



**SENET-HUB**  
SINO-EUROPEAN HEALTH NETWORKING HUB

# Initial roadmap for enhancing EU-China health research and innovation collaboration

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(Version 1.0, 29/10/2021)



## Content

Executive summary.....	1
1. Introduction .....	2
2. Methodology.....	2
2.1 Policy stakeholder dialogues.....	3
2.2 Research & Innovation expert group meetings .....	4
2.3 Multi-stakeholder meeting: Research Innovation and Policy Expert meeting .....	4
3. State of the art in Sino-European health research and innovation collaboration .....	4
3.1 Health research and innovation funding in Europe .....	6
3.2 Health research and innovation funding in China .....	8
4. Opportunities and challenges to EU-China cooperation in health R&D .....	10
4.1 Opportunities.....	10
4.2 Challenges, barriers and bottlenecks.....	13
5. Expected impacts of enhanced EU-China cooperation in health R&D .....	15

## List of Figures

Figure 1: Flow chart of methodology used for consultation meetings .....	3
Figure 2: Structure of Horizon Europe .....	6



## Abbreviations and Acronyms

Abbreviation, Acronym	Description
AIDS	Acquired immunodeficiency syndrome
AMR	Anti-microbial resistance
CAMS	Chinese Academy of Medical Sciences
EC	European Commission
ERA	European Research Area
ERC	European Research Council
EU	European Union
GACD	Global Alliance for Chronic Disease
GERD	Gross Domestic Expenditure on R&D
HIV	Human immunodeficiency virus
ICD	Innovation Cooperation Dialogue
NBS	National Bureau of Statistics
NMP	National Science and Technology Major Project
NSFC	National Natural Science Foundation of China
PUMC	Peking Union Medical College
R&D	Research & Development
R&D&I	Research & Development & Innovation
RMB	Renminbi
S&T	Science & Technology
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

## Executive summary

Acknowledging the notion of China as a powerhouse for research, development and innovation (R&D&I), the SENET project intends to facilitate the dialogue between Chinese and European research and innovation entities to increase the participation in health collaborative projects. To that end, SENET organised a series of dialogues, meetings and other types of events with the aim to bring together relevant stakeholders and to gather their input and feedback on pertinent aspects and questions related to strengthening collaboration in health R&D&I between the EU and China. Based on the feedback provided by the participating stakeholders, a range of opportunities as well as a number of challenges and barriers could be identified related to cooperation between the EU and China in the health R&D&I area.

As measures to strengthen future cooperation, joint EU-China funding schemes and support to researcher mobility programmes were identified as important mechanisms. Moreover, major common fields of interest were described that may be chosen as priority areas of joint research in the future. Suggested areas include for example infectious disease research, global health, antimicrobial resistance, development of prophylactic, pharmaceuticals and diagnostics innovations, and research addressing issues concerning the elderly/aging population.

Concerning challenges and barriers to an enhanced Sino-European collaboration, major obstacles identified within this initial roadmap include differing regulations and restrictions from one geographic area to the other, as well as unharmonized legal frameworks between the European Union and the People's Republic of China. Additional obstacles to collaboration, amongst others that were identified here, comprise language barriers and cultural differences, scarceness of funding schemes to support EU-China cooperative research, the strong dependence on state authorities adding additional layers of complexity to cooperation involving tedious bureaucracy as well as the lack of partner networks for Chinese research & innovation actors in Europe and vice versa.

For supporting R&D&I in their respective region/country, both the EU and China have a wide range of different support programmes, schemes and mechanisms in place, including some that focus specifically on health. In addition, China and the EU have designed dedicated programmes, schemes and/or mechanisms to facilitate and support international cooperation. It will be highly important that specialized EU-China cooperation schemes will be further developed and enhanced in the future, including measures to address the challenges that have been identified to hamper cooperation so far and taking full advantage of the opportunities identified.

Some of these areas could also be addressed in joint roadmaps for research and innovation that could be agreed upon between the Chinese government and the EC as a basis for future cooperation.



## 1. Introduction

Acknowledging the notion of China as a powerhouse for research, development and innovation (R&D&I), the SENET project<sup>1</sup> intends to facilitate the dialogue between Chinese and European research and innovation entities to increase the participation in health collaborative projects. As part of this overall effort, SENET organised a series of dialogues, meetings and other types of events that had the objective to bring together relevant stakeholders and to gather their input and feedback on pertinent aspects and questions related to strengthening collaboration in health R&D&I between the EU and China (see *Methodology* for further details).

Ultimately, SENET strives to develop a sustainable network and knowledge hub for R&D&I interactions between the EU and China in the field of health. The vision is that this hub can facilitate a constant and constructive dialogue between Chinese and EU research and innovation stakeholders and – in the future – can serve as a platform for continuing and strengthening collaborative efforts to address common research and innovation challenges in the health field.

To achieve this overall aim and vision, SENET has defined the following specific objectives:

1. To identify health challenges of common interest between the EU and China by facilitating the joint identification of relevant topics in healthcare through the engagement of different stakeholders from the EU and China
2. To develop a sustainable health networking hub between the EU and China by facilitating a constant dialogue on common research and innovation challenges in health
3. To implement collaborative health research initiatives between the EU and China, generating synergies by closer bi-lateral and multi-lateral cooperation.

The initial roadmap presented here describes existing challenges and potential opportunities for a closer cooperation between the EU and China that have been identified through stakeholder consultations in several expert meetings. In addition, it assesses the potential expected impact that might be achieved in case these Sino-European interactions will be further strengthened in the near future. Moreover, an overview is provided about the state of the art of the current situation of support schemes and policies in place at the European Union (EU) level and within China respectively, with a focus on health research & development & innovation (R&D&I)<sup>2</sup>.

