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1. Introduction

The primary task of the CHOICE project is to develop a roadmap towards a strengthened EU-China ICT R&D cooperation strategy for EU-China research cooperation beyond FP7, as well as an action plan based on the roadmap that provides a strategy that will provide a sustainability strategy for EU-China research cooperation outside of European funded research programmes.

Before presenting the proposed CHOICE roadmap it is important to set out what was learned through the work of the project about the context within which the roadmap and action plan exist so that the reasoning underpinning the roadmap becomes clear making it more intelligible. To better appreciate this context it should be noted that when developing the roadmap it was held in mind that its emphasis should be on:

- Identifying obstacles to reciprocity and encouraging a more balanced relationship with China based on reciprocity
- Supporting European nationals, companies and organisations willing to access Chinese research programmes
- Highlighting both EU and Chinese excellence in ICT R&D

In the following, the context sets out how the goals of the roadmap were arrived at. The roadmap then sets out the framework within which the roadmap goals must be pursued. The roadmap goals are then set out. Finally, an action plan is presented of actions that will help in meeting the roadmap goals.

2. Context

Holding in mind that in the development of the roadmap there was to be an emphasis on highlighting both EU and Chinese excellence in ICT R&D it was apparent almost from the outset that, an EU model of excellence in ICT R&D needed to be identified that matched as far as possible the Chinese vision of excellence in ICT R&D if the roadmap was to be underpinned by an agreed vision of what constituted excellence.

The International S&T Cooperation Programme (ISTCP), launched by the Chinese Ministry of Science and Technology (MoST) in 2001, engages with Europe at the bilateral or multilateral level not the EU level.

It funds projects with foreign research institutions universities and enterprises to carry out cooperation in R&D:

- attracting outstanding overseas talents and teams to work in China, promoting China's international scientific and technological cooperation base construction
- strengthening China's capacity of indigenous innovation.

Excellent projects are in Chinese terms those that meet these criteria.

On the European side, what constitutes excellence in European ICT R&D was extensively studied within The European ICT Poles of Excellence (EIPE) research project (2010-13) which defined European ICT Poles of World-Class Excellence (EIPE) as [1]: “geographical agglomerations of best performing Information and Communication Technologies production, R&D and innovation activities, located in the European Union, which play a central role in global international networks.”

The definition of a EIPE while incorporating excellence in ICT R&D places it in a broader context of production and innovation in a global operational environment which goes a long way to matching the Chinese vision of excellence in ICT R&D.

The definition of EIPE incorporates the notion of cases of excellence in ICT R&D, production and innovation activities, primarily being found within a geographical agglomeration of such excellence. China has long been aware of the agglomeration phenomena and it has been a significant driver behind China's push to establish special economic zones with targeted specialisations.

The EIPE Project concluded that [1], “Excellence in ICT is built up of high and balanced performance in all activities, i.e. ICT R&D, innovation (I) and business, and in all three characteristics: agglomeration, internationalisation and networking.”

It follows that it is not meaningful to consider ICT R&D excellence in isolation. It can only exist alongside business and innovation excellence in an environment of agglomeration, internationalisation and networking. Further support for this argument was provided in [2] which concluded that: “For any country seeking to collaborate with China, ensuring a density and diversity of connections will be crucial, spanning the academic, research, commercial, trade and cultural spheres” and that this could only be achieved through clustering.

As the primary task of the CHOICE project includes developing a strengthened EU-China ICT R&D cooperation strategy for EU-China research cooperation beyond FP7 the different approaches to clustering ICT R&D&I that have been taken within Europe and their effectiveness were reviewed with a view to promoting clustering; This work is reported in Appendix 5 CHOICE Internal report I-5 Clustering for Success.

Having set the context for excellence we move onto reciprocity. In the development of the roadmap there was to be an emphasis on identifying obstacles to reciprocity and encouraging a more balanced relationship with China based on reciprocity. The natural starting point for moving towards a balanced relationship was to seek a better understanding of the extent of the imbalance and the causes of it.

There has been extensive EU funding of Chinese participation in FP ICT R&D Projects. However, the funding of the Chinese participants by the EU has in a number of cases clearly been in the interests of the EU. FP projects with funded Chinese participation have included projects that promoted European led standardisation initiatives and/or promoted the development of open source tools of key interest to EU business. As a result of Chinese involvement in FP7 projects the EU now has a track record of successful initiatives with China around standardisation and the provision of open source tools which can be built upon; See Appendix 1 CHOICE Internal report I-1 Examples of excellent EU China collaboration in EU funded ICT R&D projects and support actions.

Furthermore, the importance to some member states of FP7 collaborative projects as a mechanism for ICT R&D collaboration with China is apparent. For Spain, Austria and Slovenia they have been the main mechanism for collaboration and they were a significant part of Germany’s overall collaborative activities.

However, some smaller EU member states have no frontier ICT related research capabilities of international significance and that many of those that do have such capabilities in very specific and limited areas. This is not a weakness of the member states concerned but reflects the reality that ICT research is not a prime concern of a number of member states.

The above observations arose out of the work reported in Appendix 3 CHOICE Internal report I-3 EU member state cooperation with China in ICT R&D&I: Bilateral cooperation in ICT R&D&I.

Concerning EU participation in Chinese funded ICT R&D projects, The National Natural Science Foundation of China (NSFC) has cooperation with a number of EU member states.

Jointly funded activities do exist, joint Institutes play a very important role in some member states collaboration in ICT R&D with China, the following member states known to have Joint Institutes with Chinese partners; Belgium, Germany, France, Lithuania, and The Netherlands.

However, relatively few member states have funded distinct bilateral ICT R&D collaborative projects with China. Those that have are known to include: Belgium, Eire, Germany, France, Finland, and UK.

In recent years much has been made of the importance of Chinese municipal and provincial funding bodies for Science and Technology (S&T) research in the context of the total annual spend on publically funded S&T research in China. It is widely appreciated that going beyond Beijing and looking for regional strategic collaboration partners would assure a wider geographical coverage of EU-China collaboration and offer considerable potential for the articulation of cooperation opportunities.

To understand the structure of the Chinese local government offices funding S&T research it is necessary to be aware of where they are located in the hierarchy of Chinese administrative divisions. Work was done to review the activities of a sample of Chinese local government offices funding S&T research according to the type of administrative division to which they belong and provide recommendations on how an EU organisation could explore the potential for collaborative ICT R&D&I with a Chinese regional or local funding body; This work is presented in Appendix 2 CHOICE Internal report I-2 Chinese regional and local funding bodies for Scientific and Technical research.

In the development of the roadmap there was an emphasis on supporting European nationals, companies and organisations willing to access Chinese research programmes the natural starting point for improving the support provided was to provide an overview of the support currently available. Given that on the Chinese side at least innovation is seen as a key component of ICT R&D collaboration it is important to pay careful attention to the support provided in China for EU companies the area in business and innovation. This is because it is widely acknowledged Europeans expect future threats to cooperation, such as the possibility of losing know-how (Intellectual Property) and the risk of China acquiring greater competitive advantages from such cooperation. Additionally, the different legal system and related limited law enforcement possibilities are recognized as potential threats.

The report [2] describes China as an absorptive state adept at attracting and profiting from global knowledge and networks. Underpinning this assertion is the observation that “A distinctively Chinese approach to innovation involves not only absorbing the best ideas from around the world but recasting them and recombining them through ‘re-innovation’ much of

which involves ‘hidden innovation’: the innovation in design, processes and organisational models in manufacturing and services not captured by the traditional measures of R&D.” While it is acknowledged that, especially in the field of ICT, China is much more than just an absorptive state, as evidenced by its world leading R&D capabilities in 5G technologies, it nevertheless remains absorptive in certain key sectors relevant to ICT, for example, smart Cities.

It follows that effective protection of EU IPR is crucial if EU organisations are to proactively pursue collaborative ICT R&D&I with China in the long term. Work was therefore done to provide an overview of the support available to EU organisations for innovation in collaborative ICT R&D with China paying particular attention to the extent to which this support addresses IPR related concerns; This work is reported in Appendix 6 CHOICE Internal report I-6 Support available for innovation in ICT R&D&I in China: Protecting IPR.

It is important to be aware that the UK government has acknowledged China’s IP protection law broadly matches or exceeds that of the UK but that for some EU businesses in China IPR protection remains a major issue because of the distinctive nature of the IP law in China and cultural differences.

What the work done on establishing the context of EU-China collaborative ICT R&D made clear is that in thinking about strengthening EU-China collaboration in ICT R&D the focus should be on its role in developing bilateral innovation and business. In planning towards a strengthened EU-China ICT R&D cooperation strategy for EU-China research cooperation beyond FP7, as well as an action plan based on the roadmap that provides a strategy that will provide a sustainability strategy for EU-China research cooperation outside of European funded research programmes the target will be to provide a longer term overview of the future of China in ICT and how this will affect the opportunities for EU-China collaborative ICT R&D in terms of the role it can play in developing bilateral innovation and business. This emphasis on bilateral business and research will ensure the sustainability of the strategy outside of European funded research programmes that is being developed.

The primary mechanism used by the CHOICE project for determining the future opportunities for EU-China collaboration in ICT R&D in light of the above is, feedback provided by project partner CATR on the activities of: The EU-China Dialogue on Information Technology, Telecommunications and Informatization (ITTI) which was established in 2009 between the Ministry of Industry and Information Technology of the People's Republic of China (MIIT) and the European Commission Directorate General for Communications Networks, Content & Technology (EU DG CONNECT). The dialogue, as a high level cooperation mechanism between the EU and China, is a good platform which has positively pushed EU-China ICT cooperation and achieved fruitful and practical outputs. From the latest 5th EU-China ICT Dialogue Meeting in April 2014 in Yangzhou, CHOICE knew the cooperation fields included ICT policies, ICT regulation, broadband, 5G, network

security, IoT, e-commerce, smart cities, medical electronics and cloud computing. It was decided to proceed initially by focussing on providing input to the dialogue. CHOICE organized the following activities accordingly.

- 1) The first workshop on IoT in London to discuss IoT research excellence and IoT R&D collaboration mechanisms, as IoT is the most important cooperation point from the beginning of the ICT dialogue and the IoT expert group was set up at the third meeting. The proposal for collaboration mechanisms arising from the workshop will be submitted to the 6th ICT dialogue in 2015 in Europe.
- 2) The first event on collaborative innovation in ICT in Chengdu, covered Smart Cities, Future Internet, Internet of Things, 5G, Broadband, etc. The research cooperation priorities discussed by the event will be reported to the 6th ICT dialogue in 2015 in Europe.

Since more than 90% of Chinese cities are constructing Eco-city developments of one form or another and most Chinese cities fund their projects through public funding mainly at the local municipal level work was done to establish some insights into the potential of China's emerging market for Eco-city solutions for EU-China collaborative ICT R&D&I which resulted in CHOICE Internal report I-4 The current status of ICT R&D&I for Chinese Eco-Cities, see Appendix 4.

Under the guidelines of the dialogue, after the 1st phase cooperation on EU-China Green Smart City cooperation supported by PDSF II, 15 pilot cities from each side were selected, and a comparative study report, a white paper and a common statement were published. CHOICE Internal report I-4 was provided to a member of the project's technical experts group, who is an active member of the CHOICE advisory board, ahead of a proposal for the 2nd phase cooperation on EU-China Green Smart City cooperation with a view to informing the work of the proposal. The proposal for the 2nd phase supported by PDSF II has been submitted for final approval from MIIT and DG CONNECT.

3. Roadmap

Framework with which the roadmap goals must be pursued

It needs to be acknowledged that some smaller EU member states have no frontier ICT related research capabilities of international significance and that many of those that do have such capabilities in very specific and limited areas because some of the criticisms of the EUs initiatives around promoting EU ICT R&D could be driven by concerns over the balance of EU spending not necessarily reflecting the balance of member states interests.

What the EU can do for smaller member states in the given context is identify ways to help them gain improved access to collaboration mechanisms with China if the demand is there.

The focus of EU-China collaboration in ICT R&D should be in terms of ICT R&D&I.

Funding models for 'traditional' R&D cooperation cannot be decoupled from funding models for educational cooperation and more importantly business pilots. In particular, if EU-China collaborative ICT R&D&I is to be promoted in the future, EU-China academic and cultural exchanges must be sustained.

The underlying problem with the perceived lack of reciprocity in EU-China collaboration in ICT R&D appears to be the perception of reciprocity purely in terms of how much is spent. Reciprocity in EU-China ICT R&D collaboration needs to be considered in terms of its benefits to Europe not in terms of financial matching. Moreover, under H2020 there is no automatic funding for Chinese organisations, so when talking about reciprocity it is no longer appropriate to ask for funding from the Chinese side, but rather request a greater and simpler access to Chinese funded R&D&I programs.

What is absolutely clear is that the main priority at the EU level needs to be on cooperation in a context of policies driven research and dialogues focused towards standardization and regulatory initiatives that have the potential for initiating economic sustainable cooperation with China. This has the merit of benefiting all member states as standardisation and regulation for open markets reduces ICT related unit costs for all member states.

A further added benefit of the above approach is that it accommodates the reality that EU member states involved in bilateral collaboration with China are often direct competitors in Chinese markets and, where they are not, have a tendency to be involved different fields across which best practice sharing is difficult or not meaningful.

It essential to be aware that for those organisations looking to participate in ICT R&D collaboration with China, ideally they should have someone in the organisation with a good command of Chinese otherwise access to support from Chinese speakers is critical.

In 2013 the Chinese central government announced the first batch of ten pilot innovative industrial clusters to stimulate innovation and industrial competitiveness. A new batch of innovation clusters which are to be based within existing national high-tech zones will be announced each year. This means that there will be, in effect, Chinese poles of ICT excellence that can, and should be, networked to EU poles of ICT excellence for their mutual benefit.

If such networking is to be pursued it has to be recognised that [2] “a significant feature of Europe’s leading ICT poles of excellence is their diversity in specialisation, with each region showing one or several specific strengths” and that “only a very small number of EU regions demonstrate intensive ICT activity and they represent a large share of the total EU ICT activity”. Therefore, a fundamental challenge for the EU is to enable enterprises outside of these clusters to network globally through them. This is as much an intra EU challenge as it is an EU-China challenge.

The obvious alternative to exploiting the established EIPE model of clustering is to promote alternative forms of ICT clustering that align with Chinese notions of excellence so consideration of alternative forms of ICT clustering became a big part of the work on the CHOICE roadmap.

At this point the natural starting point for promoting clustering at an EU level is to pursue a better involvement of existing EU clusters, networks of excellence, and associations by relying on structures already existing at European level (National Contact Points, European Technology Platforms, Public Private Partnerships, European Industrial Associations).

The risk of a brain drain of Chinese research talent to the EU is a major Chinese concern and such issues need to be accounted for when assessing the real extent of reciprocity between the EU and China in ICT R&D collaboration as it sits in the context of the Chinese vision of ICT R&D excellence outlined above.

The ECC publishes an annual Position Paper that outlines the problems European businesses in China are currently facing with regard to World Trade Organisation implementation, trade, regulatory and broader policy-related issues and the Working Groups recommendations for alleviating them. It is presented to senior Chinese officials from over 20 ministries and general administrations and directly to the European Commission. Its work should not be duplicated.

In terms of working with China on standardisation initiatives, working with the two main Chinese ICT standards associations which are the China Communications Standards Association (CCSA) and the China Electronics Standardization Association (CESA) and which have as influential members the relevant Chinese industrial associations should be considered.

Several Chinese industrial associations have an interest in IPR protection and leveraging these interest groups should be considered when promoting the case for more efficient and effective IPR protection in China.

The focus of the pursuit of EU-China collaboration in ICT R&D&I at the regional level has to be on the potential for collaboration offered by the involvement of Chinese municipal and provincial government Science and Technology (S&T) offices in funding S&T research.

Given the extent of Chinese investment in eco-cities their ICT needs are currently the most important area for EU-China collaboration in ICT R&D&I. The technology infrastructure required to deliver smart city projects should be defined by function rather than in terms of a specific technology, which means prioritising services and creating service platforms for EU-China collaboration.

Because the high level Chinese national industry alliances focussed on smart cities address the cross-sector challenges of realising smart cities they link extensively to more sector specific national industry associations, and when planning cross-sector dialogue on EU-China collaboration in ICT R&D&I with Chinese industry their potential for acting as focal points for the dialogue should be considered.

4. Road map goals

Goals targeted directly at encouraging EU stakeholders in EU-China ICT R&D in be proactive in pursuing collaboration with China in ICT R&D

1. Encourage EU participation in EU-China collaborative projects in ICT R&D in H2020
2. Encourage EU participation in Chinese funded collaborative projects in ICT R&D
3. Encourage EU participation in bilateral collaborative ICT R&D with Chinese organisations.
4. Encourage EU organisations interested in establishing collaborative ICT R&D&I activities with China to participate in clustering.
5. Mitigate the concerns of EU organisations about ICT related IPR protection in China
6. Encourage EU organisations to explore the potential for collaborative ICT R&D&I with Chinese organisations targeted at China's emerging market for Eco-city solutions.
7. Encourage EU organisations to explore the potential for participation in collaborative ICT R&D&I funded by a Chinese regional or local funding body
8. In support of the above goals, facilitate European ICT based firms access to the regulatory and standards framework for ICT in China

Goals targeted directly at encouraging the EU to be proactive in supporting stakeholders in EU-China ICT R&D in pursuing collaboration with China in ICT R&D

9. Encourage the EU to support the clustering of stakeholders in EU-China ICT R&D pursuing collaboration with China in ICT R&D in order to maximise their chances of establishing collaborations
10. Encourage the EU to promote the case for more efficient and effective ICT R&D related IPR protection in China
11. Encourage the EU to support European based ICT firms in accessing the regulatory and standards framework for ICT in China
12. Encourage the EU to support EU organisations wishing to explore the potential for participation in collaborative ICT R&D&I funded by a Chinese regional or local government funding body
13. Encourage the EU to support EU organisations wishing to explore the potential for collaborative ICT R&D&I with Chinese organisations targeted at China's emerging market for Eco-city solutions.
14. Encourage the EU to take strategic actions in support of the above goals.

5. Action plan

Actions targeted at EU Stakeholders in EU-China ICT R&D and intended to be on-going with immediate effect.

Addressing goal 1: Encourage EU participation in EU-China collaborative projects in ICT R&D in H2020

- To maximise the chance of a H2020 proposal involving EU-China collaboration in ICT R&D resulting in a successful project the Chinese involvement should be focussed on either a standardisation or regulatory initiative, or open source software of common EU-China interest, or bringing world leading expertise to the project.

Addressing goal 2: Encourage EU participation in Chinese funded collaborative projects in ICT R&D

- CHOICE Deliverable D2.2 Information package for European researchers' First end of year report provides a list of relevant Programmes and "Guidance for application submission" which should be referred to.

Addressing goal 3: Encourage EU participation in bilateral collaborative ICT R&D with Chinese organisations.

- In pursuing bilateral collaborative ICT R&D with Chinese organisations be aware the Chinese will only engage in cooperation with centres of internationally significant expertise. Furthermore, bilateral ICT R&D cooperation with China cannot be pursued outside of considerations of innovation so in this context the target of cooperation must be international excellence in ICT R&D&I.
- For some EU member state organisations with internationally significant expertise interested in pursuing bilateral ICT R&D&I collaboration with Chinese organisations the report of Appendix 3 provides links to national agencies which are the first point of contact for exploring what is possible which should be referred to.

Addressing goal 4: Encourage EU organisations interested in establishing collaborative ICT R&D&I activities with China to participate in clustering.

- For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state that hosts an EIPE it is worth investigating if the EIPE relates to the organisation's interests. If so, it may be possible to approach a national industrial association or Chamber of Commerce with a view to getting support for clustering through the EIPE.

- For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state with a bilateral programme of ICT R&D&I cooperation with China it is worth investigating if that programme relates to the organisations interests. If so, pursuing funding through the programme should be considered.
- For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state with very limited collaborative ICT R&D&I links with China it is worth considering participating in appropriately targeted business-to-business matching events.

Addressing goal 5: Mitigate the concerns of EU organisations about ICT related IPR protection in China

- It is important to be aware that the UK government has acknowledged China's IP protection law broadly matches or exceeds that of the UK but that for some EU businesses in China IPR protection remains a major issue because of the distinctive nature of the IP law in China and cultural differences.
- It is important to be aware of the recent report: China IPR considerations for European businesses in the ICT industries available from China IPR SME Helpdesk.
- The ECC Intellectual Property Rights Working Group 2013-14 position paper provides a very useful summary and critique of the recent developments in Chinese IPR law on trademarks, copyright, and patents including recommendations in support of the efficiency and effectiveness. While these are very generic issues they are nevertheless of major and direct importance for the EU ICT industry sector.
- Member states that are heavily involved in ICT R&D collaboration with China provide access to support for their businesses operating in China through chamber of commerce type organisations. If your organisation resides in a member state that provides such support it should be your first port of call if you are concerned about IPR protection in China.
- If your organisation is an SME the EU provides business support through the EU SME Centre, the European Enterprise Network (EEN) and the China IPR SME helpdesk which you should refer to as useful support may well be forthcoming.
- In the event of a dispute around IPR protection in China it is worth considering approaching The China International Economic and Trade Arbitration Commission (CIETAC) which accepts foreign-related and international cases and offers to independently and impartially resolve economic and trade disputes by means of arbitration.
- If your organisation wishes to raise specific concerns related to IPR protection in China it is useful to hold in mind that the European Chamber of Commerce is a very effective

forum through which to air these concerns. Furthermore, several Chinese ICT related industrial associations and centres, and at least two Chinese municipal government science and technology bureaus, have an interest in IPR protection and it may be appropriate to approach one or more of these bodies with a view to eliciting their support. See the report of Appendix 6 for more details.

Addressing goal 6: Encourage EU organisations to explore the potential for collaborative ICT R&D&I with Chinese organisations targeted at China’s emerging market for Eco-city solutions

- Where possible know-how transfer in the area of IT service management for Eco-cities should be the main focus of an EU organisation pursuing cooperation with China in ICT R&D&I in the area of Eco-cities in order to maximise the chances of establishing cooperation.
- European industrial associations active in smart cities need to encourage and support EU companies in targeting the Chinese markets for digital services, in particular, services supporting the Chinese vision of the eco-city (or smart city) in order to maximise cooperation opportunities.
- The EU China Smart City Cooperation Project Technical Expert Group has responsibility for Identifying and sharing “good practice” and maintaining a database of technical experts from China. It is a useful resource for disseminating activities promoting EU-China ICT R&D cooperation in Eco-cities.

Addressing goal 7: Encourage EU organisations to explore the potential for participation in collaborative ICT R&D&I funded by a Chinese regional or local funding body

- For an EU organisation to engage effectively with a Chinese municipal and provincial government S&T office it is highly advisable to do so through a Chinese speaking member of staff, indeed in most cases it is essential.
- To explore the potential for collaborative ICT R&D&I with Europe with a direct-controlled municipality its S&T Commission should be approached in the first instance.
- To explore the potential for collaborative ICT R&D&I with Europe with a Chinese province its S&T department should be approached in the first instance.
- To explore the potential for collaborative ICT R&D&I with Europe with a Chinese prefectural level municipality its S&T bureau should be approached in the first instance.
- Targeting sub-provincial divisions’ S&T offices for focused partnership opportunities in ICT R&D&I with EU partners is particularly promising; as is highlighted in the report of Appendix 2 through examples of specific sub-provincial divisions’ S&T offices highly focussed on specific areas of ICT R&D&I.

Addressing goal 8: facilitate European ICT based firms access to the regulatory and standards framework for ICT in China

- Refer to CHOICE deliverable D2.4 Handbook for ICT Industrial Support Services - Bringing together European and Chinese Industrial Associations. The final version of this deliverable will be a handbook for industrial support services presenting support mechanisms and structures in China that facilitate European based ICT firms access to the regulatory and standards framework for ICT in China. This draft begins by presenting the policy framework within which regulations and standards in the field are developed. Financial support for such development is provided through the China's annual Electronic Development fund. The draft outlines the process of tendering for funding from this fund. It then goes on to provide an overview of what it describes as the socialised service system. This is the system of industry associations and related bodies by which the relevant regulations and standards are developed. The roles of these associations are summarised.

Actions targeted directly at the EU

The action plan actions targeted directly at the EU comprise a series of steps which are categorised as short-term, could be achievable within a year or less, medium-term, achievable over the next five years, and long term, in the sense of sustained or on-going for the foreseeable future. It is important to note that many of the short-term steps involve exploring potential opportunities for collaboration that could lead to long term actions. The steps in each category are distinguished between those that are relatively easy to achieve and those that are more difficult to implement. As CHOICE addresses EU-China collaboration the steps proposed would be the responsibility European Commission Directorates-General in the first instance rather than at the member state level.

It is noted that most of the more difficult to achieve long-term steps proposed are related to the innovation (I) component of R&D&I. This may go some way to providing an understanding of why there has been less focus on this component than on R&D in the past in projects dedicated to EU-China cooperation.

Addressing goal 9: Encourage the EU to support the clustering of stakeholders in EU-China ICT R&D pursuing collaboration with China in ICT R&D in order to maximise their chances of establishing collaborations

Short term steps

Relatively easy to implement

- The COOPOL Innovation program between the French competitiveness clusters and the Chinese science parks is an interesting initiative in support of clustering and should be investigated to see if it provides a model for clustering that could be applied in other member states.

- EU poles of ICT excellence (EIPE) should be networked to Chinese ICT innovative industrial clusters for their mutual benefit. The first step should be a mapping of EIPE to their corresponding Chinese ICT innovative industrial clusters.

Medium term steps

Relatively easy to implement

- As some member states that do not host an EIPE may have the resources to be able to actively positioning themselves for cross-sector cooperation and this approach is being pioneered by Finland, the Finnish initiative should be monitored to see if it whether or not the cross-sector clustering will be effective in fully engaging industry. If so this approach should be promoted to those member states with the sectorial breadth to benefit from it.
- Smaller member states should be encouraged to identify any internationally significant ICT industry players with a strong business link to a major Chinese ICT industry player and where such a link exists then provide high level political support at the national level for developing long term strategic ‘broadband’ company to company collaboration.

More difficult to implement

- The two main Chinese ICT standards associations are the China Communications Standards Association (CCSA) and the China Electronics Standardization Association (CESA).
 - The possibility of exploiting involvement of these associations in organising academic exchanges to support the establishment of the collaborative innovative bodies needed to progress EU-China collaborative ICT R&D&I that would include industry, research institutes, and academia, should be explored.

Long term steps

Relatively easy to implement

- EU-China B2B matching trips should be supported by the EU that cluster participants from smaller member states and member states with limited B2B collaboration with China with participants from larger member states that are very active in collaboration with China such as France, Germany, and the UK; This is referred to in the CHOICE project as B2B clustering.
- Funding models for ‘traditional’ R&D cooperation with China cannot be decoupled from funding models for educational cooperation and more importantly business pilots. In particular, if EU-China collaborative ICT R&D&I is to be promoted EU-China academic and cultural exchanges must be sustained.

- The EU needs to recognise and support China-CEEC clustering in the context of ICT R&D&I. In particular, the EU should support the establishment of a China-CEEC association of chambers of commerce.

More difficult to implement

- A fundamental challenge that the EU urgently needs to address is the establishment of mechanisms that enable enterprises outside of the EIPE to network globally through them.

Addressing goal 10: Encourage the EU to promote the case for more efficient and effective ICT R&D related IPR protection in China

Short term steps

More difficult to implement

- Several Chinese industrial associations and centres supporting Chinese industry have an interest in IPR protection and the EU should explore the potential for leveraging these interest groups when promoting the case for more efficient and effective IPR protection in China including:
 - China Smart City Industry Alliance (CCIT)
 - Shanghai Integrated Circuit Industry Association (SICA)
 - Shanghai Software Industry Association (SSIA)
 - China Software Industry Association (CSIA)
 - The Ministry of Industry and Information Technology Software and Integrated Circuit Promotion Center (CSIP)
- The potential of the Xi'an Science Technology Bureau and the Qingdao Science and Technology Bureau as partners for the EU in exploring good practice in IPR protection and enforcement in China at the municipal level is significant and should be explored further.
 - Xi'an's Municipal Government has a very interesting policy on IPR; it is encouraging to note that on May 8th, 2014, the China Science and Technology Exchange Center (CSTEC) held a Horizon 2020 Infoday in Xi'an.
 - Qingdao Science and Technology Bureau is actively engaged in intellectual property rights protection.

Medium term steps

Relatively easy to implement

- The ECC Intellectual Property Rights Working Group 2013-14 position paper provides a very useful summary and critique of the recent developments in Chinese IPR law on trademarks, copyright, and patents including recommendations in support of the efficiency and effectiveness. These recommendations should be carefully considered by the EU.

Long term steps

Relatively easy to implement

- The European Chamber of Commerce in China (ECC) R&D forum hosts events that address R&D in general and the fundamental issues around R&D management and IPR protection of R&D activities in China. The information provided by such activities forms the foundation for specifically ICT R&D focussed guidance on such issues and should be widely disseminated.

More difficult to implement

- The establishment of some form of EU chamber of commerce to provide support for EU businesses operating in China from member states that do not provide access to national chamber of commerce support of this type is strongly recommended.
- Chinese IP protection laws are not an issue. The major issue is the challenge EU face companies in making effective use of them due to China's different legal system and culture. To address this, the EU should appoint an Intellectual Property (IP) Attaché to China to improve the IP environment for EU companies.

Addressing goal 11: Encourage the EU to support European ICT based firms in accessing the regulatory and standards framework for ICT in China

Medium term steps

Relatively easy to implement

- The main priority at the EU level needs to be on cooperation in a context of policies driven research and dialogues focused towards standardization and regulatory initiatives that have the potential for initiating economic sustainable cooperation with China. This has the merit of benefiting all member states as standardisation and regulation for open markets reduces ICT related unit costs for all member states.
- The ECC ICT Working Group position paper 2013-14 makes significant recommendations around ICT standardisation and certification in China. These recommendations should be carefully considered the EU.

More difficult to implement

- The two main Chinese ICT standards associations which are the China Communications Standards Association (CCSA) and the China Electronics Standardization Association (CESA) have as influential members the relevant Chinese industrial associations and should in general be the first points of contact for EU ICT related standardisation initiatives with China.
 - These associations will probably be best engaged with after having aligned standardisation EU objectives with those of constituent Chinese industrial associations but given their involvement in international standardisation also have the potential to apply ‘leverage downwards’ towards Chinese industry if appropriate.

Addressing goal 12: Encourage the EU to support organisations wishing to explore the potential for participation in collaborative ICT R&D&I funded by a Chinese regional or local funding body

Long term steps

Relatively easy to implement

- Targeting sub-provincial divisions’ S&T offices for focused partnership opportunities with EU partners in ICT R&D&I is particularly promising and is recommended. Examples of specific sub-provincial divisions’ S&T offices with the potential for highly focussed collaborative ICT R&D&I with EU partners are:
 - The Dalian Bureau of Science and Technology centrally administers the computer development and application of the city and is responsible for the application and promotion of computer technology.
 - Guangzhou Municipal Government which appears to be distinctive in having a Bureau of Science and Information Technology. The main responsibilities of the Guangzhou Bureau appear to be exceptionally relevant to ICT R&D&I. In particular they include: Promoting the ‘Integration of Three Networks’, namely, the telecommunications network, the Internet and the broadcast network; Deploying and managing radio spectrum resources; and organizing inter-governmental and international cooperation projects in science and information technology.
 - The Shenzhen Municipal Bureau of Science, Technology and Information (Guangdong Province) formulates and implements plans for international exchanges and cooperation in S&T and crucially the information economy.

