CHINA EUROPE Water Platform

Alignment of EU-China Scientific and Technological Funding Schemes and Opportunities in the Water Sector

Summary for Policymakers

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Background

Tensions and conflicts over access to water are likely to become more frequent and could endanger stability and security in many parts of the world. This could also have a direct bearing on European interests (especially those related to the de-localization of the production of goods in China particularly), as well as on international peace and security (Council conclusions on EU Water Diplomacy, 2013). Thus, it is important to manage the effects of climate change, demography and economy, as well as reconciling different uses of water resources such as drinking water and sanitation, agriculture, ecosystem services, urbanization, industry and energy.

In this context, as highlighted by the Council of the European Union in the conclusions on EU Water Diplomacy from 2018, "EU water diplomacy must aim at facilitating the prevention, containment and resolution of conflicts, contributing to the equitable, sustainable and integrated management of water resources from source to sea, and promoting resilience to climate change impacts on water. Cooperation on water must be harnessed to promote regional integration and address political instability." This implication is even more exacerbated today due to an unprecedented health and economic crisis caused by the COVID-19 pandemic.

A strong collaboration between the European countries and China in the water sector and other research and development areas has been in place for almost half a century. As highlighted by this study (chapters 3 and 4), China and Europe are powerhouses when it comes to publications of scientific research papers and calls for proposals through public funding programmes. This particularly relates to many fields of study related to research and innovation for economic, social and environmental security and development. As the study demonstrated, the activities in the water sector overlap with many other sectors, with the Chinese water sector being managed by several ministries (chapter 5), while in the EU, laws and regulations are applied at a European, national and regional level (chapter 6).

In spite of the development of strong and persistent collaboration between Europe and China in R&I, the matching and alignment of R&I funds between Europe and China in Horizon Europe programme is often perceived as confined to Food, Agriculture and Biotechnology. Other traditional cooperation areas are subject to a case-by-case analysis from the Chinese Ministry of Science and Technology (MoST) following the approval of projects that include Chinese participants in European consortiums. If Chinese participants are not successful in getting MoST funds, European consortiums will not deliver the intended results. As a result, the invitation of Chinese partners to enter consortiums may decline over time. Moreover, there is a considerable number of Research and Innovation bilateral cooperation agreements between the European

Member States and Chinese MoST, however with lack of articulation among them, which may lead to a lack of negotiating capacity of joint European interests.

Aim

The study explores water-related issues in funding and research between Europe and China. The final goal of the study is to highlight some of the key considerations and thus contribute to the alignment of funding opportunities for business, research and innovation between Europe and China in the water sector. Furthermore, the study aims to provide an overview of R&I projects made both in China and Europe, as well as R&I cooperation projects between the two regions in the past ten years. The study also aimed to identify and highlight structural projects in the field of water, which are of mutual interest and could be jointly implemented by Europe and China.

Methodology

The methodology (chapter 2) applied to collect information for this study included stakeholder consultations, desk research and database analysis (Figure 1). More than 200 European and Chinese stakeholders from business, research and policy fields participated in workshop and roundtable sessions, studies, and web-consultations on the alignment of funds of the China Europe Water Platform.

The workshops included oral presentation sessions of Chinese and European institutions. Both sessions were followed by four parallel workshops with teams dedicated to each of the CEWP focus areas to further identify, prioritize, and categorize flagship initiatives identified in the global challenges of Horizon Europe as well as Chinese priority areas identified. A set of four final roundtable sessions were organized to discuss draft study content and correction of inconsistencies or data refinement.

Several sources of information were used to gather information from relevant studies conducted by European and Chinese actors of the national research landscape, particularly by those linked to the water sector. Online databases such as Community Research and Development Information Service (CORDIS) and Chinese National Knowledge Infrastructure (CNKI) and Sciencenet (SCNET) databases were used to access reliable information about funded programmes and initiatives.

The search categories and core structure of the analysis are based on four research themes of the CEWP. The four research themes were identified during the CEWP Alignment of EU and

Chinese Research Funds on Water workshop, which took place on the 8th November 2019 in Guimarães, Portugal. For each of the four themes the following key words were used:

- Water Management and Ecological Security: 'Water Management Ecolog'
- Rural Water and Food Security: 'Rural Water Food'
- Water and Urbanisation: 'Water Urbanisation'
- Water and Energy Security: 'Water Energy'

The results were filtered and only relevant hits that met the following criteria entered the study analysis: 1) Clear water research connection; 2) Met a wide interpretation of the related category.