## 2. Methodology

The findings of the present document *D2.2: Initial roadmap for enhancing EU-China health research and innovation collaboration*, and others related to it such as *D2.3: Strategic recommendations for health research and innovation collaborations* and *D2.4: Consolidated action plan for research and innovation*

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<sup>1</sup> Detailed description of the SENET project <https://www.senet-hub.eu/about-senet/>

<sup>2</sup> For more details on funding please see SENET report: “Guide for health researchers from Europe and China through the funding landscape”; [https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET\\_Guide-for-health-researchers\\_website.pdf](https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET_Guide-for-health-researchers_website.pdf)

*priorities in health* were prepared based on information gathered by a bottom-up process in which key stakeholders from different target groups were engaged. Key stakeholder groups included researchers from the public and private sector, policy and decision makers, funders, and other groups of experts.

Two different types of interactive online consultation meetings were organised by SENET: (i) Policy stakeholder dialogues and (ii) Research & Innovation expert group meetings. In line with the scope and objectives defined for the meetings, selected stakeholders were invited to participate. Some experts were selected to give presentations on specific subjects relevant for the respective meetings. Following the presentations and subsequent discussions involving all participants and speakers, outcomes and findings of the meetings were summarised in meeting reports. The different meetings built on each other, with findings from previous meetings being presented and validated during later meetings. The findings directly influenced the agenda and content of later meetings.

One major conclusion after two rounds of policy dialogues and research & innovation expert meetings was the identified need to bring together the two stakeholder groups and co-design ideas for specific actions that will support Sino-European research collaborations in the future. Therefore, the third round of meetings was held as a multi-stakeholder meeting informing the *SENET report: Consolidated action plan for research and innovation priorities in health*.

For further details regarding the individual meetings, see sections 2.1 and 2.2 below and the footnotes included therein.

The overall methodology of the meeting preparation and organisation is summarised in Figure 1.

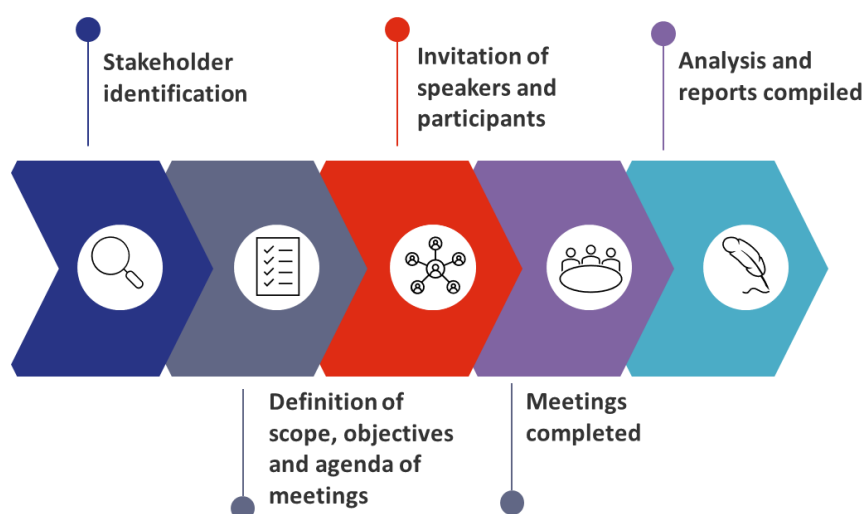


Figure 1: Flow chart of methodology used for consultation meetings

## 2.1 Policy stakeholder dialogues

A total of two Policy stakeholder dialogues were implemented in December 2020<sup>3</sup> and March 2021<sup>4</sup> with a total number of 50 participants. The first one was coordinated by the SENET partners in China and held in a hybrid format, allowing the European participants to connect online via the ZOOM platform. The agenda included presentations from high level policy makers, mostly from China but also

<sup>3</sup> SENET 1st Policy Dialogue (9 Dec 2020); <https://www.senet-hub.eu/wp-content/uploads/2021/08/SENET-Meeting-Dec-2020-Report-Final-External.pdf>

<sup>4</sup> SENET 2nd Policy Dialogue (9 March 2021); <https://www.senet-hub.eu/wp-content/uploads/2021/08/SENET-Meeting-Dec-2020-Report-Final-External.pdf>

from the European Commission. The speakers presented detailed information on the policy background for fostering health research and international collaborations in the future. The second Policy stakeholder dialogue was coordinated by the European SENET partners using an interactive format allowing co-creation of policy recommendations to reduce and eliminate existing gaps and barriers in research collaboration between the EU and the People's Republic of China. The discussion was triggered by a presentation about the initial insights gained in the SENET consortium and guided by predefined questions compiled by the organising committee. Participants of this meeting were mainly associated with intermediary organisations, such as R&I clusters, that play an important role in supporting researchers in finding international collaboration partners. The feedback from the Policy stakeholder dialogues allowed SENET to draft recommendations on how to increase the participation of European and Chinese counterparts in the respective research programmes and described ways to enhance research mobility mechanisms.

## 2.2 Research & Innovation expert group meetings

The two Research and Innovation expert group meetings<sup>5,6</sup> brought together 19 researchers from the academic and private sector working in areas of major societal and health challenges such as chronic diseases, infectious diseases and other areas of health-related research. The major goals of the meetings in June 2020 and May 2021 were to engage participants in discussions about specific opportunities in Sino-European health research and innovation collaborations. The experts were asked to identify and validate health research priorities of high importance relevant for their research fields and beyond. Additionally, the meeting exploited the experience of those experts who were already involved in joint China-EU actions to identify bottlenecks and hurdles blocking or impeding collaborations as well as to determine the most persistent challenges where innovations are instantly needed regarding R&D&I.

