

Mapping data about China

Annotated collection of data and evidence providing entities: which data can be found where

EU Research and Innovation Knowledge Network on China

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Preface

The EU-KNOC initiative was launched in July 2020, by the Directorate-General for Research and Innovation of the European Commission and the Strategic Forum for International Cooperation (SFIC) and is implemented by a consortium consisting of DLR Management Agency, Intrasoft, Teamwork, Technopolis and ZSI. EU-KNOC brings together representatives of the EU Member States' Ministries of Science, Technology and Innovation and other relevant ministries who constitute the Core China Group (CCG) and external experts to tackle thematic issues related to R&I policy towards China and to promote a common response.

As input and background information for EU-KNOC several studies are prepared by a research team. These studies aim to provide more in-depth knowledge regarding specific sub-topics within the wider area of STI collaboration with China.

This study focuses on providing guidance on where to find reliable data and evidence about R&I in China. It focuses on the data and evidence gap that exists with regards to research and innovation data for China. China is the largest country that does not belong to the OECD. This means that the OECD figures are not always complete and/or reliable. This paper provides an overview of the quality and timeliness of data on China's research and innovation system, where it is available, under what conditions and at what price.

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1. Introduction: Key concepts and methodology

This paper focuses on providing guidance on where to find reliable data and evidence about R&I in China. It focuses on the data and evidence gap that exists with regards to research and innovation data for China. China is the largest country that does not belong to the OECD. This means that the OECD figures are not always complete and/or reliable. This paper provides an overview of the quality and timeliness of data on China's research and innovation system, where it is available, under what conditions and at what price.

The paper is structured in three main sections: In section two the key concepts of R&I data and the methodology to assess data quality are introduced, in section three an overview is provided of the available data sources, the differences between the data sources are explained and guidance is provided regarding which source can be used for which indicator. In the fourth section the conclusions and insights are summarised. In the appendix an extensive overview of data sources and indicators is provided.

1.1 Definition of R&I data quality

Indicators provide information for reality interpretation and allow for progress evaluation, help to understand and detect patterns in behaviour, and identify future trends. Indicators thus mainly guide informed decision-making. For R&I policy, science, technology and innovation indicators provide essential strategic statistical data for both formulations of public policies and investment in these areas. In recent decades, the measurement of the production and application of new knowledge has become one of the most repeated demands from both public and private domains. The academic discussions responding to this demand have led to the emergence of a body of recommendations, methodologies and analyses that, with different degrees of diffusion (and application), shape the science, technology and innovation (STI) indicators available nowadays.

The collection of manuals published by the Organization for Economic Cooperation and Development (OECD) together with the contributions from other recognised international organisations (such as Eurostat and UNESCO) are common and some of the first methodologies. STI indicators cover a number of dimensions, for example research capacity is e.g. measured in terms of the number of R&D personnel and PhD students, technology usage is measured e.g. in terms of expenditure for acquisition of foreign technology and innovation capacity is measured e.g. in terms of expenditure of enterprises on R&D. In the context of this paper, a selection was made that, when analysed jointly, provides a more or less holistic image of the dynamics of the innovation system.

China's R&I statistics started late but developed fast. Compared with other government statistics, R&I statistics based on science and technology statistics have a shorter history of only more than thirty years, but developed more rapidly and kept higher consistency with international norms.¹ At present, the channels of release mainly include the statistical bulletin, statistical yearbook, statistical abstract, statistical summary, the China Development Report, official website of the National Bureau of Statistics of China, national statistical database and mobile client, WeChat and Weibo.

Still, with a number of organisations publishing internationally, comparative indicators on R&I do not provide data on China. There are multiple challenges to accessing Chinese R&I data of which language is one. Though a number of sources or channels have a version of the website, and in some instances data too, available in English, the main body of data is often in Mandarin interfaces. In addition, not all databases or sub-datasets are publicly available, available outside China, or available outside of research/academic institutions.

¹ OECD, 2018. Available at: https://www.oecd.org/iaos2018/programme/IAOS-OECD2018_Item_2-D-2-Gao-Guan-Li-Zhang.pdf

Furthermore, the format in which data is made available often means that data cleaning, manipulation and conversion requires much more time and resources (e.g. consider downloading tables in a pdf or excel format). Finally, the storage and archiving of data is in some cases inconsistent which requires a daily check on available sources and potential updates.