For each of the four themes the following types of projects were excluded:

- Water Management and Ecological Security: projects devoted to marine ecosystems, nature conservation in terrestrial habitats (e.g pure forests), pure species ecology and biodiversity in terrestrial habitats, soil in farmland.

- Rural Water and Food Security: projects related to the direct enhancement of production methodologies

- Water and Urbanisation: projects related to traffic management or other city management components not directly involving water, urban water management and associated ecological areas

- Water and Energy Security: projects related to direct technical energy production methods.

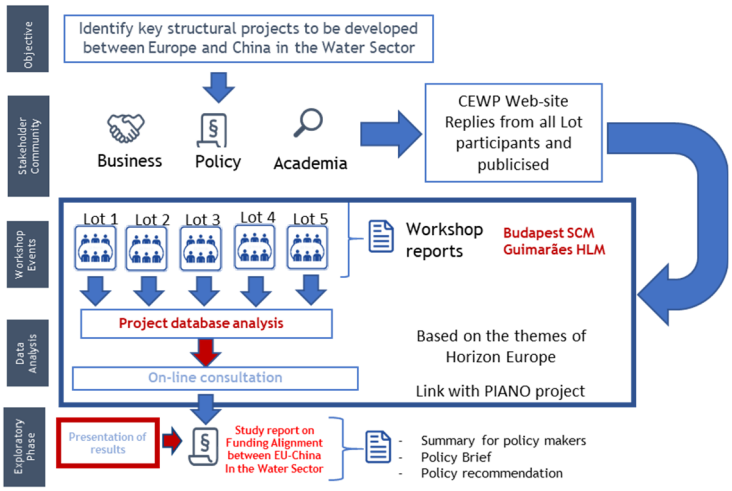


Figure 1 – Overview of study methodology and steps

Results overview

In total, 1286 projects were scanned from Cordis and NSF databases that produced a sub-sample of 284 projects. A total of 953 projects were retrieved from CORDIS database, from which 178 matched the criteria to enter the study. From CNKI and ScienceNet databases, a total of 333 projects were retrieved and 106 matched the criteria to enter the analysis.

Summary of FP7 and Horizon 2020 project analysis results:

A total of 606 organizations were involved. The highest participation was observed from **Business organizations** (35%), followed by **Research organizations** (25%), Higher education establishments (24%) and Public organizations (8%) (Figure 2).

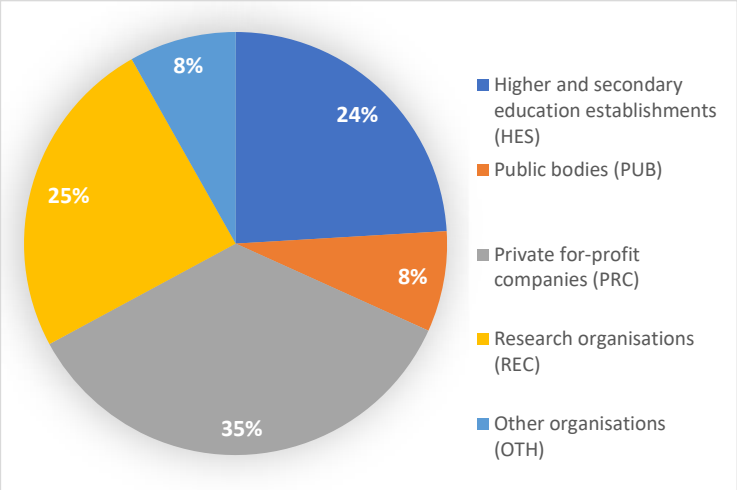


Figure 2: FP7 and H2020 participations

Organizations from all 27 Member States have been involved in projects, with the highest number of organizations from **Spain, Germany and Netherlands**.

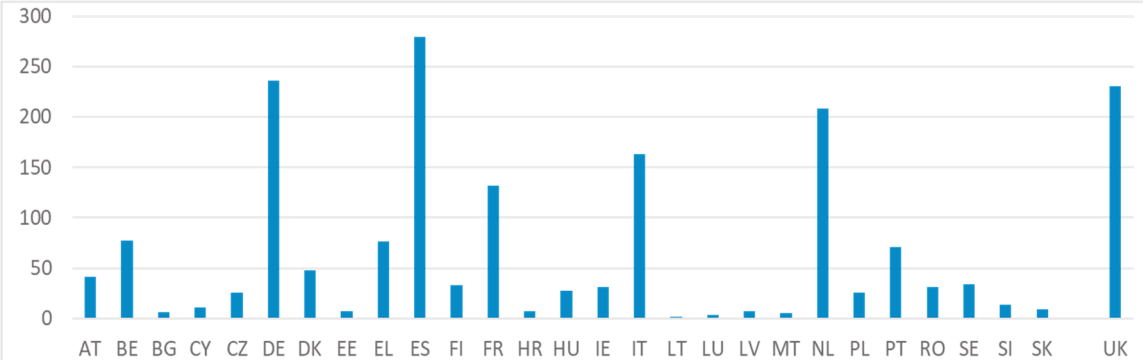


Figure 3: Participation of organizations from EU-27

In the past ten years, the water R&I was mostly funded by the following programmes:

- H2020 –Societal Challenge/Climate Env, Resource Efficiency and Raw Materials
- FP7 – Environment Cooperation
- 2020 Industry leadership – Leadership in enabling and industrial technologies

From the identified H2020 and FP7 projects, the highest project average funding was related to the **Water and Urbanization and the Water Management and Ecological Security research** themes.

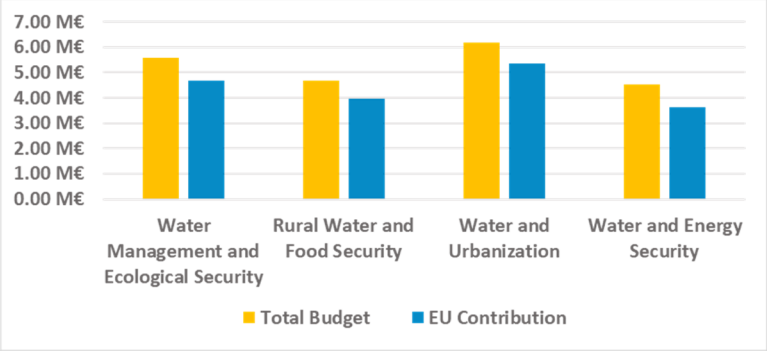


Figure 4: Average EU project value per focus area

In the **Water Management and Ecological Security** focus area, the m**ajority of projects** were **dedicated to WFD support** (particularly management) and **sanitation** (to address water quality problems). In **FP7,** more projects were targeted to applied research to design **water and river basin management** problems to implement WFD. In **H2020,** the majority of research projects were target to **concrete problems arising from WFD implementation** (this being improvement of restoration practices, decision support tools, monitoring, biodiversity continuum and ecosystem services).

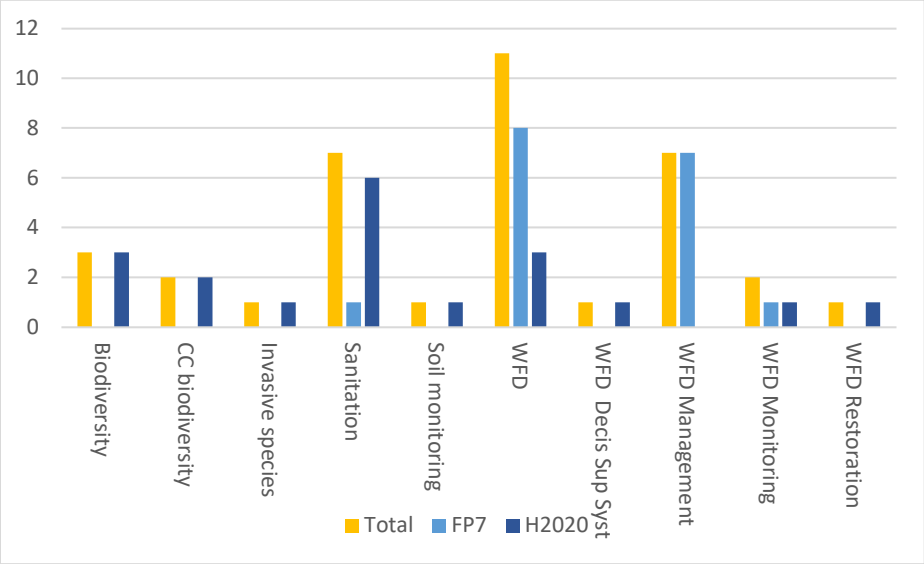


Figure 5: Tipology of projects funded in FP7 and H2020 in Water Management and Ecological Security area

In the **Rural Water and Food Security** focus area, the majority of projects were dedicated to **sanitation** (to address water quality problems) and **water supply chain management**. H2020 and FP7 projects were targeted towards the same areas of R&I. H2020 projects having a broader research domain and including areas such as **policy, energy and pollution**.