- In 2012, the Wuhan Municipal Science and Technology Bureau made an offering of 10 million Yuan for domestic public tendering for the “intelligent city” master plan project. In 2013, “The Intelligent Wuhan City Overall Plan” has been formed, and is expected to start to pay off within 3-5 years. It was claimed that Wuhan will be the fastest growing Chinese city in term of Internet speed.

More difficult to implement

- The potential of EU-China collaboration in ICT R&D&I at the regional and local level in China should be extensively explored:
 - To explore the potential for collaborative ICT R&D&I with Europe a direct-controlled municipality its S&T Commission should be approached in the first instance.
 - To explore the potential for collaborative ICT R&D&I with Europe with a Chinese province its S&T department should be approached in the first instance.
 - To explore the potential for collaborative ICT R&D&I with Europe with a Chinese prefectural level municipality its S&T bureau should be approached in the first instance. However, in some cases collaboration at the member state level may be more appropriate than EU level collaboration.

Addressing goal 13: Encourage the EU to support EU organisations wishing to explore the potential for collaborative ICT R&D&I with Chinese organisations targeted at China’s emerging market for Eco-city solutions.

Short term steps

Relatively easy to implement

- The role of the National Industry Alliance of Smart City Technology Innovation in the development of Chinese smart city technology standards is crucial for EU-China standardisation initiatives related to smart cities. It is strongly recommended that mechanisms for dialogues on EU-China standardisation with this body be identified as soon as possible.
- As Wenzhou Municipal Sci-Tech Bureau administers the whole city’s digital seismic precursor networks and seismic safety evaluation it would be of interest to identify and propose as a potential partner city an EU City that has to do seismic monitoring.

Medium term steps

Relatively easy to implement

- The high level Chinese national industry alliances addressing the challenges of realising smart cities, as they link extensively to more sector specific national industry associations, are fundamentally important for EU-China collaboration in ICT R&D&I and should be focal points for cooperation. It is strongly recommended that they are the priority for technical area specific EU-China dialogues around ICT R&D&I.

More difficult to implement

- The European Commission (EC) needs to encourage and support EU companies in targeting the Chinese markets for digital services, in particular, services in support of the Chinese concept of the eco-city (or smart city).

Long term steps

Relatively easy to implement

- The China Software Evaluation Center plays a significant role in smart cities development in China; it has responsibility for City top-level design and evaluation. The EU has already actively engaged with China's National Industry Alliance of Smart City Technology Innovation but needs to broaden its engagement to encompass the smart cities activities of The China Software Evaluation Center.

Addressing goal 14: Encourage the EU to take strategic actions in support of the above goals.

Medium term steps

More difficult to implement

- Numerous Chinese industrial associations have an interest in academic and technical exchanges and the EU should explore the potential for leveraging this interest when seeking to ensure that its policy objectives for academic and technical exchanges with China in the ICT area are met.

Long term steps

More difficult to implement

- Business orientated Chinese language and culture training should be provided for those businesses that require it for the purposes of pursuing collaborative ICT R&D&I with China.
- Establishment of an EU Center of Chinese Law and Chinese Legal Culture Center that promotes education in the field in universities, among legal practitioners and the wider community is recommended. In particular as it would have a role in supporting policy

development for developing business models to promote commercial connections between the EU and China.

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[2] CHINA'S ABSORPTIVE STATE Research, innovation and the prospects for China-UK collaboration, Kirsten Bound, Tom Saunders, James Wilsdon and Jonathan Adams, October 2013, Nesta

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Appendix 1: CHOICE Internal report I-1 Examples of excellent EU China collaboration in EU funded ICT R&D projects and support actions

Document organiser: Dr T J Owens, Brunel University London

Example projects provided by SPI

Date: 30 October 2014

Abstract: In this brief report nine examples are presented of EU funded ICT R&D projects and support actions with Chinese partners which provide excellent examples of EU China collaboration. For each project considered the work of the project is briefly described and it is explained why the work is an excellent example of EU China collaboration. Conclusions are presented together with the implications of the report for the work of the CHOICE project.

Rationale for the report: In the CHOICE project an emphasis is placed on identifying obstacles to reciprocity in EU China collaborative ICT R&D and encouraging a more balanced relationship with China based on reciprocity. The Chinese have been major participants in FP7 and there has been much concern about a lack of reciprocity in the funding of EU Chinese collaborative research in ICT, especially there is a keenness for the EU to be seen to be supporting European nationals, companies and organisations willing to access Chinese funded research programmes. To determine how big a problem this perceived lack of reciprocity is and its nature it makes sense to look at excellent examples of EU China collaboration in EU funded ICT R&D projects and support actions to assess whether the Chinese involvement provided significant benefits to the EU and if so what the nature of the benefit to the EU was. To provide a consistent view of excellent collaboration over time, and to pick up on any evolution in the nature of the collaboration over time, the example projects considered are projects that were active over the period November 2005 – April 2014 and are presented in order of the oldest first.

Disclaimer: The views presented in this report reflect those of the document organizer and do not necessarily represent the views of the European Commission.

Examples of excellent EU China collaboration in EU funded ICT R&D projects and support actions

FP6 Go4IT http://www.irisa.fr/tipi/wiki/doku.php/go4it_project?do=export_xhtml

Summary of the work of the project

The FP6 IST Go4IT (Nov, 2005 – April 2008) project partners comprised 11 organizations from Europe, China and Brazil. The main contribution of the project is the T3DevKit¹, a free open source toolkit for simplifying the development of test suites in the TTCN-3 environment. “TTCN-3 (Testing and Test Control Notation version 3) is a strongly typed test scripting language used in conformance testing of communicating systems and a specification of test infrastructure interfaces that glue abstract test scripts with concrete communication environments”.²

The 6lowpan Test Suite Documentation of 29 April 2012³ makes clear the 6lowpan codec is based on the T3DevKit codec generator. 6LoWPAN is the name of a concluded working group in the Internet area of the IETF⁴. “The 6LoWPAN concept originated from the idea that “the Internet Protocol could and should be applied even to the smallest devices,” and that low-power devices with limited processing capabilities should be able to participate in the Internet of Things.”⁵

Why it is an excellent example of EU China collaboration

Go4IT demonstrates the huge contribution that international cooperation activities, including with Chinese partners, can make to development of open source software tools and through them to enabling global standardisation initiatives.

Go4IT made a significant contribution to establishing a track record of success in EU initiatives with China around global standardisation initiatives aimed at promoting the Internet of Things (IoT), a current policy priority in EU China collaboration, which can be built upon by future initiatives in this area.

CASAGRAS http://cordis.europa.eu/projects/rcn/85786_en.html

¹ <http://www.irisa.fr/tipi/wiki/doku.php/t3devkit>

² <http://en.wikipedia.org/wiki/TTCN-3>

³ forge.etsi.org/websvn/filedetails.php?repname=IoT.6LoWPAN

⁴ <http://datatracker.ietf.org/wg/6lowpan/>

⁵ <http://en.wikipedia.org/wiki/6LoWPAN>

Summary of the work of the project

“While much of the emphasis of European attention to RFID focuses upon electronic product code (EPC) and associated EPC-compliant data carriers it has to be recognised that other numbering systems exist and are being promoted for global applications.

The ubiquitous identification (UID) system being promoted widely within the Asia-Pacific regions of the world. There is a need to resolve the global numbering requirements and the means whereby these numbers can be freely issued, managed and maintained.

The European emphasis upon EPC also extends to a disproportionate attention to EPCglobal designated standards in contrast to ISO/IEC standards and promotion of the Internet of Things as an aspirational objective for RFID and alignment with the European research framework in respect of ubiquitous computing and networks. Again there is a need to identify and consider the components that distinguish a global framework for RFID regulation, standardisation and developments with respect to RFID.”

CASAGRAS (Jan. 2008 – Jun. 2009) was a support action in which the broader framework outlined above could be recognised and used as a basis for providing a more incisive reference platform for European usage of RFID and a more informative foundation for European regulatory decisions. The team assembled included organisations from Europe, China, Japan, Korea, and USA and experts on ISO/IEC standardisation and regulatory issues.

Why it is an excellent example of EU China collaboration

CASAGRAS successfully promoted the Internet of Things (IoT) as an aspirational objective for RFID and its alignment with the European research framework in respect of ubiquitous computing and networks. In particular, in the Asia-Pacific regions of the world which would not have been possible without Chinese participation.

GRIFS http://cordis.europa.eu/projects/rcn/85402_en.html

Summary of the work of the project

GRIFS: Global RFID interoperability forum for standards (Jan.2008 – Dec. 2009) was a support action for global RFID-related standardisation activities, involving organisations from Europe, China, Japan, Korea, USA and additional countries to give good global coverage. Global supply chains require that: “RFID tags and associated sensors can operate, can be seen and can be interrogated anywhere in the world. For maximum competitiveness and greatest efficiency this requires standards that are global and open in definition and in application.” The aim of GRIFS was to improve collaboration and thereby maximise the global consistency of RFID standards.

Most of the GRIFS partners were GS1 member organisations. GS1 member organisations are independent, not-for-profit national organisations working to make organisations in their country more efficient by getting everybody speaking the same language when it comes to locating, transporting and trading goods. There are 108 GS1 member organisations across 150 countries, which operate in multiple sectors and industries, and collectively set standards, using unique numbers, for global use which makes the reliable identification of products and assets possible. It is important to note that GS1 sets the Electronic Product Code global (EPCglobal) standards for RFIDs.

Why it is an excellent example of EU China collaboration

The GRIFS project was a European led standardisation initiative to maximise the global consistency of RFID standards the success of which was contributed to significantly by its Chinese participants.

MULTICUBE <http://www.multicube.eu/>

Summary of the work of the project

The MULTICUBE project: Multi-objective design space exploration of multi-processor SOC architectures for embedded multimedia applications (Jan. 2008 – Jun. 2010) focused on the definition of an automatic multi-objective Design Space Exploration (DSE) framework to be used to tune the System-on-Chip architecture for the target application evaluating a set of metrics (e.g. energy, latency, throughput, bandwidth, QoR, etc.) for the next generation embedded multimedia platforms.

“The MULTICUBE project will develop a multi-level system specification and modeling framework to provide static and dynamic evaluation of the system-level metrics. The design methodology will be implemented at system-level in a set of open-source and proprietary EDA tools to guarantee a large exploitation of the results of the MULTICUBE project in the embedded system design community. The overall goal is to support the competitiveness of European industries by optimizing embedded hardware/software systems while reducing the design time and costs.”⁶

The MULTICUBE consortium comprised seven EU partners, one Swiss partner and two Chinese partners. The Chinese partners played a crucial role in the project. Two European industrial partners (STM-Italy and DS2) together with STM-China defined the requirements of the design tools and validate step-by-step the results of the exploration tools to design a set

⁶ http://cordis.europa.eu/projects/rcn/85462_en.html

of target industrial applications while the Chinese Academy of Sciences contributing to the research and technological development.

The two major achievements of the MULTICUBE project consist of two open source prototype tools Multicube Explorer and Multicube-SCoPE which are available from the MULTICUBE website.⁷

Why it is an excellent example of EU China collaboration

The two Chinese partners in MULTICUBE contributed to the delivery of open source tools targeted at the needs of European industry.

HELIUM3D <http://www.cse.dmu.ac.uk/~heliumusr/>

Summary of the work of the project

The aim of HELIUM3D High Efficiency Laser-Based Multi-User Multi-Modal 3D Display (Jan. 2008 – Dec. 2010) was to create a 3D display that would extend the state of the art in autostereoscopic (glasses free) displays. The consortium comprised six EU partners and one Turkish partner and one Chinese partner. The HELIUM3D display technology addressed the efficiency and colour limitations of current and next generation displays by developing a new display technology based on direct-view RGB laser projection via a low loss transparent display screen to the eyes of viewers. The Chinese partner in the project Nanjing University was responsible for near-field viewer tracking, its involvement in the project being justified by the fact that it has world leading researchers in imaging as evidenced by a recent publication in Nature on ‘Experimental imaging properties of immersion microscale spherical lenses’⁸.

Why it is an excellent example of EU China collaboration

The Chinese involvement in HELIUM3D gave its EU partners access to world leading expertise in imaging.

MYFIRE <http://www.my-fire.eu/>

⁷ http://www.multicube.eu/open_source.html

⁸ <http://www.nature.com/srep/2014/140120/srep03769/full/srep03769.html>

Summary of the work of the project

The MYFIRE Multidisciplinary network of research communities in Future Internet (FIRE) (Jun. 2010 – May 2012) identified FIRE testbeds user communities and their needs with a view to improving the research value of the huge investments in FIRE testbeds. In simple terms MYFIRE sought to promote better use of the FIRE experimental facilities.

The MYFIRE project created an environment that provided the awareness necessary for the efficient development of experimental facilities in Europe in collaboration with international partners. The project had one partner from each of the BRIC countries and four EU partners.

A balance was sought between the requirements for strong collaboration and the stakeholders expectations to achieve good experimental activities in order to be able to develop sustainable testing methodologies able to contribute to European standards development. The framework was developed through the creation of open dialogue between the ICT networking research communities and experts from key areas of sociology, policy making, economic models and standardisation.

Why it is an excellent example of EU China collaboration

MYFIRE improved the research value of the huge investments in Europe in FIRE experimental facilities through inputs from international partners, including a Chinese partner, which enabled sustainable testing methodologies to be developed that can contribute to European standards development in FIRE.

MOSQUITO http://cordis.europa.eu/projects/rcn/95738_en.html

Summary of the work of the project

MOSQUITO Mobile software and services, Standardisation, Quality, Interoperability, Testing, Open source (Sept. 2010 –Sept. 2012) provided: “key and focussed support mainly to overcome mobile application fragmentation which prevent taking full benefit of the development of internet of services that current technology such as 3G, Wireless and future 4G (LTE, Wimax) should permit.” According to its final report⁹ the main outcomes of the project were: An analysis of the numerous symptoms of fragmentation resulting in the elucidation of a series of causes for it; identification and description of a set of concrete steps that could be taken to reduce fragmentation. The project consortium comprised 5 EU partners and one Chinese partner.

⁹ http://ec.europa.eu/information_society/apps/projects/logos/7/258067/080/reports/001_Finalreportv121pdf.pdf

Why it is an excellent example of EU China collaboration

MOSQUITO identified and described a set of concrete steps that could be taken to reduce fragmentation in the mobile applications market. In particular, to promote the development of a global internet of services which would not have been possible without Chinese participation.

OMELETTE http://cordis.europa.eu/projects/rcn/95584_en.html

Summary of the work of the project

OMELETTE Open Mashup Enterprise service platform for LinkedIn data in The Telco domain (Oct. 2010 – Mar. 2013) “aimed at researching on the development, management, governance, execution and conception of converged services with a specific focus on the telco domain.” OMELETTE had eight EU based partners and one partner from China.

The convergence of Telecom, IT and content services drives new emerging service markets based on an open Internet of Services. The success of the Web 2.0 services has encouraged Telcos to expose their network infrastructure services as Telco Mashups, facilitating the entry of new API-driven telco agents that allow third party businesses to bring traditional telco services (telephony, messaging, IP location, etc.) to the Web. However, the technologies underlying each of the different mashup types are heterogeneous, which makes integration challenging. Mashup development is not vendor independent. A mashup developed within a specific technology has to be re-coded in order to be deployed in another engine. OMELETTE aimed at developing an open platform for building convergent mashups for the telco domain.

Why it is an excellent example of EU China collaboration

OMELETTE promoted a global free market in telco services on the web which would not have been possible without the participation of a Chinese partner.

TABULA RASA <http://www.tabularasa-euproject.org/>

Summary of the work of the project

TABULA RASA Trusted Biometrics under Spoofing Attacks (Nov. 2010 – Apr 2014) addressed some of the issues of direct (spoofing) attacks on trusted biometric systems. This issue affects not only companies in the high security field but also emerging small and medium sized enterprises (SMEs) that wish to sell biometric technologies in emerging fields. Among other things the work of the TABULA RASA project addressed the need for a draft

set of standards to examine the problem, The first issue of a draft set of standards was addressed by analyzing the effectiveness of direct attacks on a range of biometrics to provide an insight as to how vulnerable the different biometric traits are to these attacks. The project had 3 Swiss partners including the coordinator, eight EU partners and one Chinese partner, the Chinese Academy of Sciences, which functions as China's national scientific think-tank as well as academic governing body, providing advisory and appraisal services on issues stemming from the national economy, social development, and science and technology progress.

Why it is an excellent example of EU China collaboration

The benefit of the involvement of the Chinese partner in TABULA RASA was that it supported a European standardisation initiative of key strategic interest to Europe.

Conclusions

Although a small sample has been taken, the examples of excellent EU China collaboration in EU funded ICT R&D projects and support actions presented in this brief report suggest that the underlying problem with reciprocity in EU-China ICT R&D collaboration is that it is perceived by some people in purely financial terms, in the sense of which side spends what on the participation in the projects it funds of partners from the other side.

With the exception of HELIUM, which gave its EU partners access to world leading expertise, the example projects and support actions promote European led standardisation initiatives and/or promote the development of open source tools of key interest to EU business. In this context, demands for financial reciprocity in research funding could be interpreted as complaints about a lack of EU participation in Chinese led standardisation initiatives and/or EU involvement in developing tools of key interest to Chinese business.

Considerable thought and care needs to go into determining what constitutes reciprocity in the totality of EU-China ICT collaboration. For example, it not clear whether European involvement in Chinese led standardisation initiatives is best achieved through conventional funded research projects and support actions given the different very organisation of standardisation activities in the EU and China.

Implications for the CHOICE project

Chinese involvement in FP7 projects is not considered an issue going-forward by the CHOICE Project. Indeed, CHOICE will actively promote Chinese participation in Horizon

2020 programmes, in particular, to build on the EU's track record of successful initiatives with China around standardisation and the provision of open source tools in FP7.

In the CHOICE project reciprocity in EU-China ICT R&D collaboration will be considered in terms of its benefits to Europe not in terms of financial matching. Nevertheless, a major focus of the work of CHOICE will be on promoting and supporting EU participation in Chinese funded ICT R&D programmes.

Appendix 2 CHOICE Internal report I-2 Chinese regional and local funding bodies for Scientific and Technical research

Document organisers: Dr T J Owens and Dr T Itagaki, Brunel University London

Date: 31 October 2014

Abstract: In this report it is shown that to understand the structure of the Chinese local government offices funding S&T research it is necessary to be aware of where they are located in the hierarchy of Chinese administrative divisions. The activities of a sample of Chinese local government offices funding S&T research are reviewed according to the type of administrative division to which they belong starting with the most important divisions and progressing down the hierarchy. Conclusions are presented followed by recommendations on how an EU organisation could explore the potential for collaborative ICT R&D&I with a Chinese regional or local funding body.

Rationale for the report: In recent years much has been made of the importance of Chinese municipal and provincial funding bodies for Science and Technology (S&T) research in the context of the total annual spend on publically funded S&T research in China. In this report the involvement of Chinese municipal and provincial government S&T offices in funding S&T research is reviewed in an attempt to assess how EU organisations could engage with these offices with a view to pursuing funding for collaborative ICT R&D&I with them.

Introduction

The starting point for the consideration of the importance of Chinese municipal and provincial funding bodies for S&T research in this report is a U.S.-China Economic and Security Review Commission report containing information current in January 2011¹⁰. It notes that municipal and provincial local government in China was spending 40-50% of all reported government spending on science and were working with national Chinese research organisations to establish new facilities for R&I within their jurisdictions in an attempt to meet the innovation needs of their local economies.

The scale of such spending is evident from the report which notes that¹: “The 909 Project, for example, saw the Shanghai government invest 10 billion Yuan to establish Huahong, which is now one of China’s most advanced chip manufacturers.” However, it also cautions: “Such local funding was typically spent on projects with short time horizons and minimal considerations for technological innovation.” Nevertheless, the scale of local ambitions can be considerable: “Jiangsu Provincial Government’s support for a ‘strategic innovation alliance’ in 2010 involved 61 enterprises, research institutes and universities conducting R&D on LED semiconductors”; Yangzhou in Jiangsu is a major center for the LED industry.

It is implied that driving much of this spend is the fact that the governments of technologically advanced localities such as Jiangsu, Shanghai and Beijing control various companies in high-tech areas. A bilateral collaborative activity by the Zhejiang Provincial Government is reported; the setting up in 2005 of, the Zhejiang-California International Nanosystems Institute for joint research and management skills transfer.

The only example of collaboration between Europe and a local government funding agency mentioned in the report is the establishment in 2002 of the non-profit Shanghai Integrated Circuit Research and Development Center with support from the Shanghai government where the researchers of the Center have opportunities to engage in international cooperation through Europe’s Interuniversity Microelectronics Center.

The report¹ notes that: “Local governments are tempted to support companies that bring jobs and prestige to their area” and do not necessarily buy into the long-term vision of the central government resulting in MoST criticizing local governments for not providing adequate investment in some centrally-sponsored longer-term innovation projects.

What is certainly clear is that many local governments in China have substantial financial resources and are incentivized by the national government to support research and

¹⁰ Micah Springut, Stephen Schlaikjer, and David Chen, China’s Program for Science and Technology Modernization: Implications for American Competitiveness, the U.S.-China Economic and Security Review Commission, 2011.

innovation¹¹: “As a result, local governments have crafted their own industrial policies to support the development of high-technology industries, and have become important partners with national level institutions in establishing new platforms for R&D, technology diffusion, standards development, and high technology industrialization.”

To understand the structure of the Chinese local government offices funding S&T research offices it is necessary to be aware of where they are located in the hierarchy of Chinese administrative divisions.

Chinese administrative divisions

Chinese provinces

A provincial level administrative division is the highest-level Chinese administrative division. These divisions include 22 provinces and 4 province level municipalities (= direct-controlled municipalities).

Province-level municipalities

China’s direct-controlled municipalities or municipalities are directly under the central government and are also known as province-level municipalities. This is the highest level classification for a city in China. Cities in this class have the same rank as provinces and form part of the first tier of administrative divisions of China. The current direct-controlled municipalities are those of Beijing, Shanghai, Tianjin, and Chongqing.¹¹

Prefectural level municipalities

The next class of cities below the province-level municipalities are known as prefectural level municipalities, they rank below a province and above a county in China's administrative structure. “Cities in this class are often not a "city" in the usual sense of the term (i.e. a large continuous urban settlement), but instead an administrative unit comprising, typically, a main central urban area (a city in the usual sense, usually with the same name as the prefectural level city), and its much larger surrounding rural area containing many smaller cities, towns and villages. The larger prefectural level cities span over 100 kilometres (62 miles).”¹²

Shijiazhuang and Zhengzhou are the largest prefectural level cities.

Sub-provincial divisions

A sub-provincial division in China is like a prefecture-level city that is governed by a province, but is administered independently in regard to economy and law.

¹¹ http://en.wikipedia.org/wiki/Direct-controlled_municipalities_of_China

¹² http://en.wikipedia.org/wiki/Prefecture-level_city

This report will now review the activities of a sample of Chinese local government offices funding S&T research according to the type of administrative division to which they belong starting with the most important divisions and progressing down the hierarchy. The review was carried out through web search and the use of google translate to translate the mostly Chinese language web sites of the offices reviewed into English. In the experience of the document organisers' google translate works well when translating Chinese into English but less well the other way.

Offices of province-level municipalities

The Science and Technology Commissions

Beijing Municipal Science & Technology Commission (BMSTC)¹³

BMSTC is the part of Beijing Municipal Government that is mainly responsible for formulating local S&T development programs, building Beijing's innovation architecture by means of policies and budgetary plans, improving its competitiveness and promoting coordinated economic and social development. The website of BMSTC states that being fully aware of the globalization of S&T activities BMSTC opens its arms to all government institutions, enterprises and NGOs worldwide that are seeking opportunities for S&T cooperation, and, together with its affiliates, provides a full range of support and services. However, its English language website appears not to have been updated since 2008.

More up to date information is on the English language version of the Beijing government which reports the responsibilities of BMSTC¹⁴ as including:

- Implement laws, regulations, strategies, policies and principles of the state concerning S&T endeavours; organize the drafting of strategies and policies to develop S&T to promote economic and social progress in the city; draft local regulations and rules concerning S&T development and facilitate their implementation.
- Formulate medium- and long- term and annual plans for S&T development in the city; identify priority areas; promote the establishment of mechanisms for S&T innovation and services.
- Set forth policy measures for basic research on applied sciences, high-tech development and research on applications of major S&T research findings. Design plans for major basic research projects on applied sciences, high-tech research and development, and give guidance on their implementation.

¹³ <http://www.bjkw.gov.cn/n244495/index.html>

¹⁴ <http://www.ebeijing.gov.cn/Government/Departments/t930030.htm>

- Lead the efforts to put high-tech R&D findings into industrial production; put into operation major projects on special S&T subjects or industries;
- Explore ways to increase S&T development funding through multiple channels; funding for S&T development and special S&T projects.
- Formulate policies to set up new-type R&D institutions; exercise qualification screening of R&D institutions; and guide the restructuring of research institutes.
- Regulate the technology market, protect S&T-related intellectual property rights in coordination with other competent departments; make annual plans to stage major events to propagate scientific knowledge.
- Handle the registration of sustainable development experimental zones in the city and support and give guidance to their construction and development.
- Formulate policies for S&T cooperation and exchanges and manage S&T exchanges and cooperation with other countries; coordinate technology import and export in cooperation with other departments concerned.

Shanghai Municipal Science and Technology Commission¹⁵

The Shanghai Municipal Science and Technology Commission is the part of the Shanghai Municipal Government that is responsible for the Municipality's work in S&T. Its major duties are: to implement the strategies, guidelines, policies and laws, rules and regulations of the State related to S&T; to draw up the drafts of rules, regulations and policies concerning the Municipality's S&T development; to determine the priority fields of S&T; To draw up long- and medium-term and annual plans for Shanghai's S&T development; to guide the Municipality's reforms of scientific research institutes. To develop project plans for basic, applied and developmental research in S&T and organize their implementation. To promote the industrialization of high and new technology; to guide the Municipality's work on technological markets; to formulate and implement the construction plans for the Municipality's key laboratories, scientific research centers, and engineering technology research centers; to optimize the allocation of S&T resources; to be responsible for the formulation of the budget and final accounting of related funds such as S&T funds; to implement the Municipality's training program for scientific and technological talents; to be responsible for the Municipality's work on foreign affairs and international cooperation related to S&T; attendance of international academic conferences and S&T cooperation, and to examine and approve foreign S&T personnel coming to Shanghai for S&T cooperation; to

¹⁵ <http://www.shanghai.gov.cn/shanghai/node17256/node17679/node17681/userobject22ai12991.html>

be responsible for the checking of technology-related exports and the protection of technological secrets.

Tianjin Municipal Science and Technology Commission¹⁶

Tianjin Municipal Science and Technology Commission inaugurated the China-US Center for Environmental Remediation and Sustainable Development. The IT industry is one of the four key cluster industries in Tianjin. The objectives of the R&D activities in the city are mainly to support the economic and social development in Tianjin. From 2006 to 2010, each year, there was 200 million Yuan from Tianjin Municipal Science and Technology Commission to fund the innovation projects in Tianjin.

Chongqing Municipal Science and Technology Commission

The Chongqing Municipal Science and Technology Commission appears to fulfil similar roles to the other direct-controlled municipalities S&T Commissions¹⁷. However, some of its usual roles as an S&T Commission may have been delegated to the Chongqing Academy of Science and Technology reviewed below:

Chongqing Academy of Science and Technology (CAST)¹⁸

Chongqing Academy of Science and Technology (CAST) is a public institution approved by the People's Government of Chongqing Municipality. CAST is an industrial & technical all-around institution for the integration of R&D, personnel training and international exchanges. CAST consists of nine (9) institutes and eight (8) centers. They include the Chongqing Institute of Industrial Automation and Instrumentation, the Chongqing High-Tech Incubation Center, the Chongqing Institute of Mechanical & Electrical Engineering, the Chongqing Center for Information and Automation Technologies, the Chongqing Center for Scientific & Technical Testing and Chongqing Center for Technology Evaluation & Transfer Services.

CAST is committed to the services of economical & social development of Chongqing Municipality, aiming at the frontier of the world's S&T and key technical problems as well as the technical bottleneck problems in the industrial development, while insisting on the concurrent developments of research & industrialization, and of innovations and services to emphasize the leading position of technology developments and outcome-transformations, mainly develop innovations of S&T. It undertakes the key projects of S&T; technical training, and international cooperation & exchanges.

¹⁶ <http://cohesion.rice.edu/NaturalSciences/ChinaUS/emplibary/ACF12E.pdf>

¹⁷ <http://english.cric.cn/news/cric/17784.html>

¹⁸ <http://www.cast.gov.cn/public/english/index.php>

The Associations for Science and Technology

It should be noted that each of the province-level municipalities as an association for science and technology:

- Beijing (city) association for science and technology¹⁹
- Shanghai (city) association for science and technology²⁰
- Tianjin (city) association for science and technology²¹
- Chongqing (city) association for science and technology²²

These associations promote academic exchanges within China. They are members of a national umbrella organisation:

China Association for Science and Technology (CAST)

CAST consists of national professional and academic societies focusing on various disciplines and fields in science and engineering. It liaises with its local affiliates through a network formed by the local associations of science and technology in various provinces, autonomous regions and municipalities down to the county level. As an organisation with a national focus the primary roles of CAST include apart from academic exchanges within China, promoting science publications, and popularising science. CAST and its affiliates now publish 892 journals so of which have journals have established cooperative links with their foreign counterparts.

An example of the work of such an association is that of the:

Suzhou Association for Science and Technology²³

The Suzhou (City) Association for Science and Technology (SZAST) is a non-governmental organization of S&T workers under the leadership of Communist Party of China, Suzhou Committee. SZAST is the bridge linking the Suzhou S&T community with the Communist Party of China, Suzhou Committee and Suzhou Municipal Government. SZAST is a constituent member of Suzhou People's Political Consultative Conference, where it joins in the affairs of political consultation, policy-making and democratic supervision.

¹⁹ <http://www.bast.net.cn/>

²⁰ <http://www.sast.gov.cn/>

²¹ <http://www.tast.org.cn/2011/3-4/15094193719.html>

²² <http://www.cqast.cn/>

²³ <http://www.szst.cn/ENGLISH/aboutus.htm>

The main purpose of SZAST includes making contributions to, the prosperity and development of S&T, non-governmental international exchange and cooperation, and to the overall economic and social development in Suzhou.