## 2.3 Multi-stakeholder meeting: Research Innovation and Policy Expert meeting

The multi-stakeholder meeting in September 2021<sup>7</sup> involved 33 number of participants with mixed profiles: researchers from the academic and private sector, policy makers, and intermediaries such as programme managers from clusters. The objective of the meeting was to translate identified opportunities, challenges, and policy recommendations into concrete actions that could be of value to all stakeholders in the R&I process. Therefore, the gathering of diverse perspectives from all involved stakeholders was important to achieve in this meeting. The format of the meeting followed an interactive approach guiding the discussion with pre-set questions facilitating the open discussion format and encouraging well balanced contributions from all participants.

## 3. State of the art in Sino-European health research and innovation collaboration

Direct interactions between Europe and China go back a long way in history, probably starting already in the ancient world. From the beginning of the 16<sup>th</sup> century onwards, thanks to major improvements in shipping and navigation technologies, European empires kicked off the European expansion across the

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<sup>5</sup> SENET 1st Research Innovation Expert Meeting (23 June 2020): [https://www.senet-hub.eu/wp-content/uploads/2021/02/SENET\\_1st\\_Research\\_Innovation\\_Expert\\_Meeting.pdf](https://www.senet-hub.eu/wp-content/uploads/2021/02/SENET_1st_Research_Innovation_Expert_Meeting.pdf)

<sup>6</sup> SENET 2nd Research Innovation Expert Meeting (18 May 2021); <https://www.senet-hub.eu/public-report/>

<sup>7</sup> SENET 3rd Research Innovation and Policy Expert Meeting (14 September 2021); <https://www.senet-hub.eu/public-report/>

world, leading to the establishment of complex and ever more global trade systems that eventually also included China. Although clearly trade was the main objective of these early interactions, they also initiated a fruitful and cross-fertilising exchange of knowledge, technologies and of scientific interactions.

In current times, for supporting R&D&I in their respective region and country, both the EU and China have a wide range of different support programmes, schemes and mechanisms in place, including instruments that focus exclusively on health. The main objectives of these different funding programmes are to support R&D&I activities within their respective region or country, but both China and the EU have also dedicated programmes and schemes as well as specific mechanism in place to facilitate and support international cooperation.

A dedicated High Level Innovation Cooperation Dialogue (ICD)<sup>8</sup> was set up between China and the EU in 2012. The ICD raises the level and intensity of research and innovation relations between the EU and China by providing a forum to discuss respective innovation policies and systems, framework conditions and it acts as a platform to launch joint initiatives. The latest meeting<sup>9</sup> took place between Commissioner Gabriel and the Minister for Science, Technology and Innovation, Mr Wang Zhigang of the People's Republic in January 2021. In addition, the EU-China scientific cooperation is governed by a Science and Technology Cooperation Agreement that was first signed in December 1998 and officially renewed for the third time in December 2014 followed by a tacit renewal in 2018. The implementation of the Agreement is overseen by a Joint Steering Committee.

Also, EU-China leadership summits are held now on an annual basis – due to the increasing strength of China in the field of science, research, and innovation and, more recently, the demand for global cooperation against the COVID-19 pandemic – and they deal as well with important R&D&I issues. The importance of these issues is demonstrated, for example, by the establishment of several EU-China flagship initiatives<sup>10</sup> addressing the topic of human health among many other fields, showing the great importance of health as an issue for Sino-European cooperation.

Cooperation targets for flagship initiatives:

- Food, agriculture and biotechnologies
- Environment and sustainable urbanization
- Surface transport
- Safer and greener aviation
- Biotechnologies for environment and human health

These flagships prepared the bases for concrete, substantial and balanced joint research and innovation cooperation activities on selected priorities of common interest. Successful EU-funded collaborations in

<sup>8</sup> Background information on EU-China scientific cooperation [https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/europe-world/international-cooperation/china\\_en](https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/europe-world/international-cooperation/china_en)

<sup>9</sup> EU-China High Level Dialogue on Research and Innovation [https://ec.europa.eu/info/news/eu-china-high-level-dialogue-research-and-innovation-2021-jan-25\\_en](https://ec.europa.eu/info/news/eu-china-high-level-dialogue-research-and-innovation-2021-jan-25_en)

<sup>10</sup> EU-China flagship initiatives [https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/europe-world/international-cooperation/china\\_en](https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/europe-world/international-cooperation/china_en)





the area of health and life sciences include, for example, the recent extension of the European Virus Archive<sup>11</sup> to include China.

In the following subsection, we provide an overview of the current situation of support schemes and policies for EU and China with a focus on health R&D&I. We would like to point out, that SENET's *report: Map of major funding agencies and stakeholders in Europe and China*<sup>12</sup> contains very detailed information about specific funding opportunities.

### 3.1 Health research and innovation funding in Europe

Horizon Europe has a total budget of approximately €95.5 billion. Its major goals are i) to tackle climate change, ii) to help to achieve the United Nations's (UN) Sustainable Development Goals, and iii) to boost the EU's competitiveness at a global scale as well as to generate sustainable economic growth.

