

# RECONNECT CHINA POLICY BRIEF 2

— October 2023 —

## EU27/AC-China: Science, Technology and Innovation Co-operation Areas (and Non-areas) in the Big Data-related Scientific Fields

*Gábor Szüdi & Philipp Brugner*

### Executive Summary

The science, technology and innovation (STI) co-operation has been rapidly increasing between China and European countries in scientific fields related to big data in the last ten years. The collaboration is diverse in terms of sectors and countries, but artificial intelligence (AI) and image processing, as well as networking and telecommunications stand out as the most relevant areas.

China is a frontrunner in the relevant policy-making: after three sectoral regulations (on recommendation algorithms, synthetically generated content and generative AI), the country plans to soon adopt its AI Act.

The declared goals of these laws are to ensure control over information for Chinese state actors and to make China a global AI leader (with ethical consideration often only broadly defined). This poses a challenge to the EU in respect of aligning its values and principles on AI, as proposed by its own AI Act, with Chinese AI standards and norms.

At least three interrelated risks stem from this situation in terms of STI co-operation; i.e., risks involving national and EU-level security, economic competitiveness and ethics.

Considering these challenges, and following its 'de-risking' approach, the EU should define the scientific areas that are deemed very or unacceptably risky for collaboration with China. A set of objective and transparent criteria should be specified for this purpose, which allows for a 'case-by-case' assessment of AI applications.

Different risk mitigation measures can be used accordingly in various areas, ranging from restrictions to regulations and advisory services. The successful implementation of mitigation measures would also require targeted awareness-raising activities towards organisations working with China.

New permanent structures of information exchange between risk experts and institutions engaged in STI collaboration with China could facilitate a better understanding of co-operation risks associated with specific big data-related scientific fields.

## GENERAL TRENDS OF CHINA-EU STI CO-OPERATION IN AI-RELATED SCIENTIFIC FIELDS

Despite ongoing political tension and economic disputes, the **science, technology and innovation (STI) co-operation** between China and its main European scientific partners (the EU27 and Norway, Switzerland and the United Kingdom; hereinafter referred to as EU27/AC) **has been rapidly growing** in the last ten years in the scientific fields related to big data, such as artificial intelligence (AI) or machine learning (ML), and as measured by the number of scholarly co-publications and co-patents between 2011 and 2022.<sup>1</sup>

It is noteworthy that the **China-EU27/AC co-publication output surpassed the China-US output** in 2022 in the big data-related fields, which might be partly attributable to scientific ‘ripple’ effects of the more nationalist US stance in related trade policies. The protectionist measures by the US – such as the CHIPS and Science Act<sup>1</sup> – do not only affect China but also might have negative implications for other developed regions such as the EU; as shown by the downward trend of co-publication output of US-EU27/AC after 2020 (Fig.1).

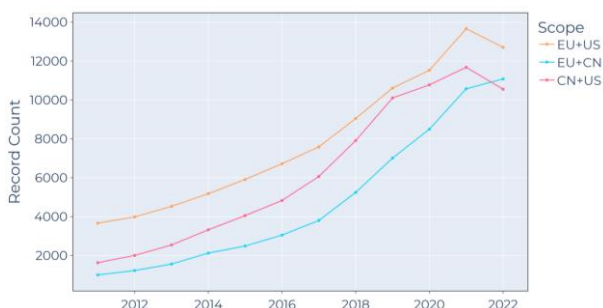


Figure 1 Number of co-publications per year related to artificial intelligence, machine learning and big data published between regions

In the context of the weakening STI co-operation of the US with both the EU27/AC and China, the strengthened role of China takes on even greater

<sup>1</sup> For more details on the methodology behind the policy brief, please refer to Section “Policy Brief Methodology”

significance: as regards publication dynamics, China has had the highest growth rate of in the big data-related publications since 2011. While China in 2011 still had the lowest output, it managed to overtake both the US and EU27/AC by 2022 (Fig. 2).

