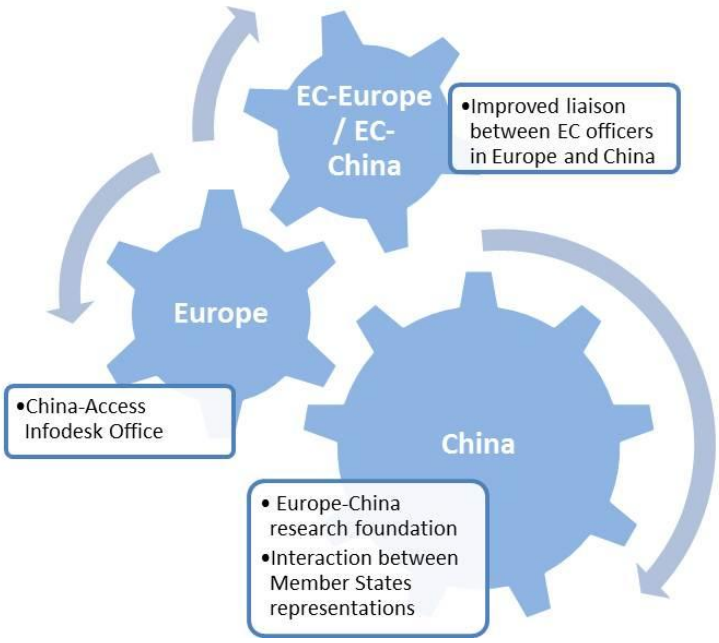

Figure 8 Suggested communication and information flow

In China

A significant need to improve the communication flow between the different European actors in China has been identified. The exchange of information between Member States' (MS) representations and EC officers as well as among MS representatives is rather weak. A much closer dialogue and exchange of information is required.

Interaction between Member States' representations in China[53]	• In order to fully exploit potential synergies, facilitate Best Practice sharing and facilitate an effective exchange of information, a close interaction between the different Member States' representations in China - through their Scientific Counsellors - and EC officers should be arranged. Organising an "EU-China Scientific Week" at least twice a year could support the implementation of

[53] The idea has been raised on many occasions and seems to impose itself in an always more obvious way. It was already one outcome from a background report published in September 2010: *"Utilizing and strengthening the European S&T policy experts working in China: Evaluate the possibility of establishing a European S&T platform of EU and Member states Science Counsellors linking also to other policy Areas where necessary and appropriate. Member States should ensure that at embassies sufficient resources are provided and clearly assigned for addressing and following the developments of the S&T area in China which will be even more important in the future developments than until now. When full time personnel for the S&T sector is not possible at least clear part time assignments with realistic resources should be considered."* (Horvat M., Remøe, S.: Approaching China: Background report on steps towards developing strategies for S&T cooperation with China. September 2010. p.4.)

this measure.

- It would be however indispensable to also involve the representatives of Member States' national entities (DFG, CNRS, the Royal Society, etc.), which are often more involved in substantive research collaboration than the Science Counsellors.

In Europe

As previously mentioned, at the European level ChinaAccess4EU has identified a growing need for a more coherent and well-structured strategy regarding the access to information about funding schemes, opportunities for participation and communication flow between China and the EU.

The basic idea would be to provide a *single entry point* in Europe for gathering and coordinating the information on specific issues to consider if deciding to embark on collaboration with Chinese organisations (better understanding of China) as well as information on Chinese funding and cooperation opportunities (see Key Recommendations section, ChinaAccess Infodesk Office).

Between EC in Brussels and EC representations in China

The ChinaAccess4EU consortium has identified a lack of coordination and communication between EC officers in Brussels and the EC representation in Beijing. Improving the current situation will demand efforts from both sides. Indeed, this represents an important challenge for improving the participation of European researchers in Chinese funding initiatives.

Reconsidering EC internal communication flow

- In order to improve coherence and strengthen the EU visibility in China, it is essential to enhance the communication between the EC in Brussels and the EC delegation in Beijing. In this regard, the ChinaAccess Infodesk Office could play a major role by interacting with the EC delegation in China as well as with the Europe-China Research Foundation (which will be precisely described as a new central cooperation instrument in 3.3).