This paper puts forward an overview of available sources and indicators on China per subdomain of the following R&I indicators:

- Science (e.g., R&D personnel, number of PhD students, scientific publications, etc.)
- Technology (e.g., high-technology exports, proportion of tech manufacturing value added, etc.)
- Innovation (e.g., firms that spend on R&D, expenditure of enterprises on R&D, patent applications, etc.)
- Framework conditions (e.g., GERD expenditure, number of R&D institutions, broadband subscriptions, etc.)
- Education (e.g., number of students, net flow of internationally mobile students, etc.)

1.2 Methodology

For this paper, several steps were undertaken to arrive at the presented list of sources, findings and the accompanying flow chart to identify the required source.

A first step involved a quick scan across the web to identify key sources that were accessible in either English or Mandarin and which covered indicators that were not (fully) covered by the OECD's overview. Based on the list of main topics other potential sources were further narrowed down, which resulted in an overview of additional sources and indicators.

In order to be able to provide guidance regarding where to find further *reliable* data about the status of R&I in China, a number of criteria were developed that combined constitute the reliability of data sources. These criteria are:

- **Origin:** Where the data stems from, which organisation or agency is responsible for releasing the data?
- **Format:** In what format is the data presented (static images or pdf reports or excel files)?
- **Timeliness:** How frequent and consistent is data reported, are there any gaps across time?
- **Pricing:** Is there a paywall or other type of financial restriction on the data?
- **Language:** In what language can you access the data and is the data itself presented?
- **Data collection method:** How was the data collected, e.g. through surveys, self-reporting or otherwise?
- **Primary data:** Does the source contain the original, primary data or is it sourced from a different database?

For each source and indicator, the above listed criteria were collected and an overview of data sources for the STI indicators was constructed. This overview forms the body of this paper and serves as a reference point for supporting data on R&I in China.

Next, initial findings were verified with four interviewees experienced in using STI data on China for their work in the public and private sector. The interviewees were also able to provide additional sources and reflect on the reliability of some of the sources and indicators. These findings have been incorporated in the findings presented in Chapter 2 as well as in the synthesis of Chapter 3.

2. Overview of data sources

2.1 Differences between data sources

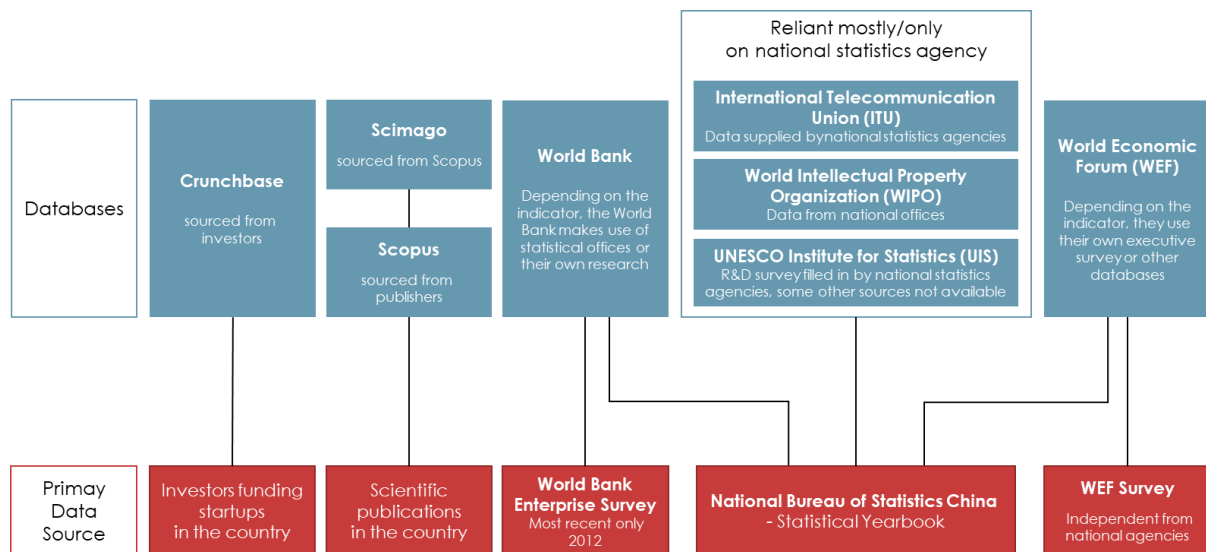
There are various types of data sources on China. There are organisations that offer databases with indicators on R&I in China, such as Crunchbase, Scimago and Statista. There are also other organisations that offer reports with both quantitative and qualitative data available. Although the main focus is put on the available quantitative databases, this paper will also shortly dive into various reports. A more elaborate overview of data sources, which includes the indicators each data source provides, is available in Appendix 5.1.