The main tasks of SZAST are as follows:

- To develop academic exchanges, enliven academic ideas, promote development of all scientific disciplines and encourage innovation; carry out technology development, technology transfer, provide a technology solving and technology service; undertake tasks of projects appraisal, achievements assessment, and evaluation of professional qualifications.
- To organize international S&T exchanges, promote international cooperation and develop friendly relations with overseas S&T organizations and scientists, promote development of an open economy and reunification of motherland.
- To develop continuing education and training programs

SZAST maintains cooperative relations with S&T organizations in many countries. In 2005, SZAST successfully organized 28th ICSU (International Council of Scientific Unions) General Assembly.

Offices of Provinces

We now consider a few examples of offices of provinces involved in funding S&T research.

The Science and Technology departments

Guangdong Science and Technology Department²⁴

The main aims of the Guangdong Science and Technology Department include:

- To carry out the national and provincial guidelines, policies, laws and regulations of S&T; to draft regional rules, provisions and regulations, policies and measures and to organize their implementation and supervision.
- To formulate provincial medium and long-term development plans and annual plans; to organize the implementation of S&T planning of provincial key basic research, applied research, and research and development; to take charge of the overall development and coordination of basic research, frontier technology research, important social technology research as well as key technology and generic technology research.
- Make suggestions for important adjustments in the implementation of key S&T projects.

²⁴ <http://www.gdstc.gov.cn/eng/mission.html>

- Promote the building of the provincial S&T innovation system. Jointly draft policies and measures to promote the knowledge innovation and technology innovation of the province.
- To jointly formulate policies on high and new technology and its industrialization with other related departments; to direct the construction of high and new technology development zones.
- To lead the formulation of policies related to the collaboration of industry, universities and research institutes.
- Join with other related departments in promoting the construction of the rural information highway project
- To formulate policies and layout for the S&T service industry.
- Take charge of the budgeting and final accounting of S&T funds and the supervision of the use of the funds; offer suggestions about important policies and measures for S&T investment and the optimization of S&T resource allocation.
- Formulate policies and measures for S&T cooperation and exchange; to organize and implement the inter-governmental S&T cooperation programs and cooperation programs with international organizations.

Sichuan Provincial Department of Science and Technology²⁵

The Sichuan Provincial Department of Science and Technology is responsible for the implementation and administration of research subjects of National Scientific and Technical Supporting Programs delegated by the Ministry of Science and Technology and for promoting the construction of the innovation system for Sichuan Province. Its main functions include:

- Implementing state policies and laws and regulations in relation to S&T development; drawing up local policies, draft regulations as well as policies and measures in relation to S&T development for Sichuan Province;
- Taking the lead in drawing up and implementing the S&T development plans for Sichuan Province; putting forward the layout of the S&T development and the priority fields of Sichuan Province; taking charge of the drafting and implementation of the S&T Supporting Program, Basic Research Program, and Soft Science Program; taking charge of the overall coordination of basic research, frontier technology research, key technologies and common technology.

²⁵ <http://www.sc.gov.cn/10462/10758/10759/10763/2010/10/28/10147629.shtml>

- To make proposals for significant adjustments in the implementation of major S&T special projects.
- To draw up planning, policies and measures for high-tech industries and high-tech industrial zones with other departments concerned; to provide guidance on the construction of high-tech industrial zones and bases; to promote the construction of enterprises' capacity for independent innovation.
- To organize the formulation of policies and measures on taking advantage of S&T to promote rural and social development; to provide guidance to the construction of technology park and experimental zones for sustainable development.
- To accelerate S&T institutional reform; to put forward policies and measures in relation to the above as well as proposals on the establishment or adjustment of related scientific research institutions; to optimize the layout of scientific research institutions.
- To provide guidance on transforming S&T achievements into production.
- Taking charge of S&T communication and cooperation with other countries; organizing and implementing international scientific and technological cooperation plans; undertaking matters in relation to S&T aid.

Jiangsu Science and Technology Department²⁶

The major functions of the Jiangsu Science and Technology Department include:

- Implementing the guidelines, policies and regulations of the State related to the work of S&T; to study the key problems related to the S&T development and economic and social development driven by S&T; to study and determine the layout of this municipality's S&T development and the fields of S&T that enjoy priority of development; to promote the construction of the S&T innovation system, and the upgrade S&T innovation capability of the province.
- Organizing the drawing up of the long-and-medium-term planning and annual plans for the province's S&T development.
- Studying and putting forward policies and measures for the province's system reform of S&T; to promote the establishment of systems and mechanisms of S&T innovation that adapt themselves to the socialist market economy; to be responsible for the guidance of the province's work of system reform of S&T.

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http://www.js.gov.cn/JSGOVEN08/08jsgov_GovernmentStructure/ProvincialGovernmentDepartments/200805/t20080526_214363.html

- Responsibility for the formulation of the budget and final account of related funds such as scientific undertaking funds, different kinds of provincial-level scientific and technological funds, and foreign affairs expenses of S&T.
- Studying and working out policies and measures for strengthening basic research and high and new technology; drawing up and organizing for implementation of basic research, hi-tech research, key technology breakthroughs, soft science research, and S&T plans for social development.
- Intensifying the industrialization of high and new technology and the development and expansion of applied technology; organizing major S&T innovation projects, such as the Torch High and New Technological Riverside Industrial Zone and Spark Industrial Development Zone in the northern part of Jiangsu; to administer the major new production of provincial high and new technology; to be responsible for the drawing up of S&T development plans of the Torch Program, Spark Program, and the plans of achievements expansion and organize for implementation; to administer the High and New Technological Development Zones in the province.
- Directing the construction plans for the province's technological infrastructure, such as key laboratories, secondary trial base, and scientific research centers.
- Studying and drawing up the province's plans for foreign affairs and international cooperation related to S&T and organize implementation; according to authorization of provincial government, to undertake foreign exchanges related to S&T.
- Studying and putting forward suggestions to make local S&T regulations; to put under centralized administration the province's S&T achievements, S&T awards, technological markets and the protection of intellectual property rights of related S&T; to promote the development of social agencies, such as S&T consultation, bid invitation and evaluation; to promote the construction of the S&T service system.
- Responsible for the setting up and readjustment of scientific research institutions; directing the province's privately-run scientific and technological work.
- Administering the Jiangsu Intellectual Property Bureau, and direct the related work of S&T of the units of the central government stationed in Jiangsu.

Department of Science and Technology of Zhejiang Province²⁷

The main aims of the Department of Science and Technology of Zhejiang Province include:

²⁷ http://english.zj.gov.cn/art/2012/6/11/art_1149_165599.html

- To map out the medium to long-term S&T development and draft guidelines and policies on S&T in Zhejiang Province; and to draft relevant local laws, regulations and draft regulations and organize their implementation after approval.
- To make overall plans for basic and applied research; facilitate the process of industrialization; take the lead in organizing and carrying out major S&T projects; supervise the Provincial Natural Science Foundation; build an investment and financing system for S&T.
- To formulate policies for the reform of the S&T system and S&T innovation in Zhejiang Province; to take charge of the restructuring of S&T institutes in Zhejiang Province and the establishment and restructuring of relevant research institutes; supervise intermediary science and technology organizations, nongovernmental science and technology institutions and societies.
- To formulate plans for the development of R&D organizations affiliated with enterprises, key laboratories, science and technology incubators and local service centers for S&T innovation; and to implement these plans and manage the development of these institutions.
- To formulate policies and introduce measures for the industrial application of high and new technologies; approve and supervise the construction of S&T parks such as high and new tech development zones and high-tech industrial bases; It important to note that the Economy and Informatization Commission of Zhejiang Province²⁸ supervises the bidding for industrial technological innovation projects and undertakes work in industrial parks and information technology parks in accordance with the division of responsibilities, and promotes the development of industrial parks, agglomeration economy and industrial clusters, and develops regional brands.

As an aside it is noted that there is a Zhejiang Provincial Government Scholarship for Foreign Students (ZGSFS) fund established by the Zhejiang Provincial Government that aims to attract and encourage excellent foreign students to study in Zhejiang.²⁹

Offices of Prefectural level municipalities

We will now consider a few examples of offices of prefectural level municipalities that are sub-provincial divisions which are involved in funding S&T research.

The Science and Technology Bureaus

²⁸ http://english.zj.gov.cn/art/2012/6/11/art_1149_165597.html

²⁹ http://scholarship.cucas.edu.cn/HomePage/content/content_29.shtml

Suzhou Science & Technology Bureau³⁰

In 2013 the Suzhou Science & Technology Bureau announced that Suzhou Municipality (Jiangsu Province), Suzhou Industrial Park, and Suzhou New District were among the first 15 areas authorized as provincial models in technology financial cooperation and innovation.

These areas fall into two categories of innovation-based cities and provincial or national hi-tech parks, featuring integrated resources of technologies, research, and R&D SMEs, active start-up venture capital, a good financial ecosystem, and a complete network of financial institutions and services.

Local policy-makers plan to improve these model areas in the next three years to meet the needs of local growth so as to create an initial mechanism in 2015 for effective interactions between technological innovations and financial innovations as well as efficient connection of the resources in the two sectors.

Wenzhou Municipal Sci-Tech Bureau³¹

The mission of the Wenzhou³² Municipal Sci-Tech Bureau includes:

- Implementing the laws, regulations and policies for S&T of the Party, the state and Zhejiang Province; to formulate and implement the policies and measures for the administration of S&T and the protection of IPRs; to organize the formulation of the city's medium- and long-term development plans for S&T; to organize the formulation and implementation of the long- and short-term plans of new- and high-tech industries and their zones; to direct and manage, in cooperation with related departments, the use of funds for sci-tech risk investment, such as those for technology innovation of municipal S&T-intensive SMEs.
- To direct and supervise the system reform of the city's scientific research institutes; to guide the work of technological markets, sci-tech intermediaries.
- To organize applications for establishing projects concerning constructing provincial key labs, new- and high-tech R&D centers, distinctive new- and high-tech industry bases; to guide and supervise new- and high-tech industry zones.
- To coordinate and administer the city's work of protection of IPRs focused on patents; to take charge of the city's patent law enforcement and patent technology implementation and popularization; to offer professional guidance to patent intermediaries.

³⁰ http://www.suzhou.gov.cn/zgszeng/news/suzhou8focus/201301/t20130104_190154.shtml

³¹ <http://english.wzsj.gov.cn/>

³² Zhejiang Province

- To take charge of the centralized administration of all the Wenzhou's foreign affairs in S&T; to formulate and implement the plans of sci-tech exchanges and cooperation; to coordinate the city's sci-tech exchanges and cooperation with foreign relations.
- To take charge of the formulation and to organize the implementation of the city's medium- and long-term planning for protection against and mitigation of earthquake disasters; to guide the city's work of earthquake monitoring and prediction, protection against and mitigation of earthquake disasters, to administer the whole city's digital seismic precursor networks and seismic safety evaluation; to examine and approve the standards for earthquake protection of major construction projects.

Zhengzhou City Municipal Science and Technology Bureau³³

The office functions of the Zhengzhou³⁴ City Municipal Science and Technology Bureau include³⁵:

- Implementing the national S&T work policies, laws and regulations; elaboration of the city's technological development and the promotion of economic and social development policies, measures and draft legislation, together with relevant departments to promote the city's science and technology innovation system
- Responsibility for preparing the city's long-term S&T development plans and annual plans; major issues the city's S&T research to promote economic and social development; research to determine the city's S&T development and priority areas.
- Responsibility for the management and use of the city's S&T R&D funds, special funds and Technology Science and Technology Development Fund.
- Responsibility for developing the city's technological innovation projects and social development plans.
- Responsibility for the city's foreign S&T cooperation and exchanges work.

Other examples of such offices are:

Science and Technology Bureau of Dongguan Municipality³⁶ in Guangdong Province

Shijiazhuang Bureau of Science and Technology³⁷ (Hebei Province)

³³ <http://www.zznet.com.cn/viewpage?path=/index.html>

³⁴ Henan Province

³⁵ <http://www.zznet.com.cn/viewCmsCac.do?cacId=402881f923c57ca70123c705c36c003c>

³⁶ http://www.fortune.net.cn/en_asp/news_show.asp?typeid=18&id=50

³⁷ <http://www.heblaser.com/en/kykf.asp>

Yunfu Yuncheng Science and Technology Bureau³⁸

Offices of sub-provincial divisions

We will now consider a few examples of offices of sub-provincial divisions involved in funding S&T research.

The Bureaus

Bureau of Science and Information Technology of Guangzhou Municipality³⁹

Guangzhou⁴⁰ Municipal Government appears to be distinctive in having a Bureau of Science and Information Technology rather than a Bureau of Science and Technology. Furthermore, the main responsibilities of the Guangzhou Bureau appear to be exceptionally relevant to the work of the CHOICE project. In particular they include: Promoting the ‘Integration of Three Networks’, namely, the telecommunications network, the Internet and the broadcast network; Deploying and managing radio spectrum resources; and organizing inter-governmental and international cooperation projects in science and information technology.

Xi’an Science Technology Bureau⁴¹

Xi’an⁴² Municipal Government seems to be as mature as that of Guangzhou in terms of its approach to Science and Technology and although it does not have Guangzhou’s focus on ICT it does have very interesting policy on IPR. Significantly, the main responsibilities of the Xi’an Science Technology Bureau include:

- Organizing the protection work regarding intellectual property, enhancing the construction of intellectual property protection system; and arranging to coordinate matters on international intellectual property rights of Xi’an;
- Mediating patent disputes according to laws and regulations, and investigating and treating with the counterfeiting of patents; taking charge of the management of approval and registration of patent license contracts; directing the business work of patent service agents, and taking charge of the construction of patent information publicity service system of Xi’an.

Given that the responsibilities of the bureau also include:

³⁸ <https://plus.google.com/116524312501761441360/about>

³⁹ <http://www.gz.gov.cn/publicfiles/business/htmlfiles/gzgooven/s3709/201104/787535.html>

⁴⁰ Guangdong Province

⁴¹ http://www.xa.gov.cn/ptl/def/def/index_1121_3316_ci_trid_160997.html

⁴² Shaanxi Province

- Taking charge of the scientific and technological cooperation and exchange of Xi'an;
- Directing the commercialization of research findings;
- Research major technical issues on social development, and directing the S&T on aspects of social development and social public welfare regarding population resources, medicine and health, ecological environment, etc.

It is gratifying to note that on May 8th, 2014, the China Science and Technology Exchange Center (CSTEC) held a Horizon 2020 Infoday in Xi'an, which attracted over 130 participants from local research centers, universities and enterprises participated in.⁴³

That CSTEC organised this event is important because it is affiliated to the Ministry of Science and Technology has expertise in international S&T exchanges and plays a significant role in the reform and opening-up of China, as well as the construction of the socialist economy.

Wuhan Municipal Science and Technology Bureau

Wuhan⁴⁴ presents itself as an “intelligent city”⁴⁵, identified as a national “intelligent city” pilot by the Ministry of Science and Technology. In 2012, the Wuhan Municipal Science and Technology Bureau made an offering of 10 million Yuan for domestic public to tender the “intelligent city” master plan project. In 2013, “The Intelligent Wuhan City Overall Plan” has been formed, and was expected to start to pay off within 3-5 years. It was claimed that Wuhan will be the fastest growing Chinese city in term of Internet speed. Currently, the average 2 mbps household bandwidth will be increased to 50-100 Mbps through the optical fiber plan. For understandable reasons this pilot appears to be the main focus of the Wuhan Municipal Science and Technology Bureau.

Dalian Bureau of Science and Technology⁴⁶

The Dalian⁴⁷ Bureau of Science and Technology appears to have a very similar remit to those of the provincial S&T departments. It does however include: to centrally administer computer development and application of the city and be responsible for the application and promotion of computer technology. Although it has the usually local responsibilities for international S&T matters this does not seem to be a major focus of its work.

⁴³ <http://www.dragon-star.eu/cstec-held-horizon-2020-infoday-in-xian/>

⁴⁴ Zhejiang Province

⁴⁵ <http://www.chinaabout.net/intelligent-wu-han-fiber-plan-increase-the-overall-internet-speed-to-100-mbps-in-next-3-5-years/>

⁴⁶ <http://www.dalian-info.com/news/other/page/kjjznen.html>

⁴⁷ Liaoning Province

Hangzhou Municipal Science & Technology Bureau⁴⁸

Hangzhou⁴⁹ Municipal Science & Technology Bureau also appears to have a very similar remit to those of the provincial S&T departments. It does however include: “Take charge of the earthquake, quakeproof and calamity relief work in the whole city. Undertake the daily work of the administration office of Quakeproof and Calamity relief Leadership Group.”

Significantly for the work of the CHOICE project it has a responsibility for IPR: “Manage and coordinate the intellectual property and patent protection work in the whole city, take charge of law execution and supervision related to the intellectual property and patent, solve relevant disputes according to laws.”

Although the responsibilities of the Hangzhou Municipal Science & Technology Bureau do not emphasise international cooperation Hangzhou hosts The Singapore-Hangzhou Science & Technology Park which was jointly developed by Asia’s leading IT Park brand Ascendas and markets itself as ‘The Haven for IT’.⁵⁰

Qingdao Science and Technology Bureau

As of May 2014 according to the city's science and technology bureau authorities in Qingdao⁵¹, expect S&T to play a more important role in driving local growth.⁵²

Significantly for the work of the CHOICE project the city has been actively engaged in facilitation of intellectual property rights protection¹⁴⁹:

“In 2013, police across the city cracked 109 cases of IPR violations, with 144 criminals arrested. The combined value of relative intellectual property was worth 492 million Yuan.

An increasing number of IPR-related training workshops are being conducted in the city.

Last year, a total of 7.5 billion Yuan was loaned to 68 enterprises as intellectual mortgages by Qingdao-based financial institutions.

The city has also been encouraging the legal trading of intellectual properties and facilitating the development of IPR agencies.

Bureau officials said the government is also improving its service to create a better business environment for high-tech companies.

⁴⁸ <http://eng.hangzhou.gov.cn/main/zpd/English/org/gov/T306906.shtml>

⁴⁹ Zhejiang Province

⁵⁰ <http://www.shstp.com/en/index.asp>

⁵¹ Shandong Province

⁵² http://qingdao.chinadaily.com.cn/2014-05/18/content_17548005.htm

Efforts include helping enterprises recruit and train talented professionals and enhancing intellectual property rights protection.”

While the local government has been trying to improve the city's innovative strength by facilitating the transfer of new technologies for commercial use by guiding more funds into R&D and public services the focus understandably is on supporting local industry. However, its efforts in the area of IPR protection emphasise the importance of local enforcement and will create a better environment of EU ICT businesses within to operate in Qingdao.

Shenzhen Municipal Bureau of Science, Technology and Information⁵³

The Shenzhen⁵⁴ Municipal Bureau of Science, Technology and Information (Guangdong Province), directs the development of S&T as well as information projects. It provides services jointly with the Shenzhen Association of Science and Technology (SAST).

Its major responsibilities include:

- Directing professional training in science, technology and information economy;
- Formulating and implementing plans for international exchanges and cooperation in S&T and the information economy;
- Conducting centralized management of the outcomes in science, technology and information programs.

Conclusions

Generally, the responsibilities of the S&T Commissions of direct-controlled municipalities include:

- Designing plans for major basic research projects on applied sciences, high-tech research and development, and giving guidance on their implementation.
- They are expected to lead the efforts to put high-tech R&D findings into industrial production and put into operation major projects on special S&T subjects or industries.
- Regulating the technology market and protecting S&T-related intellectual property rights in coordination with other competent departments.

⁵³ http://www.sznews.com/english/content/2006-03/29/content_68736.htm

⁵⁴ Guangdong Province

- Handling the registration of sustainable development experimental zones and supporting and give guidance to their construction and development.
- Formulating policies to set up new-type R&D institutions and guiding the restructuring of research institutes.
- Formulating policies for S&T cooperation and exchanges and managing S&T exchanges and cooperation with other countries.

However, in the case of the Chongqing Commission the integration of R&D, personnel training and international exchanges appear to have been delegated to the Chongqing Academy of Science and Technology.

Chinese provinces have S&T departments with broadly similar remits.

Generally, the responsibilities of the S&T departments of China's provinces include:

- Drafting regional rules, provisions and regulations, policies and measures, for S&T;
- Organizing the implementation of S&T planning of provincial key basic research, applied research, and research and development;
- Taking charge of the overall development and coordination of basic research, frontier technology research, important social technology research as well as key technology and generic technology research;
- Building of the provincial S&T innovation system;
- Formulating policies and measures for S&T cooperation and exchange; organizing and implementing the inter-governmental S&T cooperation programs and cooperation programs with international organizations.

However, the Department of Science and Technology of Zhejiang Province appears to delegate and limit its international cooperation and exchanges to a Zhejiang Provincial Government Scholarship for Foreign Students (ZGSFS) fund established by the Zhejiang Provincial Government.

The prefectural municipalities have S&T bureaus with broadly similar remits.

Generally, the responsibilities of the S&T bureaus of China's prefectural level municipalities include:

- Formulating and implementing plans for international exchanges and cooperation in S&T and the information economy;
- Municipal S&T R&D expenditure.

However, the Suzhou S&T Bureau appears to leave non-governmental international exchange and cooperation to the Suzhou Association for Science and Technology

Sub-provincial divisions' S&T offices are particularly interesting in that their S&T offices appear to be highly distinctive.

- Guangzhou Municipal Government appears to be distinctive in having a Bureau of Science and Information Technology rather than a Bureau of Science and Technology. The main responsibilities of the Guangzhou Bureau appear to be exceptionally relevant to the work of the CHOICE project. In particular they include: Promoting the 'Integration of Three Networks', namely, the telecommunications network, the Internet and the broadcast network; Deploying and managing radio spectrum resources; and organizing inter-governmental and international cooperation projects in science and information technology.
- Xi'an's Municipal Government has a very interesting policy on IPR. It is gratifying to note that on May 8th, 2014, the China Science and Technology Exchange Center (CSTEC) held a Horizon 2020 Infoday in Xi'an.
- In 2012, the Wuhan Municipal Science and Technology Bureau made an offering of 10 million Yuan for domestic public to tender the "intelligent city" master plan project. In 2013, "The Intelligent Wuhan City Overall Plan" has been formed, and was expected to start to pay off within 3-5 years. It was claimed that Wuhan will be the fastest growing Chinese city in term of Internet speed.
- The Dalian Bureau of Science and Technology centrally administers the computer development and application of the city and is responsible for the application and promotion of computer technology.
- Although the responsibilities of the Hangzhou Municipal Science & Technology Bureau do not emphasise international cooperation Hangzhou hosts The Singapore-Hangzhou Science & Technology Park which markets itself as 'The Haven for IT'.
- Qingdao Science and Technology Bureau is actively engaged in intellectual property rights protection.
- The Shenzhen Municipal Bureau of Science, Technology and Information (Guangdong Province) formulates and implements plans for international exchanges and cooperation in S&T and crucially for the CHOICE project the information economy.
- Wenzhou Municipal Sci-Tech Bureau administers the whole city's digital seismic precursor networks and seismic safety evaluation and examines and approves the standards for earthquake protection of major construction projects.

Recommendations

For an EU organisation to engage effectively with a Chinese municipal and provincial government S&T office it is highly advisable to do so through a Chinese speaking member of staff, indeed in most cases it is essential.

To explore the potential for collaborative ICT R&D&I with Europe with a direct-controlled municipality its S&T Commission should be approached in the first instance.

To explore the potential for collaborative ICT R&D&I with Europe with a Chinese province its S&T department should be approached in the first instance.

To explore the potential for collaborative ICT R&D&I with Europe with a Chinese prefectural level municipality its S&T bureau should be approached in the first instance.

- As Wenzhou Municipal Sci-Tech Bureau administers the whole city's digital seismic precursor networks and seismic safety evaluation it would be potentially be an interesting partner for an EU City that needs to do seismic monitoring.

Targeting sub-provincial divisions' S&T offices for focused partnership opportunities in ICT R&D&I with EU partners is particularly promising, as has been highlighted in this report through examples of specific sub-provincial divisions' S&T offices highly focussed on specific areas of ICT R&D&I.

- The potential of the Xi'an Science Technology Bureau and the Qingdao Science and Technology Bureau as partners for exploring good practice in IPR protection and enforcement in China is significant.

Appendix 3 CHOICE Internal report I-3 EU member state cooperation with China in ICT R&D&I: Bilateral cooperation in ICT R&D&I

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Abstract: In this report EU member states bilateral programmes of cooperation with China in ICT R&D are reviewed. Conclusions are presented followed by recommendations targeted at organisations in EU member states interested in exploring the potential for bilateral collaborative ICT R&D with Chinese organisations.

Rationale for this report: Many EU member states have substantial bilateral programmes of cooperation with China in ICT R&D. In this report many of these are reviewed in order to determine the types of activities encompassed by bilateral cooperation with a view to promoting bilateral cooperation as a way of encouraging a more balanced relationship in collaborative ICT R&D with China based on reciprocity.

Disclaimer: The views presented in this report reflect those of the document organizers and do not necessarily represent the views of the European Commission.

Introduction

On the EU side, a 2012 report of the Delegation of the European Union to China [1] identifies ICT as a priority area for cooperation with China for the following member states: Austria, Denmark, Finland, France, Germany, Lithuania, Slovenia, Spain, Sweden, and the United Kingdom. Significantly this report notes that at their 14th Summit in February 2012 the EU and China broadened their exchange in Science and Technology to innovation (I). The report [1] summarises information received from a majority of member states embassies on bilateral agreements, priorities, joint institutes/laboratories, innovation related activities, and mechanisms for cooperation. It addresses generic S&T people to people and innovation dialogues, and mobility and scholarship programmes, in detail and readers interested in these are referred directly to [1].

On the Chinese side⁵⁵, “The International S&T Cooperation Programme (ISTCP) was launched by the Ministry of Science and Technology of the People’s Republic of China (MoST) in 2001. There are two sub-schemes under the ISTCP: The Special funds programme and Bilateral S&T cooperation programme between governments. ISTCP integrates resources for international cooperation under major national S&T programmes such as ‘863’ and ‘973’.”

Special funds programme

“Special funds programme serves as an umbrella scheme to 863 Programme, 973 Programme and other major national S&T programmes. Consequently, Special funds programme features the same topics called by 863 Programme, 973 Programme and other major national S&T programmes.”

“Activities/projects supported under the 2011 programme guidelines include:

Inter-governmental science and technology cooperation projects based on bilateral or multilateral agreements (not EU), promoting China's science and technology, economic and social development;

High-level international cooperation projects catering to the needs of national economic and social development and national security, in line with the policy objectives of the country's external scientific and technological cooperation, aiming to solve major scientific issues restricting China's economic and technological development;

International cooperation projects with first-class foreign research institutions universities and enterprises to carry out cooperation in research and development, attracting outstanding

⁵⁵ <http://www.973.gov.cn/English/AreaCoop.aspx>

overseas talents and teams to work in China, promoting China's international scientific and technological cooperation base construction, and strengthening China's capacity of indigenous innovation.”

For the Special funds programme the current programme information is available in Chinese⁵⁶.

Bilateral S&T cooperation programme

“Bilateral S&T cooperation programme between governments publishes calls for proposals concentrating on certain countries/regions.”

From [12]: “Bilateral cooperation is cooperation in which through parallel support arrangements each nation is committed to funding R&D performed by the joint venture partner company from its own country in accordance with its own respective laws and regulations and based on its own decisions.”

All current funding opportunities available under this scheme are listed in the Chinese language⁵⁷ for Sino-Germany S&T Cooperation Projects, Sino-France S&T Cooperation Projects, Sino-UK S&T Cooperation Projects, Sino-Italy S&T Cooperation Projects and Sino-Denmark S&T Cooperation Projects. Each cooperating country has their own mechanism for parallel funding under this scheme for their nationals, for example, in the case of the UK⁵⁸ this is handled by Research Councils UK (RCUK).

Currently China only engages in projects under the in Bilateral S&T cooperation programme with Germany, France, The United Kingdom, Italy, and Denmark. Member state participation in projects in this programme is dependent on that involvement being funded by the member state concerned.

NSFC international activities

The National Natural Science Foundation of China (NSFC) is an institution aimed at promoting and financing basic research and applied research in China which is directly affiliated to the State Council for the management of the National Natural Science Fund.

The NSFC web page on its international activities⁵⁹ gives country by country information on its cooperation with national scientific organisations with links to the web sites of the national

⁵⁶ <http://www.istcp.org.cn/index.html>

⁵⁷ http://www.most.gov.cn/tztg/201109/t20110905_89483.htm

⁵⁸ <http://www.rcuk.ac.uk/international/funding/collaboration/>

⁵⁹ <http://www.nsf.gov.cn/publish/portal1/tab159/info24587.htm>

organisations they cooperate with. While all these web sites are in the national languages several have links to English language versions.

The bilateral ICT R&D&I cooperation with China will now be reviewed on a member state by member state basis for those member states that engage in it. The review was carried out through web search, it updates and expands the information on ICT R&D&I cooperation provided in [1]. Where applicable the extent of member states involvement in ICT R&D cooperation with China in FP7 projects is summarised so to establish the importance of their bilateral cooperation compared to their cooperation in FP7. In the following member states are addressed in alphabetical order.

Member state cooperation with China in ICT R&D&I

Austria

The priority areas of the bi-lateral cooperation between the Federal Ministry of Transport, Innovation and Technology (BMVIT) of the Republic of Austria and Chinese partner authorities include “Green Technology”.

A Memoranda of Understanding was signed between AustriaTech - Federal Agency for Technological Measures Ltd. and Chinese City People’s Government on cooperation in the ICT related field of “Low-Carbon-City” planning. In 2012 there were two bilateral agreements with the People’s Government of the City of Nanchang (the capital of Jiangxi Province, a prefecture-level city) and the Huangqiao (district’s) People’s Government of the City of Taixing (a county-level city in Jiangxi Province).

There was extensive cooperation between Austria and China through FP6 and FP7 projects. In FP6: Austria was involved in networking and cooperation with Chinese partners and other EU partners in 53 projects with 76 Austrian and 87 Chinese participations. In FP7 by March 2012 Austrian involvement in networking and cooperation with Chinese partners comprised 27 projects with 43 Austrian and 35 Chinese participations.

The Austrian Science Fund (FWF)⁶⁰ web site provides links to the China Scholarship Council CSC-FWF Scholarship Programme that is aimed at incoming Chinese PhD students, the FWF bilateral agreement with the NSFC, and Joint Projects to support bilateral research projects with closely integrated content, however there are no current calls for Joint Projects with the NSFC.

⁶⁰ <http://www.fwf.ac.at/en/>

Austria hosts The International Institute for Applied Systems Analysis (IIASA)⁶¹: “Founded in 1972, the IIASA conducts policy-oriented research into problems of a global nature that are too large or too complex to be solved by a single country or academic discipline. IIASA is sponsored by its National Member Organizations in Africa, Asia, Europe, Oceania and the Americas. Its research is independent and completely unconstrained by political or national self-interest.” The NSFC is China’s National Member Organization.

Belgium

Belgium has a decentralised approach to scientific co-operation with China that reflects the governance of the country and for Flanders and the French speaking community microelectronics is a priority area of cooperation which has resulted in one joint institute, the IMEC/Zhangjiang Hi-tech Park/Huali on nanoelectronics.