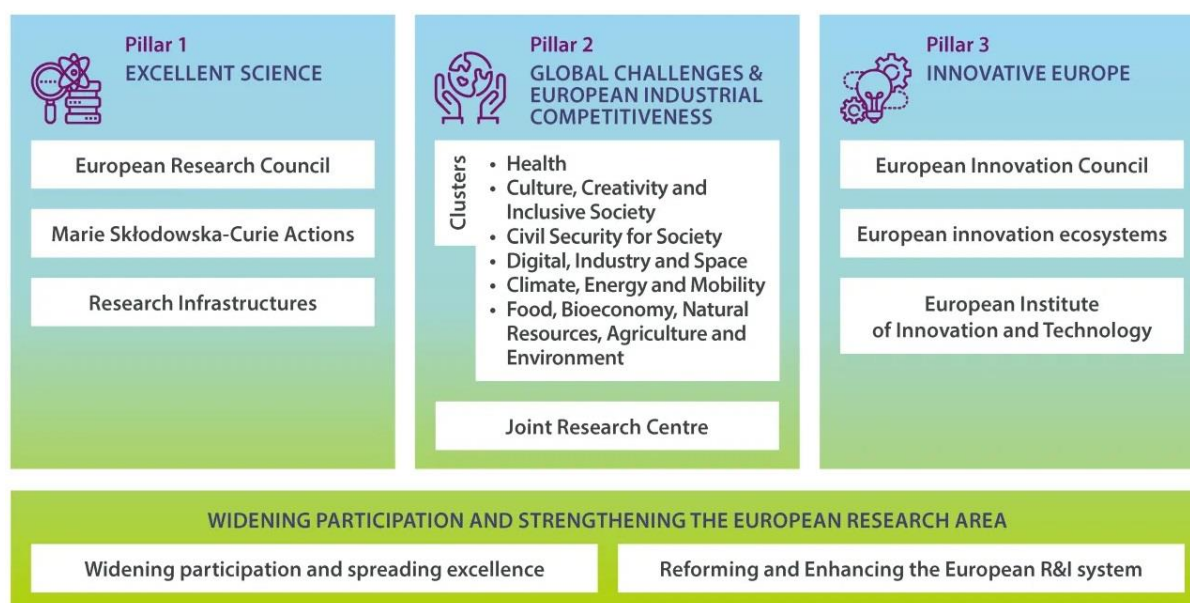


Figure 2: Structure of Horizon Europe<sup>13</sup>

Horizon Europe facilitates collaboration and strengthens the impact of research and innovation in developing, supporting and implementing EU policies while tackling global challenges, including those related to health. It supports creating and better dispersing of excellent knowledge and technologies. Moreover, it aims to create jobs, boost economic growth, and promotes industrial competitiveness and optimises investment impact within a strengthened European Research Area.

Within Horizon Europe, Research & Development (R&D) in health will mainly be supported via Cluster 1 Health. Its aims are (1) to contribute to the promotion of social cohesion and inclusiveness and the health and well-being of people, (2) to support research (and coordination) in order to make innovative, high-quality health technologies and health care both available and affordable for citizens; and (3) to make health care systems more accessible and sustainable, including through the digital transformation of health and care.

<sup>11</sup> European Virus Archive (EVA) [www.european-virus-archive.com](http://www.european-virus-archive.com)

<sup>12</sup> SENET's D2.2: Map of major funding agencies and stakeholders in Europe and China <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5cf2aa8f1&appId=PPGMS>

<sup>13</sup> Structure of Horizon Europe [https://ec.europa.eu/info/horizon-europe\\_en](https://ec.europa.eu/info/horizon-europe_en)

To this end, the role of research and innovation is to advance knowledge and capabilities, to improve the understanding of health and diseases, to develop innovative methodological and technological solutions to better manage health and diseases. Sustainable approaches for the digital transformation shall be designed and integrated, as well as more person-centred and equitable health and care services be delivered.

Six areas of intervention, also called destinations, have been defined for activities within “Cluster 1: Health” that represent focus areas for the activities to be funded under this cluster:

1. Staying healthy in a rapidly changing society
2. Living and working in health-promoting environments
3. Tackling disease and reducing disease burden
4. Ensuring access to innovative, sustainable and high-quality healthcare
5. Unlocking the full potential of new tools, technologies and digital solutions for a healthy society
6. Maintaining an innovative, sustainable and globally competitive health industry

With respect to previous framework programmes, Horizon Europe introduces new elements such as the EU Missions<sup>14</sup>. The EU Missions are special commitments to solve major societal challenges. Of the five missions defined within Horizon Europe, one of them has a health-related focus, the Mission Cancer, which will be linked to Cluster 1 Health. Cancer affects everyone regardless of age, gender or social status and represents a tremendous burden for patients, families, and societies at large. Unless further action will be taken, it has been estimated that the number of people newly diagnosed with cancer every year in Europe will increase from the current 3.5 million to more than 4.3 million by 2035. The Mission Cancer thus aims to reverse these frightening trends in cancer. The mission will join efforts across Europe and aims to contribute to achieving that more people will live without cancer mainly due to more cancer patients being diagnosed and treated with better therapies at earlier disease stages with significantly higher chances to cure and treat the disease, directly translating into a gain of life quality for the EU citizens.

Outside Cluster 1 Health, there are also a number of areas of potential relevance for health R&D&I where international cooperation would play an important role. Examples include Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment), the European Research Council (ERC), Marie Skłodowska-Curie Actions and some of the numerous partnerships and global initiatives that have been defined in the Horizon Europe work programme.