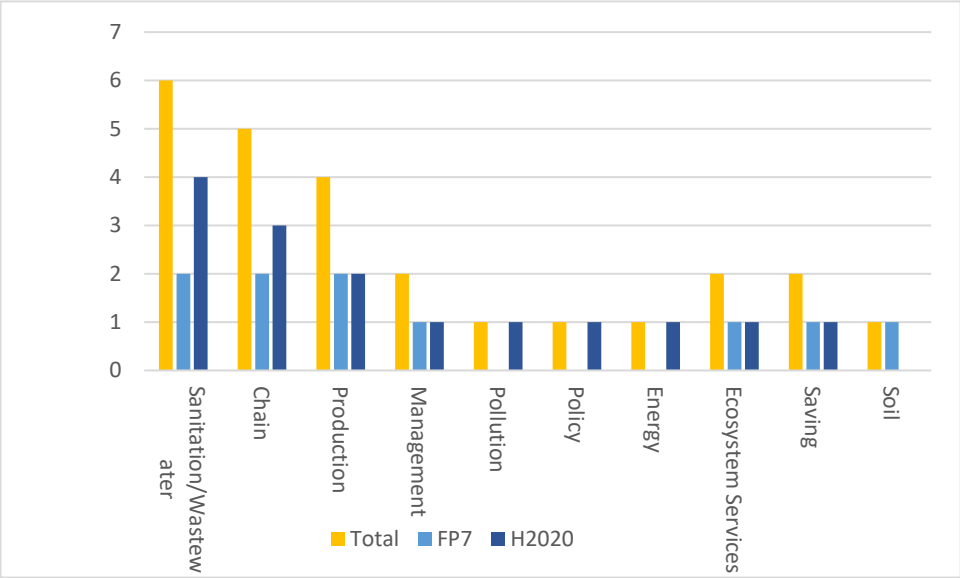


Figure 6: Tipology of projects funded in FP7 and H2020 in Rural Water and Food Security

In **Water and Urbanisation** focus area, the majority of projects are dedicated to **nature-based solutions** (NBS) (to protect, manage and restore water resources) and **sanitation** (to address water quality problems). With the exception of policy development projects, the majority of both **H2020 and FP7 projects were targeted towards the same areas of R&I. H2020** projects had a broader research domain and included more projects in the **areas of floods/droughts and urban agriculture**.

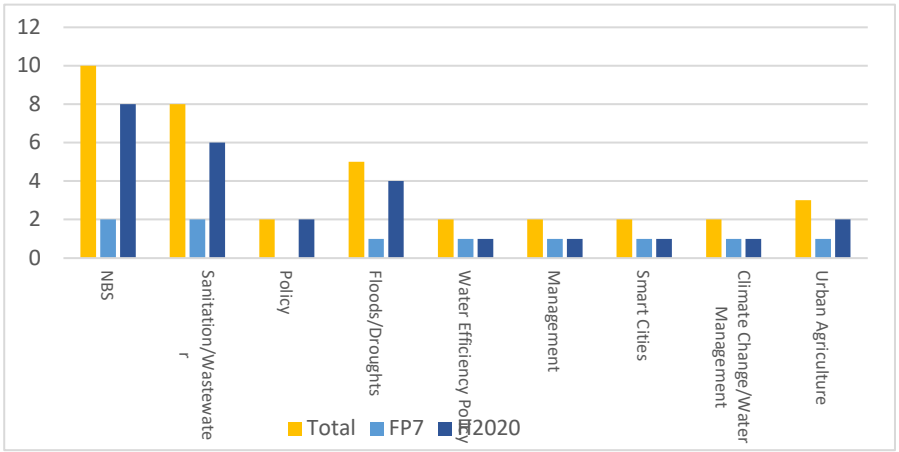


Figure 7: Tipology of projects funded in FP7 and H2020 in Water and Urbanisation

In the **Water and Energy** focus area, the majority of projects were dedicated towards **energy saving** (79%). H2020 and FP7 projects targeted primarily the same areas of R&I. **H2020** projects had a broader research domain, including more projects focused on energy saving together with other, **crosscutting issues (wastewater, agriculture, water).**