The Ministry of Science and Technology of the People’s Republic of China (MoST) cooperates with FWO ((Research Foundation – Flanders) and WBI (Wallonie-Bruxelles International) on research projects in microelectronics; researchers of professorial rank are eligible project funding.

The Chinese Scholarship Council (CSC) has agreements with WBI that aim at promoting and encouraging cooperation in research and higher education between university level institutions with ICT and nanoelectronics being priority areas.

FWO has an incoming mobility programme for postdocs called Pegasus.

"Platform for Innovation China-Wallonia" promotes Wallonia technological innovations in China through technology transfer partnerships as a public service.

Czech Republic

On the website of the Czech Academy of Sciences of the Czech Republic⁶² it is easy to verify that no cooperation activities with China are reported around ICT.

Denmark

⁶¹ http://www.iiasa.ac.at/web/home/about/whatisiiasa/what_is_iiasa.html

⁶² <http://www.cas.cz/index.html>

In September 2007 a Memorandum of Understanding (MoU) was signed between the Danish Ministry for Science, Technology and Innovation (MSTI) and the Ministry of Science and Technology of the People's Republic of China (MoST) on scientific and technological cooperation. ICT is a priority area as is the related area of nanoscience and technology.

In September 2007, the Danish Ministry for Science, Technology and Innovation and the Danish Ministry for Foreign Affairs opened Innovation Center Denmark⁶³ in Shanghai. Its mission is to promote Denmark as a knowledge society and facilitate cooperation between Denmark and China within R&D and innovation. It was provided with limited funding to support network activities; Denmark's first research attaché in China was stationed at Innovation Centre Denmark ([2]). The Centre offers a wide selection of services to Danish researchers and companies looking to innovate and grow in China. Through its services and initiatives it seeks to ensure a Danish business is provided with the best possible solutions if it is looking to grow in China. It works in various sectors but claims to be especially strong within ICT, Cleantech and Life Sciences

In February 2008, the Danish Ministry for Science, Technology and Innovation published a strategy for knowledge-based collaboration between Denmark and China [2]. The implementation of this strategy focusses on education and research fields where Denmark and China hold a powerful position or have a strong potential, and ICT is identified as one such field. Within this framework it is up to individual researchers and knowledge institutions in Denmark to identify relevant collaboration partners supporting the principle of researcher driven collaboration. It notable that the strategy states [2]: "Denmark is only really interesting for China when Danish knowledge institutions and innovative businesses are present with an adequate critical mass of visible competencies that are in demand in China." Furthermore, careful consideration needs to be given to the observation that [2]: "in collaborating with China it is important to ensure that the Danish effort is firmly anchored in the political system."

In collaboration with the National Natural Science Foundation of China (NSFC), the Danish National Research Foundation (DNRF) established a joint program that funds Danish-Chinese research centers⁶⁴. This programme began in 2005 and, since 2008, has given rise to 10 Danish-Chinese research centers; under the program the DNRF offers 10-15 mil. DKK to a Danish research center over a period of three years and their Chinese counterparts are supported by the NSFC. It is possible for Centers' funding to be extended into a second funding period. The DNRF expects to spend up to 140 mil. DKK on the programme.

⁶³ <http://kina.um.dk/en/about-us/danish-representations-in-china/innovation-center-shanghai/>

⁶⁴ <http://dg.dk/en/internationalization/danish-chinese-research-centers/>

The DNRF provides a list of current Danish-Chinese research centres⁶⁵. Of these three are essentially ICT focussed:

- The Danish-Chinese Center for the Theory of Interactive Computation, partners: Aarhus University and ITCS, Tsinghua University, funded 2011-14.
- The Danish-Chinese Center for IDEA4CPS: Foundations for Cyber-Physical Systems, partners Aalborg University and East China Normal University, funded 2011-14.
- Danish-Chinese Center for Applications of Algebraic Geometry in Coding Theory and Cryptography, partners DTU Mathematics and East China Normal University, funded 2011-14.

Finland

An important basis for S&T Finland-China cooperation is the Science and Technology Cooperation Agreement between the two countries. Cooperation under this agreement is administered by the Ministry of Employment and the Economy of Finland (MEE) and Ministry of Science and Technology of the People's Republic of China (MoST). In 2011 a Memorandum of Understanding on Nanotechnology cooperation was signed.

As of March 2012 there was one Finland-China joint initiative the China-Finland ICT Alliance between Tivit Ltd. and Shanghai Research Center for Wireless Communications (WICO).

In Finland the main framework for bilateral cooperation in ICT is the China-Finland ICT Alliance. This initiative was originally set up to meet the cooperation needs of ICT-focused Finnish research institutes and companies. However, going forward for the alliance to align with Finland's national strategy for cooperation in R&D&I with China its focus has been broadened beyond traditional ICT to multilevel and multi-linked applications supported by ICT in those areas where Finland has globally recognised capabilities. Consequently, [3]: "The main objective of the China-Finland ICT Alliance is to advance an efficient and business-oriented cooperation between China and Finland in ICT and ICT enabled applications and services in society and industry."

Recent Finnish government initiatives such as [4] have been directed towards enabling a move towards ICT enabled applications and services.

Cooperation through the China-Finland ICT Alliance commenced in the following mutually agreed thematic areas [3]: Future Wireless (Connection), Future Wireless Networking and

⁶⁵ <http://dg.dk/en/internationalization/danish-chinese-research-centers/list-of-research-centers/>

Core Network, and Future (Ubiquitous) Services. As of September 2012 there had been no joint Finland-China calls for research funding in these areas under this framework. Related research funding decisions were being made separately by MoST on the Chinese side and by Tekes on the Finnish side. First stage projects have produced a number of joint publications and standards proposals. Going forward the most important feature of this work is that it has established cooperation and exchanges that can be exploited when seeking to extend the joint work to new themes involving considerable industry and business oriented elements. To appreciate the significance of this it is important to note that on the Finnish side the cooperation to date has essentially been university led. Even though within the EU it is widely recognised that Finnish industry and academia are very well connected, within Finland it is acknowledged by policy makers that a systematic approach is needed to develop ICT R&D cooperation with China into large scale business relationships [3].

The following lessons learned through the work of the China-Finland ICT Alliance have been fed through to policy makers in Finland [3]:

- “At the university level, cooperation has traditionally stemmed from the individual initiatives of professors, researchers and research teams. University cooperation has naturally developed to the direction where links are also becoming established at institutional levels, the university-university level. This cooperation layer has proved to be a practical way for opening up international R&D&I cooperation.”
- “At the (large) company level, international research cooperation among companies has been almost non-existing as they carry out their R&D activities independently due to IPR, financial, administrative and other relevant issues. Chinese companies have been even more “closed” with their R&D cooperation model and this appears to apply also to their collaboration with local Chinese universities. The large multi-national companies have had some research activities with top-class Chinese universities facilitated typically by their local China-based R&D centres. SMEs, on the other hand, have so far been very marginally involved in this cooperation due to the lack of resources and skills for international R&D even though they could substantially benefit from such cooperation.”

To highlight the above issue, a table giving the projects under the China-Finland ICT Alliance which were on-going in September 2012 is provided, the project partners are listed in the table taken from [3].

Chinese Project	Partners	B.	Finnish Project	Partners	B.
<i>Key Technology Research for Future Wireless Connection</i>	WICO, ZTE, POTEVIO, Datong Mobile, Tsinghua Univ, Southeast University, Beijing University of Posts and Telecommunications (BUPT), University of Electronic Science and Technology of China (UESTC), Tongji University, Beijing Jiaotong University (NJTU), Jushiri Technologies, Inc, etc	1,1 ME	NETS 2020 and JADE	Oulu University/CWC, Aalto University, Nokia, VTT	2 ME
<i>Research on Future Ubiquitous Services and Applications</i>	SIMIT, Huawei, WICO, DTmobile, ZTE, institute of Acoustics, Shanghai Jiaotong University, University of Science and Technology of China (USTC), Zhejiang Univ, BUPT, Huazhong Univ of S&T, Southwest Jiaotong Univ, Xiao'an Jiaotong Univ, Xidian Univ, Tsinghua Univ, etc	1,1 ME	Ubiserve	Aalto University, Tampere University of Technology, Jyväskylä University	1,2 ME
<i>R&D of Future Wireless Networking and Core Network</i>	Beijing University of Posts and Telecommunications (BUPT), DTmobile, BJ Starpoint Inc, WiCo, Southeast Univ, Chongqing Univ of Posts and telecommunication, Huazhong Univ of S&T, Xian Jiaotong Univ etc	0,2 ME	Energy and Cost Efficiency for Wireless Access	Aalto University, Tampere University of Technology + companies	1,4 ME

This situation could be perceived to be the result of Finnish ICT R&D&I operating outside of a European ICT Pole of Excellence (EIPE), see [5] for more information on EIPE, and this led Tekes the Finnish Funding Agency for Technology and Innovation, the main public funding organisation for R&D in Finland, to develop a cross sector model of clustering.

The website of the Academy of Finland⁶⁶ indicates the main focus of its recent activity with China has been in comparative law.

France

France and China decided in the last joint committee meeting (Paris, 30 May 2011) to reinforce their S&T cooperation on topics which included ICT and smart cities. A bilateral workshop was organized for each topic to identify detailed cooperation perspectives and plan actions on the period 2011 - 2014.

French joint institutes with China are ‘bottom-up’ initiatives. The France-China joint laboratories related to ICT are: The Sino-French laboratory for computer science, automation and applied mathematics, The Sino-French institute for engineering education and research – IEER (Guangzhou), The Mechatronics laboratory: methods, models and crafts – M3M (Xi’an), and the Cooperation platform “Complexcity” in Shanghai (UTSEUS).

The French Embassy organises meetings involving French companies involved in R&D&I in Shanghai, Beijing and Guangzhou (Clubs R&D).

⁶⁶ <http://www.aka.fi/en-GB/A/>

COOPOL Innovation is a program established in 2008 by the Service of Science and Technology (SST) of the French Embassy in China after the signature in 2007 of an agreement between the French competitiveness clusters and the Chinese science parks. As such it is an interesting initiative in support of clustering. Its goal is to facilitate the cooperation between French innovative small and medium sized enterprises (SMEs) of the competitiveness clusters and their research partners with their Chinese counterparts. The program has two parts: 1) An exploration mission of one week organized by the SST, for two persons (one from the SME, one from the partner research institution), to meet potential collaborators, both academics and industrials; 2) A subvention to a R&D collaborative project. This program has been made to support R&D projects and not only commercial projects.

France's *Agence nationale de la recherche* (ANR) and the National Natural Science Foundation of China (NSFC) have one call for proposals each year to support new Sino-French projects. Its priorities for 2012 were on ICT and Green and Sustainable Chemistry.

Germany

First intergovernmental consultations between Germany and China were held in June 2011 between the Ministry of Education and Research (BMBF), Germany, and MoST. Information and communication technologies are a priority theme of cooperation for BMBF.

The main German initiatives in Information and Communication technologies are Joint Institutes: The Sino-German Joint Laboratory of Software Integration Technologies (SIGSIT) in Beijing is a joint institute by Fraunhofer society and CAS. The institute develops next generation software integration technologies in innovative solutions and the Sino-German Joint Institutes for Information and Communication: The Sino-German Joint Software Institute (JSI) in Beijing and the German-Sino Mobile Communication Institute (MCI) in Berlin perform joint Chinese-German research activities. The collaboration is supported by MoST, and BMBF, Germany.

In the area of eco-cities two cooperative projects with Chinese partners were funded by the BMBF "The Sustainable Development of the Megacities of Tomorrow" initiative. The Hefei project: Metrasys - Mega Region Transport Systems for China focussed on analysing the current planning processes for the city development and transportation and to implement up-to-date traffic management systems.

In FP7 Germany was among the EU-Member States with the highest number of projects with Chinese participation.

There exists an Eco-platform for Sino-German collaboration in the Qingdao's Sino-German Eco-Park⁶⁷: “an example of the city's efforts to use German experience for its sustainable development. The park was built under an agreement between top leaders of both nations. When completed, the 11.6 square km eco-friendly industrial park is expected to host 60,000 people. The park's design uses German concepts and energy conservation, smart power grids and efficient irrigation have been created with the help of German companies.” Reflecting German excellence, in particular in advanced manufacturing, the core industries of the park are energy saving, new energy and advanced equipment manufacturing. Although not focused on ICT the work of this park highlights the Chinese preference for R&D cooperation with poles of global excellence in areas of key national interest. It also highlights the degree to which this preference results in highly targeted bilateral cooperation reinforcing the message of [6] that the transfer of ‘best practices’ in collaboration is far from straightforward.

The German research foundation *Deutsche Forschungsgemeinschaft* (DFG)⁶⁸ website reports activities with China but nothing specific to ICT.

Greece

The website Greece's National Hellenic Research Foundation⁶⁹ does not appear to mention activities with China.

Ireland

The Science Foundation of Ireland⁷⁰ website reports significant cooperation activities with China. In particular, a 2013 Science and Innovation Cooperation⁷¹ which involved up to one million euro of funding up to € 1 million of funding over 12 months by the Irish Government to advance science and innovation cooperation between Ireland and China, a significant level of matching funding from China had already been obtained or pledged. The funding will focus on a number of thematic areas of co-operation priorities including Nanotechnology and ICT and Health. The International Strategic Collaboration Programme: China (ISCP China) aims to build research capacity between Irish and Chinese universities and knowledge-intense

⁶⁷ http://www.chinadaily.com.cn/m/qingdao/2014-05/09/content_17495935.htm

⁶⁸ <http://www.dfg.de/en/index.jsp>

⁶⁹ <http://www.eie.gr/index-en.html>

⁷⁰ <http://www.sfi.ie/>

⁷¹ <http://www.sfi.ie/news-resources/press-releases/science-and-innovation-cooperation-between-ireland-and-china-to-receive-significant-funding.html>

industries in the strategically important areas including ICT⁷² which is a universities driven collaboration.

Italy

The English language brochure that can be downloaded from the website of *Consiglio Nazionale delle Ricerche*⁷³ (The National Research Council, Italy) makes no mention of China. However, it is important to note that Italy does have very extensive collaboration with China through the Sino-Italian Cooperation Program for Environmental Protection (SICP)⁷⁴ and that this does have implications for ICT R&D&I.

From⁷⁵: In October 2007 a ten-story C-shaped green building was unveiled on the Tsinghua University campus—the Sino-Italian Ecological and Energy Efficient Building (SIEEB) – that houses not only Tsinghua University’s Department of Environment and Technology but is a center for teaching, experiments, research and Sino-Italian environmental technology exchanges as well as a model for future Chinese eco-building construction. In September 2010, SICP hosted a series of international workshops at the Shanghai World Expo’s Italian Pavilion that highlighted eco-friendly technologies, climate change and sustainable development, as well as progress in the Sino-Italian environmental and energy cooperation over the past decade.

The SIEEB green building project is just one of the many environmental cooperation initiatives between Italy and China cooperation which have since expanded to many other government departments, universities, research institutes and enterprises. The focus of SICP is primarily high-level technical cooperation to create on-the-ground initiatives with Chinese national institutions and municipal authorities. To facilitate projects, a Joint Program Management Office was established in Beijing coordinated by the Italian Trade Commission. Bilateral work on energy and environment tends to be technology focused and takes a three-pronged approach: pilot projects; cooperative research programs; and capacity building exercises. More than 200 projects have been carried out by the two partners and their affiliates in a wide variety of areas. The total value of on-going and past projects is over \$438 million, nearly half of which was co-financed by the Italian Ministry for the Environment,

⁷² <http://iscpchina.ie/>

⁷³ <http://www.cnr.it/sitocnr/Englishversion/Englishversion.html>

⁷⁴ <http://www.sinoitaenvironment.org>

⁷⁵ <http://www.wilsoncenter.org/publication/ces-11-pp-216-238>

Land and Sea (IMELS) and multilateral funds. Italy was also responsible for the first international cooperation project for earthquake reconstruction in Gansu Province.

The Urban Energy Planning for Sustainable Development (ENP) initiative was charged with identifying and evaluating optimal solutions for Chinese municipalities to reduce CO₂ emissions and to improve integrated environmental quality in the long run. The project began by selecting three second and third-tier municipalities: Jinan, Suzhou, and Taiyuan, which represented a cross-section of energy efficiency challenges in industry, building, and transportation sectors. A complete energy characterization of the selected municipalities was set up to gather the fundamental information of the main energy consumption sectors and possible energy efficiency improvements. The methodologies and outcomes for energy efficiency in these municipalities was disseminated through an English-language publication and an online “energy portal” that guided users through energy assessment steps. This portal is a significant example of ICT as an enabling technology.

Lithuania

Mobile operator Omnitel, University of Vilnius (Lithuania) and China's Huawei Technologies established a joint research laboratory in autumn 2011 which focuses on speech recognition, cloud computing, and other issues.

Lithuania's NORTHTOWN technology park signed a cooperation agreement with the EU Innovation Center Chengdu EUPIC and Chengdu high-tech industrial park. The main cooperation fields include IT. The main objectives of this cooperation are active communication, cooperation in innovation, trade and investment and other bilateral cooperation.

The Netherlands

The Netherlands has two Sino-Dutch Joint Institutes related to ICT which are the Joint Initiative on Internet of Things, the Dutch partner is IMEC HOLST Center and the Chinese partner is SIMIT, and the TU Delft Beijing Research Centre Delft University of Technology, the Dutch partner is TU Delft and the Chinese partner is the CAS Institute of Semiconductors.

The Netherlands Organization for Scientific Research (NWO)⁷⁶ website provides links to the Hé Programme of Innovation Cooperation (PoIC) Sino-Dutch partnership in research and

⁷⁶ <http://www.nwo.nl/en>

innovation 2013⁷⁷. Crucially funded projects will include industry as proposals for projects must include at least four parties: one Chinese industry partner; one Dutch industry partner; a Chinese academic research institution, and a Dutch academic research institution. Within The Netherlands, the research themes to be addressed have to fit the ICT Roadmap of the Topsector High Tech Systems and Materials (HTSM) or the Chemistry Innovation Contract of the Topsector Chemistry. For China the International Science and Technology Programme (ISTCP) provides the policy context. For 2012-13 priorities included LED and Semiconductors.

The Netherlands Organization for Applied Scientific Research (TNO)⁷⁸ website contains some interesting links to Sino-Dutch research activities though these do not appear to be NSFC funded including the September 2012 partnership agreement between TNO and Beijing Building Technology Development Company (BBTDC) to extend TNO's Urban Strategy software in China for more environmental variables and to use it for the "Haidian District"⁷⁹ megaproject in Beijing.⁸⁰ Also of interest is the AGT International partnership of November 2011 with Yellow River Conservancy Commission (YRCC) of the People's Republic of China to implement the first milestone in a long-term program surrounding the AGT International Flood Early Warning System (FEWS) in the Yellow River's local environment.

Slovenia

Slovenian and Chinese researchers jointly collaborated in at least 3 projects in 7th Framework programme for RTD in the domain of ICT.

The Research and Innovation Strategy of Slovenia 2011-2020 [7] directly addresses ICT under establishment of capacities in support of research and development. This is about securing the budget for the development and maintenance of the e-Infrastructure needed to make use of emerging distributed forms of research activity so there is a focus on high performance computing and innovation in knowledge-based services which enhance innovation in a horizontal manner. Therefore although Slovenia has identified ICT as a priority area it is not a priority in the sense of a commitment to dedicated ICT R&D.

⁷⁷ <http://www.nwo.nl/en/documents/cw/cooperation-china---ha-programme-of-innovation---call-for-proposals>

⁷⁸ <https://www.tno.nl/index.cfm?Taal=2>

⁷⁹ North West part of Beijing city where Z-park High Tech Park, Tsinghua University, and Beijing University are located. (Z - Zhong Guan Cun)

⁸⁰

https://www.tno.nl/content.cfm?context=overtno&content=persbericht&laag1=37&item_id=201209140039&Taal=2

Spain

A Spain-China Joint declaration on industrial, technological cooperation, and cooperation in the fields of telecommunication and Information Society was signed in 2002. However, as of 2012, none of the priority fields for this Spain China cooperation were focussed directly on ICT R&D and only two clearly have the potential to involve significant ICT related R&D: 1) Climate change and environmental sciences, low carbon emission industries and the new energy vehicles, 2) LED technologies; Reducing carbon emissions encompasses sustainable electrical power generation which to be fully exploited normally requires the use of smart grid technologies. LED technologies can be relevant to ICT R&D because the high switching rates of LEDs are useful in advanced communications technology.

As an aside it is interesting that one of the Spain-China priority areas of cooperation is: Human resources, fostering the training of R&D experts, the return to their home country of famous scientists of Chinese origin and the attraction of foreign experts. This explicitly addresses China's concern about the brain drain it experienced in previous decades.

In FP6 Spain cooperated with China in 79 projects, 29 of which were related to information society technologies.

Since 2012, to the knowledge of the organisers of this document, the main Spain-China ICT related initiative of note in the context ICT R&D took place on 9 April 2014, the ICO Foundation and Casa Asia organised conference on the Evolution of ICT and its role in Chinese society: e-commerce and digital governance⁸¹, the objective of which was to present the evolution of e-commerce and digital governance.

The mission of the ICO Foundation⁸² is to support and contribute to the development of society by promoting culture and knowledge in Art, Education, Self-employment and Entrepreneurship, Studies and Publications, Forums and Debates. With an annual budget of approximately €2.5 million, it operates mainly in Spain, but has strong international ties, particularly with China and Germany.

⁸¹ <http://www.spain-china-foundation.org/es/noticia/casa-asia-y-fundacion-ico-organizan-una-conferencia-sobre-las-tic-en-china>

⁸²

http://www.fundacionico.es/fileadmin/user_upload/FUNDACION/PRESENTACION_FUNDACION_ICO_EN_G_mayo14.pdf

Casa Asia⁸³ aims to strengthen the knowledge and dialogue on Asia in Spain by supporting activities and projects that contribute to a better understanding between Asian and Spanish societies and promote the development of relations between them.

ICO Foundation and Casa Asia are patrons of the Spain China Council Foundation⁸⁴, a private non-profit organization whose purpose is to promote the growth of bilateral relations between Spain and China by promoting activities that encourage cultural exchange and trade between Spain and China.

Finally, and more importantly the existence of the The Hispano-Chinese Bilateral Technology Cooperation Program (Chineka) and its potential as a source of funding for bilateral ICT R&D&I should be noted. Chineka⁸⁵: “promotes international technological cooperation between Spain and China institutions through projects led by companies with the aim of boosting the competitiveness of Spanish and Chinese companies to encourage and support the implementation of projects technological units, oriented to development and / or adaptation of new products, processes or services intended for international markets.” Crucially, projects may be in any technical area and the participation of public research organizations within consortia is allowed.

Sweden

On 16 February 2012 the Swedish Government adopted a new strategy on research and innovation cooperation with China [8]. It is stated in [9] that: “the strategy aims to increase and deepen the collaboration with China, identifies areas of priority and tasks Government Agencies with implementing different parts of the objectives.” However, what the report says about relations with China is really a declaration of intent to facilitate export and internationalisation among small and medium-sized enterprises. Interestingly it does note that in China: “Within information and communications technology, for example, the development of certain new functions and areas of application is moving quicker than in other more wealthy countries.”

In terms of cooperation this strategy is starting to deliver tangible results. For example, the Sweden in China - Trade & Promotion newsletter of April 2014⁸⁶ reports that: “the (Swedish) Consulate General in Shanghai, together with a number of partners, has organized a week of

⁸³ <http://www.casaasia.es/>

⁸⁴ <http://www.spain-china-foundation.org/es/fundacion>

⁸⁵ <http://www.cdti.es/index.asp?MP=7&MS=563&MN=3&TR=C&IDR=101>

⁸⁶ <http://www.ichuguo.org/swinchina/swinchina102.html>

urbanization-themed seminars and workshops under the title of Smart Urban Living - Sino-Swedish Solutions for Cities on the Move. The objective of this week of events is to be a platform for meetings and discussions on the challenges and opportunities of urbanization and create awareness about Swedish solutions, expertise and technology. In addition to a number of seminars, challenges and events on the topic of urbanization.”

Related to the above, on 23 September 2014 Business Sweden in cooperation with the Consulate of Sweden in China led a delegation in Shanghai on the topic future elderly care and solutions for homecare. The overall objective of the delegation was to build a Chinese - Swedish platform for experience exchange⁸⁷ . .

United Kingdom

Research Councils UK (RCUK) have agreed a number of joint calls on research, with the Natural Science Foundation of China and Chinese Academy of Sciences. The Research Councils had a joint call with the Natural Science Foundation of China on Smart Grids (£3m and matched NSFC effort). This formed part of a series of calls for collaborative research and forms part of an ongoing collaborative programme with China. Discussions on future activity included the internet of things.

Details of the RCUKs current calls for funding for UK-China collaborative research is available on the RCUK China website⁸⁸. RCUK will coordinate the delivery of multidisciplinary research in the priority area of Digital economy⁸⁹. The funding is for multidisciplinary research.

By way of examples of excellent UK-China collaborative projects funded by RCUK, the RCUK website provides case studies including one on R&D on (B)4G Wireless Mobile Communications⁹⁰. The aim of the project was to promote systematic, long-term, and sustainable collaboration between the UK and China in the R&D of 4G and beyond 4G (B4G) wireless mobile communication systems and may provide insights into how to achieve sustainable EU-China collaboration. The collaboration consortiums include 10 UK universities, one UK company, and 6 Chinese universities with 7 Chinese companies.

The UK-China Science Bridge funded by RCUK is a strategic alliance between Queen’s University Belfast and leading universities and industrial partners in both China and the

⁸⁷ <http://www.business-sweden.se/en/about-us/Seminars-and-events/EventsSeminars/Elderly-Care-Delegation-to-China/>

⁸⁸ <http://www.rcuk.ac.uk/international/offices/china/>

⁸⁹ <http://www.rcuk.ac.uk/research/xrcprogrammes/>

⁹⁰ <http://www.rcuk.ac.uk/international/Offices/china/case/MobileCommunications/>

UK⁹¹. The project is intended to accelerate the deployment of research knowledge, deepen and strengthen current research links and contribute to wealth generation in both the UK and China through dedicated technology transfer in the following fields: Sustainable energy and associated control techniques and Sustainable built environment. Associated research clusters at Queen's include the Intelligent Systems & Control research Group (ISAC). The project is funded collaboratively by RCUK and Queen's University Belfast to an amount of £2.3 million. A report on its activities is available on web site of Queen's University Belfast⁹²

Conclusions

The importance to some member states of FP7 collaborative projects as a mechanism for ICT R&D collaboration with China is apparent. For Spain, Austria and Slovenia they have been the main mechanism for collaboration and they were a significant part of Germany's overall collaborative activities. Chinese involvement in FP7 was funded by the EU thus raising concerns over reciprocity.

Bilateral cooperation guarantees reciprocity because it is cooperation in which each nation is committed to funding R&D performed by the joint venture partner company from its own country. Each cooperating country has their own mechanism for parallel funding under this scheme.

Joint Institutes play a very important role in some member states bilateral collaboration in ICT R&D with China. The following member states known to have Joint Institutes with Chinese partners; Belgium, Germany, France, Lithuania, and the Netherlands; an overview of Joint Institutes (Laboratories) in China is provided in [10].

Relatively few member states have funded distinct bilateral ICT R&D collaborative projects with China: Belgium, Germany, France, Finland, and UK.

Currently relatively few member states are interested in dedicated ICT R&D collaboration with China. Of those that have identified ICT as a strategic interest in S&T research collaboration at least 2 are not interested in specific ICT R&D collaboration as such but see ICT as a key horizontal enabler.

The National Natural Science Foundation of China (NSFC) has bilateral cooperation with a number of member states national scientific organisations and provides links to their web sites which reveal that both Ireland and the Netherlands have important strategic ICT R&D collaborative projects with China.

⁹¹ <http://www.qub.ac.uk/sites/sciencebridge/>

⁹² www.qub.ac.uk/sites/sciencebridge/ScienceBridgeReport/

Eco-cities related ICT R&D bilateral cooperation activity with China has been undertaken by Germany and the United Kingdom. This is an area of interest for Austria and Sweden. Related to this, Italy's major vehicle for S&T R&D&I collaboration with China appears to be the bilateral Sino-Italian Cooperation Program for Environmental Protection (SICP), ICT contributes to this program as an enabler.

RCUK funded projects are examples of bilateral collaborative ICT R&D projects with China that have industrial as well as academic participants on both sides. Some explicitly seek to establish sustainable collaboration outside of RCUK funding.

Recommendations

The International S&T Cooperation Programme (ISTCP) of the Ministry of Science and Technology of the People's Republic of China (MoST) engages with Europe at the bilateral or multilateral level not the EU level. The ISTCP funds projects with foreign research institutions universities and enterprises to carry out cooperation in R&D:

- attracting outstanding overseas talents and teams to work in China, promoting China's international scientific and technological cooperation base construction
- strengthening China's capacity of indigenous innovation

The Chinese preference for R&D&I cooperation with poles of global excellence in areas of key national interest results in highly targeted bilateral cooperation a consequence of which is that the transfer of 'best practices' in bilateral cooperation is far from straightforward. What is clear is that the Chinese will only engage in cooperation with centres of internationally significant expertise. Furthermore, bilateral ICT R&D cooperation with China cannot be pursued outside of considerations of innovation so in this context the target of cooperation must be international excellence in ICT R&D&I.

The Danish strategy for knowledge-based collaboration between Denmark and China [2] gives voice to an impression gained of the way other nation's bilateral collaborative activities with China have been initiated: in collaborating with China it is important to ensure that the effort is firmly anchored in the Chinese political system.

Smaller member states seeking to initiate bilateral cooperation activities in ICT R&D&I with China are encouraged to follow the example of Lithuania and identify any internationally significant ICT industry players with a strong business link to a major Chinese ICT industry player and where such a link exists then provide high level political support at the national level for developing long term strategic company to company collaboration.

For some EU member state organisations with internationally significant expertise interested in pursuing bilateral ICT R&D&I collaboration with Chinese organisations this report provides links to national agencies which are the first point of contact for exploring what is possible.

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<http://www.eu-chinasmartcities.eu/>

Appendix 4: CHOICE Internal report I-4 The current status of ICT R&D&I for Chinese Eco-Cities: The implications for EU-China collaboration in ICT R&D&I

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Date: 3 November 2014

Abstract and rationale: This report attempts to give a flavour of the current of status of ICT R&D&I for Chinese Eco-cities and thereby provide some insights into the potential of China's emerging market for Eco-city solutions for EU-China collaborative ICT R&D&I. It addresses Eco-city standards development in China, Evaluation Centres for Eco-City software solutions, the context into which ICT for Chinese Eco-cities fits, Chinese ICT R&D in smart cities, EU-China collaboration in ICT R&D smart cities, EU Member states bilateral cooperation with China on ICT R&D for Eco-cities, Chinese smart city industry alliances, other Chinese industry alliances active in eco-friendly cities, Wuhan Intelligent City, and current concerns related to the market situation for the EU ICT industry. Conclusions are presented followed by recommendations targeted at organisations in EU member states interested in exploring the potential for collaborative ICT R&D&I with Chinese organisations targeted at China's emerging market for Eco-city solutions.