Legal entities from the EU and associated countries can participate in Horizon Europe and receive funding from the European Commission. Regarding the participation in Horizon Europe projects for legal entities from non-associated non-EU countries, the situation is mixed. For most health-related research actions, legal entities from China can participate, but they are currently not eligible to receive funding from the EU. International cooperation has been recognised as essential for tackling many global challenges and therefore underpins all key orientations of Horizon Europe. Despite the importance that has been given to international cooperation in Horizon Europe, the framework programme tries to also

<sup>14</sup> Information on Missions in Horizon Europe [https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/missions-horizon-europe\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/missions-horizon-europe_en)



balance the need to safeguard EU interests in strategic areas and to ensure that high standards and principles are respected. Horizon Europe offers a number of opportunities for international research cooperation via specific schemes and mechanisms, and there will be intensified targeted actions for international cooperation across the entire framework programme that will include, for example, flagship initiatives, joint calls, and others. All currently available funding opportunities through the Horizon Europe work programme can be found in the EU Funding & Tender portal<sup>15</sup>.

### 3.2 Health research and innovation funding in China

Also, in China a large variety of funding schemes, programmes and mechanism exist to support R&D&I, including the health field. The most important ones are briefly summarised below.

#### National Natural Science Foundation of China (NSFC)

China's largest fund for supporting basic and applied research in natural sciences, including health related programmes that are initiated and managed by the Department of Life Science and the Department of Health Science of the NSFC. It is divided into 14 different programmes, grouped into three categories: research promotion, talent fostering, and research environment. Some of the programmes are specifically linked to international joint research, while others target exclusively China-based actors only open to China-based affiliates of European institutes and European scientists working in China.

The research areas of the Health Science Department mainly focus on innovative theoretical and methodological research aimed at: i) scientific issues emerging from medical practices, ii) systematic and indigenous study on key scientific issues emerging from medical disciplines, iii) translational medicine through combination of basic research as well as iv) clinical research and integrative medical research on the occurrence, development and regression of diseases at various levels. In addition to these research foci, a central priority of the Health Science Department lies in the basic research on major diseases closely related to the national welfare, human livelihood, and major emergency events of public health. It is relevant to highlight that the department is putting a special effort on research on rare diseases based on existing accumulated research work.

There are five dedicated funding programmes for European researchers within the NSFC that support different areas and activities, including innovative explorative research, young scientists, international collaborations and others.

#### National Science and Technology Major Project (NMP)

The NMP (hereinafter referred to as "Mega Projects") is seen to be the most ambitious research and development (R&D) assignment for China's mid- and long-term development. "Mega Projects" address key product categories, technologies and engineering challenges of strategic importance for the country's economy and competitiveness.

Health-related research is one of the main priorities under the NMP. The "Mega Project for Significant New Drugs Development" was launched in 2008, focusing on research and development of new targets and certifications for Chinese-made chemicals and biopharmaceutical products. The project is dedicated to designing new drugs, developing key technologies of large-scale, the selection of highly efficient

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<sup>15</sup> Detailed information on Horizon Europe <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon>

drugs, the evaluation of drug potency and the establishment of a novel drug safety evaluation. In addition, there is the “Mega Project for Prevention and treatment of Major Infectious Diseases” such as AIDS and viral hepatitis that are also considered as main priorities under the NMP. This project focuses on the prevention and control of technologies for emergent acute infectious diseases; the diagnosis and prevention of HIV/AIDS, Hepatitis B and tuberculosis via new technologies and products for treatment; vaccine research; R&D of a series of advanced detection diagnostic products and the formulation of traditional Chinese medicine-based treatment plans.

### Chinese Academy of Medical Sciences (CAMS)

Founded in 1956, CAMS is the only state-level academic centre for medical sciences and multidiscipline medical research institution in China. Furthermore, the Peking Union Medical College (PUMC), founded in 1917, is the first key medical school to offer an eight-year curriculum on clinical medicine and undergraduate courses on nursing in China. Both CAMS and PUMC produce and provide world-class medical research and education.

CAMS and PUMC have been leading modern medicine in China for over a century. There are 19 institutes (and five sub-institutes), six hospitals, seven schools and five CAMS branches among CAMS and PUMC. More importantly, international cooperation is one of the main focuses in CAMS, being an associated member of the Global Alliance for Chronic Disease (GACD) and providing funding for health research. Although there are other initiatives that could be mentioned here, based on the information gathered in the SENET reports *Review on health research and innovation priorities in Europe*<sup>16</sup> and *Map of the major funding agencies and stakeholders in Europe and China*<sup>17</sup>, the project team has decided to describe the GACD in more detail as chronic diseases have been identified as a top health priority in both China and the EU with a dedicated Horizon Europe call topic<sup>18</sup> in 2022. For additional information on specific initiatives, we refer to the aforementioned public reports.

### Latest Developments of R&D&I in China

According to the National Bureau of Statistics (NBS), China’s R&D expenditures have reached a new high in 2020, accounting for 2.4% of China’s gross domestic product<sup>19</sup>, as the country continues to become a globally leading powerhouse in research and technology. Preliminary data from NBS indicates that China spent 2.44 trillion RMB (€330.000 million) on research and development in 2020, an annual growth rate of 10.3%. Even though this represents a new record for China, it is also the slowest incremental growth in the recent five years and the numbers are down from a 12.5% rise in 2019. Nevertheless, these numbers show that China is closing the gap with other countries including the US in term of R&D input. The press release shared by NBS also mentions that by the end of 2020, China had 522 “national key laboratories” and 350 “national engineering research centres” in operation. Concerning R&D funded projects, NBS highlighted that around 457.000 projects were funded by the NSFC in 2020 and 3.6 million patents were granted, that’s a 40% increase with respect to the previous year in 2019.