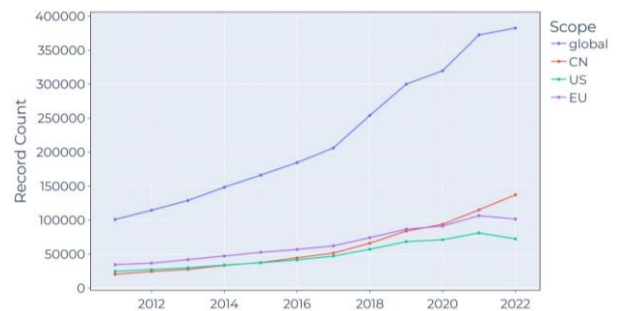


Figure 2 Number of publications per year related to artificial intelligence, machine learning and big data published by region

China’s big data-related STI collaboration is **diverse** in terms of both scientific fields and institutions with Europe. As regards scientific areas of the co-publications between the EU27/AC and China, applied sciences stand out, with **AI and image processing, and networking and telecommunications** as the predominant fields (ca. one-third of the total co-publication output).

Excluding UK institutions that account for ca. 44% of the co-publication output, the most relevant EU institutions collaborating with Chinese partners in the applied big data-related topics stem from **nine countries (NL, SE, DK, DE, FI, PL, IT, BE, FR)**, representing all four main European regions.

Regarding the side of China’s institutions in co-publications, the **Chinese Academy of Sciences** is by far the most represented actor, being the strongest collaborator with 11 out of the 15 top European institutions listed in Fig. 3.

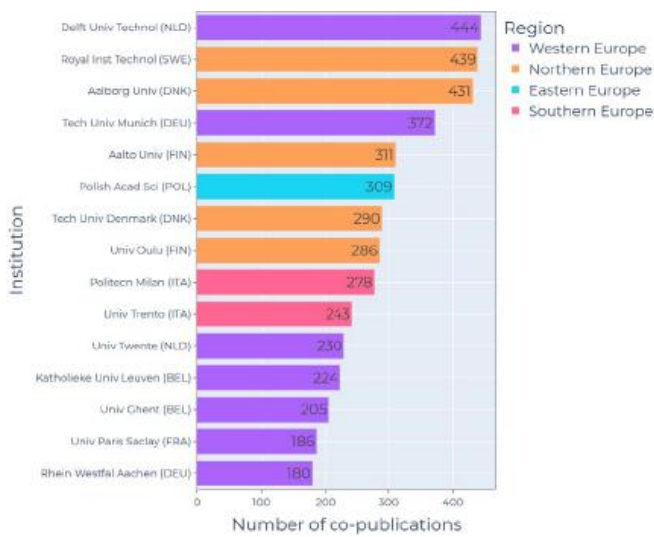


Figure 3 Top 15 most active institutions (EU27) publishing on applied AI-related topics in collaboration with Chinese institutions

The co-patent data between the EU27/AC and China also shows a dominance of the telecommunications/electronics sector within the AI, ML and big-data related STI co-operation, characterised by the joint efforts of such **industrial heavyweights** as Nokia, Ericsson, Siemens or Huawei, Lenovo and TCL.

## POLICY BACKGROUND

The rapid growth of STI collaboration between Europe and China in the scientific fields related to big data, and in particular in sectors with its practical application, such as AI, image processing and telecommunications, may be traced back to the declared goals of China’s STI-related policy documents.

Based on the **technological sovereignty objectives** of the 13<sup>th</sup> Five-Year Plan<sup>ii</sup> (FYP) of 2016-20 and the Made in China 2025<sup>iii</sup> initiative adopted in 2015, the 2017 **New Generation Artificial Intelligence Development Plan**<sup>iv</sup> (NGAIDP) set out the aim of global AI leadership of China by 2030. This resulted in an enhanced industry activity and policy support for AI development.