Quantitative databases

An overview of the quantitative databases and what they base their data on is available in Figure 1. Overview of free quantitative databases and the primary data sources they are based on. Figure 1. Regarding databases on R&I in China, the most important database is the data published by the National Bureau of Statistics of China². The main entry point for the data they publish is the national statistical yearbook. This is available in both Mandarin and English. Secondly, there are various official international databases, such as the World Bank, Scopus/Scimago and the World Intellectual Property Organization (WIPO). These largely base their data on the data provided by the National Bureau of Statistics and are available in English. Next to these official data sources, there are privately collected data sources available such as indices by NGOs and private organisations that synthesize data and offer it for free, such as Scimago (based on Scopus) and the World Economic Forum (WEF), or ask a certain price for accessing the data, such as Statista, EPS China Data and Crunchbase.

² <http://www.stats.gov.cn/english/>

Figure 1. Overview of free quantitative databases and the primary data sources they are based on.



Source: Technopolis Group, 2021

Regarding pricing, there are both free and paid databases available. Most of the databases based on the data from the National Bureau of Statistics are free: including the Statistical Yearbook, the data from the International Telecommunications Union (ITU), the World Intellectual Property Organisation (WIPO), and the UNESCO Institute for Statistics (UIS). EPS China Data is an organisation that translates data available in Chinese only to English, among other sources also from the National Bureau of Statistics. The data of the World Economic Forum (WEF), as well as Scimago and the World Bank Enterprise Survey (WBES) are free, although for the latter one needs to prove their status as researcher in order to get access. Regarding private collectors, Crunchbase is available in a free version, offering just basic company information and a paid full version (€600 annually) which includes to filter data and export all data required. Other paid sources include Statista (€720 annually).

The format of the available data also differs per data source. Most of the databases offer the option to download the data in .csv or .xlsx files, which are easy to use in Microsoft Excel. The only exceptions to this are the Statistical Yearbook of China, and the WBES. The Statistical Yearbook is provided in .png files on the website, which makes it hard to copy the data. The WBES is available in .dta files, which can be read in the statistics software Stata.

Reports with both quantitative and qualitative information

There are various organisations that publish reports on the state of R&I in China:

- National Natural Science Foundation of China:** The National Natural Science Foundation publishes an annual report³ detailing their funding for various purposes over the last year. In addition, the report outlines main scientific activities and breakthroughs in the country over the previous twelve months. The report is available in English and Mandarin, and free of charge.

³ http://www.nsf.gov.cn/english/site_1/report/C1/2021/03-29/230.html

- **Ministry of Science and Technology:** The Chinese Ministry of Science and Technology lists their current calls for proposals on an online platform⁴. This website is only available in Mandarin, as the English version is not updated⁵. This source is free of charge.
- **Ministry of Education:** The Chinese Ministry of Education releases each year an overview of educational achievements⁶ in the country. The report covers statistics from primary, secondary and higher education and also includes adult and non-state education. It is available in Mandarin and English. This source is free of charge.
- **CWTS Leiden⁷:** Open Access score for universities. Leiden university offers insights in the scores of universities on several indicators, including Open Access indicators. The Chinese universities are also featured in the CWTS Leiden Ranking⁸. Detailed data carry a fee.
- **IREG observatory⁹:** This observatory tracks the rankings of universities, including Chinese universities. Here one can retrieve information on what type of indicator of Chinese universities' success can be found in which ranking. Data carry a fee.
- **Datenna¹⁰:** This private China Economic Intelligence organisation publishes reports on demand. They build data intelligence tools for government decision-making on China. They focus on investment screening, innovation intelligence and export control. Data carry a fee.
- **Economist Intelligence Unit¹¹:** The Economist, a UK-based weekly international newspaper, provides data and insights on China through its Intelligence Unit. Detailed data carry a fee.