3.2.2 Following Chinese STI landscape evolution

When engaged in international cooperation it is strategically important to really understand the partner at stake in all dimensions. Whereas nowadays information about the Chinese Science, Technology and Innovation (STI) system and programmes is more or less known outside China (even though not to the last detail), there is still a need to articulate a continuous follow-up of evolution of funding , S&T priorities shifts and R&D progress.[54]

Having an overview of China's rapid development proves to be necessary in order to understand China's priorities and needs and to deepen understanding of its reform process. Currently, from a European perspective, it is still very difficult to coordinate the access to information in order to ensure that an up-to-date picture of the Chinese STI landscape is readily available. This section suggests some measures to ameliorate this situation.

As previously mentioned, obtaining statistical information concerning the participation of foreign organisations in Chinese funding programmes still represents a considerable challenge. Nonetheless, getting a general overview of Chinese initiatives and basic rules for participation is possible through information available on the internet, e.g. thanks to the three-year European project ECRAN (Europe China Research and Advice Network)[55] which aims to establish a wide network of experts and institutions across Europe who share a common interest in China.

Getting experts on board

- As part of the preparatory work for Science & Technology (S&T) Steering Committee meetings, a well-focused and target-oriented round of **expert panels or consultations** should be organised with specialists on the field of EU-China S&T cooperation. As revealed by surveys conducted within the ChinaAccess4EU project, the large majority of programme operators and respondents from the EC consider the input of experts essential. This would

[54] Horvat M., Remøe, S.: *Approaching China: Background report on steps towards developing strategies for S&Tcooperation with China*. September 2010. pp.6-8.

[55] http://www.euecran.eu

	enable the European Steering Committee members to define clear aims and accurately plan their strategy and attend the meeting with really concrete propositions aligned to European needs and Chinese expectations. • Fostering cooperation between **existing European research institutes** working on China STI topics should be considered. The purpose would be to deliver punctual advice and input to EC officers involved.[56] The possibility of launching European projects in this regard should be envisaged, in order to e.g. organise joint workshops, etc.
Consolidation of EC internal channels	• A more solid and coherent interaction and communication flow between relevant European actors having RTD collaboration initiatives with China should be promoted. This would entail much closer collaboration between EC officials and Member States' representations in China, as well as among EC officials both in Brussels and Beijing (see 3.2).
Promotion of success stories	• ChinaAccess4EU has identified success stories of experienced researchers having successfully implemented joint research projects with Chinese organisations[57]. Their experiences are a valuable source of information waiting to be exploited. They are in the best position to give advice and provide practical hints on how to articulate a successful and fruitful RTD cooperation with China. • A broad promotion of these success stories is thus recommended. This could occur for instance through

[56] *"Strengthening the strategic intelligence on S&T in China: Analyse the possible creation of a Network of European think tanks with a focus on China and utilize the insight of European researchers with China experience ensuring continuous monitoring, assessment and foresight on Chinese S&T policies, strategies, plans and programmes."* (Horvat M., Remøe, S.: *Approaching China: Background report on steps towards developing strategies for S&T cooperation with China.* September 2010. p. 5.)

[57] Examples of identified Success stories can be found at http://www.access4.eu/China/751.php

	the ChinaInfodesk Office presented earlier. Publishing a pamphlet could also be an option centralizing and compiling information.
Benchmarking and comparative Studies	• **Benchmarking and comparative studies**, analysing STI strategies of China, the EU and its Member States and Associated Countries **should be performed** in order to get a valuable insight on critical issues to consider when negotiating any future RTD cooperation agreement. **Bibliometric analyses** would definitely have to be included. • In order to get the full picture, it would be useful as well to look at **China's positioning and role *vis-à-vis* the USA and other relevant countries** as far as RTD collaboration is concerned.
Mapping IPR Best Practices	• IPR issues are still one of the main concerns for many European organisations preparing to collaborate with China. On the other hand, specific measures have been enacted to ameliorate this situation and these are not always known in Europe. Thus, **mapping IPR best practices** both in China and Europe should be supported as a mechanism to obtain valuable input to shape a new IPR collaboration framework. In this regard, the EU's China IPR Helpdesk could be a very useful source of information. Needless to say, the results of such a mapping exercise should be **broadly disseminated**.[58]