The policy support is also reflected in the fact that artificial intelligence (and quantum computing) is included in China’s 14<sup>th</sup> FYP<sup>v</sup> as one of the seven ‘frontier’ technologies to be prioritised in 2021-25. China can build on the already running **national key R&D projects** in scientific areas related to big data. The most important of these projects that could also be of interest to STI stakeholders from EU27/AC are listed in Fig. 4.<sup>vi</sup>

<b>2015-2020</b>	Cloud computing and big data  High-performance computing  Cybersecurity  Quantum control and quantum information
<b>2017-2022</b>	Smart robotics  Key scientific issues of disruptive technologies  Network integrated manufacturing, and smart factory  Key technologies and demonstration of IoT and smart cities

Figure 4 China’s national key R&D projects in areas related to AI, ML and big data

While the NGAIDP primarily focuses on stimulating AI development, it can also be seen as a starting point for China’s **AI governance** as it set a policy timetable for regulations until 2030.

China is currently preparing its **horizontal AI Law** which will be built upon the three most relevant sectoral regulations adopted until today: the 2021 Provisions on the Management of Algorithmic Recommendations in Internet Information Services <sup>vii</sup>, the 2022 Provisions on the Administration of Deep Synthesis Internet Information Services<sup>viii</sup>, and the 2023 Measures for the Management of Generative Artificial Intelligence Services<sup>ix</sup>.

The three regulations focus on the AI applications deemed most disruptive from a social and political perspective, i.e. recommendation algorithms, synthetically generated content (text, images, video, audio) and generative AI such as ChatGPT. While they contain broad high-level principles for AI ethics, their main objectives are to achieve **information control** and to make China the global leader in AI development and applications.<sup>x</sup>

This is to be achieved through **new administrative and technical measures**, such as model auditing mechanisms, technical performance standards and disclosure requirements, including an online database (repository) of algorithms and an algorithm security self-assessment report.

In contrast, the proposed **EU AI Act**<sup>xi</sup> takes a more horizontal approach, putting less emphasis on content control and more focus on the ethical use of applied AI technologies in full respect of universal human rights, also establishing rights and obligations for users and providers dependent on the level of risk posed by a certain AI technology.

## IMPLICATIONS FOR STI CO-OPERATION

The EU-China STI co-operation is governed by the Science and Technology Cooperation Agreement (renewed in 2018), while discussions in concrete topics are undertaken in the **Joint Roadmap for**

**Future Science, Technology and Innovation Cooperation**<sup>xii</sup> launched in 2019.

The different foci of Chinese and European AI policy regulations profoundly influence the framework conditions on STI-co-operation concerning big data as negotiated in the context of the Joint Roadmap. China aims to boost co-operation with Europe and other parts of the world in order to achieve technological leadership in key applied AI technologies, coercing their partners to be aligned with Chinese priorities and to observe the country's binding AI rules.

In contrast, aligned with the **'de-risking'** approach under the European Economic Security Strategy, the EU takes a more cautious, risk-based approach in the STI co-operation with China. Accordingly, the proposed EU AI Act divides AI systems and applications into unacceptable, high and limited **risk categories**.

Dependent on their usage, image processing and telecommunications – the most relevant two sectors in China-EU27/AC STI co-operation concerning big data – may fall into the high or even unacceptable risk category, necessitating a careful risk assessment of specific STI collaboration forms.

From a European perspective, at least three risk categories can be highlighted for STI co-operation in fields related to big data, namely: **national and EU-level security, economic competitiveness and ethics**.

**National and EU-level security** risks are inherently related to China's ambition to achieve technological sovereignty and independence from the West. This might involve imposing its own AI standards and norms not aligned with European security interests. The potential **dual-use** application of AI-related technologies resulting from joint China-EU endeavours pose serious concerns for Europe in terms of future co-operation in the rapidly evolving AI fields.

As regards **economic competitiveness**, it should be ensured that benefits of STI collaboration are shared equally between China and Europe. China has access to almost all of the European research area, but European stakeholders still have difficulties in accessing China, including mobility of researchers, data impositions or export controls.<sup>xiii</sup> **Protectionist policies** in China infer that European actors are able to benefit less from STI co-operation than their Chinese counterparts, with the latest of such disputes concerning the perceived difficulties of EU companies in using industrial data.