2.2 How R&I data is used in practice

The main practical barrier for researchers on R&I China is the language barrier. Most of the information is available in Mandarin, which makes it hard for non-Mandarin speakers to access this information. Some researchers also make use of newspapers (both national and regional / local) to get to the required level of detail. A challenge when using these types of information is that it is not always common practice in Chinese newspapers to indicate where data comes from, which makes it hard to track the primary source of the data.¹² Also, some data bases are only accessible in case a researcher is part of a Chinese university, which makes it impossible for European researchers to make use of the information.

Another barrier is the scale of the country, and the large differences between regions. Although data on the national level are available via the National Bureau of Statistics, this information cannot be translated to China's provinces, and the provinces themselves are often less well organised in terms of statistics.¹³ Their data are also mainly available in Mandarin. The collection of data from the provinces is also a challenge for the National Bureau of Statistics. According to an interviewee, there is the possibility that data is

⁴ <https://service.most.gov.cn/>

⁵ <http://en.most.gov.cn/>

⁶ http://en.moe.gov.cn/documents/reports/202102/t20210209_513095.html

⁷ <https://www.cwts.nl/>

⁸ <https://www.leidenranking.com/ranking/2021/list>

⁹ <https://ireg-observatory.org/en/>

¹⁰ <https://www.datenna.com/>

¹¹ <https://www.eiu.com/n/>

¹² Based on interview data, conducted on 10/08/2021.

¹³ Based on interview data, conducted on 10/08/2021

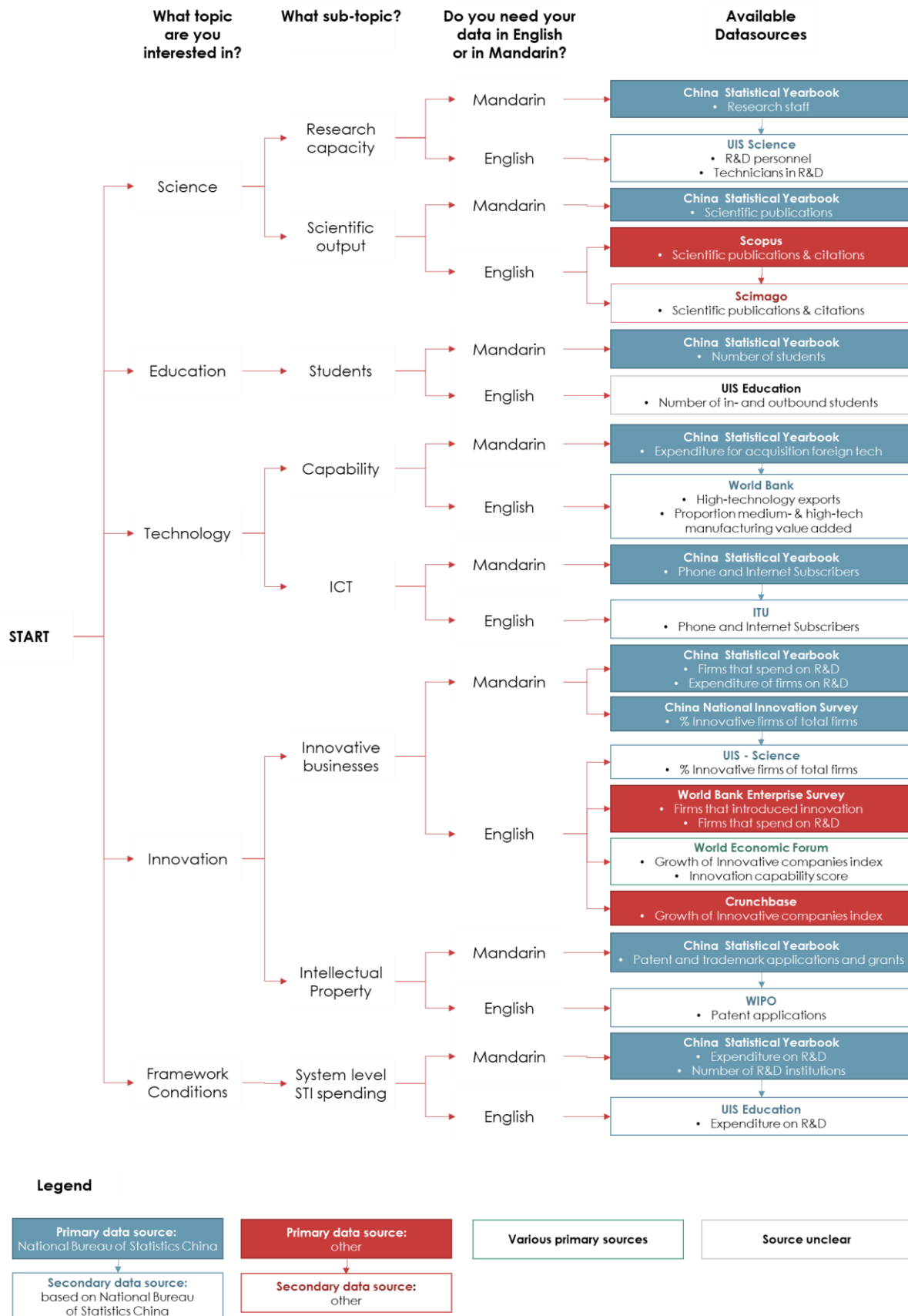
manipulated before it reaches the national level. The manipulation can either be by accident or on purpose. Still, the National Bureau of Statistics is the best available data source on China according to the interviewees.