[58] *Approaching China: Towards a more coherent EU/Member States China Strategy*, 3rd-4th May 2011, Brussels. p.18

3.2.3 Rethinking cooperation instruments

As a corollary to this Strategy Paper and considering the elements presented on the previous pages, this section provides a series of specific and concrete measures aimed at complementing and enhancing the currently existing cooperation mechanisms.

Whereas it has been identified that novel cooperation instruments are necessary and will deliver momentum to the EU-China S&T collaboration, it is also true that guaranteeing continuity and stability to existing cooperation mechanisms that have brought positive results is equally important. A balanced combination of both will deliver needed coherence towards Chinese counterparts and will definitely reinforce confidence building.

The recommendations presented herein are, at the same time, an invitation to reflect on the manner in which S&T collaboration with China has evolved in recent years and the results achieved so far. Finally, this section offers an opportunity to consider the future orientation of the S&T collaboration with China.

> *"The EU should accept that this might mean some changes in the way EU schemes normally work. The EU should take a long-term view -- and not just another 3-year project with no follow-up. It needs to take a 10 or 20-year view and set up something for this sort of timescale."*
>
> Senior Manager of Royal Society's International Exchanges

In this regard, as pointed out by various European representatives (see quotations), it would be important that Europe becomes more open to new forms of collaboration that will be sustainable, i.e. based on a longer term strategy, and match expectations and demands from both sides. For this purpose, as emphasized during an "Approaching China" workshop in May 2011, an essential aspect to take account of is to consider "the characteristics and policy framework of the Chinese S&T and innovation system including the government's short-, medium and long-term plans and programmes as well as the strategies, priorities and plans of the prospective partner institutions. At the European level, that means that a kind of "FP-

> *"So for the future, the EU needs to consider how to develop a model that will successful in building good quality partnerships with China over the next decade or two, rather than coming up with so many short term schemes that are not continued or implemented on a long-term basis."*
>
> Former representative of UK Research Council in Beijing

centrism" has to be avoided when dealing with China […].[59]

RTD Excellence Initiative	• ChinaAccess4EU has identified that in the Chinese RTD community the concept of "excellence" occupies top priority. This is also reflected in the way they perceive the non-Chinese organisations they collaborate with. Currently, Chinese organisations prefer to focus on USA RTD organisations with good reputations because they consider that this way they are more likely to be able to access more specialised expertise. • This lack of motivation to collaborate with European universities could be mitigated by identifying and labelling European best RTD organisations with the title **"elite/excellent RTD institution"** and articulating an **EU-China RTD excellence initiative** in which elite Chinese RTD organisations (see p.16) can join efforts with their European counterparts. • This initiative could be part of the funding programmes offered by the Europe-China research foundation.
Professors and Students Exchanges	• Initiatives like the Science and Technology Fellowship (STF) programme should be **continued and expanded**. This would be in line with the necessity of reaching instruments' stability. • There is a need for a new EU-China scheme to kick off early career research collaborations. Indeed experience shows that such early career collaborations lead to much larger-scale collaboration later on (see e.g. the British Newton Scheme or the Humboldt Foundation's Fellowship Programme and the various CAS schemes open to international researchers). The advantages are

[59] *Approaching China: Towards a more coherent EU/Member States China Strategy*, 3rd-4th May 2011, Brussels. p.12

manifold. In particular, they enable the easier integration of EU researchers into Chinese society and the Chinese S&T community from an early stage when language and cultural difficulties can be minimised. Furthermore, these exchanges provide a good opportunity to get to know Chinese funding initiatives (for instance, if planning to go back to China for a research stay).[60] Moreover, such programmes offer the possibility to participants to consolidate their network of contacts in China before going back to Europe, contacts which appear to be indispensable in order to implement common projects at a later date. Last but not least, it is advised that such an initiative follows a flexible approach and allows each side to work according to its own research funding culture and does not pretend to impose a model from one side upon the other's culture.