**Ethics** risks might stem from the different emphases given to ethical and integrity rules within Chinese and EU AI regulations. The proclaimed values incorporated in Chinese regulations are often vague and take a backseat to pragmatic considerations, potentially resulting in AI technologies to be used for unethical purposes, including human rights violations, such as in the case of **surveillance tools**. Considering the above intertwined risks and challenges, as well as the intensity and diversity of the current joint work, the EU should consider its options to find safe and mutually beneficial ways to continue STI collaboration with China in the fields related to big data.

## POLICY RECOMMENDATIONS

Based on the above considerations, the following policy recommendations are put forward to better understand the areas where co-operation is possible and advisable between China and the EU in scientific fields related to big data:

**1. Use a list of criteria to define unsafe areas for STI co-operation with China:** In its Recommendation on critical technology areas for the EU's economic security<sup>xiv</sup>, the EC foresees a **risk assessment** for four technology areas likely to present the most

immediate and serious risks in terms of national and EU-wide security, competitiveness and ethics. AI and related technologies (ML or algorithms) are among these areas.

The risk assessment should also include risks involved in the scientific collaboration on AI technologies. We acknowledge the difficulties stemming from the inherent characteristics of innovation: it is difficult to objectively assess the risk level of novel technologies since this often depends on their actual application. In addition, it is even more complicated to foresee how current basic research on AI develops into applications in the future.

Therefore, we advise to use a nuanced approach where a set of **objective and transparent criteria** is specified, serving as **indicators** to define risky (unsafe) and less risky (safe) areas for STI co-operation with China in the fields related to big data. The indicators would also enable a 'case-by-case' assessment of technologies, also taking into account socio-economic aspects. The EC might rely on expertise from different scientific fields, including social sciences and humanities, to draw up such a list of indicators.

**2. Apply tailor-made risk mitigation measures:** In case a certain AI (sub-)sector or actor is deemed risky according to the defined indicators, a specific mitigation strategy should be decided upon. This can take the form of **restrictions, regulatory approaches** or **advice**.

Restrictive measures should only be used when the risk is considered unacceptably high. Regulations can be used more widely when the EU interests are at stake, when fair and transparent framework conditions should be ensured or when EU standards and values should be set or protected.

China directly and indirectly imposes its standards and values embedded in its AI regulations on their

STI co-operation partners. In case the EU considers such standards contrary to its established principles, it should take an active stance to set limits and apply mitigation measures.

Restrictive and regulatory measures are formal processes and thus need time to be discussed and adopted. If more immediate action is needed, advice provided to European organisations engaged in STI collaboration with Chinese partners might be used to support organisations and researchers to reach their evidence-informed decisions.

### **3. Raise awareness on the STI co-operation risks:**

Many European academic and non-academic stakeholders are not aware of the risks involved in scientific co-operation with Chinese institutions. If information on AI sectors or partners connected with potential dual-use applications, human right violations or other unethical behaviour were better accessible, this could make a significant contribution to mitigate risks in STI collaboration.

The results of the co-publication and co-patent analysis support policy-makers to understand which European institutions co-operate most frequently with which Chinese organisations and in which big data-related topics.

These organisations and their researchers should be **specifically targeted** in order to foster their understanding of the concrete rules of China's AI regulations applying to their specific research situation.

### **4. Establish new formats of information exchange:**

It would be beneficial to make new permanent structures of information exchange between the EC and its experts, as well as organisations and researchers engaged or interested in STI co-operation with Chinese partners.

This might require the continuous monitoring of the AI-related research and policy landscape of China by

a group of European experts in order to be able to inform European stakeholders on potential new advancements in the field. This should ensure that the core EU values, standards and principles are adhered to even under changing circumstances, and European stakeholders avoid entering into STI collaboration deemed unacceptably risky or prone to unethical practices.