Disclaimer: The views presented in this report reflect those of the document organizers and do not necessarily represent the views of the European Commission.

Introduction

We begin our overview of the current of status of ICT R&D&I for Chinese Eco-cities by addressing the Chinese Eco-city standardisation process because at its highest level it defines the Chinese Eco-city.

Eco-city standards development in China

Unlike the United Kingdom where Eco-town standards are usually expressed in general terms in China the government and leading institutions are working to define detailed specific standards to assist with the implementation of Eco-cities and the subsequent monitoring of their performance. These standards address a broad range of relevant aspects but their development is at an early stage as they are contributing to the specification of an overall national standard for Eco-cities. This has significant implications for future EU China cooperation in ICT R&D and innovation because more than 90% of Chinese cities are constructing Eco-city developments of one form or another.

China Society for Urban Studies (CSUS)

The leading government body responsible for the development of a national Eco-city standard is the China Society for Urban Studies (CSUS). Most research around China's Eco-Cities standard focuses upon Key Performance Indicators, several of which have been established by CSUS against which the performance of Eco-Cities, once constructed, will be evaluated.

Progressing Eco-city Policies into Main-stream Practice – Action Research on Policy, Financing and Implementation Strategies for Low Carbon Cities in China was a project supported by the UK Foreign & Commonwealth Office and China's National Development & Reform Commission that reported its results in July 2012 [1].

The project reviewed the Chinese national standard for Eco-cities standard and its KPIs. An implementation tool was developed in the project to support the Eco-City Assessment and Best Practice standards developed by CSUS. The tool comprises a framework with sets of high-level, strategic questions that aid decision making at the planning and master plan design stages.

The project determined that the 'hardware' of Eco-city urban planning and design should include SMART infrastructure which utilises Information and Communications Technology (ICT) to enable virtual connections, reduce physical urban loads, and in combination with face-to-face interaction promote quality of life. Although SMART can be adopted loosely as a label, Eco-city relevant technologies can be clearly defined, critically appraised and selectively adopted.

The China Smart City Industry Alliance (CCIT)

The China Smart City Industry Alliance (China smart Cities IndusTry Alliance), abbreviated as CCIT⁹³ was founded on 10 October 2013 to boost the development of smart technologies

⁹³ www.ccit.org.cn

in China and help the country meet its **urbanization** challenges⁹⁴. It a Chinese national Ministry of Industry and Information Technology (MIIT) approved agency the aims of which include developing industry standards with independent intellectual property rights and promoting the harmonious development of emerging smart industries.

The totality of its work is best viewed in the context of the hierarchy of Chinese industry associations focussed on Smart Cities which reviewed in a later in this report.

Evaluation Centres

China Software Evaluation Center⁹⁵

This Center is of major national importance to ICT businesses in China. Its main roles that relate to ICT for Eco-cities are:

- Product Evaluation and Information Systems which includes:
 - National e-government system application software acceptance testing
 - Power Information System Test
 - National Science and Technology Special Assessment Service
- Information Security Evaluation which includes:
 - Electronic authentication of public services
 - Government information security research and policy advice auxiliary
 - Personal Information Protection Standards Compliance Assessment

The Center plays a significant role in smart cities development in China. It has responsibility for City top-level design and evaluation of Smart City Consulting, environmental / health planning and evaluation of Smart City Seminar series, Project Management. Its responsibilities are very wide ranging and included areas that relate to ICT for Eco-cities: Government Information Technology Project Management; E- ITSS conformity assessment and consultation; IT Services / Security Management System Consulting; the Government website performance evaluation group.

State Information Center Software Testing Center⁹⁶

⁹⁴ http://www.chinadaily.com.cn/bizchina/2013-10/10/content_17021380.htm

⁹⁵ <http://www.cstc.org.cn/>

⁹⁶ <http://www.stc.sic.gov.cn/>

National Information Center Software Testing Center is a National Development and Reform Commission approved national home-level software products and information systems professional evaluation agency, with national measurement certification.

The Center provides, evaluation services: a cloud services platform, information systems auditing, software reliability assessment; personnel training and other professional information; technical services for government, research institutions and enterprises to provide overall technical service solutions.

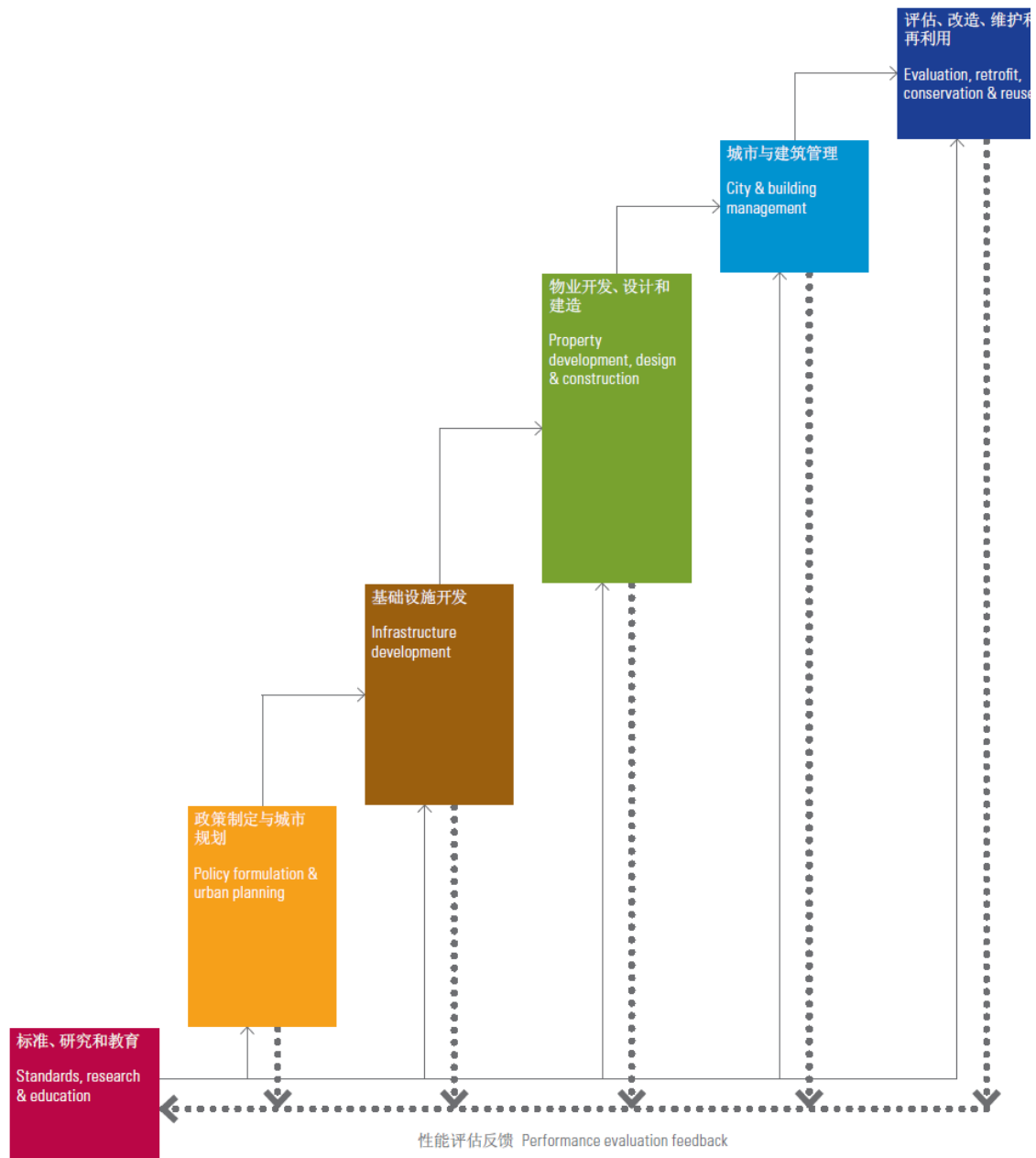
The National Evaluation Service System has regional centers in Chongqing, Guangdong, Sichuan, Fujian, Shenzhen, Shanghai, Shandong, Yunnan, Jiangsu, Tibet, Hebei, Hubei, Liaoning, Zhejiang, Inner Mongolia and other regions, under the unified management of the Center.

On 9 July 2014 the Center hosted the Smart City Development Research Center of China 2014 annual meeting.

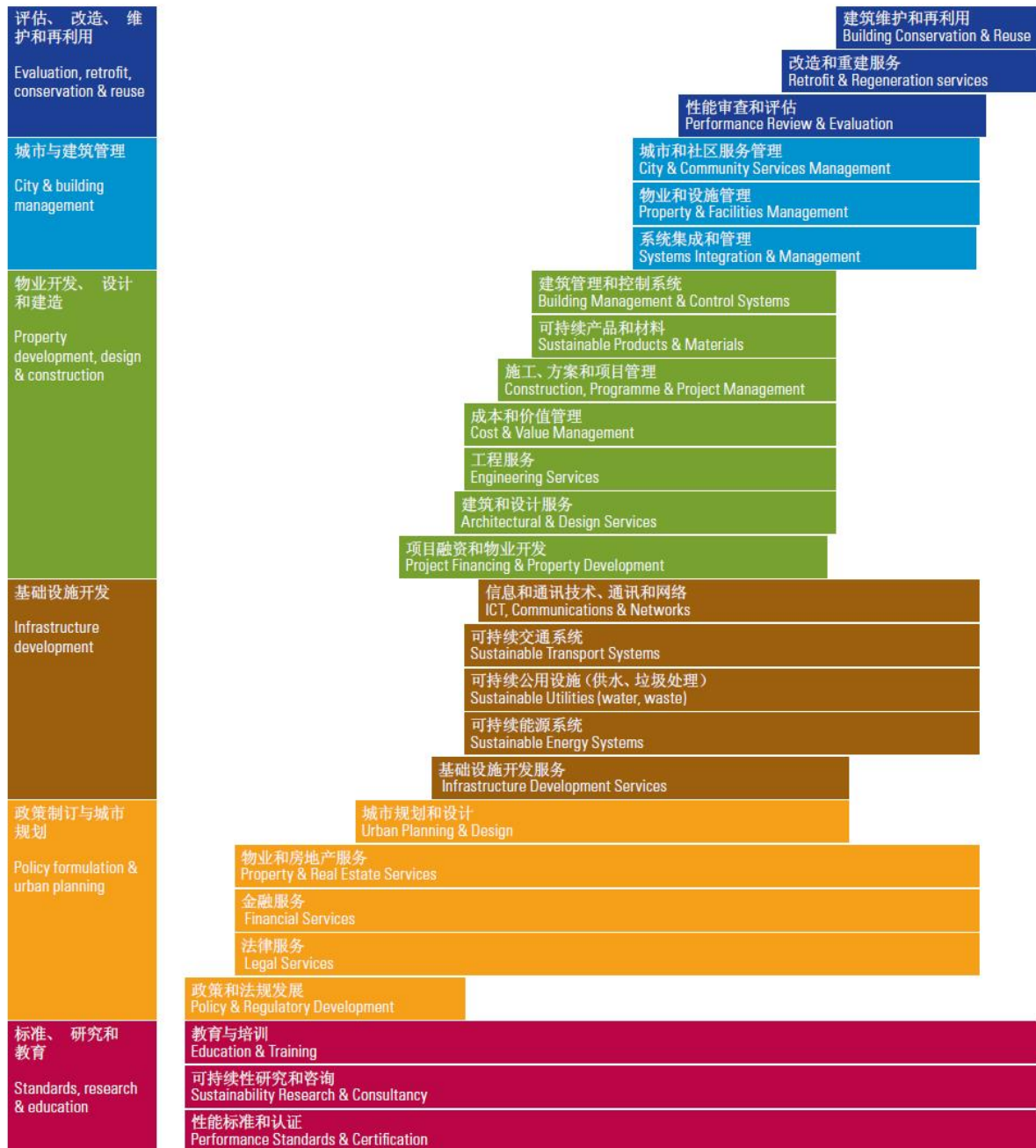
The context into which ICT for Eco-cities fits

Innovation in digital systems offers the potential for SMART infrastructure for Eco-cities that is an enabler for efficient and environmentally friendly systems for managing commuter traffic, food distribution, electricity grids and waterways, all of which have to be integrated for effective Eco-city urban planning and design. The anticipated benefits are a reduction in the use of energy and natural resources and in the emission of greenhouse gases. Although most of the envisaged applications of technology exists only in prototype form it is already clear that properly implemented they could provide substantial benefits.

In [2] a roadmap is provided for the effective development of eco-cities and green building that shows in the form of a figure reproduced below the key development stages.



The UK's special capabilities to support the value-chain that is essential to deliver the roadmap are also illustrated in [2] the form of a figure which is reproduced below.



Although this figure is UK specific all of the above capabilities are essential to support the value chain of an Eco-city and it gives a very good view of the wider context within which ICT for Eco-cities fits.

Professional property and facilities management services appear in the above figure because they are required to optimise building performance in commercial and sustainability terms. They can also be considered as a pre-requisite for city and community services focussed on

the management of city services, transport, energy and other utilities. However, collectively these are just aspects of the crucial role that IT services have to play in realising Eco-cities. The IT services required to deliver the Eco-city concept rely on the effective use of management, communication and control systems, and consequently on systems integration and management.

Chinese ICT R&D in smart cities

In China ICT R&D on smart city concepts is being undertaken through Digital Shanghai (services anywhere), Digital Zhejiang (浙江 province) and “Intelligent City Wuxi 无锡” in Jiangsu (江苏) province. Public services to address key challenges related to urbanisation such as traffic management, health and wellbeing issues, aging care and limiting CO₂ emissions are also being developed while requiring technology realising the Smart City also requires research at the systems and services level. This provides opportunities for international cooperation to realise the required integration of interdisciplinary research and accompanying cross-sector development. In purely technical terms topics explicitly included in provincial level plans include the Internet of things, cloud software, data to intelligence, and digital services and next media.

EU-China collaboration in smart cities

EU-China Green Smart City Cooperation <http://eu-chinasmartcities.eu>

EU-China Green Smart City Cooperation is an EU-China Dialogue on Smart Cities funded by the EU-China Policy Dialogues Support Facility II (PDSF II) which aims to develop “Green Smart City” cooperation, to establish an expert framework for promoting EU-China Smart Cities cooperation, to select pilot cities from China and the EU, and establish a technical experts group to carry out related research and cooperation. Currently the initiative has fourteen Chinese partner cities and fifteen EU partner cities.

PDSF is an initiative co-funded by the European Union and China to facilitate and support current and future implementation of Policy Dialogues between the EU and China on a broad range of key sectors and issues, with the overall aim to strengthen strategic relations between the EU and China. The second phase of the EU-China Policy Dialogues Support Facility (PDSF II) started in March 2012 and runs for 4 years.

In the context of strategic EU-China collaboration in smart cities it is fundamentally important to note that there have been numerous EU funded Smart City Knowledge

Exchange and Cooperation Platforms, see appendix 3 of [3], which have informed the recent EU-China Smart and Green City Cooperation Comparative Study of Smart Cities in Europe and China. The key findings key findings of which were reported at the EU-China Smart Cities Exchange Meeting, Beijing, 28 - 30 April 2014 [4]. However, it was not within the remit of this study to make explicit connections to the outcomes of bilateral cooperation initiatives in smart and green cities. Given that such initiatives are with global poles of excellence the outputs of these bilateral activities will in a business context take precedence over the outputs of EU-China initiatives when the two overlap. So for example, while in [4]: “Cities are encouraged to use the “Smart City Assessment Framework” as an internal management tool for assessing the status quo of their smart city development and to identify any gaps and weaknesses” any such assessment will be subservient to the Eco-City Assessment and Best Practice standards developed by CSUS.

Although [3] looks at smart and green cities in far broader terms than [1], there are important examples of bilateral cooperation that impact on the recommendations of [4] not discussed in [3]. In particular, the energy conservation, smart power grids and efficient irrigation that have been created by Qingdao's Sino-German Eco-Park. The question is therefore, where should the process of bringing such outputs into the emerging vision for wider EU-China collaboration in smart and green cities begin. There is a strong case for beginning by mapping the outputs of [1] into [4] because [1] focusses on planning and development from a service point of view from the outset. This is the best way to achieve the primary recommendation of [4] on ICT infrastructure that: “Technology infrastructure required to deliver smart city projects should be defined by function rather than in terms of a specific technology”. Furthermore, the primary and secondary recommendations of [4] on smart city services are: Prioritise services and Create Service platforms, respectively.

An observation of [4] of great importance in a business context is that most cities fund their projects through public funding mainly at the local municipal level. Accordingly, in the first instance know-how transfer in the area of IT service management for Eco-cities should be the main focus of EU China cooperation in ICT R&D and innovation in the area of Eco-cities. Once the service requirements have been defined the technology needed to support the service bundle can be rolled out in a cost effective manner. China could benefit significantly from European smart city models and experience it terms of what has been gained so far from smart cities. Specifically, examples of service provision and delivery reliant on IT services by individual European companies should be provided. Some failed experiments could also be presented so the Chinese do not repeat these. Thought needs to be given as to whether there are any regulatory barriers (or inter-regulatory body issues) to the repurposing of EU IT services for the management of smart cities to China. If this is to be achieved careful attention needs to be given to Chinese procurement models for such IT Services and their place in the value-chains of Chinese Eco-cities. The target audiences for associated

dissemination activities are representatives of EU ICT industry seeking innovation business opportunities in China and in particular of local municipalities in China as the key decisions in terms of procurement are made at the local municipal level. Outputs from such activities need to be presented in the context of Progressing Eco-city Policies into Main-stream Practice [1] as providing strategies for promoting innovation business opportunities for EU industry in China and wider EU-China Smart and Green City Cooperation [4].

The EU-China Green Smart City cooperation that delivered [4] established the EU China Smart City Cooperation Project Technical Expert Group as part of the project. This group has responsibility for Identifying and sharing “good practice” and maintaining a database of technical experts from China. It is a useful resource for disseminating activities promoting EU-China ICT R&D cooperation in Eco-cities.

DG CONNECT

The EC DG CONNECT is presently involved in two on-going policy dialogues with the Ministry of Science and Technology (MOST), focused on mutual access to the EU’s Framework Programme and China’s R&D programmes, as well as the dialogues on information technology, telecommunications and informatization with the Chinese Ministry for Industry and Information Technology (MIIT), focusing green smart cities, as well as on the Internet of Things, IPv6 electronic communications, and internet security.

EU Member states bilateral cooperation with China on Eco-cities

Austria

A Memoranda of Understanding was signed between AustriaTech - Federal Agency for Technological Measures Ltd. and Chinese City People’s Government on cooperation in the ICT related field of “Low-Carbon-City” planning In 2012 there were two bilateral agreements with the People’s Government of the City of Nanchang (the capital of Jiangxi Province, a prefecture-level city) and the Huangqiao (district’s) People’s Government of the City of Taixing (a county-level city in Jiangxi Province).

Finland

The Finland-China Memorandum of Understanding (MoU) on co-operation in the Built Environment was signed on the 15 May 2014 [5]. This MoU followed a meeting between the President of Finland and the President of China, the participants to which formally recognised the need for smart and sustainable cities and to find energy-, resource- and cost efficient solutions through cooperation. The MoU is based on an emerging Finnish paradigm of cooperation with China that has its basis in a long history of Finland-China cooperation and a

realisation by Finland that historically there had been very little business involvement in this co-operation accompanied by an increasingly strong desire on the part of the Finnish government to address this deficiency.

Of the globally recognised areas of Finnish competence in the context of Eco-cities the obvious one to focus on is Energy efficiency. Because of its cold climate, relatively large size and energy intensive main industries, Finland has invested in energy efficiency for decades. Finland has globally recognised competence in various areas including combined heat and power generation, district heating and cooling, and smart grids and power electronics. Furthermore, Finland is one of the world's leading users of renewable energy.

Crucial to an appreciation of the background to [5] is the acknowledgement in [6] of traditional areas of globally recognised Finnish competence including ICT. In essence in [6] these globally recognised competences are seen as potential gateways to international cooperation in cross-sector areas that encompass them such as environmental solutions and smart city concepts, which require expertise from several different domains, when they are offered as part of a complete package of required cross sector expertise.

Finland is actively positioning itself for cross-sector cooperation. In [6] two forums are quoted as illustrating: “a national aim to create a high-level foundation for over-lapping cross-sectoral cooperation in technology applications, industrial needs and business models.” Both these forums are in the area of ICT ([6]) one of which is the United Forum.

The “Ubiquitous Networks Industry Technology and Development Forum (United Forum) has as its main objective promoting the interests of and development of the industry as a whole. Its main focus areas are key technologies, service architectures and future business models. It has three working groups and another three groups are under specification on smart city concepts, as well as elderly care and education.

United Forum is a network for knowledge and technology transfer among industrial and academic partners in China. It has about 25 key partners representing the whole R&D and business sector, such as Huawei, Intel, China Mobile, Samsung and Alcatel. United Forum is affiliated by MIIT and it works closely with CATR, BUPT and China Communication Standards Association (CCSA).”

To highlight the potential of this approach example topics in ICT-related areas in provincial and municipal R&D plans in China are presented in [6] which notably include several that are eco-city related. Examples include, Shanghai-city (上海市 direct-controlled municipality), smart city security; Jiansu (江苏省 province), smart travelling; Chongqing (重庆市 direct-controlled municipality), next generation information terminal and relate key technologies; Zhejiang (浙江省 province), Smart city.

France

France and China decided at a joint committee meeting (Paris, 30 May 2011) to reinforce their S&T cooperation on topics, which included ICT and smart cities. A bilateral workshop was organized for each topic to identify detailed cooperation perspectives and plan actions on the period 2011 - 2014.

French joint institutes with China are ‘bottom-up’ initiatives. The France-China joint laboratories related to ICT include the Cooperation platform “Complexcity” in Shanghai (UTSEUS).

Germany

In the area of Eco-cities two cooperative projects with Chinese partners were funded by the BMBF: “The Sustainable Development of the Megacities of Tomorrow” initiative; The Hefei project: Metrasys - Mega Region Transport Systems for China focussed on analysing the current planning processes for the city development and transportation and to implement up-to-date traffic management systems.

Sweden

The Sweden in China - Trade & Promotion newsletter of April 2014⁹⁷ reports that: “the (Swedish) Consulate General in Shanghai, together with a number of partners, has organized a week of urbanization-themed seminars and workshops under the title of Smart Urban Living - Sino-Swedish Solutions for Cities on the Move. The objective of this week of events is to be a platform for meetings and discussions on the challenges and opportunities of urbanization and create awareness about Swedish solutions, expertise and technology. In addition to a number of seminars, challenges and events on the topic of urbanization.”

United Kingdom

For ICT business in the area of eco-cities and the green value chain there is a platform for UK-China cooperation in the development and delivery of world-class solutions, the UK-China Eco-cities & Green Building Group⁹⁸. The existence of this group reflects the Chinese preference for R&D cooperation with poles of global excellence in areas of key national interest [1]: “At the IGEBEC conference in March 2011 Vice Minister Qiu outlined China’s plans to develop 300 eco-cities in the coming years. He noted that the UK has much relevant experience in this area, including global leadership in garden cities, new towns, and eco-

⁹⁷ <http://www.ichuguo.org/swinchina/swinchina102.html>

⁹⁸ http://www.cbbc.org/guide/uk_china_eco_cities_green_building_group

towns, from which China could learn and build upon. Given that experience, he invited the UK to become China's lead partner in their eco-cities development programme.”

Chinese smart city industry alliances

The Chinese smart cities industry alliances that the EU can interface with in seeking to effectively promote EU-China ICT R&D&I collaboration related to the realization of smart cities. Before discussing these alliances it is useful to highlight their hierarchy. There is a national overarching association focused on forming a smart city industry chain and promote the rapid and orderly development of China's large-scale smart city industry (National Industry Alliance of Smart City Technology Innovation), a technically focused national association promoting technology innovation and technology standards for smart cities (CCIT), an association focussed on the training and nurturing of the required personnel (CSAoSCITI), an association focussed on urban governance Smart City Development Alliance). (These associations will be reviewed in order of their position in this hierarchy.

National Industry Alliance of Smart City Technology Innovation

The National Industry Alliance of Smart City Technology Innovation brings together expertise related to the urban industrial chain, including sensor design and manufacturing, data acquisition and processing, chip design and manufacturing and intelligent terminals, software and industry applications, planning and consulting, investment, and all aspects of competitive enterprises.

The overall objectives of the Alliance are through market demand traction, gathering smart city enterprises, universities, and research institutes, and industrial capital, to create a smart city technology innovation system and industrial base, to form a smart city industry chain and promote the rapid and orderly development of China's large-scale smart city industry, establish a well-known brand, build a national team, and nurture and strengthen member companies.

As the main technical innovation alliance in this area it has: developed an information platform of smart city technology standards; developed the smart city's diverse heterogeneous data acquisition, processing, and exchange technology; within the established urban infrastructure elements developed a monitoring and management platform and related construction specifications and procedures, developing a series of sensors that connect to the urban management and automation equipment. It has addressed challenges of large-scale production, and the operation and maintenance of urban management "big data" systems,

including dynamic monitoring, information extraction, and the refinement of the application of information services.

At the 2nd Internet of Things (IoT) Symposium 16-17 April 2014 in Hong Kong officials from the Chinese government and the EU spoke about the development of smart cities using the IoT in China and the EU⁹⁹. The secretary general of National Industry Alliance of Smart City Technology Innovation¹⁰⁰ said the central government's objectives for smart cities are to enhance city planning, building and management stating that: “The Smart city is a new ecosystem of city management and public service delivery,” The Alliance’s smart city initiatives will aim to improve city traffic, city administration, energy supply, underground space utilization, water supply and other areas closely related to the well-being of the public. The three areas that have been the focus of largest number of smart city projects have been public information portals (79 projects), public infrastructure databases (72 projects), and e-government (53 projects).

The China Smart City Industry Alliance (CCIT)

The China Smart City Industry Alliance (China smart Cities IndusTry Alliance), abbreviated as CCIT¹⁰¹ was founded on 10 October 2013 to boost the development of smart technologies in China and help the country meet its **urbanization** challenges¹⁰². It a Chinese national Ministry of Industry and Information Technology (MIIT) approved agency that is expected to become an important platform for promoting communication among people in government organizations, academia and the business world with the aim of enhancing China’s technological innovation industries, encouraging knowledge based industries and modern service industries in the field of research and innovation, pioneering the smart city applications market, developing industry standards with independent intellectual property rights, and promoting the harmonious development of emerging smart industries. To achieve its aims at a voluntary cross-sectoral group of universities, research institutions, industry associations, standardization organizations and government, a number of cities and other regional organizations being composed. It has more than 100 member companies. A list of 103 cities, districts, towns and industrial zones, recently earmarked by the Ministry of Housing and Urban-Rural Development for development into smart city pilots was released in August 2013. It names the second batch of smart city pilots in China. The list of the first batch of 90 pilots was released in January 2013. The secretary-general of the China Smart

⁹⁹ <http://cw.com.hk/feature/china-eu-tackle-urbanization-challenges-smart-city-pilots>

¹⁰⁰ <http://cylm.scitycn.org/en>

¹⁰¹ www.ccit.org.cn

¹⁰² http://www.chinadaily.com.cn/bizchina/2013-10/10/content_17021380.htm

Cities Industry Alliance pledged to set up a smart city evaluation system and draft an industrial code of conduct by 2014 to boost the growth of smart technologies in China.

However, in the context of collaboration in ICT R&D&I the National Industry Alliance of Smart City Technology Innovation is more immediately relevant¹⁰³ than CCIT.

China Strategic Alliance of Smart City Industrial Technology Innovation (CSAoSCITI)¹⁰⁴

This alliance is the most research focussed of the alliances though its most fundamental role is the training and nurturing of indigenous Chinese technical experts in smart cities technology in order to promote China's innovative capacity in smart cities. Its mission is to achieve the goal of breaking through common and critical technology and developing the key technology competitiveness of China's smart city IT industry. It seeks to achieve this by integrating industry-university-research-application resources, establishing a mechanism and communication channel with the government, acting as platform for training and international cooperation, and promoting the self-development of its member companies. Specifically, the alliance supports the construction and implementation of independent Chinese technology and standards for smart cities, promotes the realization of a leap in the development of Chinese cities informatization level, seeks to lead and guide the technical development trends of relevant fields at the international level. The ways in which the alliance pursues its mission include:

- 1) Around the common and critical technology issues, taking smart city data processing as the core, organizing enterprises, universities, and research institutions to develop technical cooperation, building the key technical competitiveness of China's smart city IT industry;
- 2) Publicizing and executing the relevant policies, laws and regulations, establishing a common strategy, together seeking the support of policy, law, regulation, funding, public opinion, and reporting the wishes and requirements of alliance members to the relevant departments of the government, creating a good social environment for industry development;
- 3) On the basis of complementary advantages, resources sharing, and fully developing the resource and capacity of alliance members, realising the effective division of labour and the reasonable connection of innovation resources. Building a public technical platform and executing intellectual property sharing;

¹⁰³ <http://cylm.scitycn.org/cn/about>

¹⁰⁴ <http://www.smartcityunion.cn/>

- 4) Implementing technology transfer, accelerating the commercialization of technical achievements, and improving the competitiveness of the industry in China;
- 5) Jointly cultivating expertise, strengthening personnel exchanges and interaction, providing personnel support for continuous industrial innovation.

Smart City Development Alliance

There is a fourth Chinese national smart city alliance "Smart City Development Alliance", a signing ceremony for which was held concurrently with China International Urbanization Forum 2014 in Shanghai on April 19, 2014¹⁰⁵. Formed by the National Development and Reform Commission (NDRC)¹⁰⁶ this alliance helps promote urban governance, city management and public service innovation.

Other industry alliances active in eco-friendly cities

Reflecting the intense activities of Chinese national smart city industry alliances there have been a number of related initiatives at the Chinese municipal and provincial levels by industry alliances whose major focus is not on smart cities. For example, addressing the role of the IoT in the development of eco-friendly cities and big data.

The Chengdu IoT Industry Development Alliance sponsored a Smart City Construction and Application Seminar¹⁰⁷ with the theme of: Accelerating the Application of IoT Technology and Promoting the Construction of Smart City on 24th April 2014, which was co-organised by the Sichuan Provincial IoT Industry Development Alliance.