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<sup>16</sup> [https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET\\_Scoping-paper\\_website-1.pdf](https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET_Scoping-paper_website-1.pdf)

<sup>17</sup> [https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET\\_Map-of-major-funding-agencies-and-stakeholders\\_website.pdf](https://www.senet-hub.eu/wp-content/uploads/2020/09/SENET_Map-of-major-funding-agencies-and-stakeholders_website.pdf)

<sup>18</sup> HORIZON-HLTH-2022-DISEASE-07-03 <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-hlth-2022-disease-07-03>

<sup>19</sup> China’s R&D expenditures <https://www.cnbc.com/2021/03/01/chinas-spending-on-rd-hits-a-record-378-billion.html>

China has a population of 1.4 billion and has become the second largest market for medicine in the world, with more elderly people than any other country and unique patterns regarding diseases, diets, and lifestyles.

Via different national policies supporting science and technology innovation, China has been striving to upgrade its industrial structure and shift its economy toward a growth model that draws strength from innovation. In order to accelerate the transformation of the Chinese economy to a more productivity-driven, knowledge-based economy, the Chinese government made considerable efforts to improve the Science & Technology (S&T) and innovation capabilities through a series of national strategic plans. These include mainly the following ones:

**National Medium and Long-term Plan for building key science and technology infrastructure (2012 - 2030)**

- Aiming to improve the research infrastructure in seven strategic fields, including life sciences.

**Made in China 2025**

- Focusing on advanced and competitive economy based on highly innovative manufacturing technologies, including biopharma and advanced medical products.

**National Innovation-Driven Development Strategy**

- Aiming to lead the development of scientific, technological, and institutional innovation, including the development of advanced health technology to meet the challenges of major diseases and population ageing.

**Healthy China 2030 Plan**

- Complete national action plan covering important areas of healthcare.

In addition to the strategic plans listed above, various training programmes and schemes exist for supporting S&T Innovation, as well as support schemes and programmes for international collaboration. These include, for example, the “President's International Fellowship Initiative”, the “NSFC - International Young Scientists Fellowship”; the “China/United Nations Educational, Scientific and Cultural Organization (UNESCO) - The Great Wall Fellowship Programme”; and the “Chinese Government Scholarship-Chinese University Programme”.

## 4. Opportunities and challenges to EU-China cooperation in health R&D

There was a broad consensus during the manifold activities implemented by SENET that the health sector, and R&D&I related to it, is a key area for the future development of both Europe and China. There is already strong support provided in both geographic areas to make this sector thrive. Specific collaboration schemes and additional mechanisms in this field to support collaborations between the EU and China would represent an additional impetus. Opportunities therefore abound, their full exploitation however is often impeded by obstacles and bottlenecks. The key challenges and opportunities identified by SENET through the various stakeholder meetings are summarised below.

### 4.1 Opportunities

The following issues, including potential priority areas for cooperation in health, were identified during the interactive meetings organised by SENET as potential opportunities where EU-China cooperation

may achieve a particular impact. The areas for potential cooperation described below have been identified by European and Chinese policy makers as topics of major interest.

### Joint EU-China Roadmap for Research and Innovation

In October 2018, a Roadmap for EU-China S&T Cooperation<sup>20</sup> was published and identified a number of areas for collaboration in health research, including rare diseases (within the International Rare Diseases Research Consortium), chronic diseases (in the frame of the Global Alliance for Chronic Diseases) and cancer (as part of the International Cancer Genome Consortium). The roadmap also mentions the prevention and treatment of infectious diseases, traumatic brain injuries, personalised medicine, brain research, Alzheimer's disease, diabetes and respiratory diseases as potential areas of cooperation. Future revisions of the roadmap are likely to include the identification of new and additional priority areas for joint research that will represent major opportunities for the cooperation between the EU and China. The roadmap will be linked to the definition of framework conditions that have to be met by both sides in order to have a level playing field as a basis for EU-China cooperation in health.

### Major common fields of interests between Europe and China

Both the EU and China have committed themselves to reaching the UN's Sustainable Development Goals (SDGs), and this therefore represents an overall area of shared interest between the two sides. This was for example highlighted at the EU-China High Level Innovation Cooperation Dialogue taken place in Brussels on April 9, 2019. The two sides also share a common interest to promote open science and accelerate the transition to an open access model to scientific publications and research data.

There is an added value to both Europe and China by sharing and comparing their respective experiences and lessons learned in the context of disruptive innovations. Common topics of interest, that were identified in the course of SENET's 2<sup>nd</sup> Policy Meeting in March 2021, were the following:

- Health and care systems
- Researcher mobility
- Digital health and care agenda
- Pandemic challenges
- Research collaborations to access larger data bases and data exchange for more robust research results

In addition, from a business perspective a collaborative approach would provide the foundation for the exploration of bigger markets to turn research into a sellable product.

### Joint funding schemes

For the tackling of global challenges such as the COVID-19 pandemic, truly international funding and cooperation schemes are a must. They would promote knowledge exchange and joint research in priority health areas. It was therefore one of the major conclusions during the SENET 3<sup>rd</sup> Research Innovation and Policy Expert Meeting in September 2021, that the funding of Sino-EU projects would

<sup>20</sup> Roadmap for EU-China S&T Cooperation

[https://ec.europa.eu/info/sites/default/files/research\\_and\\_innovation/strategy\\_on\\_research\\_and\\_innovation/documents/cn\\_roadmap\\_2018.pdf](https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/documents/cn_roadmap_2018.pdf)

need to be increased and new funding platforms to build new links and connections would need to be explored.