# RECONNECT POLICY BRIEF

*Philipp Brugner is a researcher at the ZSI – Zentrum für Soziale Innovation in Vienna and, jointly with Gábor Szüdi, leads the ReConnect China work on STI co-operation with China. His research interests are in science diplomacy, practices and values of research cooperation and technology sovereignty.*

*Gábor Szüdi is a researcher at the ZSI – Zentrum für Soziale Innovation in Vienna and, jointly with Philipp Brugner, leads the ReConnect China work on STI co-operation with China. His research interests are science diplomacy, research integrity and trust in science.*

## POLICY BRIEF METHODOLOGY

The background to this policy brief is the **ReConnect China public report on EU-China research co-operation (D1.1)**<sup>xv</sup>, published in September 2023. For this analysis, we used data on co-publications and co-patents between R&I institutions (including universities, research institutes and private companies) from the EU27/AC (the 27 EU Member States, as well as three non-EU Member States with strong STI links to China, namely Norway, Switzerland and the United Kingdom that are already or expected to be associated to Horizon Europe) and China. An institution qualifies as “European” if it is located in any of the EU27/AC countries and as “Chinese” if located in China.

Regarding data availability on co-publications from “Web of Science” and on co-patents from “PATSTAT”, in both cases the **latest data accessible is from 2022** (with the caveat that co-patent data for 2021 and 2022 is incomplete due to a considerable time lag between the date of patent submission and the date of its publication in PATSTAT).

## REFERENCES

- 
- <sup>i</sup><https://www.congress.gov/bill/117th-congress/house-bill/4346/text>
- <sup>ii</sup><https://www.greenpolicyplatform.org/national-documents/13th-five-year-plan-economic-and-social-development-peoples-republic-china>
- <sup>iii</sup><https://isdpc.eu/content/uploads/2018/06/Made-in-China-Backgrounder.pdf>
- <sup>iv</sup><https://digichina.stanford.edu/work/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>
- <sup>v</sup><https://cset.georgetown.edu/publication/china-14th-five-year-plan/>
- <sup>vi</sup><https://chinainnovationfunding.eu/national-key-rd-programmes/> (data from 2022)
- <sup>vii</sup> <https://www.chinalawtranslate.com/en/algorithms/>
- <sup>viii</sup> <https://www.chinalawtranslate.com/en/deep-synthesis/>
- <sup>ix</sup><https://digichina.stanford.edu/work/translation-measures-for-the-management-of-generative-artificial-intelligence-services-draft-for-comment-april-2023/>
- <sup>x</sup><https://carnegieendowment.org/2023/07/10/china-s-ai-regulations-and-how-they-get-made-pub-90117#:~:text=The%202017%20New%20Generation%20AI,China's%20economy%20and%20national%20power>
- <sup>xi</sup>[https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS\\_BRI\(2021\)698792\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf)
- <sup>xii</sup>[https://research-and-innovation.ec.europa.eu/system/files/2021-12/cn\\_roadmap\\_2018.pdf](https://research-and-innovation.ec.europa.eu/system/files/2021-12/cn_roadmap_2018.pdf)
- <sup>xiii</sup><https://leidenasiacentre.nl/wp-content/uploads/2018/11/LeidenAsiaCentre-Report-Assessing-Europe-China-Collaboration-in-Higher-Education-and-Research.pdf>
- <sup>xiv</sup>[https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_4735](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4735)
- <sup>xv</sup> Brugner, P., Szüdi G., Demir U.B., Weiss G. et al. (2023): Report on the results of the research cluster on EU-China research co-operation (co-patent/co-publication analysis), ReConnect China deliverable D1.1. Available at [https://www.zsi.at/object/news/6715/attach/ReConnect\\_China\\_D1\\_1\\_Report\\_on\\_the\\_results\\_of\\_research\\_cluster\\_on\\_EU-China\\_research\\_cooperation\\_co-patent\\_co-publication\\_analysis.pdf](https://www.zsi.at/object/news/6715/attach/ReConnect_China_D1_1_Report_on_the_results_of_research_cluster_on_EU-China_research_cooperation_co-patent_co-publication_analysis.pdf)



Funded by  
the European Union

The opinions expressed in this Policy Brief are those of the author(s) alone, and they do not necessarily reflect the views of the European Union. *All rights reserved.*