Due to its quality, other international organisations also base their data on the National Bureau of Statistics data. However, a challenge in this case is that sometimes, during the translation or adaptation of the data to this specific organisation, the scope of the data might be (slightly) altered. Therefore, when using data derived from the Chinese official data, one always needs to pay attention to the exact scope of similar indicators.

2.3 Visualisation of data sources per STI indicator

In order to structure the different sources that contain data on research and innovation, they were classified in five different topics, and eight subtopics. Though not exclusive, these categories enable clear and concise search terms to identify the correct data source. In terms of accessibility for the researcher, it is important to know whether these data are available in English or Mandarin. Regarding the quality of the data, it is important to know the primary source of the data. A flowchart providing guidance on when to use which data source and whether it is needed in English or Mandarin is presented in Figure 2 on the next page. In this figure also, the primary data source has been specified. A more elaborate overview of the separate indicators is available in Appendix 5.2.

Figure 2. Flowchart with overview of available data sources on R&I in China for various (sub-)topics



Source: Technopolis Group, 2021

3. Synthesis

The starting point of the analysis has been to provide guidance on where to find reliable R&I data on China. What emerged from this analysis is that quite some data is (increasingly) available, although to lesser extent accessible for non-Chinese speakers outside China.

The primary data source in the majority of the cases is the National Bureau of Statistics China (China statistical yearbook). Although often available in both Mandarin and English, this data is not easy to process as it is available in .png or .pdf and only offers national statistics. The data presented in English is a small subset of the available data in Mandarin, but we have no evidence of the data in English deviating from the Mandarin content. Considering the vast size of China and the significant differences across regions this is a substantial limitation in terms of obtaining a reliable picture. The national government is struggling with obtaining reliable regional data, in that sense it is unlikely that reliable regional data will be available outside China in the near future. Moreover, in terms of obtaining rich evidence on R&I in China, it would be preferable to be able to combine data sources in order to include multiple indicators. As the majority of the data is not provided in .csv or .xlsx files as it is a (too) laborious exercise.

As several data sources on R&I in China are being generated also within the EU it would be interesting to work on aggregated data sets and where possible compare and combine them with data from Chinese sources. Perhaps that way an estimate could be calculated regarding R&I data on a regional level. This could significantly improve the development of targeted evidence-based policies.

4. Appendix

4.1 Overview of data sources

Table 1 shows an overview of the available (types of) data sources on R&I data on China, and the characteristics of these sources.

Table 1 Overview of sources for R&I data on China, and their characteristics.