### Researcher mobility

Researcher mobility and career development schemes should be put in place and further strengthened, forming an integral part of national and trans-national funding schemes under the umbrella of global cooperation. Already existing projects have shown the strong potential of enhanced Sino-European researcher mobility regarding successful mobility schemes for collaborative Master and bi-national PhD programmes.

### Mobilisation of support for a cooperative approach to strengthen the global health system

Despite the negative impact of the COVID-19 outbreak, the pandemic also presents a tremendous opportunity to mobilise support to health and to change relevant policy agendas. This will affect the awareness on certain health issues and give additional impetus to the global aspect of the health system and the universal nature of our current and future health challenges. Only global approaches and joint actions across borders can tackle these challenges. The COVID-19 pandemic can therefore be considered as a driver for continuous innovation. In China, for example, this is reflected in the strong increase in R&D funding, boosting the number of publications by Chinese authors in science and technology and the number of patents applied for and approved. Similarly, in the EU the largest economic stimulus package ever financed was adopted by the European Commission as a response to the COVID-19 crisis which will provide a total of €2.018 trillion, substantial parts of this stimulus package will be dedicated to research and innovation activities.

### Joint awareness of the importance of the global health sector

In both regions the awareness of the health sector being essential to the further national and trans-national development has been significantly increased over the last decades and this manifests itself in the establishment of ambitious health research and innovation programmes previously and currently in place in China and in Europe. As an example, the Chinese government has initiated in 2016 the “Healthy China 2030 Initiative”, which is seen as the most significant health initiative of the country that prioritises health topics in China’s development agenda. At the same time, China is planning to create a global reserve and transportation hub of public health emergency supplies in cooperation with the United Nations. In Europe, the latest research and innovation framework programme, Horizon Europe, with a budget of €8,25 billion exclusively dedicated to health over a period of seven years will significantly contribute to better global health. Therefore it appears, that the conditions to further bolster the efforts to join hands in collaborative efforts to improve the global health system have never been better and the collaboration between the EU and China is paramount.

### Suggested research priority areas

One key and reoccurring element to an extended and improved collaborative approach between the two geographic areas highlighted in the different SENET meetings was the need to identify research priority areas suitable for cooperation between Europe and China. Some of the suggested research priority areas of common interest are as follows:

- Infectious disease, including emerging pathogens and including approaches based on the One Health concept. The COVID-19 experience has demonstrated the importance of a close and open cooperation between the EU and China. It is of mutual benefit to prevent and confine the spread of pathogens with pandemic potential.

- Global Health. Both China and the EU are subscribing to supporting the SDG's, thus have a common interest in furthering global health.
- Antimicrobial Resistance (AMR). A global threat that needs international cooperation and coordination. Europe and China address AMR in very different ways and a better alignment will pave the way towards a better global approach in tackling AMR.
- Support to the development of innovative prophylactic measures and technologies for early diagnostics. Both China and the EU see large increases in healthcare costs due to advances in technology and an expansion of the public health system. One of the most promising developments to become more cost-effective and decrease healthcare spending is the uptake of new and improved diagnostic tools. The EU has a long history of developing high quality diagnostic tools, while China has a rapidly emerging digital sector creating opportunities for a combination of ideas and expertise.
- Support to the development of other affordable, innovative and sustainable pharmaceutical products and technologies. Cost of pharmaceuticals are increasing as more individualised and tailored products require higher development costs. This is a particular challenge for both the EU and China, where costs of pharmaceuticals are partially subsidised by the public sector.
- The elderly and aging populations. In the EU and China, the proportion of elderly people in the general population is forecasted to increase dramatically over the next decades.
- Health care management.
- Addressing the slow uptake and low acceptance of novel health products, see e.g. vaccine hesitancy.

## 4.2 Challenges, barriers and bottlenecks

### Regulations and legal frameworks

Regulations and restrictions for manufacturing, and possession, use and transport/shipment of biological samples (human tissues, highly contagious pathogens, biological samples etc) are still a challenge to an enhanced collaboration between Europe and China. The collection of necessary legal and practical information and preparation of paperwork is time consuming, and in some cases the exchange is still not possible due to stringent regulations.

Intellectual property rights and other relevant legal frameworks need to be created, respected, and enforced. Important measures to support research within SMEs, an important driver in technology innovation, must include strong and enforceable intellectual property protection. This was also highlighted at the EU-China High Level Innovation Cooperation Dialogue Brussels on April 9, 2019.

### Networks

As part of the SENET 2<sup>nd</sup> Policy Meeting, the need for an adequate identification of partners with a joint vision and purpose, as well as complementary skills for research and innovation projects was highlighted. For this purpose, the engagement of European and Chinese stakeholders in international key networks and groups of exchange were deemed to be most relevant. The exchange of good practices and ideas and the building of a mutual understanding and trust in the course of those networks and groups is then seen as the starting point for the network members to engage with collaborators (academic researchers, industry partners, etc.) who share aligned institutional objectives.