The Internet of Things China 2014 Conference on Internet of Things Creating Smart life 28-29 October 2014, Shanghai¹⁰⁸, has Technical Partners:

- Shanghai Internet of Things Industry Association (city)
- Shanghai Pudong New Area IoT Association (a district in Shanghai)
- Zhangjiang IoT Industry Association (a district in Shanghai)
- Z-Park Internet of Things Industry Association (Zhongguancun, a district in Beijing)¹⁰⁹

¹⁰⁵ http://www.chinadaily.com.cn/m/beijing/zhongguancun/2014-05/05/content_17483684.htm

¹⁰⁶ <http://www.chinabusinessreview.com/smart-city-development-in-china/>

¹⁰⁷ <http://www.chinasoft.org.cn/en/list.php?cid=187>

¹⁰⁸ <http://www.iotexpo.com/upload/201402/19/20140219100219989552.pdf>

- Qingdao Internet of Things Industry Association (a city in Shandong province)
- Hangzhou Internet of Things Industry Association (a city in Zhejiang province)
- Suzhou Internet of Things Industry Association (a city in Jiangsu province)
- Chengdu Internet of Things Industry Development Alliance (a city in Sichuan province)¹¹⁰

The Conference's focus includes:

- Frontier Technology & Standard/Smart City & Community:
 - Benchmarking of IoT deployments in smart cities
 - Living in Smart Cities
 - Big Data in Building Smart Cities
 - From IoT Application to Sustainable Smart Community Cases

Shenzhen City Big Data Industry and Innovation Alliance

In January 2014 the Shenzhen City Big Data Industry and Innovation Alliance was launched, this Alliance is sponsored by the Technology Innovation Committee of the Shenzhen Government which comprises numerous key enterprises of the Big Data industry in Shenzhen City. The Alliance aims at promoting industry collaborations and Big Data technology developments and applications to promote Shenzhen City's pioneering position in China's Big Data industry¹¹¹.

“As a national strategic emerging industry, Big Data has received great attention from the Chinese government. The "Twelfth Five-year Plan for the National Development of Strategic Emerging Industries" clearly advocated the research and development of mass data storage, processing technology, and industrialization. The "Internet of Things Five-Year Plan" lists information processing technology as one of the top technology innovation initiatives. Smarter Cities are leveraging Big Data technology to improve infrastructure, planning and management, and human services with the goal of making cities more desirable, livable, sustainable, and green. Some specific focus areas include mass transit, utilities, environment, emergency response, big event planning, public safety, social security, and healthcare.”

¹⁰⁹ <http://www.ziota.org/>

¹¹⁰ <http://www.chinaiot.org.cn/index.html>

¹¹¹ <http://www.prnewswire.com/news-releases/china-information-technology-inc-chairs-the-shenzhen-city-big-data-industry-and-innovation-alliance-240458841.html>

Wuhan Intelligent City

Wuhan¹¹² presents itself as an “intelligent city”¹¹³, identified as a national “intelligent city” pilot by the Ministry of Science and Technology. In 2012, the Wuhan Municipal Science and Technology Bureau made an offering of 10 million Yuan for domestic public to tender the “intelligent city” master plan project. In 2013, “The Intelligent Wuhan City Overall Plan” has been formed, and was expected to start to pay off within 3-5 years. It was claimed that Wuhan will be the fastest growing Chinese city in term of Internet speed. Currently, the average 2 mbps household bandwidth will be increased to 50-100 Mbps through the optical fiber plan. For understandable reasons this pilot appears to be the main focus of the Wuhan Municipal Science and Technology Bureau.

Current concerns

The report [7] describes China as an absorptive state adept at attracting and profiting from global knowledge and networks. Underpinning this assertion is the observation that “A distinctively Chinese approach to innovation involves not only absorbing the best ideas from around the world but recasting them and recombining them through ‘re-innovation’ much of which involves ‘hidden innovation’: the innovation in design, processes and organisational models in manufacturing and services not captured by the traditional measures of R&D.” While it is acknowledged that, especially in the field of ICT, China is much more than just an absorptive state, as evidenced by its world leading R&D capabilities in 5G technologies, it nevertheless remains absorptive in certain key sectors relevant to ICT, for example, digital services for smart Cities.

European companies have a long history in China’s ICT market, yet European access to participate in China’s ICT services market lags dramatically behind participation in China’s ICT infrastructure and devices market.

The European Chamber of Commerce in China (ECCC) ICT working group has noted that while European companies have a long history in China’s ICT market, European access to participate in China’s ICT services market lags dramatically behind participation in China’s ICT infrastructure and devices market¹¹⁴.

¹¹² Zhejiang Province

¹¹³ <http://www.chinaabout.net/intelligent-wu-han-fiber-plan-increase-the-overall-internet-speed-to-100-mbps-in-next-3-5-years/>

¹¹⁴ <http://www.europeanchamber.com.cn/en/publications-archive/238>

Conclusions

More than 90% of Chinese cities are constructing Eco-city developments of one form or another. Most Chinese cities fund their projects through public funding mainly at the local municipal level. Given the extent of Chinese investment in eco-cities their ICT needs are currently the most important area for potential EU-China collaboration in ICT R&D&I.

The leading Chinese government body responsible for the development of a national Eco-city standard is the China Society for Urban Studies (CSUS); effectively defining the Chinese Eco-City.

The ‘hardware’ of Eco-city urban planning and design should include SMART infrastructure which utilises Information and Communications Technology (ICT) to enable virtual connections, reduce physical urban loads, and in combination with face-to-face interaction promote quality of life. Although SMART can be adopted loosely as a label, Eco-city ICT relevant technologies can be clearly defined, critically appraised and selectively adopted.

The technology infrastructure required to deliver smart city projects should be defined by function rather than in terms of a specific technology, which means prioritising services and creating service platforms. However, European access to participate in China’s ICT services market lags dramatically behind participation in China’s ICT infrastructure and devices market.

The IT services required to deliver the Eco-city concept rely on the effective use of management, communication and control systems, and consequently on systems integration and management.

There is a hierarchy of Chinese smart cities industry alliances that EU organisations can interface with in seeking to effectively promote EU-China ICT R&D&I collaboration related to the realization of smart cities. There is a national overarching association focused on forming a smart city industry chain and promote the rapid and orderly development of China's large-scale smart city industry (National Industry Alliance of Smart City Technology Innovation), a technically focused national association promoting technology innovation and technology standards for smart cities (CCIT), an association focussed on the training and nurturing of the required personnel (CSAoSCITI), and an association focussed on urban governance Smart City Development Alliance).

It follows that in the context of EU-China collaboration in ICT R&D&I for Chinese Eco-cities, in terms of deployment the National Industry Alliance of Smart City Technology Innovation is the most important industry association. However, from the point of view of EU-China collaborative ICT R&D&I related exchange of research personnel and university research and technology transfer the China Strategic Alliance of Smart City Industrial Technology Innovation is the most important industry association.

The high level Chinese national industry alliances addressing the challenges of realising smart cities appear to be special cases established to address the particular challenges posed by the need for extensive cross-sector integration to realise the smart city vision. However, as such by their very nature they have to link extensively to more sector specific national associations and therefore could be a natural focus for effective EU collaboration with Chinese industry with respect to standardisation and regulatory initiatives.

The China Software Evaluation Center plays a significant role in smart cities development in China; it has responsibility for City top-level design and evaluation.

Eco-cities related collaborative ICT R&D activity with China has been undertaken by Germany and the United Kingdom. This is an area of interest for Austria and Sweden.

Recommendations

In the first instance know-how transfer in the area of IT service management for Eco-cities should be the main focus of EU organisations cooperation with China in ICT R&D&I in the area of Eco-cities.

The European industrial associations need to encourage and support EU companies in targeting the Chinese markets for digital services, in particular, services supporting the Chinese vision of the eco-city (or smart city).

The EU China Smart City Cooperation Project Technical Expert Group has responsibility for Identifying and sharing “good practice” and maintaining a database of technical experts from China. It is a useful resource for disseminating activities promoting EU-China ICT R&D cooperation in Eco-cities.

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Appendix 5: CHOICE Internal report I-5 Clustering for Success: Cluster to establish EU-China collaborative ICT R&D&I

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Abstract: A lot of work has been done which highlights the important role clustering plays in the establishment of EU-China collaborative activities in ICT R&D&I. This report reviews much of this work and in doing so provides an overview of different approaches to clustering that have been taken and their effectiveness. Conclusions are presented and recommendations made which are targeted at organisations interested in establishing collaborative ICT R&D&I activities with China.

Disclaimer: The views presented in this report reflect those of the document organizers and do not necessarily represent the views of the European Commission.

The major EU clusters: European ICT Poles of Excellence (EIPE)

The EIPE project investigated the issues of growth, jobs and innovation in ICT. In [1] the following definition of EIPE was provided: “European ICT Poles of World-Class Excellence (EIPE) are geographical agglomerations of best performing Information and Communication Technologies production, R&D and innovation activities, located in the European Union, which play a central role in global international networks.” Crucially, this definition while incorporating excellence in ICT R&D places it in a broader context of production and innovation in a global operational environment. This approach goes a long way to matching the Chinese vision of excellence in ICT R&D. However, the definition of EIPE also incorporates the notion of cases of excellence in ICT R&D, production and innovation activities, primarily being found within a geographical agglomeration of such excellence. The Chinese have long been aware of this phenomena and it has been a significant driver behind China’s push to establish special economic zones with targeted specialisations. In [1] it is in effect acknowledged that while processes are in play driving a geographical redistribution of economic and knowledge-intensive activities, at the same time related processes have led to, and continue to lead to, the concentration and clustering of these activities in specific zones, a

phenomena known as the paradox of ‘sticky places within a slippery space’. Careful attention must be paid to this phenomena when seeking to promote European excellence in ICT R&D as the target audiences are very aware of it and actively seek it out.

In [1] it was noted that: “there is only scarce data when it comes to systematically analyse Europe-wide regional and sub-regional areas, the location of ICT-specific activities or their nature (i.e. R&D related). Furthermore, methods and indicators for measuring processes, such as internationalisation or global networking, are still under development in this decade.” A consequence of this observation was that the EIPE project put considerable effort into generating such data. Because the EIPE project is a recent project it provides the main source of information on excellence in ICT R&D and innovation at the European Union level. Effectively, [1] acknowledges the important role the knowledge function plays in growing and sustaining EIPE. The three leading EIPE all incorporate long established and globally recognised university and research institute ICT R&D activities.

An important contribution of [1] is to assess the quality of European Union ICT R&D and innovation both in terms of its global impact and how it compares against the world’s best. However, while there is discussion of fostering and supporting clusters of European ICT excellence in [1], the issue of how to help individual European ICT related businesses outside of these clusters thrive is beyond of the scope of the work of the EIPE project.

In the context of promoting networking with China in ICT activities much of relevance is reported in [1] relating to networks where the primary outputs are knowledge integration and market reach. However, in context of networking in China, for the Chinese targeted networking activities are only merited when the proposed networking is of sufficient scale either in terms of the magnitude of the activities of the individual partners concerned or the number of partners.

The key findings of the EIPE project are reported in [2]. The findings of particular interest in the context of seeking to pursue collaborative ICT R&D&I with China are:

“Excellence in ICT is built up of high and balanced performance in all activities, i.e. ICT R&D, innovation and business, and in all three characteristics: agglomeration, internationalisation and networking.” It follows excellence in European ICT R&D in China cannot be promoted outside of its context in terms of these activities and characteristics. This is a manageable constraint since the EU and China agreed at their 14th Summit in February 2012, to broaden their exchange in science and technology towards innovation ([3]).

[2]: “Only a very small number of EU regions therefore demonstrate intensive ICT activity and they represent a large share of the total EU ICT activity. This concentration is observable in all indicators, i.e. R&D, innovation and business. Their distribution shows that excellence is concentrated in a very small number of EU regions.” Given that the European Commission has tacitly acknowledged that ICT R&D excellence in Chinese terms is found only in a small

number of EU regions it would not be appropriate to promote European ICT R&D taking place outside of these regions as excellent in Chinese terms, a more nuanced approach is required.

“Only twelve EU Member States (Germany, the UK, France, Sweden, Finland, the Netherlands, Belgium, Italy, Ireland, Denmark, Austria and Spain) host all of the top 34 regions” This emphasises the lack of critical mass of excellence ICT R&D in new member states. Just how difficult this is to address is emphasised by the finding reported in [2] that:

“Key locations of ICT activity in Europe like Inner London East or Paris exhibit very rich and diverse ICT R&D landscapes with large numbers of universities with high scientific output. ICT innovation and business activities also exhibit very strong agglomeration characteristics.”

Unsurprisingly, [2] goes on to observe that: “Improving the performance of Eastern Europe appears to be on another scale, where probably another rationale should be applied (e.g. cohesion policies).

Furthermore: “No homogeneous policy has emerged as the optimal path towards improving performance.”

In [2] it is noted that a significant feature of Europe’s leading ICT poles of excellence is their diversity in specialisation, with each region showing one or several specific strengths. China has long recognised this and its bilateral ICT R&D agreements with member states strongly reflect the specific strengths of their ICT R&D poles of excellence. This raises the question as to the role of the EU in promoting European excellence in ICT R&D.

The results of the EIPE project show that [2]: “all types of networks of ICT activity, i.e. R&D, innovation and business, are sparsely connected and the differences between regions are very pronounced. There are only very few locations which play central roles in these networks. In addition, these central locations are usually very well connected with each other. This reflects how agglomeration forces influence the location of ICT-related activities and the structure of the global ICT networks.” It follows that the most effective way to promote ICT R&D collaboration with China is to make these forces work for Europe. Support for this approach is provided by [4] which reasons that: “If networks become the dominant form of organising economic and innovative [activities], one can expect that network viability and countries' positions in this network will depend on their ability to develop collaboration mechanisms that support co-dependencies between them.” The potential impact of the proposed approach is emphasised by the conclusion of [4] that: “the expansion of the R&D network is driven not by the large and industrialized countries, but rather by the entry of smaller countries, which become niche players.” It follows that [4]: “A country's attractiveness as a location for R&D activities and hence its bargaining power will strongly

depend on its technological uniqueness.” A crucial point to pay attention to when designing programmes to promote such networking.

From [5]: “One of the reasons why there is no complete picture of the position and dynamics of China in the process of international technology transfer is lack of information.” And “between 1990 and 2007, Chinese entities owned nearly two thousand inventions that were developed by foreign inventors. In the same time period, nearly six thousand inventions developed by Chinese inventors were owned by foreign applicants. Thus, in the language of international trade, China recorded 300% deficit in the international technology transfer.” This should be accounted for when considering the real extent of reciprocity on the part of China in EU-China collaborative ICT R&D. However, the direct impact is that activities undertaken to promote collaboration in ICT R&D&I should as far as possible not be seen to have the potential to contribute to a worsening the EU-China imbalance in international technology transfer if they are to be well received in China. This means there should be a focus on promoting mutual ICT R&D excellence through its relationship to market opportunities. The upside of this is that [6]: “China is turning into one of the most prolific countries in terms of applications for and grants of patents.” “For China between 2000 and 2008 the three fastest growing technological classes, i.e. nanotechnology, IT methods and digital communication, maintained a CAGR of over 50%.” “All this confirms a relatively strong development of Chinese R&D landscape and a sound diversification of the technological portfolio.” This points to there being excellent opportunities for mutually beneficial EU-China collaboration in globally leading ICT R&D&I.

Clustering in China: The absorptive state and clustering

A UK Nesta report of 2013 [8] explored the prospects for China-UK collaboration and concluded that collaboration with China could only be achieved through clustering. Accordingly the report is reviewed with respect to what it can tell us about achieving clustering around ICT R&D.

“The UK has now overtaken Japan to become second only to the US in the number of its joint research publications with China” ([8]), therefore, the 2013 Nesta report [9] on the prospects for UK-China collaboration in research and innovation is an important contribution in the context of EU-China collaboration in ICT R&D because the work reported was funded in part by the UK government Department of Business, Innovation and Skills (BIS), and The Foreign Office, with funding also coming from the BIS Science and Innovation Network, and Research Council UK (RCUK) in China. The central message of the report that: “China is an absorptive state, increasingly adept at attracting and profiting from global knowledge and networks” has profound implications for the EU-China collaboration in ICT R&D.

“The report shows, a distinctively Chinese approach to innovation can now be seen in many sectors. It involves not only absorbing the best ideas from around the world but also recasting them and recombining them through ‘re-innovation’. Some of that is the result of classic R&D. But much involves what Nesta has called ‘hidden innovation’ – the innovation in design, processes and organisational models in manufacturing and services which isn’t captured by the traditional measures of R&D.”

The importance of appreciating this when pursuing EU-China collaboration in ICT R&D cannot be understated as ([8]): “One way of understanding this trajectory is through the concept of ‘introduce, digest, absorb and re-innovate.’ This concept featured prominently in China’s Medium and Long-term National Plan for Science and Technology Development (MLP), which was published in 2006 and remains the primary blueprint for innovation policy until 2020.”

It is recommended in [8] that: “China’s innovation system is advancing so rapidly in multiple directions that the UK needs to develop a more ambitious and tailored strategy, able to maximise opportunities and minimise risks across the diversity of its innovation links to China. For the UK, the choice is not whether to engage more deeply with the Chinese system, but how.” This recommendation applies was much to the EU as a whole as it does to the UK.

The Nesta report states with respect to Chinese national policy ([8]) that: “absorption will remain a core strand of national research and innovation policy, and Chinese firms’ impressive ability to rapidly absorb and re-innovate, while adding novelty and value to ideas and technologies in the process, is crucial to understanding their competitiveness.” In particular, the report emphasises that research collaboration in innovation “should encompass the full breadth of potential innovation links between the two systems, from research through to the commercialisation, demonstration and scaling phases of new technologies.”

Furthermore, the report also emphasises that ([8]): “For any country seeking to collaborate with China, ensuring a density and diversity of connections will be crucial, spanning the academic, research, commercial, trade and cultural spheres.”

It is important to note that with respect to China ([8]): “There is very little evidence available on the effectiveness and economic impact of different models of support for international innovation collaboration. Each country’s strengths and modes of engagement are unique, ..., the transfer of ‘best practices’ in collaboration is rarely straightforward.”

A recommendation of [8] with respect to UK-China collaboration that carries over directly to EU-China collaboration is: “sophisticated methods and metrics for identifying ... innovation opportunities and for evaluating impact” should be developed. The potential benefits of engaging with China’s strengths in developing, iterating and scaling technologies is emphasised as is the need to develop approaches to collaboration in R&D that support ecosystems of collaboration rather than individual companies.

Chinese priority themes spanning research and innovation, mentioned in [8] which encompass ICT R&D&I include: Ageing and healthcare, and Smart and sustainable cities. The first theme is a natural area of collaboration for the EU because of its ageing populations. The second theme has been explored in CHOICE Internal report I-4 [9].

Breznitz and Murphree go so far as to argue that ([8]), “China has been sustaining its long run of economic growth ‘by innovating in many stages of production, but not in novel product R&D’.”

More pointedly ([8]): “The 2006 Medium and Long-term National Plan for Science and Technology Development (MLP) 2006–2020 describes one of its central objectives as strengthening indigenous innovation by “enhancing original innovation, integrated innovation, and re-innovation based on assimilation and absorption of imported technology.”

The 12th Chinese Five Year Plan identified ‘seven strategic emerging industries’ of which Next generation IT is the most obviously relevant to ICT R&D&I but Energy conservation and environmental protection is also highly relevant through aspects such as smart grids and eco-friendly smart cities underpinned by Internet of Things applications.

The importance of a diversity of connections when pursuing ICT R&D collaboration with China is apparent from Chinese government policy ([8]): “The latest policy guidance for indigenous innovation talks of stepping up efforts to ‘improve innovation capabilities in key social fields’ – with an emphasis on education and digital technology, healthcare systems and technologies, public safety and disaster management and the ‘modern cultural industry system’, which covers industries ranging from publishing and printing to online games and animation.”

With respect to the case made by the EIPE project for paying due attention to the importance of EU poles of excellence in ICT R&D and innovation (I), it is striking that in 2013 the Chinese central government announced ([8]): “the first batch of ten pilot innovative industrial clusters to stimulate innovation and industrial competitiveness within clusters and stimulate industrial upgrading of the industries located there. The plan states that a new batch of innovation clusters which are to be based within existing national high-tech zones will be announced each year.” This is significant in that it not only recognises the economic importance of clustering but highlights that there will be, in effect, Chinese poles of ICT excellence that can be networked to EU poles of ICT excellence for their mutual benefit. The first batch of innovation clusters includes a cluster In Mobile Internet in Beijing Zhongguancun (北京 中关村), a cluster in Next-generation Internet in Shenzhen (深圳) High-Tech District, and a cluster in Cloud computing and smart terminals in Huizhou (惠州), as well as other clusters of relevance to ICT R&D. The focus on ICT related clusters reflects China’s relative global strength in ICT related manufacturing and the importance of R&D to this sector which is evidenced by the fact that ([8]): “a tiny number of Chinese companies,

concentrated in the ICT equipment industry, accounts for the largest share of the dramatic increase in United States Patent and Trademark Office patents held by Chinese residents.”

The growing importance of networking corresponding clusters rather than individual companies was highlighted by Denis Simon who ([8]): “describes five shifts in China’s approach to international cooperation since the publication of the 2006 Medium and Long-term National Plan for Science and Technology Development (MLP):

- From general international S&T cooperation to proactive, targeted cooperation focused on the needs and mission of the MLP;
- From project-based collaboration to ‘the integration of projects, talent and R&D base’s’;
- From an orientation to technology imports to a combined process of ‘inviting in’ and ‘going abroad’;
- From cooperation driven by government to cooperation driven by multiple players;
- From bottom-up to top-down project identification and approval in line with the requirements of the MLP.”

Parallel UK policy development

On 31 March 2014 the UK Minister for Universities and Science, David Willetts, chaired the 7th UK China Joint Commission on Science and Technology in London with his Chinese counterpart Minister Wan Gang.¹¹⁵ “Ministers discussed the new UK-China Research and Innovation Partnership (known in the UK as the Newton Fund), £200m joint funding over five years for cutting edge research and innovation collaboration between the UK and China, which was announced during the China Summit in December 2013. It comprises three strands: people exchanges; research partnerships; and innovation and translation partnerships.” The proposals for the partnership include: “using China’s network of science parks and national high tech zones”. More formerly the new partnership is known as: Newton UK-China Research and Innovation Partnership.

Cross-sector clustering in the EU

Given that majority of existing international cooperation within the EU in ICT R&D is based around poles of excellence it is extremely important for any member state that does not host a ICT pole of excellence to explore any emerging paradigm outside of this established model for cooperation. In the following the national level cross-sector approach to clustering is considered.

¹¹⁵ <https://www.gov.uk/government/publications/china-david-willetts-hosts-uk-china-joint-commission-on-science-and-technology-april-2014/china-david-willetts-hosts-uk-china-joint-commission-on-science-and-technology-april-2014>

Cross-sector clustering at the national level

Of particular interest in this context is the Finland-China Memorandum of Understanding (MoU) on co-operation in the Built Environment signed on the 15 May 2014 [10]. This MoU followed a meeting between the President of Finland and the President of China, the participants to which formally recognised the need for smart and sustainable cities and to find energy-, resource- and cost efficient solutions through cooperation. The MoU is based on an emerging Finnish paradigm of cooperation with China that has its basis in a long history of Finland-China cooperation and a realisation by Finland that historically there had been very little business involvement in this co-operation accompanied by an increasingly strong desire on the part of the Finnish government to address this deficiency.

Tekes the Finnish Funding Agency for Technology and Innovation is the main public funding organisation for R&D in Finland. In September 2012 it appointed TIVIT, the Finnish Strategic Center for Science, Technology and Innovation in ICT to coordinate and further develop the China-Finland ICT Alliance. It responded by publishing a substantial report on new opportunities for China-Finland R&D&I cooperation [11]. The starting point of the report is the recognition that: “China is heavily modernizing its innovation system by structural changes, new international partnerships and huge financial investments in R&D&I activities. This development is happening simultaneously with big societal changes and challenges: rapid urbanization, aging population and rising awareness on environmental protection. This development offers new possibilities for R&D&I cooperation and business between China and Finland for the mutual benefit of both countries.” The report recognises that in China’s 12th Five-Year Plan (2011-15), there are many cross-cutting themes that create new business and research opportunities which include ICT-enabled intelligent services. It goes on to acknowledge that to address these themes, “Multi-disciplinary approaches are typically needed as well as better linking of relevant sectors of industries and government entities at different levels (municipal, provincial, state and inter-governmental levels)”, and that “In such a complex environment, the potential value of business-oriented R&D results and developed technologies and solutions may be best put in practise when their integration to the industry and society, for example in China, is facilitated in a strategic way.” To meet these challenges ([11]), “The Tekes strategy specifies three horizontal drivers, including business in global value networks; value creation that is based on service solutions and intangible assets; and the renewal of services, production and products by digital means.” In the context of EU-China ICT R&D collaboration it is important to note that the report [11] makes clear that: “In this framework it is evident that ICT and digital services will play an essential role, when not regarded primarily as a technology focus area but recognised as the key enabler of global business, value creation, and the renewal of services, products and production.”

The Finnish report [11] contains a number of observations that are of fundamental importance for the future of EU-China ICT R&D cooperation, including that, “There are several ‘hot’ technology research topics in the 12th Five-Year Plan that are commonly included in the plans across provinces and municipalities. These include Internet of things, cloud computing, next generation wireless and broadband technologies, and tripleplay, i.e. the convergence of television, telephone and Internet, as well as IC technologies, where original Intellectual Property (IP) is being developed. These are the underlying technologies that provide the basis for creating new intelligent solutions and services in various industries.” The real differentiation in the ICT R&D pursued comes from the applications and industry sectors in which these technologies are deployed thus is cannot be decoupled from innovation. Application areas given as examples in [11] are manufacturing systems, logistics, e-business, services industry, and public sector services. More specifically, research is increasingly geared towards supporting a move towards digitalisation through the creation of intelligent products and services. Inevitably such research involves not just identifying and integrating the enabling ICT technologies for the new services but also dedicated user-needs driven research on the actual services. Of the globally recognised areas of Finnish competence in the context of Eco-cities the obvious one to focus on is Energy efficiency. Because of its cold climate, relatively large size and energy intensive main industries, Finland has invested in energy efficiency for decades. Finland has globally recognised competence in various areas including combined heat and power generation, district heating and cooling, and smart grids and power electronics. Furthermore, Finland is one of the world’s leading users of renewable energy.

In China R&D on smart city concepts is being undertaken through Digital Shanghai (services anywhere), Digital Zhejiang (浙江 province) and “Intelligent City Wuxi 无锡” in Jiangsu (江苏) province. Public services to address key challenges related to urbanisation such as traffic management, health and wellbeing issues, aging care and limiting CO₂ emissions are also being developed. While requiring technology realising the Smart City also requires research at the systems and services level. This provides opportunities for international cooperation to realise the required integration of interdisciplinary research and accompanying cross-sector development. In purely technical terms topics explicitly included in provincial level plans include the Internet of things, cloud software, data to intelligence, and digital services and next media.

Crucial to an appreciation of the background to the Finland-China Memorandum of Understanding (MoU) on co-operation in the Built Environment [10] is the acknowledgement in [11] of traditional areas of globally recognised Finnish competence including ICT. In essence in [11] these globally recognised competences are seen as potential gateways to international cooperation in cross-sector areas that encompass them such as environmental solutions and smart city concepts, which require expertise from several different domains,

when they are offered as part of a complete package of required cross sector expertise. This can be viewed as the state of the art in clustering. Interestingly this form of clustering should be easier to coordinate and more agile in smaller member states which are otherwise disadvantaged by a lack of scale when it comes to establishing conventional poles of excellence. In this way cooperation in areas of existing globally recognised competences that is of benefit to business can be achieved while at the same time these competences can be used to leverage cooperation in other areas when they are collectively needed to address a cross-sector challenge.

Finland is actively positioning itself for cross-sector cooperation. In [11] two forums are quoted as illustrating: “a national aim to create a high-level foundation for over-lapping cross-sectoral cooperation in technology applications, industrial needs and business models.” Both these forums are in the area of ICT ([11]):

“The Future Mobile Communication Forum (Future Forum) is directed towards the future technologies of telecommunications and information services. Through its working groups it supports technology exchange and international technological cooperation. It has about 50 key partners in research and technology, such as China Mobile, Nokia, Ericsson and France Telecom. Significantly, Future Forum has a mandate from The Ministry of Science and Technology of the People’s Republic of China (MoST), is supported by NDRC and MIIT, and cooperates closely with China Academy of Sciences, Beijing University of Posts and Telecommunications (BUPT) and the China Academy of Telecommunication Research (CATR) of MIIT.

Future Forum has a role in formulating and promoting national R&D&I policy initiatives in telecommunication and information technology areas. For example, Future Forum integrates its activities and working groups to support the implementation of Chinese national strategies, such as the National Science and Technology Key Special Project (the 863 Programme).” In an EU context it is notably that Finland has been looking to cooperate with its neighbours to strengthen its clusters global competitiveness. For example, Sweden has been active in the Future Forum’s international activities.

“Ubiquitous Networks Industry Technology and Development Forum (United Forum) has as its main objective promoting the interests of and development of the industry as a whole. Its main focus areas are key technologies, service architectures and future business models. It has three working groups and another three groups are under specification on smart city concepts, elderly care and education.

United Forum is a network for knowledge and technology transfer among industrial and academic partners in China. It has about 25 key partners representing the whole R&D and business sector, such as Huawei, Intel, China Mobile, Samsung and Alcatel. United Forum is

affiliated by MIIT and it works closely with CATR, BUPT and China Communication Standards Association (CCSA).”

To highlight the potential of this approach a table of example topics in ICT-related areas in provincial and municipal R&D plans in China is reproduced from [11] below, which notably includes several that are ‘cross-sector’. N.B. Beijing-city (上海市 direct-controlled municipality), Shanghai-city (上海市 direct-controlled municipality), Yunnan (云南省 province), Xaanxi (陕西省 province), Hubei (湖北省 province), Jiansu (江苏省 province), Chongqing (重庆市 direct-controlled municipality), Zhejiang (浙江省 province)

Beijing	Shanghai	Yunan	Shaanxi	Hubei	Jiangsu	Chongqing	Zhejiang
Internet of things	Digital Shanghai (services anywhere)	Next generation Internet	Next generation communication networks	Communication and networks	Cloud computing	New generation Information terminal and related key tech	Smart city, Smart Zhejiang
Cloud computing (esp. virtualisation, security)	Smart Harbour	3rd generation mobile communication	Tri-networks convergence	Electronic materials and devices	Internet of things	Cloud computing	Manufacturing industry IT
Wireless mobile communication network	Smart agent services	Network convergence	Internet of things	Software and information services	Track traffic	Communication key technologies	Improve traditional industry R&D level, innovation platform building
LTE core chips	Intelligent home devices	Modern services	High end software	Innovation platform for building	Electronic information	Internet of things	Service industry digitalisation
Triple play, three networks convergence	Smart community	E-payment	High performance IC design		Smart travelling	IC design and manufacturing	Cloud computing
Very large scale integrated circuit	Smart traffic and logistics	Internet of things	Beidou GPS navigation systems		RFID	Modern logistics	Internet of things
High speed optical access chips	Smart city security	Modern logistics	New display tech		Tri-network convergence	Traffic key technologies	Wireless digital communication
IT services operation platform	IT industry foundation strategic products	Digital traveling	Antique / cultural heritage services			National largest offshore data development processing centre	Tri-network convergence
	Microchip	Communication and cooperation tech			Mobile Internet	Tri-network convergence	E-business
	New wideband mobile communication	Information transfer and exchange security			Next wireless LAN	Authentication and testing	Optical communication industry
	New human-machine environment and smart monitoring				Smart search engine	IC industry clusters	Digital traveling
	Smart home device and network convergence tech				Massive data storage		Antique / cultural heritage services and protection
	Embedded technologies						Modern logistics
	Trusted systems						Smart traffic

It is too early to state definitively whether or not the Finnish approach of cross-sector clustering can be considered effective in fully engaging industry in Finland-China R&D&I but initial indications are that it will be. The China – Finland Strategic ICT Alliance website¹¹⁶ contains up-to-date information on its projects and newsletters on its activities. China-Finland ICT Alliance: Newsletter: January-March 2014¹¹⁷ reports a MoST-Tekes call

¹¹⁶ <http://ictalliance.org/>

¹¹⁷ <http://ictalliance.org/china-finland-ict-alliance-newsletter-january-march-2014/>

in ICT and applications which opened in March and closing at the end of April 2014 and related cooperation with Jiangsu and Zhejiang provinces. This call was specifically aimed at industrial partners and SMEs in particular. The overall theme of call, cleantech and its applications, fitted with Chinese strategic priorities identified by Tekes.