Source	Main topics	Quality	Type of source	Timeliness	Pricing	Language	Format	URL	Alternative for which OECD indicators
National Chinese data									
Statistical yearbook China	Expenditure on R&D by gov and firms, patents, scientific publications	Official statistics	Database	2004-2020 For most indicators annual reporting	Free	Mandarin, English	.png files	http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm	Main STI indicators (GERD) R&D database, Patent Statistics Database, Activity of Multinational Enterprises (AMNE) database – on R&D expenditure by firms, Analytical Business Enterprise Research and Development (ANBERD) Database
National Natural Science Foundation of China	Statistics on funding programs	Official statistics	Reports	Annual reporting, 2015 - 2019	Free	Mandarin, English	.pdf files	http://www.nsf.gov.cn/english/site1/report/C1/2021/03-29/230.html	R&D database
Ministry of Science and Technology (MOST)	Call for research proposals for state funding	Official statistics	Reports	Current	Free	Mandarin	.pdf files	https://service.most.gov.cn/	-

Source	Main topics	Quality	Type of source	Timeliness	Pricing	Language	Format	URL	Alternative for which OECD indicators
Ministry of Education	Statistics on education	Official statistics	Reports	Annual reporting, 2010 – 2019	Free	Mandarin	.pdf files	http://en.moe.gov.cn/documents/statistics/2018/national/	-
Official international databases									
UIS - Science	R&D, Science statistics	Official statistics provided by China's statistics office	Database	Annual	Free	English	.csv files	http://data.uis.unesco.org/	Main STI indicators (GERD) R&D database, Careers of Doctorate Holders (CDH) indicators (joint UIS-OECD database)
UIS - Innovation	Innovation statistics	Official statistics provided by China's statistics office	Database	Annual	Free	English	.csv files	http://data.uis.unesco.org/	Innovation indicators
WB Enterprise survey	Firm-level innovation measures	Official statistics	Database	From 2014, every 3 years	Free – after creating a research account	English	.dta files	https://login.entrepreneur.com/content/sites/financeandprivatesector/en/signin.html	Innovation indicators
WIPO	Patent databases, IP statistics	Official statistics based on China's yearbook	Database	Annual	Free	English	.csv files	https://patentscope.wipo.int/search/en/search.jsf	Patent Statistics Database

Source	Main topics	Quality	Type of source	Timeliness	Pricing	Language	Format	URL	Alternative for which OECD indicators
ITU – International Telecommunications Union	ICT / Telecommunications statistics	Official statistics based on China's Yearbook	Database	Annual	Free	English	.xlsx files	https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx	Key ICT indicators database, Broadband portal
Indices by NGOs									
CWTS Leiden	Open Access score for Chinese universities	Method provided in accompanying paper	Reports	2018-2020, annual	Free	English	.xlsx file	https://www.leidenranking.com/ranking/2021/list	-
IREG observatory	Academic Ranking	Based on rankings by universities	Reports	Annual	Free	English	Website	https://ireg-observatory.org/en/	-
Private collectors of data									
Crunchbase	Innovative companies	Investors	Database	Ongoing	Free version, Paid full version €600 / year	English	.csv files, .xlsx files	https://crunchbase.com/	Innovation Database
Scimago	Scientific publications	Based on Scopus	Database	Ongoing	Free	English	.xlsx files	https://www.scimagojr.com/countrys_ea_rch.php?country=CN	R&D Database
Statista	All kinds of indicators	Various sources	Database	Differs per indicator	Paid - €720 / year	English	.csv files, .xlsx files	https://statista.com	Main R&D Databases

Source	Main topics	Quality	Type of source	Timeliness	Pricing	Language	Format	URL	Alternative for which OECD indicators
Datenna	Innovation intelligence	Own research, webscraping	Reports	On demand	Paid, On demand	English, Dutch	On demand	https://www.datenna.com	-
EPS China data	Macroeconomy	Based on China's yearbooks, translated	Database	On demand	Paid, unknown	English, Mandarin	On demand	http://www.epschina.com/data-resource.html	-
Economist Intelligence Unit	Macroeconomy	Own research	Reports	On demand	Paid, unknown	English	On demand	https://country.eiu.com/china	-
WEF - World Economic Forum	Macroeconomy, innovation	Based on various sources	Database, reports	Ongoing	Free	English	.csv files, .pdf files	https://www.globalinnovationindex.org/analysis-indicator	-

4.2 Overview of indicators

Table 2 shows an overview of the available indicators on R&I data on China, and the characteristics of these indicators.