- Hence, it is advised to consider a more ambitious **pilot exchange programme** following, for instance, the example of the programme ERASMUS.
- **Mobility schemes** should also be considered **for professors**. Enabling "lecturing stays" will definitely reinforce the relationships between organisations as well as between individuals.[61]
- Furthermore, the different alumni associations both in China and in Europe should be linked more efficiently.[62]

[60] Very good practices for initiation of contacts have been identified, e.g. RCUK's Summer Schools and the organization of tailored visits in China.

[61] "Researcher mobility should be used also in a strategic way strengthening institutional links and stimulating long-term sustainable cooperation between sending and host organizations. It was recommended that EU to China researcher mobility schemes should address mainly post-docs and advanced researchers and offer also short time stays for developing contacts between principal investigators and initiating longer term cooperation." Horvat M., Remøe, S.: *Approaching China: Background report on steps towards developing strategies for S&T cooperation with China*. September 2010. p.11)

[62] *Approaching China: Towards a more coherent EU/Member States China Strategy*, 3rd-4th May 2011, Brussels. p. 17. This was also pointed out by the experts taking part in EURAXESS Links China workshop, and it was confirmed by ChinaAccess4EU survey in Work Package 3 (see report p.6).

Long-term Scientific Stays

- In line with the necessity to favour confidence building measures in order to facilitate a fruitful and sustainable collaboration among the scientific community, a key issue would be to consider the creation of a **joint programme** to support **long-term scientific stays.** Such an initiative will serve to deeply root and strengthen the cooperation of scientists and would complement the students' and professors' exchanges (see recommendation mentioned before). In short, favouring a long-lasting interaction following common goals will serve to set the foundations towards an endurable and promising collaboration.[63]

- **It would be sufficient to create stays of a few months**, or use the Humboldt Foundation Fellowships as a model. Senior scientists commit themselves to a stay of up to one year in Germany, but it can be extended to a period of five years. Even for junior researchers, such as postdocs, one to two years are the international norm. In that sense, **joint research programmes should last three to five years to enable meaningful research and development** to be carried out.

- It is important to generate major "focused" projects on particular topics, ranked as high priorities from both parts (e.g. the use of stem cells in medicine.)

- It would be essential to distinguish between different levels of links, namely individual researchers, specific research groups, HEI (Higher Education Institutions) or institutes. Indeed, for instance, links which have buy-in and strategic support are likely to prove more

[63] "*The EU should develop a broader policy of early RTD engagement with developing countries, especially via mobility schemes. These should encompass the mobility not only of junior (post-doc) but also more senior and established categories of researcher and should explicitly contain supports that tackle the more serious language difficulties involved in mobility outside Europe.*" (Arnold E., et al.: *Evaluation of Chinese participation in the EU Framework Programme*, February 2009. p. vii)

productive, and long-term relationships have to be established not only between researchers - as it is currently still often the case -, but also at the academic level, i.e. between institutions[64].

Supporting collaboration in Social Sciences

- The EU and China should launch a scheme to encourage more collaboration in social scientific research, following the major expansion in social science teaching and research in Chinese universities in recent years.
- This scheme should be designed in such a way as to facilitate cooperation not only with the Chinese Academy of Social Sciences (CASS), but also with the growing ranks of excellent social scientists working not in the CASS institutes but in Chinese universities.
- Breakthroughs in natural science are important and need arguably to take priority in science funding, but it is only through the application of social science that all-round progress can be made and the breakthroughs achieved in the natural sciences and engineering can be fully applied. Thus, the EU has a strong interest in helping China to further develop its social sciences. social science through closer collaboration with European researchers.