Closely related to this in March 2014 the Alliance together with Chinese geoservice company Geostar (Wuda-Geo) and Finnish air quality monitoring and modelling companies initiated a China-Finland proposal for an “Air Quality Monitoring Platform”, to synchronise cross-sectoral China-Finland cooperation, a meeting hosted by CLEEN¹¹⁸ on business and R&D opportunities for monitoring and improving outdoor and indoor air quality in China was held; CLEEN facilitates and coordinates world-class, industry-driven research in the energy and environmental fields with shareholders that include major international companies with significant energy- and environmental-related R&D activities in Finland.

The best evidence of significant industry engagement is provided by one of Alliance’s most recent (Phase II) projects: Finland’s Enhanced Navigation using COMPASS/Beidou Signals¹¹⁹ the partners of which include the Finnish companies Nokia Ltd., Vaisala Ltd., and Roger-GPS Ltd.

Importantly the activities of the Alliance clearly demonstrate that Finland seeks the breath of a density and diversity of connections, spanning the academic, research, commercial, trade and cultural spheres that is so clearly desired by China.

In addition to funding a number of ‘traditional’ university and research institute driven cooperative R&D projects indicative of the diversity of the Alliance’s activities are initiatives in education such as the “Sino–Finnish Learning Factory” (SFLF). This initiative is particularly interesting because although as would be expected it is driven by the Finnish Ministry of Education and Culture it’s activities draw on expertise from companies, research institutions and organisations with a particular effort being made to involve education technology and services companies under the theme of a theme of “Education-as-a-Service” thereby linking the initiative to innovation. In support of this effort EduTech business ecosystem workshops were organised at Digile¹²⁰, which coordinates the China – Finland Strategic ICT Alliance, on 11 March 2014 and 1 April 2014.

To give an appreciation of where the SFLF initiative fits within the Finnish strategy for R&D&I cooperation with China it is acknowledged by the Alliance in the January-March 2014 newsletter that:

¹¹⁸ <http://www.cleen.fi/en/news?type=n&item=49>

¹¹⁹ <http://ictalliance.org/fincompass/>

¹²⁰ www.digile.fi

“financing international R&D&I cooperation still remains a challenge. This is particularly true when considering public funding for university research but similar challenges also appear when companies search for financing for cooperation in new areas.

In this situation it becomes even more important to be able to link complementary activities and resources as well as different modes of operation together (e.g. cooperation in research projects, education and business pilots).”

The implications of this for the future of EU-China cooperation in ICT R&D&I are that funding models for ‘traditional’ R&D cooperation cannot be decoupled from funding models for educational cooperation and more importantly business pilots.

Regional clustering

At the level of the individual EU member state the cross sector approach to clustering really only makes sense in those advanced economies with a broad base of internationally competitive commercial sectors. One possible alternative approach, particularly for smaller member states, that has been explored is to reach out to neighbouring countries and cluster at the regional level. In the following a transnational regional approach to clustering is considered.

Lessons from the BENCH project

For EU member states without a broad base of internationally competitive commercial sectors inward investment from China is more likely to be a higher priority than collaborative R&D&I with China. To pursue collaborative ICT R&D&I with China in an environment where the resources available at the national level to support such activity are limited clustering at the regional level may be a way forward.

An interesting example of an EU funded regional clustering initiative is the BENCH project¹²¹: ‘Beneficial Business Relations between the Central Baltic Region and China’. BENCH was a pilot project within the European Union Regional Development Fund Central Baltic INTERREG IVA Programme 2007-2013. The regions involved were Päijät-Häme and Uusimaa in South Finland, Östergötland in Sweden, and significantly the whole of Estonia. The Estonian Chamber of Commerce and Industry (ECCI) was an active partner within the project.

BENCH specifically sought to answer the question of how Finnish, Estonian and Swedish regions could cooperate on contact with China and how established contacts and exchange

¹²¹ <http://projektwebbar.lansstyrelsen.se/benchproject/En/Pages/default.aspx>

with could China be utilised more efficiently for the benefit of trade and industry. Although the main focus of BENCH was on attracting inward Chinese investment some of its findings have a direct relevance to the promotion of collaborative ICT R&D&I with China. For Estonia, 3 sectors were the priority: Cleantech, logistics and tourism where Information and Communication Technology (ICT) is reflected horizontally.

Estonia, situated at the heart of the Baltic Sea Region, has a relatively small population of approximately 1.3 million inhabitants. It is not part of any EIPE nor given its size is cross sector clustering at the national level viable and yet [12]: “ ‘e-Estonia’ is a term commonly used to describe Estonia’s emergence as one of the most advanced e-societies in the world. This success story grew out of a partnership between a forward thinking Government, a proactive ICT sector and a switched-on tech-savvy population. Thanks to this Estonians and the Estonian state enjoy an unusually wide range of e-solutions, and the nation has become an example for other countries that wish to follow the same path.” Furthermore, Estonian ICT solutions were reported as gaining great recognition in China as a result of the Estonian presence at Expo 2010 which was hosted by Shanghai.¹²²

However, the above remarks have to be qualified by the observation that [12]: “Companies in Sweden, Finland and Estonia are at different development stages in general. In Finland and Sweden, they are mostly at the highest level in the value chain. Estonian companies are still rather subcontract-oriented.” It is therefore not surprising that a BENCH case study taken to illustrate a common pattern among Estonian SMEs entering the Chinese market concerned a logistics company with net revenue of 1.8 million Euro in 2011 entering the Chinese market through a joint venture with a Finnish company. It was observed earlier in this report that with respect to EU-China collaboration in ICT R&D the biggest challenge is actually the wider fundamental challenge the EU faces of enable enterprises outside of EIPE to network globally through them and that this is as much an intra EU challenge as it is an EU-China challenge. The case of Estonia suggests that open recognition of this challenge may well be welcomed by SMEs in member states that do not host EIPE as it can reflect business realities.

To understand the direct significance the results of BENCH have for EU-China collaborative R&D it is important to be aware that another question that BENCH was seeking to address was: “How can universities support small and medium-sized enterprises (SMEs) in the Central Baltic region in developing business with China?”

For collaborative ICT R&D&I the conclusions of BENCH are somewhat circuitous [12]: “stakeholders and project partners have developed an increased understanding and knowledge about business relations with China by utilising the benefits of cooperation in the European Union common market. Especially the SMEs in small EU regions and countries can obtain a

¹²² <http://e-estonia.com/estonian-ict-solutions-gain-great-recognition-shanghai/>

lot of support from such collaborations. It is not an exaggeration to say that many companies and supporting organisations have not yet understood the full potential of the EU community.” This only gives rise to the question: has the full potential of the EU community for providing such supporting been realised?

The BENCH website contains some useful resources for stakeholders in collaborative ICT R&D&I with China and although it will not be updated with new information it will be available until the end of 2018, in particular, it provides a link to the interactive digital handbook¹²³. The BENCH Digital Handbook¹²⁴ [12]: “takes the viewer through several steps of a typical entry process to the Chinese market of a small business. It focuses on a set of questions important to companies deliberating on a potential expansion to China. In several video clips questions are raised, such as: What are you planning to sell in China? Who and where are your main clients? Have you drafted your entry strategy? Who is helping you? How will you get your product or service to your clients? Will you hire Chinese nationals to work for your business in China? Are you planning to set up a manufacturing facility on the mainland? Who does your accounting? How do you plan to finance your operations?”

The BENCH project made one recommendation at the European Union level relevant to promoting EU-China collaborative ICT R&D&I [12]: “The European Union should map different EU countries’ activities in China, increase the joint activities and provide access to existing support structures for companies from other EU countries. Larger European countries present themselves in China through various organisations, but they are not sharing the opportunities with other EU Members.”

Whilst the observation that larger European countries present themselves in China through various organisations but they are not sharing the opportunities with other EU Members needs to be qualified by saying that rather than larger countries the statement really applies to those member states hosting EIPE, or with highly developed national level cooperation programmes with China. Nevertheless, the broad thrust of the argument is undoubtedly correct. However, China is rapidly becoming a market of such fundamental national importance to EU member states it is unrealistic in most cases to expect that those member states with significant presence in China will ‘share opportunities’ with other EU member states. Irrespective of this, it is critically important that the European Union should increase the joint activities and provide access to support structures, for those member states that currently do not have significant presence in China, which address the fundamental challenge of networking organisations from these member states to China through clustering. It should

¹²³ <http://projektwebbar.lansstyrelsen.se/benchproject/En/information-material/Pages/bench-handbook.aspx>

¹²⁴ http://prezi.com/hheqzylletnc/bench-handbook/?utm_campaign=prezi_landing_related_author&utm_medium=prezi_landing_related_solr&utm_source=website

already be apparent that there are a variety of strategies that could be adopted to do this. The observation made by BENCH that [12]: “the EU funded ‘Understanding China Programme’ is an excellent opportunity for companies interested in China. However, the programme is marketing Europe as a whole, not as regions.” is just making a case for one particular approach to clustering. Even though a regional approach is viable for Estonia it is not clear that it is the best approach. More generally it is not always obvious how regions should be defined and even when they can be defined the local actors may not wish to cooperate in this way. In any case the Understanding China Programme¹²⁵ is a platform for business and policy dialogue on EU-China relations which seeks to address difficulties faced by EU businesses, especially SMEs, in trying to enter the Chinese market. As such it is seeking to develop policies that either clarify or support the development of the business models needed by EU businesses to enter the Chinese market.

The Central and Eastern European Countries (CEEC) Cluster

A Meeting of the Heads of the Government of China and Central and Eastern European Countries was held in Bucharest, Romania, 26 November 2013. The meeting reviewed the achievements made in cooperation between China and CEECs and commended the important contribution of China-CEEC cooperation. It was stressed that China-CEEC cooperation is in concord with the China-EU comprehensive strategic partnership and all parties expressed their readiness to strengthen and deepen China-CEEC cooperation. To advance China-CEEC cooperation, parties at the meeting jointly formulated and issued the Bucharest Guidelines for Cooperation between China and CEECs¹²⁶. Interestingly, these guidelines support the establishment of a China-CEEC association of chambers of commerce, joined by chambers of commerce of China and CEECs on a voluntary basis, and crucially the strengthening of cooperation in the information and communications sector.

Individual broadband links

To place Estonia’s involvement in BENCH in the broader context of the Baltic states cooperation in ICT R&D&I with China it is noted that Lithuania, the largest and most populous of the Baltic states with a population of around 3 million, has one significant ICT R&D&I collaboration initiative with China the Chinese-Lithuanian IT Innovation Centre¹²⁷.

¹²⁵ <http://www.understandingchina.eu/>

¹²⁶ <http://gov.ro/en/news/the-bucharest-guidelines-for-cooperation-between-china-and-central-and-eastern-european-countries>

¹²⁷ <http://vilnews.com/2011-11-10457>

The members of the Centre are Chinese global ICT solutions provider Huawei and Lithuania's Vilnius University and Omnitel the leading Baltic telecommunication company owned by Scandinavian TeliaSonera. The Chinese-Lithuanian IT Innovation Centre is a research centre of information technologies the activities of which include the implementation of research programmes, traineeships for researchers, and the development of modern technologies to promote more rapid development of innovations by opening new possibilities in the global IT market. In this way this single Centre provides a diversity of connections spanning the academic, research, commercial, and trade spheres. As training in the Chinese company is provided for Lithuanian students through the Centre it could even be argued that the Centre provides connections in the cultural sphere. The Centre is therefore an interesting example of clustering through one extremely strong link between two internationally significant ICT industry players.

Perhaps unsurprisingly [13] identifies ICT as a priority area for cooperation with China for Lithuania but not for Estonia.

In light of the difficulties experienced in BENCH in establishing substantial long term collaboration through regional clustering the case of the Chinese-Lithuanian IT Innovation Centre suggests that despite the limitations of company to company based collaboration a logical starting point for ICT R&D&I cooperation with China in smaller member states is to identify any internationally significant ICT industry players with a strong business link to a major Chinese ICT industry player and then provide high level political support at the national level for developing long term strategic company to company collaboration where such a link exists. Efforts promoting regional level clustering to broaden collaboration with China to other organisations could then follow.

National SME clustering

COOPOL Innovation is a program established in 2008 by the Service of Science and Technology (SST) of the French Embassy in China after the signature in 2007 of an agreement between the French competitiveness clusters and the Chinese science parks. As such it is an interesting initiative in support of clustering. Its goal is to facilitate the cooperation between French innovative SMEs of the competitiveness clusters and their research partners with their Chinese counterparts. The program has two parts: 1) An exploration mission of one week organized by the SST, for two persons (one from the SME, one from the partner research institution), to meet potential collaborators, both academics and industrials; 2) A subvention to a R&D collaborative project. This program has been made to support R&D projects and not only commercial projects.

Business-to-Business clustering

From June 11, 2014 to June 21, 2014, a European Trip 2014 of Technology-based Enterprises was carried out in Belgium, Czech Republic and Germany under the organization of the Science and Technology Bureau of Hi-tech District, Chengdu, the Economic and Trade Development Bureau of Hi-tech District, Chengdu, and the EU Project Innovation Centre (Chengdu), which received support from the CHOICE project.

Ten cases of EU-China ICT Research and Development and Innovation (R&D&I) collaboration resulted from the European Trip 2014 which collectively illustrate the diversity of links needed for collaboration to be realised. The ten cases span almost purely commercial links to cooperation in fundamental research. It is again emphasised that collaborative research links with China will not be forthcoming unless there is a willingness to engage in a diversity of connections, in particular, including innovation. Importantly all of the ten cases come under the umbrella of Research and Development, and Innovation (R&D&I).

What is most significant is that of the ten cases presented one involves a French partner, one Belgian, one Polish, and one Hungarian; two involve Czech partners, and four involve German partners. As has already been highlighted it is difficult to establish cooperation between Chinese and east European partners. The cooperation agreements involving Polish and Hungarian partners highlight the benefits of clustering them in a block of neighbouring European, in particular German participants, through the organisation of the trip; what is referred to in the CHOICE project as Business-to-Business (B2B) clustering. All the cooperation agreements reported are a testimony to the efficiency and effectiveness of face to face, business to business, networking in the context of realising collaboration with China.

Conclusions

Excellence in ICT is built up of high and balanced performance in ICT R&D, innovation and business, and in all three characteristics: agglomeration, internationalisation and networking. It follows excellence in European ICT R&D in China cannot be promoted outside of its context in terms of innovation and business. Accordingly, the focus needs to be on ICT R&D&I rather than simply ICT R&D. Furthermore, I in this connection means innovation for business opportunity.

For an organisation to stand the best chance of success in obtaining partners and funding for ICT R&D&I it needs to present its pitch for partners within a cluster of such offers presenting a diversity of potential links; that is the organisation needs to present itself a participant in a cluster.

As clustering implies a diversity of links funding models for ‘traditional’ ICT R&D&I cooperation should not be considered in isolation from funding models for educational cooperation in ICT and more importantly ICT business pilots.

In 2013 the Chinese central government announced ([7]): “the first batch of ten pilot innovative industrial clusters to stimulate innovation and industrial competitiveness within clusters and stimulate industrial upgrading of the industries located there. The plan states that a new batch of innovation clusters which are to be based within existing national high-tech zones will be announced each year.” This is significant in that there will be, in effect, Chinese poles of ICT excellence that can be networked to EU poles of ICT excellence for their mutual benefit. The first batch of innovation clusters includes a cluster in Mobile Internet in Beijing Zhongguancun (北京 中关村), a cluster in Next-generation Internet in Shenzhen (深圳) High-Tech District, and a cluster in Cloud computing and smart terminals in Huizhou (惠州), as well as other clusters of relevance to ICT R&D&I.

At the regional level in China, as different regional centres have different priorities at the municipal level and a focus on distinct markets activities, the promotion of EU-China ICT R&D&I cooperation at the regional level in China needs to be targeted at those localities and regions that have an identified demand for the specific type of globally recognised excellent expertise being offered on the EU side.

If Chinese organizations are to be convinced that there could be long-term benefits to collaborating with EU organizations outside of Europe’s main ICT poles of excellence there needs to be a clear EU strategy in place for connecting these EU organisations to the global ICT networks relevant to them. Given the structure of these global networks it can be argued that there is a need to establish ways of networking of organizations involved in ICT R&D&I outside of Europe’s main ICT poles of excellence with particular European ICT poles of excellence so they can access the global ICT networks most relevant to their activities through them. However, it is not clear how this could be done except in entirely national contexts in specific cases by a national government agency or a national chamber of commerce or industrial association of an EU member state that hosts EIPE.

Member states bilateral programmes funding ICT R&D&I collaboration with China in effect cluster programme participants in areas, which are often cross-sectorial, in which the member state is recognised as having internationally significant expertise.

Dedicated business-to—business clustering events offer an excellent opportunity for organisations from East European member states in particular to establish cooperation in ICT R&D&I with China.

For internationally excellent companies and research institutes that do not already have links with China in the area of ICT R&D&I, in EU member states with commercial ICT R&D&I recognised as excellent by China where the scale of such activity does not merit a national agreement with China with an accompanying funded bilateral programme, it would make sense for such organizations to be directly supported by, for instance, a national government agency in networking with China, for example, for business to business networking. Participants in this group could, for example, be expected to disseminate their experience to their national ICT industry and research institutes and relevant national government agency. This could provide useful information and contacts to national policy makers seeking to intensify export trade with China, and possibly through these policy makers to the European Commission in order to network such companies within European funded programmes with a view to achieving the critical mass of excellence required to establish collaborations in ICT R&D&I with China.

Drawing on the finding of the EIPe project that the three leading EIPe all incorporate long established and globally recognised university and research institute ICT R&D, the natural starting point for long term promotion of ICT R&D&I collaboration with China in member states with limited commercial ICT R&D infrastructure recognised as excellent by China is for the national government concerned to making financial support available to universities and research institutes of the member state that undertake high quality ICT R&D for networking with leading Chinese universities and research institutes. The purpose of such networking would be for the European organisations concerned to experience the relatively high standards in China of ICT R&D in leading Chinese universities and research institutes to gain a real appreciation of what the Chinese expect from formal ICT research links. Participants in such networking could be expected to disseminate their experience to their national university and research institute systems. However, the final beneficiaries of such networking activities would be organisations and companies benefiting from any support for commercial EU-China ICT R&D&I cooperation that the participating universities and research institutes would subsequently provide.

Some EU member states that do not host an EIPe should consider whether or not they have the resources to be able to actively positioning themselves for cross-sector cooperation; it is too early to state definitively whether or not the cross-sector clustering can be considered effective in fully engaging industry but initial indications are that it can.

The COOPOL Innovation program between the French competitiveness clusters and the Chinese science parks is an interesting initiative in support of clustering of SMEs which other member states with such industrial clusters may benefit from emulating.

The Chinese-Lithuanian IT Innovation Centre provides one possible alternative model to regional clustering for smaller member states, this single Centre provides a diversity of

connections. It follows that a logical starting point for pursuing ICT R&D&I cooperation with China in smaller member states is to identify any internationally significant ICT industry players with a strong business link to a major Chinese ICT industry player and then provide high level political support at the national level for developing long term strategic company to company collaboration where such a link exists.

Recommendations

For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state that hosts an EIPE it is worth investigating if the EIPE relates to the organisation's interests. If so, it may be possible to approach a national industrial association or Chamber of Commerce with a view to getting support for clustering through the EIPE.

For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state with a bilateral programme of ICT R&D&I cooperation with China it is worth investigating if that programme relates to the organisations interests. If so, pursuing funding through the programme should be considered. For an overview of member states bilateral programmes with China see [14].

For an organisation with internationally recognised ICT R&D&I related expertise interested in collaborative ICT R&D&I with China that is located in a member state with very limited collaborative ICT R&D&I links with China it is worth considering participating in appropriately targeted business-to-business matching events.

The membership of the EU-China expert groups on ICT R&D&I should reflect the important roles played by the relevant EIPE and Chinese innovation clusters and the experts on both sides should include representatives of these clusters.

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Appendix 6: CHOICE Internal report I-6 Support available for innovation in ICT R&D&I in China: Protecting IPR

Document organizers: Dr T J Owens and Dr T Itagaki, Brunel University London

Date: 6 November 2014

Abstract: This report reviews support available to EU organisations for innovation in collaborative ICT R&D with China. In particular, attention is paid to the extent to which this support addresses IPR related concerns. The report discusses the context of the issues around IPR protection in China, reviews the support for IPR protection in China available to EU organisations at the member state and EU level, support provided by the European Chamber of Commerce in China, guidance from UK Trade & Investment, and provides an overview of Chinese industrial associations and centres, and Chinese Science and Technology Bureaus, with an interest in promoting IPR protection. Conclusions are drawn and recommendations made which are targeted at organisations concerned about ICT related IPR protection in China.

Disclaimer: The views presented in this report reflect those of the document organizers and do not necessarily represent the views of the European Commission.

The context: IPR Protection in China

Given that the promotion of collaborative EU-China ICT R&D cannot be decoupled from considerations innovation (I) ([1]) one of the major disincentives to innovation activities by EU organisations in China, concerns over the protection of intellectual property in China, has to be addressed when seeking to promote collaborative EU-China ICT R&D&I. In this report this is done in the wider context of the support for available to EU organisations for innovation in China.

When discussing the contentious issue of IPR protection in China a report by UK charitable foundation Nesta rightly emphasises effective IPR protection is of fundamental importance to Chinese industry ([2]): “According to the World Intellectual Property Organisation, the ICT giant ZTE applied for more patents (PCT) in 2012 than any other company worldwide. Huawei came a close fourth in the global rankings.”

The main issue with IPR protection in China appears to be ([2]): “China has developed a sophisticated system of IP regulations and a patent law which largely meets WTO requirements, yet enforcement hasn’t kept pace with improvements in the legal framework.”

“Chinese companies have started to voice their demands for improved IPR protection. Japan, Taiwan and South Korea all strengthened their IPR protections when they moved from low-cost manufacturing to R&D and design, and Simon argues that China will be no different.”

Most pointedly of all it is argued that ([2]): “To convince China of the value of improving its IP system, developed countries should recognise and be open about the problems in their own systems.”

While incidental evidence suggests that IPR protection is not, in general, a major barrier to ICT R&D collaboration with China. Significance direct evidence of this is provided in [1]: “according to law firm Jones Day, ‘the most serious IP problem for foreign business in China is that they often fail to register their IP there. China’s reputation of poor IP rights enforcement had led many foreign businesses to draw the conclusion that it is not worth it to apply for patent or trademark protection in China. These foreign companies have come to regret their earlier decisions.’”

Furthermore ([2]): “Ian Harvey ... believes that ‘many Western companies’ problems are self-inflicted wounds,’ because they believe that ‘we mustn’t sue – it would annoy the government.’ This issue, which was confirmed by several of the interviews we conducted with SMEs for this report, is according to Harvey, a misunderstanding. He believes that the Chinese government wants companies to use the legal system and gets annoyed when they complain about poor IP protection before doing so.”

Reflecting the observation made earlier in this report that cultural differences could be behind some of the difficulties encountered by EU companies in exploiting the IPR protection available in China, possibly by making the framing of effective patents more difficult, Nesta recommends in a UK context ([2]): “Using the new Beijing representative of the (UK) Intellectual Property Office to help UK businesses gain the knowledge they need to operate in the Chinese IP environment and to press for further improvements”. These observations motivate this report which reviews the support for doing business in China provided by governments of individual EU member states and by the EU with a specific focus on IPR protection and commercialisation more generally.

All this leads to one of the major conclusions of [2] that: “The greatest ‘China risk’ for innovative companies is focussing too heavily on downside risks, and missing out on the opportunities that China presents. Hawkish perspectives on Chinese innovation highlight the ‘dark side’ of China’s absorptive state: international flows of ideas and technology resulting

from IP theft, forced technology transfer and hacking. But innovative firms recognise that without some risk, there is little reward. Intellectual property is only as valuable as one's capacity to exploit it and stay ahead of the competition. The increasingly absorptive Chinese system brings both risks and opportunities for businesses, universities and others seeking to work with and in China. These risks need to be managed with care, but they should not be over-emphasised to the extent that they eclipse a far greater risk – that of failing to participate fully and benefit from the next phase of China's growth.”

Support at the member state level

In the case of the UK its embassy in Beijing¹²⁸ provides a list of English speaking lawyers¹²⁹, though not all are involved in commercial law, and provides some guidance on handling commercial disputes in China¹³⁰. However, it leaves the provision of more detailed advice and support for UK businesses operating in China to the China Britain Business Council (CBBC)¹³¹.

The CBBC describes itself as the leading organisation helping UK companies grow and develop their business with China, and is committed to helping companies of all sizes and sectors whether new entrants or established operations. It offers practical in-market assistance, services, industry initiatives and a membership programme delivering access, seminars and networking. The CBBC recently announced a merger with the British Chamber of Commerce South West China and the British Chamber of Commerce in China, unifying the three organisations and their membership in a stronger, more streamlined structure.

The UK/China Economic and Financial Dialogue provides a platform for engaging on market related issues , such as IP enforcement and is led by HM Treasury and the Ministry of Finance [3].

The current UK support for commercial connections in China has some striking parallels to that provided by China's biggest trading partner in ICT, the United States. The US embassy in Beijing¹³² provides a list of English speaking lawyers¹³³ and some basic advice on doing business in China¹³⁴ while advising businesses to contact the relevant China regional U.S. Export Assistance Center for advice and support on exporting to China, and the relevant

¹²⁸ <https://www.gov.uk/government/world/organisations/british-embassy-beijing>

¹²⁹ <https://www.gov.uk/government/publications/china-list-of-lawyers>

¹³⁰ <https://www.gov.uk/commercial-disputes-in-china>

¹³¹ <http://www.cbcc.org/>

¹³² http://beijing.usembassy-china.org.cn/acs_eme.html

¹³³ http://beijing.usembassy-china.org.cn/acs_legal.html

¹³⁴ <http://beijing.usembassy-china.org.cn/doing-business-local.html>

China regional American Chambers of Commerce office or the U.S.-China Business Council for in-country business support. However, uniquely for the ICT industry dedicated support is provided through The U.S. Information Technology Office (USITO) which is an independent, non-profit, membership-based trade association, representing the U.S. information communication technologies (ICT) industry in China¹³⁵:

“USITO seeks to provide new insights and approaches to the many complex challenges facing the ICT industry in China, which sits at the heart of the U.S.-China trade relationship.

USITO serves to create effective channels for engagement between our members and the Chinese & U.S. governments, academia and other industry groups focused on improving policy and regulation.

USITO serves as the China representative of four parent associations, including:

- Information Technology Industry Council (ITI)
- Semiconductor Industry Association (SIA)
- Software and Information Industry Association (SIIA)
- Telecommunications Industry Association (TIA)

USITO also represents approximately 50 leading US-based companies actively engaged in China, drawn from across the spectrum of information and communication technologies, from semiconductors, computing, networking and software to telecoms, broadcasting and digital content -- in a word, anything related to the creation, distribution and consumption of things digital.”¹³⁶

USITO reports its specialities to be⁹: “IPR, Trade & Investment Policy, Cybersecurity and Cryptography Policy, Standards & Conformity Assessment, Telecommunications Policy, Environmental Policy - RoHS, WEEE, Energy Efficiency Policy and Standards, Cloud Computing, Trade Compliance.”

No comparable dedicated support for ICT business in general is available to UK companies through the CBBC. However, it is crucial to note that for ICT business in the area of eco-cities and the green value chain there is a platform for UK-China cooperation in the development and delivery of world-class solutions, the UK-China Eco-cities & Green Building Group¹³⁷. The existence of this group reflects the Chinese preference for R&D&I cooperation with poles of global excellence in areas of key national interest [4]: “At the IGEBBC conference in March 2011 Vice Minister Qiu outlined China’s plans to develop 300 eco-cities in the coming years. He noted that the UK has much relevant experience in this area, including global leadership in garden cities, new towns, and eco-towns, from which

¹³⁵ <http://www.usito.org>

¹³⁶ <http://www.linkedin.com/company/united-states-information-technology-office-usito->

¹³⁷ http://www.cbcc.org/guide/uk_china_eco_cities_green_building_group

China could learn and build upon. Given that experience, he invited the UK to become China's lead partner in their eco-cities development programme.”

For Finnish companies the main networks and associations for receiving foresight from day-today business in China, and establishing key partnerships and contacts include, EK Confederation of Finnish Industries, Federation of Finnish Technologies Industries, the OSKE network, the FinNode network, Finland-China Trade Association and significantly the Finnish Business Councils in China [5].

The German embassy in Beijing¹³⁸ provides support to German business in China in a similar way to that in which the UK embassy in Beijing provides support to British business in China. A lawyers list is available as is advice on litigation in China, but it leaves the provision of more detailed advice and support for German businesses operating in China to The Delegation of German Industry.

Through its China regional chambers of commerce The Delegation of German Industry¹³⁹ supports German companies with a comprehensive range of services including location services, monitoring companies entering the Chinese market and looking for Chinese business partners, legal and customs information, information on tax law, labour and trade fair services etc.

Dragon-STAR Deliverable 4.4 [6] provides a concise overview of the support services offered to:

- German business by the German Centre for Industry & Trade Beijing which is a limited company and the consultancy German Industry & Commerce Greater China (Beijing) both of which charge for their services
- Austrian business by Austrian Federal Economic Chamber (WKÖ) Trade Promotion Organization: Aussenwirtschaft Austria and the Federal Promotion Bank Austria Wirtschaftsservice (aws)
- Danish business by Innovation Centre Denmark

Support at the EU level

At the EU level The EU SME Centre¹⁴⁰: “is a European Union funded initiative helping SMEs get ready to do business in China. Located in Beijing, the Centre provides practical information, confidential advice, and training in the areas of business development, legal issues, standards and HR to facilitate market access for European SMEs.” Apart from the fact that the Centre only provides guidance to SMEs, its remit in terms of providing guidance on

¹³⁸ <http://www.china.diplo.de/Vertretung/china/de/Startseite.html>

¹³⁹ <http://www.china.diplo.de/Vertretung/china/de/03-wi/bilateral/0-bilateral-ubs.html>

¹⁴⁰ <http://www.eusmecentre.or.g.cn/>

doing business in China appears to be somewhat narrower than the CBBC which explicitly includes detailed aspects such as: agents and distributors, joint ventures, representative offices, certification and standards, due diligence, and language and marketing.