## Communication

Language barriers and cultural differences, as well as preferences for different communication channels and tools, are major obstacles with regards to the goal of pursuing a more collaborative approach between Europe in China. In addition, it was concluded during SENET's 3<sup>rd</sup> Research Innovation and Policy Expert Meeting in September 2021, that when it comes to the question of further engaging with Chinese partners competitive aspects might prevail and therefore negatively influence the willingness to work together, a topic discussed among policy makers and funding authorities. Especially the policy makers tended to follow the narrative of competition and were more hesitant to further collaboration. Therefore, as highlighted by Prof. Yunping Wang and Prof. Xiaoning Hao (China National Health Development Research) at SENET's 1<sup>st</sup> Policy Meeting in December 2020, one major requirement to improve the Sino-European collaboration would be to improve the dialogue between the EU and China on a common health development strategy, but also on specific topics with transnational relevance such as chronic diseases. Aside from the improvement of top-level communication, it was further highlighted at SENET's 2<sup>nd</sup> Policy Meeting that bottom-up initiatives established on the basis of personal contacts are crucial for both sides to learn about cultural differences and to create and enhance trust overcoming the issues stated above by fostering cross-border twinning, mobility activities and higher education collaboration.

## Funding

Scarceness of funding schemes supporting collaborations between European and Chinese researchers that provide both sides with financial and other types of support in an unbureaucratic and efficient manner according to participants of the SENET meetings in 2020 and 2021 was another major obstacle. As stated by Dr. Shanhong Mao (Beijing Municipal Government) during the 1<sup>st</sup> SENET Policy Meeting in order to make a cooperation model between Europe and China feasible, a win-win situation need to be strived for, in which both sides can simultaneously benefit from the collaborations. This point was picked up again during the 2<sup>nd</sup> SENET Policy Meeting in March 2021 by Philippe Vialatte, head of the Science and Technology Section, Delegation of the European Union in China. According to him the framework conditions must be reviewed and discussed under the premise of a balanced collaboration of partners on a level playing field. It was therefore concluded during the 3<sup>rd</sup> SENET Research Innovation and Policy Expert Meeting in September 2021, that the funding of Sino-EU projects would need to be increased and new funding platforms to be built to explore new links and connections between both regions. Another issue is the uneven distribution of funds rather in favour of supporting the biomedical industry, drug development as well as the medical device and diagnostics sector over public health issues. Those sectors are potentially more viable in the absence of public funding since they are receiving in parallel larger private investments and are in addition less dependent on global collaborative efforts. More public investments into the global health systems are therefore required to achieve more resilient public health systems around the globe, being better prepared to respond to pandemic outbreaks and to deliver universal health care to their citizens. Public health is rather poorly supported by private investments and therefore heavily depends on public funding, those issues should also become a key priority in funding at the same level as market-ready innovation support.

## Knowledge exchange

Collaborations in the sense of regular and intensive exchanges of knowledge and expertise, creative brainstorming, and joint experiments are not taking place sufficiently and are often difficult to implement for various reasons: geographical distance, language, culture as well as differences in



communication channels as mentioned before under the topic of “Communication”. Therefore, the importance of promoting knowledge exchange and joint research in particular in priority health areas between Europe and China was one of the highlighted aspects to improve the collaboration between both regions, as stated during the SENET’s 1<sup>st</sup> Policy Meeting in 2020.

### Dependency on authorities

Unaligned political research priorities and differing policy frameworks on an institutional, local, regional and national level often impede or complicate international collaboration. The diversity of the involved research systems and stakeholders will therefore require serious commitments from the involved authorities and governments for a successful collaboration. According to the discussions during the 2<sup>nd</sup> SENET Policy Meeting, it was concluded that a top-down strategy would be required to foster collaboration, as most of the activities are at least partly policy driven. In the course of this process, top-down strategic topics of joint interest need to be identified, e.g. flagships and announced strategic priority areas oriented on joint R&D&I activities. The top-down strategy should be designed in a way, that it also supports bottom-up activities and does not create opposing objectives.

## 5. Expected impacts of enhanced EU-China cooperation in health R&D

Recent events have demonstrated beyond any doubt that the international cooperation in health research can deliver very relevant results with significant impacts. International collaboration and the sharing of data and research results can prevent or minimise the impact of health emergencies such as epidemic outbreaks or even pandemics such as COVID-19. Similarly, open innovation and international research collaboration can deliver impactful results in a short time, as it has been witnessed with the global efforts towards developing diagnostics, pharmaceuticals and vaccines against COVID-19.

Health research is an area where the EU and China have a lot to gain from a closer cooperation. Both sides have a long-standing tradition of health research, albeit on different backgrounds and with different areas of particular expertise. While the EU is home to several academic and industrial organisations with extensive expertise in Western medicine, China has a long tradition of Traditional Medicine as well as a rapidly expanding digital sector. This provides several possibilities for creative and mutually beneficial collaborations in areas such as medical technology, early warning systems for outbreak of infectious diseases, and improvements of the healthcare systems.

Furthermore, the demographic challenges of China and the EU are similar in the coming decades with an increasing proportion of the population being elderly, and the focus of healthcare systems being increasingly steered towards curing or alleviating long-term chronic conditions.

A number of issues need to be addressed to elicit the full impact of health research collaboration between the EU and China. These are mostly well-known obstacles that have been confirmed by the SENET stakeholder events and they will likely subsist also in the longer run. They include soft barriers such as language, mutual trust and cultural barriers, but also hard legal and structural barriers such as the lack of solid and enforceable IP systems, differences in ethics, regulatory systems, funding allocations and the setting of research priorities (top-down vs bottom-up).

Lastly, but maybe most important short-term: there are very few financial incentives for mutual research between research teams located in the EU and China. Only few funding schemes provide financial support to research groups in the other region. In comparison, the EU and the National Institutes of Health (NIH) in the US have entered into a mutual agreement, where researchers in the EU

can apply and receive research funding from the NIH, while US researchers can similarly participate in EU-funded health research consortia of the Horizon Health cluster and are eligible for funding.