Table 2 Overview of STI indicators for China from databases

Category	Indicator	Measurement	Source	Collection method	Timeliness
Science					
Research capacity	R&D personnel	Both headcount and FTE. Absolute and per capita. By gender, by field, by seniority level, by sector of employment	UIS - Science	R&D Surveys (filled in by national agencies)	Annually
Research capacity	Number of PhD students (ISCED 8)	Headcount. Absolute and per capita. By ISCED level and sex	UIS - Science	R&D Surveys (filled in by national agencies)	Annually
Research capacity	Technicians and equivalent staff	By sex, per million inhabitants, per thousand labor force, per thousand local employment, by sector of employment	UIS - Science	R&D Surveys (filled in by national agencies)	Annually
Research capacity	Number of research staff	Split up in research staff, technicians, and Supporting personnel	China statistical yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not	Annually
Capability development	Enrolment in tertiary education programmes (ISCED 5-8)	Headcount. Absolute and per capita. By ISCED level and sex	UIS - Science	R&D Surveys (filled in by national agencies)	Annually
Scientific output	Scientific publications	Absolute and per capita. By field	Scimago	Scopus database	Annually (all numbers cumulative)
Scientific output	Scientific papers issued	Absolute	China statistical yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually

Category	Indicator	Measurement	Source	Collection method	Timeliness
Scientific output	Scientific papers published in foreign periodicals	Absolute	China statistical yearbook	Self-reporting, (sample)surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Scientific output	Citations of scientific publications	Absolute, per paper, per capita. By field	Scimago	Scopus database	Annually (all numbers cumulative)
Scientific output	International co-publications	Absolute and per capita	Scopus	Scientific publishers	Continuously
Scientific output	Open Access publications	Share and absolute per capita	Scopus	Scientific publishers	Continuously
Technology					
Capability	High-technology exports	Share of total exports, share of total GDP	WB - World Bank	Export data based on WB and OECD national accounts data files (self reporting). Method to calculate high-technology exports adopted from the UN Comtrade database through the WITS platform	Annually
Capability	Proportion of medium and high-tech manufacturing value added	As share of total added value	WB - World Bank	OECD-Data for OECD countries, General Industrial Statistics Questionnaire by UNIDO for non OECD countries and 'official publications and official websites'	Annually
Usage	Expenditure for Acquisition of Foreign Technology	Absolute	China statistical yearbook	Self-reporting, (sample)surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Innovation					

Category	Indicator	Measurement	Source	Collection method	Timeliness
Capability	Innovation Capability Score	Index	WEF - World Economic Forum	Index based on a number of sub-indices with different methodologies. These include applying data from other databases (e.g. World Bank, database for R&D expenditures or SCImago) or the use of their own Executive Opinion Survey	Annually
Capability	Global Innovation Index	Index	WEF – World Economic Forum	Index based on a number of sub-indices with different methodologies. These include applying data from other databases (e.g. World Bank, database for R&D expenditures or SCImago) or the use of their own Executive Opinion Survey	Annually
Capability	Firms that spend on R&D	Share	WBES - World Bank Enterprise Survey	Enterprise survey	Most recent survey conducted in 2012
Capability	Number of enterprises having R&D activities	Absolute, share of firms	China statistical yearbook	Self-reporting, (sample)surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Capability	Expenditure of enterprises on R&D	Absolute, share of sales revenue	China statistical yearbook	Self-reporting, (sample)surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Innovative businesses	Firms that introduced innovation	Share of firms, by process, product, business model etc.	WBES - World Bank Enterprise Survey	Enterprise survey	Most recent survey conducted in 2012

Category	Indicator	Measurement	Source	Collection method	Timeliness
Innovative businesses	Innovation Description (allows keyword analysis, not for all countries)	Qualitative	WBES - World Bank Enterprise Survey	Enterprise survey	Most recent survey conducted in 2012
Innovative businesses	Growth of Innovative Companies	Scale (1-7, 7=best)	WEF - World Economic Forum	Index based on a number of sub-indices with different methodologies. These include applying data from other databases (e.g. World Bank, database for R&D expenditures or SCImago) or the use of their own Executive Opinion Survey	Annually
Innovative businesses	Funded Startups	Absolute	Crunchbase	Only a general statement available: Portfolio submissions of global investment firms (monthly), community contributors and AI validation	Monthly?
Innovative businesses	Amount of funding in for start-ups	Absolute	Crunchbase	Only a general statement available: Portfolio submissions of global investment firms (monthly), community contributors and AI validation	Monthly?
Intellectual property	Patent applications	Absolute and per capita. By resident status	WIPO - World Intellectual Property Organization	Data provided by national data office	Annually
Intellectual property	Patent applications by industrial enterprise	By type of firm (domestic funded versus foreign funded); state-owned, cooperative etc.)	China statistical yearbook	Self-reporting, (sample)surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually

Category	Indicator	Measurement	Source	Collection method	Timeliness
Intellectual property	Patent applications: inventions	Absolute; By type of firm (domestic funded versus foreign funded; state-owned, etc.)	China statistical yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Intellectual property	Patent grants	Absolute; By type of firm (domestic funded versus foreign funded; state-owned, etc.); By type of application (invention, utility model or design)	China statistical yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Intellectual Property	Value of contract deals in domestic technical markets by type of contracts	Absolute; By type of technical income; by intellectual right	China statistical yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
Intellectual property	Trademark applications	Absolute and per capita. By resident status	WIPO - World Intellectual Property Organization	Data provided by national data office	Annually
Innovative firms	Percentage of product / product-only / process / product and process innovators in manufacturing	By size class, by manufacturing industry (ISIC/NACE)	UIS- Science	Chinese National Innovation Survey of Enterprises (Carried out by the national statistics agency)	One datapoint (2014)
Innovative firms	Percentage of innovative firms in manufacturing	By size class, by manufacturing industry (ISIC/NACE)	UIS- Science	Chinese National Innovation Survey of Enterprises (Carried out by the national statistics agency)	One datapoint (2014)
Innovative firms	Percentage of organizational	By size class, by manufacturing industry (ISIC/NACE)	UIS- Science	Chinese National Innovation Survey of Enterprises (Carried out by the national statistics agency)	One datapoint (2014)

Category	Indicator	Measurement	Source	Collection method	Timeliness
	innovation by manufacturing firms			out by the national statistics agency)	
Innovative firms	Percentage of marketing innovation by manufacturing firms	By size class, by manufacturing industry (ISIC/NACE)	UIS-Science	Chinese National Innovation Survey of Enterprises (Carried out by the national statistics agency)	One datapoint (2014)
Framework conditions					
System level STI Spending	GERD - gross expenditure R&D	Absolute, as share of GDP, by researcher, by sector of performance, by source of funds, by field of R&D, by type of costs, by type of R&D activity	UIS - Science	R&D Surveys (filled in by national agencies)	Annually
System level STI spending	Expenditure on R&D:	Basic research; Applied research; Experimental development; government funds; self-raised funds by enterprises; By type of firm (domestic funded versus foreign funded; state-owned, cooperative etc.); as percentage of GDP	China statistical yearbook: Science & Technology	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
System level STI Spending	Number of R&D institutions	Absolute; at central level, at local level; by research field	China statistical yearbook: Science & Technology	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
ICT	Telecommunication subscribers	By technology (3G mobile phone subscribers, fixed telephone subscribers, Broadband subscribers)	China Statistical Yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually
ICT	Fixed broadband subscriptions	Absolute and percentage	ITU	Numbers by China's Ministry of Information Industry (MII)	Annually
ICT	Mobile broadband subscriptions	Absolute and percentage	ITU	Numbers by China's Ministry of Information Industry (MII)	Annually

Category	Indicator	Measurement	Source	Collection method	Timeliness
ICT	Percentage of Individuals using the Internet	Percentage	ITU	Numbers by China's Ministry of Information Industry (MII) & National Bureau of Statistics	Annually
Education					
Students	Number of inbound Students	By continent, region (e.g., central and eastern Europe) and country	UIS - Education	Not specified	Annually
Students	Number of outbound Students	By host region (e.g., central and eastern Europe)	UIS - Education	Not specified	Annually
Students	Net flow of internationally mobile students	Total number & percentage per country	UIS - Education	Not specified	Annually
Students	Number of students	By type of education; By level; Graduates, Entrants; Enrolment	China Statistical Yearbook	Self-reporting, (sample) surveys, NBS estimates (for unavailable data points) – not reported per indicator only on top-level	Annually

Source: Technopolis Group, 2021