The China IPR SME helpdesk¹⁴¹ funded by the European Commission's Directorate-General for Enterprise and Industry: “supports European Union (EU) small and medium sized enterprises (SMEs) to both protect and enforce their Intellectual Property Rights (IPR) in or relating to China, through the provision of free information and services. These take the form of jargon-free, first-line, confidential advice on intellectual property and related issues, plus training, materials and online resources.”

Additional support for SME's is available from the EU level Enterprise Europe Network (EEN)¹⁴². It offers help with finding international business partners, sourcing new technologies and receiving EU funding or finance. It offers advice on issues such as intellectual property, going international, and EU law and standards. It claims to be a one-stop shop for all business needs. The EEN brings together business support organisations from more than 50 countries and has close to 600 member organisations we are always close to where your business is based. Significantly, it has recently opened new network offices in China¹⁴³ where additional contact points have been established in Shanghai and Nanjing (in Jiangsu Province).

In general, there appears to be a case for at least some form of EU chamber of commerce type support for EU businesses operating in China that are based in less prosperous and in some cases less populous member states. The issue of targeted support for EU based ICT businesses operating in China is problematic since ideally any such support to be directed through clusters of global ICT excellence ([1]).

On the Chinese side The China International Economic and Trade Arbitration Commission (CIETAC)¹⁴⁴ accepts foreign-related and international cases and offers to independently and impartially resolve economic and trade disputes by means of arbitration. Its scope of accepting cases is not limited by the nature of the parties' business and it states that in recent years, on average, it has handled as many as 1,300 cases annually, involving parties from more than 50 countries and regions outside the Chinese mainland.

A concise overview of the services offered to EU business by several Chinese organisations covering different regions of China is given in [6]. The organisations concerned are:

- China International Technology Transfer Center (CITTC), a Government-based Service Agency

¹⁴¹ <http://www.china-iprhelpdesk.eu/en/about-the-helpdesk>

¹⁴² <http://een.ec.europa.eu/about/mission>

¹⁴³ <http://een.ec.europa.eu/news-media/news/new-network-offices-china>

¹⁴⁴ <http://www.cietac.org/index.cms>

- Northern Technology Exchange Market Consortium of EEN Northeast China Centre (NTEM), a State-owned National Technology Transfer organisation
- EU Project Innovation Centre (EUPIC), a non-governmental organisation and CHOICE project partner
- CCPIT Hunan Sub-Council, a Provincial foreign economic organization
- Shanghai Technology Transfer & Exchange Centre (STTE), a public organisation

Particularly interesting in the wider context of support for commercial connections between the EU and China is the work of the Finnish Center of Chinese Law and Chinese Legal Culture¹⁴⁵ which aims to promote research and education in Chinese law and Chinese legal culture. The members of the Center include Finnish universities and significantly the Finnish National Research Institute of Legal Policy. While the Center promotes education in the field in universities, among legal practitioners and the wider community, it also has a role in supporting policy development which is a crucial component in developing business models for commercial connections between the EU and China. The Center's Academy of Finland¹⁴⁶ funded research project: "Climate Change Mitigation and Energy Efficiency Legislation, Finland/EU–China"¹⁴⁷ "aims at improving the knowledge of Finnish/EU and Chinese policy-makers on energy efficiency legislation and policies applied in Finland/EU and in China". The Center is also conducting research in Intellectual Property Law to promote innovation and creativity in China¹⁴⁸.

An Internet search for European level Chamber of Commerce type support led to resources related to the work of the European Chamber of Commerce which is covered in a separate section because it could be viewed as more of a lobbying organisation than a conventional Chamber of Commerce, and in particular, because it is not affiliated to the EU or to any EU member state.

Support provided by the European Chamber of Commerce in China

The European Chamber of Commerce in China (ECC) provides its members with extensive information on business and market conditions in China but otherwise is more focussed on lobbying than a conventional Chamber of Commerce. It is Europe rather than EU wide and is not affiliated to any nation state. Nevertheless, its activities provide very significant support for EU industry in actively participating in Chinese markets. This section is devoted to exploring the implications of the work of the ECC for EU-China ICT R&D&I.

¹⁴⁵ <http://blogs.helsinki.fi/chinalawcenter/#.U7KiqrGmUzQ>

¹⁴⁶ <https://www.jyu.fi/yliopistopalvelut/research-and-innovation/international-collaboration/china/academy-of-finland-china>

¹⁴⁷ <http://blogs.helsinki.fi/chinalawcenter/environmental-law/#.U7KopLGmUzQ>

¹⁴⁸ <http://blogs.helsinki.fi/chinalawcenter/intellectual-property-law/#.U7KpObGmUzQ>

This mission statement of the European Union Chamber of Commerce in China (ECC)¹⁴⁹ is: “As the independent voice of European business in China, we seek greater market access and improved operating conditions for European companies.”

The Chamber is recognised by the European Commission and the Chinese Authorities as the official voice of European business in China. It is recognised as a Foreign Chamber of Commerce with the Ministry of Commerce and China Council for the Promotion of International Trade.”

The ECC provides the following services to its members¹⁵⁰:

“We provide European business with an effective communication and lobbying channel to the European and Chinese officials, business associations and media.

We ensure our key recommendations and lobbying strategies are shaped by business through our members’ Working Groups.

We monitor China’s compliance with the World Trade Organisation (WTO) and other international commitments that have an impact on doing business in China.

We support companies with an information platform on business and market conditions in China.

We help companies expand their networks of European and Chinese business contacts.

We promote sharing of knowledge and experience between European and Chinese businesses.”

“The ECC was founded in 2000 by 51 member companies that shared a goal of establishing a common voice for the various business sectors of the European Union and European businesses operating in China. It is a members-driven, non-profit, fee-based organisation with a core structure of 43 Working Groups and Fora representing European business in China”.

“The European Chamber now has more than 1,800 members in 7 chapters operating in 10 cities: Beijing, Chengdu, Chongqing, Nanjing, Pearl River Delta (Guangzhou, Shenzhen and Zhuhai), Shanghai, Shenyang and Tianjin. Each chapter is managed at the local level by local boards reporting directly to the Executive Committee.”

The ECCs core structure includes numerous groups of interest in the context of collaborative ICT R&D&I with China, in particular, those on: Information and Communication Technologies, Research & Development, Standards & Conformity Assessment, Intellectual Property Rights, Legal and Competition, Public Procurement, and SME. The ECC publishes an annual Position Paper that outlines the problems European businesses in China are

¹⁴⁹ <http://www.europeanchamber.com.cn/en/home>

¹⁵⁰ http://www.europeanchamber.com.cn/en/publications-archive/170/European_Chamber_Brochure

currently facing with regard to World Trade Organisation implementation, trade, regulatory and broader policy-related issues and the Working Groups recommendations for alleviating them. It is presented to senior Chinese officials from over 20 ministries and general administrations and directly to the European Commission. To ensure the relevant policymakers are informed about the latest issues concerning European business in China, regular briefings are provided to senior European officials. The ECC constantly interacts with the European authorities, including the Delegation of the European Commission in Beijing, the EU Member States' Embassies and Consulates in China, as well as the National Chamber representatives and Business Associations.

The ECC regularly organises breakfast seminars at which senior level industry experts and representatives from Chinese ministries provide information and analysis on current issues.

The ECC conducts in-depth studies on topical issues in China's economic and on the policy landscape. The ECC endeavours to propose constructive suggestions for improving the policy environment for the benefit of all stakeholders. Of particular interest in the context of this report is the ECC study launched in 2012 'Dulling the Cutting Edge: How Patent-Related Policies and Practices Hinder Innovation'.

The 2013-14 position paper of the ECC Research & Development Forum¹⁵¹ is only one page but highlights annual events organised by the Forum of major interest in the context of this report: "The Forum holds external events, like the 2012 R&D Conference on "Essential Strategies for R&D Management in China", or in 2013 the "Protection of intellectual property during the design, procurement, construction and operation of new production or R&D facilities in China" which offer European companies an insider's perspective from government officials, consultants and R&D managers on key R&D considerations on issues such as managing research collaborations, intellectual property rights and human resources." Although these events address R&D in general the fundamental issues around R&D management and IPR protection of R&D activities in China are generic and it is hard to envisage how any EU project could deliver better information on such matter. Rather the information provided by such activities is the natural starting point for developing more specifically ICT focussed guidance around such matters if there is perceived to be the a significant demand of it, which is not clear at this time.

The three key recommendations of the 2013-14 position paper of the Information & Communication Technology (ICT) Working Group¹⁵² are:

1. Develop Information & Communication Technology (ICT) Standards that Benefit the End-user and Industry as a Whole

¹⁵¹ <http://www.europeanchamber.com.cn/en/publications-archive/202>

¹⁵² <http://www.europeanchamber.com.cn/en/publications-archive/238>

2. Enhance the Efficiency and Effectiveness of China's ICT Services Sector to Provide More Choices at Lower Costs to the Consumer
3. Encourage Enhanced Innovation and Research that Drives the ICT Industry Forward Through a Global and Cooperative Approach

We will consider further key recommendation 3 first as it is closest to the interests of stakeholders in collaborative ICT R&D&I with China. To realise this recommendation the Working Group proposes that:

- Global IPR practices (or European case studies) can be applied for China national (R&D) fund applications.

Significantly, in support of this recommendation, a clear example of a lack of reciprocity in ICT R&D is highlighted: Chinese ICT companies have benefited substantially from participation the latest project of Mobile and Wireless Communications Enablers for the Twenty-Twenty Information Society (METIS) for the next generation of mobile technology. The ECC ICT Working Group believes that European companies, especially those with a research base in China, should be given equal access to Chinese research and funding programmes and funds. This is notable not only because of the scale of the market in this area but also because it relates especially to European companies with a research base in China. This means that the Chinese could be encouraged to view Chinese subsidiaries of EU companies as Chinese companies from a national funding programme point of view thereby providing programme access. This would also mirror EU policy towards European subsidiaries of non-EU countries so would achieve reciprocity in more than one sense.

The detailed recommendations made in the report in support of key recommendation 3 are listed below:

- Encourage greater reciprocity in the field of ICT research and engage in further collaboration with EU organisations with a view to developing mutually beneficial international standards.
- Open up China's national ICT R&D programmes to participation from the international community, avoiding a system that isolates R&D and consumers from reaping the benefits of a globalised research environment.
- Focus the build-up of indigenous innovation capabilities on enhancing technological innovation that drives the ICT industry forward and benefits end users, rather than short-term benefits for domestic enterprises.
- Encourage a build-up of indigenous innovation capabilities through a global and collaborative innovation approach, where global stakeholders, including academia, government, industry and other experts, communicate and cooperate on international research and standardisation in order to maximise end-user benefit.

The above detailed recommendations support the view that collaboration in EU-China ICT R&D be directed towards developing mutually beneficial international standards and the building up of China's indigenous innovation capability, and the further opening up of China's national ICT R&D programmes to participation by EU organisations.

Moving on to the second key recommendation, which is supported mainly by concerns about access to the Chinese market for mobile content for European mobile content providers, this is placed in the context of the broader concern that: European companies have a long history in China's ICT market, yet European access to participate in China's ICT services market lags dramatically behind participation in China's ICT infrastructure and devices market; In [x] it is made clear that a major market for digital services in China will be for services in support of the Chinese concept of the eco-city (or smart city) which will include mobile services.

Concerning the first of the key recommendations, this is underpinned by detailed recommendations one of which is focussed on a particular market, which probably reflects domination of the working group by telco related interests:

- Encourage the creation of a healthy ecosystem for TD-LTE by allowing European organisations a fair share of the Chinese market.

However, the means to achieve this is embodied in the other detailed recommendations all of which relate to market access for ICT products generally.

There is one recommendation related to EU participation in Chinese standardisation bodies:

- Encourage the Standardisation Administration of China (SAC) to provide written clarification in its new 2009 policy on membership management of Standards Development Organisations (SDOs) that Foreign Invested Enterprises (FIEs) and Wholly Foreign-Owned Enterprises (WFOEs) must be provided with full and equal membership access to all standardisation Technical Committees (TCs) and Working Groups in China.

There are two recommendations relating to market access impeded by the imposition of local Chinese standards:

- Increase participation and cooperation with the international community on international standardisation initiatives in ICT and harmonise Chinese ICT standards with international standards to increase interoperability.
- Encourage technology neutrality, ensuring that specific technologies are not unfairly mandated through local standards or other technical requirements.

There are two recommendations related to market access impeded by certification requirements:

- Streamline the complex and duplicative ICT equipment certification process into a simple, transparent and unified certification scheme.
- Provide clarification and transparency of licensing and certification requirements well in advance of the implementation date, and provide notification under the World Trade Organisation (WTO) Technical Barriers to Trade (TBT) Agreement for any standard that is applicable to mandatory certification and market access.

There is one recommendation related to the protection of IPR:

- Avoid testing and certification requirements compelling disclosure of sensitive commercial information and information unrelated to core product features, such as source code and additional software or hardware information.

The 2013-14 position paper from the Intellectual Property Rights Working Group¹⁵³ makes three key recommendations one of which is clearly related to ICT:

- Issue a Regulation Providing a Delisting System for E-commerce
 - This is about Fighting against the sale of counterfeit products on the internet by addressing the passive attitude of most internet service providers (ISPs) towards the problem.

However, the other key recommendations which are generic are of more direct interest to may suppliers of ICT products. For example, the key recommendation:

- Issue a Regulation about Trademark Usage in Original Equipment Manufacturing
 - This is a primary concern of the high-end ICT consumer product industries.

The Intellectual Property Rights Working Group 2013-14 position paper provides a very useful summary and critique of the recent developments in Chinese IPR law on trademarks, copyright, and patents. There are also very detailed key recommendations concerning patents and trademarks. While these are very generic issues they are nevertheless of major and direct importance for the EU ICT industry sector. This raises the issue of the extent to which the IPR barriers to EU-China collaboration in ICT R&D&I are ICT specific. Most of the issues are clearly generic and all that focussing specifically on the ICT industry sector does is effect the relative importance of these issues.

Guidance from UK Trade & Investment

On 7 June 2013 the Guardian newspaper reported that¹⁵⁴: “Britain's monthly exports to China have hit the £1bn level for the first time” Given the relative success of the UK in exporting to China it makes sense to review the support available from the UK government for UK

¹⁵³ <http://www.europeanchamber.com.cn/en/publications-archive/241>

¹⁵⁴ <http://www.theguardian.com/business/2013/jun/07/uk-exports-china-ons>

companies seeking to do business in China to see if any insights can be gained that will assist the successful establishment of EU ICT R&D&I collaborations in China.

“UK Trade & Investment (UKTI) is the British Government Department that helps UK-based companies succeed in an increasingly global economy. UKTI’s range of expert services are tailored to the needs of individual businesses to maximise their international success. UKTI provides companies with knowledge, advice and practical support.” [8]

The report *Doing Business with China* [8] produced by ima UK (International Market Advisory) highlights the scale of the ambition of UKTI in providing support for UK organisations seeking to do business with China. It comprehensively addresses the regional markets of China, legal and bureaucratic considerations, and the Chinese business culture, as such it is of general interest to EU organisations seeking to do business in China.

UKTI and the China-Britain Business Council (CBBC) provide detailed guidance on protecting intellectual property. It is stated in [8] that: “from having no IP protection law in the late 1970s, China has progressively enacted legislation to the point where it broadly matches or exceeds that in the UK.” and [8] makes the common sense observation that: “An experienced independent IPR lawyer is invaluable in helping you to establish the best [IPR] strategy for your company.” Nevertheless, for EU businesses in China IPR protection remains a major issue [8]: “The UK’s first ever Intellectual Property (IP) Attaché to China was appointed in December 2011 to improve the IP environment for UK companies.”

UKTI issues a monthly newsletter from the UK Intellectual Property Office, *IP Insight* that reports on the latest developments in the Intellectual Property and often contains valuable information on IPR developments in China. The August 2014 issue contains a section: *China IPR considerations for European businesses in the ICT industries: part 1*, which was written by the China IPR SME Helpdesk and applies to the EU ICT industry.

UKTI even issues a monthly ad hoc newsletter specifically on recent developments in the Chinese IP environment¹⁵⁵.

For a general overview on protecting intellectual property rights in China, see [9].

Other useful documents relating to protecting intellectual property in China are available through the web portal of the UK Intellectual Property Office¹⁵⁶.

A case study on UK-China Cooperation on Intellectual Property is available¹⁵⁷ that provides a number of useful links related to IPR and trade secrets protection in China.

¹⁵⁵ <https://www.gov.uk/government/publications/china-ip-newsletter>

¹⁵⁶ <http://www.ipo.gov.uk/>

¹⁵⁷ <https://www.gov.uk/government/case-studies/uk-china-cooperation-on-intellectual-property>

The UK Foreign and Commonwealth Office Guidance Overseas Business Risk – China Published 1 August 2014¹⁵⁸ is very helpful in putting IP risks in context in terms of where they fit within the wider key security and political risks which UK businesses may face when operating in China. The report looks not only at the intellectual property risks but also the organized crime, human rights, bribery and corruption, and terrorism risks.

It is noted that the (US) report [10] makes related pronouncements about IPR protection in China: “Enforcement of IPR by foreign companies is increasingly possible in large cities and against large companies, but still rare and difficult in most parts of the country. IP criteria have been built into government procurement and technical standards policies in ways that do not conform to international norms. Chinese ‘junk patents’ have also been used by Chinese technology corporations to win IP settlements against foreign businesses operating in China.”

Chinese industrial associations and centres with an interest in promoting IPR protection

Several Chinese ICT related industrial associations and centres have an interest in IPR protection and EU organisations should consider leveraging these when promoting the case for more efficient and effective IPR protection in China. Particularly notable in this context is the work of:

Shanghai Integrated Circuit Industry Association (SICA)¹⁵⁹

The Shanghai Integrated Circuit Industry Association is a nongovernmental organization composed of 5 committees on IC design, manufacturing, testing & packaging, smart card, materials & equipment. It helps the government with implementing policies, seeks to integrate the IC industry chain, engages R&D cooperation and forums, establishes industrial standards and works on IPR protection.

The Ministry of Industry and Information Technology Software and Integrated Circuit Promotion Center (CSIP)

CSIP is China’s national software and integrated circuit public service platform¹⁶⁰. It is China’s national software and integrated circuit public service platform. It engages technical exchange and consultation with domestic and overseas partners, and in industry and informatization related fields' soft science research, such as strategic research and IPRs warning research, and provides supportive services for government's decision-making and industry development.

¹⁵⁸ <https://www.gov.uk/government/publications/overseas-business-risk-china>

¹⁵⁹ <http://www.sica.org.cn/detail.aspx?id=133>

¹⁶⁰ http://www.miit-csip.org.cn/CSIPEnglish/CSIPEnglish_Aboutus/DevelopmentHistory/

The major responsibilities of CSIP include¹⁶¹:

- Promote R&D and application of advanced technologies and common technologies in relevant fields, and engage in scientific achievement transforming, promotion, and technical exchange and consultation with domestic and overseas partners.
- Engage in industry and informatization related fields' soft science research, such as strategic research and IPRs warning research, and provide supportive services for government's decision-making and industry development.

Other ICT related Chinese industrial associations and centres supporting Chinese industry that have an interest in IPR protection include:

- China Smart City Industry Alliance (CCIT)
- Shanghai Integrated Circuit Industry Association (SICA)
- Shanghai Software Industry Association (SSIA)
- China Software Industry Association (CSIA)
- The Ministry of Industry and Information Technology Software and Integrated Circuit Promotion Center (CSIP)

Chinese Science and Technology Bureau's with an interest in promoting IPR protection

At least two Chinese municipal government science and technology bureaus have an interest in IPR protection and EU organisations should consider whether it is appropriate to leverage these bureaus when promoting the case for more efficient and effective IPR protection in China.

Xi'an Science and Technology Bureau¹⁶²

Xi'an¹⁶³ Municipal Government does not have a focus on ICT but it does have very interesting policy on IPR. Significantly, the main responsibilities of the Xi'an Science Technology Bureau include:

- Organizing the protection work regarding intellectual property, enhancing the construction of intellectual property protection system; and arranging to coordinate matters on international intellectual property rights of Xi'an;
- Mediating patent disputes according to laws and regulations, and investigating and treating with the counterfeiting of patents; taking charge of the management of approval and registration of patent license contracts; directing the business work of patent service

¹⁶¹ http://www.miit-csip.org.cn/CSIPEnglish/CSIPEnglish_Aboutus/CSIPIntroduction/

¹⁶² http://www.xa.gov.cn/ptl/def/def/index_1121_3316_ci_trid_160997.html

¹⁶³ Shaanxi Province

agents, and taking charge of the construction of patent information publicity service system of Xi'an.

The responsibilities of the bureau also include:

- Taking charge of the scientific and technological cooperation and exchange of Xi'an;
- Directing the commercialization of research findings;

It is gratifying to note that on May 8th, 2014, the China Science and Technology Exchange Center (CSTEC) held a Horizon 2020 Infoday in Xi'an, which attracted over 130 participants from local research centers, universities and enterprises participated in.¹⁶⁴

That CSTEC organised this event is important because it is affiliated to the Ministry of Science and Technology of the People's Republic of China and has expertise in international S&T exchanges and plays a significant role in the reform and opening-up of China, as well as the construction of the socialist economy.

Qingdao Science and Technology Bureau

As of May 2014 according to the city's science and technology bureau authorities in Qingdao¹⁶⁵, expect S&T to play a more important role in driving local growth.¹⁶⁶ In particular, the city has been actively engaged in facilitation of intellectual property rights protection¹⁴⁹:

“In 2013, police across the city cracked 109 cases of IPR violations, with 144 criminals arrested. The combined value of relative intellectual property was worth 492 million Yuan. An increasing number of IPR-related training workshops are being conducted in the city. Last year, a total of 7.5 billion Yuan was loaned to 68 enterprises as intellectual mortgages by Qingdao-based financial institutions. The city has also been encouraging the legal trading of intellectual properties and facilitating the development of IPR agencies. Bureau officials said the government is also improving its service to create a better business environment for high-tech companies. Efforts include helping enterprises recruit and train talented professionals and enhancing intellectual property rights protection.”

While the local government has been trying to improve the city's innovative strength by facilitating the transfer of new technologies for commercial use by guiding more funds into R&D and public services the focus understandably is on supporting local industry. However,

¹⁶⁴ <http://www.dragon-star.eu/cstec-held-horizon-2020-infoday-in-xian/>

¹⁶⁵ Shandong Province

¹⁶⁶ http://qingdao.chinadaily.com.cn/2014-05/18/content_17548005.htm

its efforts in the area of IPR protection emphasise the importance of local enforcement and will create a better environment for EU ICT businesses within to operate in Qingdao.

Conclusions

Member states that are heavily involved in ICT R&D collaboration with China provide access to support for their businesses operating in China through chamber of commerce type organisations.

The European Chamber of Commerce in China (ECC) is a lobbying organisation not affiliated to any nation state. It provides European business with an effective communication and lobbying channel to the European and Chinese officials, business associations and media.

For SMEs the EU provides business support through the EU SME Centre, the European Enterprise Network (EEN) and the China IPR SME helpdesk.

The Finnish Center of Chinese Law and Chinese Legal Culture Center promotes education in the field in universities, among legal practitioners and the wider community, and has a role in supporting policy development which is a crucial component in developing business models for commercial connections between the EU and China.

The China International Economic and Trade Arbitration Commission (CIETAC) accepts foreign-related and international cases and offers to independently and impartially resolve economic and trade disputes by means of arbitration.

Several Chinese ICT related industrial associations and centres, and at least two Chinese municipal government science and technology bureaus, have an interest in IPR protection.

The ECCs core structure includes numerous working groups and fora, notably on: Information and Communication Technologies, Research & Development, Standards & Conformity Assessment, Intellectual Property Rights, Legal and Competition, Public Procurement, and SME.

The ECC publishes an annual Position Paper that outlines the problems European businesses in China are currently facing with regard to World Trade Organisation implementation, trade, regulatory and broader policy-related issues and the Working Groups recommendations for alleviating them. It is presented to senior Chinese officials from over 20 ministries and general administrations and directly to the European Commission.

The ECC Research & Development Forum holds annual external events of major significance for ICT R&D&I, like the 2012 R&D Conference on “Essential Strategies for R&D Management in China”, or in 2013 the “Protection of intellectual property during the design, procurement, construction and operation of new production or R&D facilities in China” which offer European companies an insider’s perspective from government officials,

consultants and R&D managers on key R&D considerations on issues such as managing research collaborations, intellectual property rights and human resources.

The ECC Intellectual Property Rights Working Group 2013-14 position paper provides a very useful summary and critique of the recent developments in Chinese IPR law on trademarks, copyright, and patents, including recommendations in support of the efficiency and effectiveness.

UKT&I has made clear that China's IP protection law broadly matches or exceeds that of the UK. Extensive current information related to IP protection in China is available from UK government agencies.

For EU businesses in China IPR protection remains a major issue because of the distinctive nature of the IP law in China and cultural differences. The UK's first ever Intellectual Property (IP) Attaché to China was appointed in December 2011 to improve the IP environment for UK companies.

Recommendations

It is important to be aware that the UK government has acknowledged China's IP protection law broadly matches or exceeds that of the UK but that for some EU businesses in China IPR protection remains a major issue because of the distinctive nature of the IP law in China and cultural differences.

It is important to be aware of the recent report: China IPR considerations for European businesses in the ICT industries available from China IPR SME Helpdesk.

The ECC Intellectual Property Rights Working Group 2013-14 position paper provides a very useful summary and critique of the recent developments in Chinese IPR law on trademarks, copyright, and patents including recommendations in support of the efficiency and effectiveness. While these are very generic issues they are nevertheless of major and direct importance for the EU ICT industry sector.

Member states that are heavily involved in ICT R&D collaboration with China provide access to support for their businesses operating in China through chamber of commerce type organisations. If your organisation resides in a member state that provides such support it should be your first port of call if you are concerned about IPR protection in China.

If your organisation is an SME the EU provides business support through the EU SME Centre, the European Enterprise Network (EEN) and the China IPR SME helpdesk which you refer to as useful support may well be forthcoming.

In the event of a dispute around IPR protection in China it is worth considering approaching The China International Economic and Trade Arbitration Commission (CIETAC) which

accepts foreign-related and international cases and offers to independently and impartially resolve economic and trade disputes by means of arbitration.

If your organisation wishes to raise specific concerns related to IPR protection in China it is useful to hold in mind that the European Chamber of Commerce is a very effective forum through which to air these concerns. Furthermore, several Chinese ICT related industrial associations and centres, and at least two Chinese municipal government science and technology bureaus, have an interest in IPR protection and it may be appropriate to approach one or more of these bodies with a view to eliciting their support for resolution.

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Appendix 7: The analysis on EU-China ICT Dialogue Meeting

Document organizer: Zhang Xueli, CATR

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1. Achievements of the EU-China ICT dialogue on ITTI

The EU-China Dialogue on Information Technology, Telecommunications and Informatization (ITTI) was established in 2009 between the Ministry of Industry and Information Technology of the People's Republic of China (MIIT) and the European Commission Directorate General for Communications Networks, Content & Technology (EU DG CNECT). **Five meetings have been held** in 2009, 2010, 2011, 2013 and 2014 in Brussels, Belgium and Chengdu, China.

The dialogue, as a **high level cooperation mechanism** between the EU and China, is a **good platform which has positively pushed EU-China ICT cooperation and achieved fruitful and practical outputs.**

- 1) **3 expert groups have been set up to realise detailed cooperation on the IoT, the Smart City and Broadband.**
- 2) Under the guidelines of the dialogue, two IoT white papers on identification (ID) and ARM have been finished by EU- China IOT Advisory Group and published during Internet of Things China 2014 Conference. New papers on topics such as global IoT standardisation are being considered.
- 3) Under the guidelines of the dialogue, after the 1st phase cooperation on EU-China Green Smart City cooperation supported by PDSF II, 15 pilot cities from each side were selected, and a comparative study report, a white paper and a common statement have been published. The proposal for the 2nd phase supported by PDSF II has been submitted for final approval from MIIT and DG CNECT.
- 4) Under the guidelines of the dialogue, the Broadband group has arranged mutual visits of government and industry from both sides, supported by PDSF II.

- 5) Guided the activities of EU FP7 projects such as CHOICE, and the application and financial support areas of the Ministry of Science and Technology of the People's Republic of China (MOST) international cooperation project.

2. How the dialogue influences CHOICE

From the beginning of the CHOICE project, **CHOICE has supported the Dialogue** on most of the topics covered during each meeting, by following the cooperation points decided on by the most recent dialogue meeting through information provided by CATR and inputting cooperation results and proposals to the Dialogue.

From the latest 5th EU-China ICT Dialogue Meeting in April 2014 in Yangzhou, CHOICE knew the cooperation fields included ICT policies, ICT regulation, broadband, 5G, network security, IoT, e-commerce, smart cities, medical electronics and cloud computing. CHOICE organized the following activities accordingly.

- 1) The first workshop on IoT in London to discuss IoT research excellence and IoT R&D collaboration mechanisms, as IoT is the most important cooperation point from the beginning of the ICT dialogue and the IoT expert group was set up at the third meeting. The proposal for collaboration mechanisms arising from the workshop will be submitted to the 6th ICT dialogue in 2015 in Europe.
- 2) The first event on collaborative innovation in ICT in Chengdu, covered Smart Cities, Future Internet, Internet of Things, 5G, Broadband, etc. The research cooperation priorities discussed by the event will also be reported to the 6th ICT dialogue in 2015 in Europe.

3. CHOICE proposals to the Dialogue

The practical activities and successful EU-China cooperation on IoT, the smart city and Broadband under the Dialogue, depend on full time human input from CATR to organize the event and finish the paper work. The success also depends on strong support of PDSF II, EUCTP, and CATR projects, to cover the events cost, including travel costs of the experts, conference room and translation fee, etc.

During the dialogue meetings more and more topics came up which both sides showed great interest in for further cooperation. CHOICE will propose to the dialogue that:

1. Each dialogue meeting should be preceded by a preparatory or 'scoping' meeting at which specific priority topics within the strategic areas to be discussed at the meeting can be identified.
2. This will enable suitable contact persons to be invited to the dialogue meeting who are in a position to act on actions agreed on topics discussed at the dialogue meeting.
3. The implementation of agreed actions on topics should be dealt with outside of the dialogue meetings by working groups of experts that would agree an action plan and roadmap and would present a brief report on their work to a later dialogue meeting.
4. A mechanism needs to be agreed for identifying suitable contact persons and for determining the membership of the working groups. The contact person for a topic would automatically be a member of the working group on that topic.
5. The issue of how the work of the working groups will be funded needs to be resolved. Both the EU and China have sources of funding for such work but the funding of the work of the working groups out of these budgets needs to be prioritised and coordinated between the EU and China. Possible sources of funding include the PDSF II project, the EUCTP project, and the MoST international cooperation project to support the EU-China ICT cooperation.

The Sixth China-EU Dialogue meeting on ICT will be held in the first half of 2015 in Europe. The detailed date and venue need to be confirmed. The CHOICE project will organize the workshop/event accompanying the Dialogue.