Intercultural Awareness Raising Activities

- Organising specific training activities and events in order to raise awareness on the particularities and challenges international cooperation implies should be a first step into facilitating a better mutual understanding. Differentiated support measures should

[64] See Case Study of Dr. Miguel Angel Esteban (ChinaAccess4EU WP3 Case Studies results). Dr: Esteban pointed out specifically that collaborative efforts should be established and sustained at academic levels, rather than the usual researcher-to-researcher collaborations."

be implemented depending on the target audiences:

- Policy-makers and officials - An **intensive training programme** on intercultural issues (e.g. understanding China/EU, mediation, conflict management and resolution, intercultural project management, etc.) should be part of the *welcome package or induction training* received when starting to work on China-EU issues.
- Scientific community - **Seminars** on intercultural issues should be regarded as a preparatory measure to be fulfilled by scientist when planning to have a stay in China or in the EU. Moreover, a **handbook** on *"Overcoming Intercultural challenges: Tips and tricks to a successful scientific cooperation between the EU and China"* could be considered as valuable and handy tool for interested scientists. This would be a very useful instrument which is however very difficult to develop as there are already many superficial 'how to do business with China' products. The handbook should be based on solid research and be continuously updated.

- Having **a good command of Chinese** is a critical factor for success when dealing with Chinese counterparts (as confirmed by our case studies and interviews of programme managers). Thus, language courses should be offered, e.g. at the host RTD organisation. It is quite encouraging to note that basic spoken Chinese – compared with written Chinese - can be learned quite quickly, contrary to the widespread conception that this language is rather hard to learn. It

is important to note that, **at present, those with good command of both Chinese and a European language are overwhelming ethnically Chinese**. While younger people from the EU are now coming to China and becoming cross-culturally competent, the EU will probably have to rely for some years on hiring Chinese people for such functions. It is also worth noting that busy people can quickly become impatient dealing with people whose language is not fluent. The EU should therefore place more emphasis on making use of the large and growing cohort of ethnic Chinese working in European scientific research institutions, many of whom have become European citizens. These are a valuable asset to be deployed for the benefit of European interests.

Maximising benefits of existing European initiatives

- **Take advantage of existing networks** (e.g. the Enterprise Europe Network) which enable entrepreneurs to meet and develop contacts and collaboration with Chinese organisations aimed at promoting cooperation between Chinese and European companies. Once contacts have been established, it will be more likely for both sides to jointly apply for funding.
- It would also be important to guarantee a **better involvement of clusters, networks of excellence, and associations** by relying on structures already existing at European level (National Contact Points, Technology Platforms, Joint Technology Initiatives). They would be a good basis and means of contact, both for Europe and for Chinese potential partners, to disseminate information and create synergies with similar Chinese organisations.

Supporting the participation of SMEs

- Considering the participation of Chinese and European SMEs in RTD projects as a requirement could be an option to formalise this support.
- The key cooperation areas identified earlier should be taken into account as an orientation.
- Central organisations like the Enterprise Europe Network's members in China (e.g. EUPIC) or the International Technology Transfer Network (ITTN) mentioned before would undoubtedly be of great help to promoting the involvement of SMEs.
- In line with the necessity of networking and developing platforms, it would be crucial to further conduct and build on initiatives like Euraxess Links China by involving companies more significantly. In this regard, FinChi and the Sino-Danish Network are good examples to follow.[65]

[65] The experience of European researchers working or having worked in China should be better exploited. By the way, one recommendation that came out from EURAXESS Links China workshop was to set up a platform with information-sharing, based on the intelligence and expertise accumulated by experienced European researchers in China.

Chapter Four – Conclusions

The long track record of Science and Technology (S&T) cooperation between the European Union (EU) and China has delivered fruitful results so far and offers considerable potential for the future.

It is nonetheless a challenging task for policy-makers to articulate a collaboration framework under which the foreseen cooperation can always be kept on track as expected and which (during the implementation phase) optimally fulfils both sides' expectations.

This Strategy Paper offers guidance on critical issues to be taken into account in negotiations and provides, at the same time, a set of recommendations on specific measures to be implemented.

Three key recommendations occupy top priority, the first being the creation of a **Europe-China Research Foundation** a potential cornerstone for permitting a much more solid, efficient, fruitful and sustainable S&T collaboration between the EU and China.

Political willingness and a clear vision will be needed to materialise such an ambitious recommendation. The *return on investment* should, however, serve as incentive to catalyse the launch of this initiative. The creation of a **ChinaAccess Infodesk Office** should help to overcome the current fragmentation of information and lack of visibility concerning, on the one hand, EU initiatives being implemented in China and, on the other hand, Chinese funding programmes open for foreign participation. In order to achieve a truly mutually beneficial S&T collaboration, the necessary communication infrastructure should be put in place first. This office will also function in Europe as a *one-stop shop* for all those potential EU researchers interested in embarking on S&T cooperation with China. An additional benefit would be that Chinese counterparts looking for European collaborators would have a platform to address their enquiries to.

Going well beyond Beijing and other major Chinese cities can definitely boost the potential offered by the S&T cooperation with China. The **diversification** of the collaboration strategy is therefore highly advised. Looking for regional strategic collaboration partners should not only assure a wider geographical coverage, but would also mean reaching areas perhaps not previously considered by European researchers but offering considerable potential for the articulation of cooperation opportunities.

Finally, a couple of open questions to reflect on when talking about re-shaping the S&T collaboration mechanisms between the EU and China: what kind of additionality can the European Union provide to the already existing S&T collaboration initiatives of the Member States with China and, equally important, how can these be effectively coordinated? It is important the EU does not seek to duplicate the schemes of its most advanced Member States in this area, but it is equally important that it learns from them. The EU can supplement these schemes and in some ways surpass them with added value partnership initiatives, and identify ways that can help the smaller Member States gain improved access to collaboration mechanisms with China.

Annex – List of interviewees WP4 Survey

	Organisation	Name of Interviewee	Programme
France	E2P22	Planyan De Campo	CNRS-ENS Lyon-Rhodia-CNU
Germany	Bosch Stiftung	Anna-Müller Trimbusch	Science Bridge China / Partners for sustainability
	Sino-German Research Center / DFG-NSFC	Frau Strelen	--
	DLR / BMBF	Frank Stiller	DLR
	Fraunhofer Gesellschaft	Monika Braun	--
	Fraunhofer Gesellschaft, Beijing representation	Xiaoding Han	--
	German Embassy, Beijing	René Haak	--
Italy	BIC Lazio	Andrea Belloni	various partners' programmes with China
	Ministry of Foreign Affairs Italian Cooperation for Development	Stefania Canetti	Italian Cooperation for Development
	Sviluppo Lazio	Enrica Bagnolini	Various for SMEs in particular
	Ministero Ambiente e Sviluppo	Massimo Martinelli	Sino-Italian cooperation programme for environmental protection
Netherlands	KNAW	Annemarie Montulet	PSA, CEP, CAS-KNAW joint PhD (and with NWO, TT China, JSTP)
	Netherlands Organization for	Berry J. Bonenkamp	NWO-NSFC programme + JSTP programme

	Scientific Research NWO		
	Embassy of the Kingdom of the Netherlands, Beijing	David Pho	General support
Sweden	The Swedish Environmental Protection Agency	Katrin Ottosson	Various programs related to environmental protection
	Vinnova	Sylvia Schwaag Serger	Sino-Swedish Cooperation Programmes
	Raoul Wallenberg Institute	Henrik Andersen	various in the fields of Education and Human Rights
UK	British Academy	Natasha Bevan	Sino-British Fellowship Trust / Small Grant Scheme
	The Royal Society	Hans Hagen	International Exchanges (previously called International Joint Projects
	The Royal Society	Hans Hagen	Newton International Fellowships Programme
EC Representatives	EU Delegation in China	Jessica Mitchell	--
	European Commission	Frederico Miranda	Marie Curie Actions – IRSES
	EURAXESS Links China	Jacques de Soyres	EURAXESS
	GOPA Consultants / STF Initiative	Clemens Smolders	EU Science and Technology Fellowship Programme China