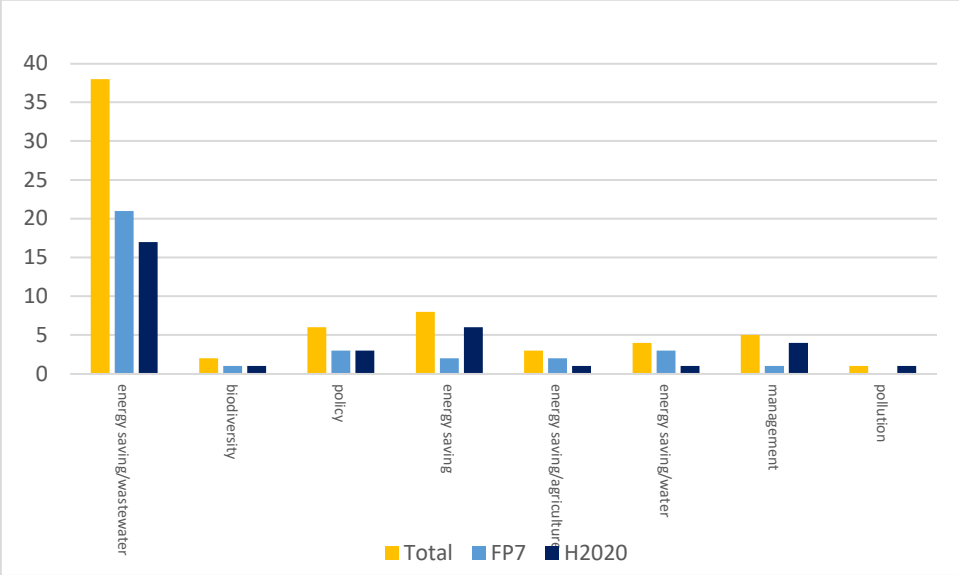


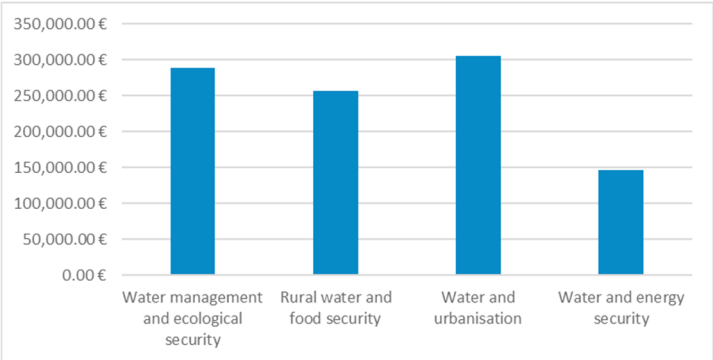
Figure 8: Tipology of projects funded in FP7 and H2020 in Water and Energy

Summary of CNKI and Sciencenet project analysis results:

In total, the identified projects were implemented by 47 research organizations, of which 24 organizations (51%), implemented more than one project.

From the identified NSFC projects, the highest project average funding was related to the **Water and Urbanization and the Water Management and Ecological Security** research themes.

In total, the projects were funded under 45 different topics. The most common topics were:



- Engineering hydrology and water resources use
- Water and mineral resources
- Surface water environment

Figure 9: Average NSFC project value per focus area

Summary of EU-China collaborative projects result analysis:

In the FP7 and H2020 projects where Chinese participants were involved, the highest project average funding was related to the **Water and Urbanization and the Rural Water and Food Security** research themes.

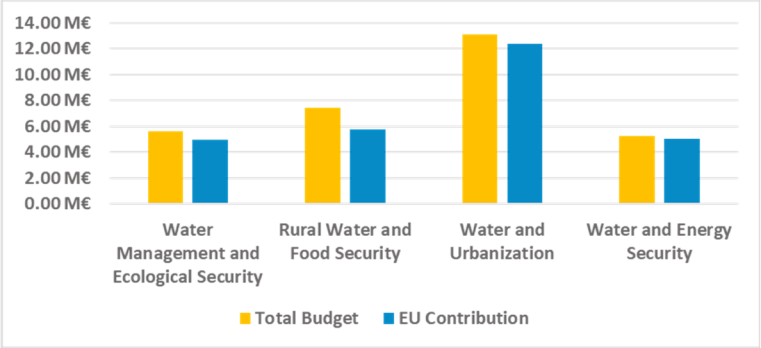


Figure 10: Average EU-China collaborative project value per focus area

The most common topic among of the sample of projects was "**SCC-02-2016-2017 - Demonstrating innovative nature-based solutions in cities**".

The highest number of projects was funded under the programme: H2020 - 3.5. - **SOCIETAL CHALLENGES - Climate action, Environment, Resource Efficiency and Raw Materials**.

On average, **two Chinese partners were involved in one EU-China collaborative project**.

Organizations from 22 EU-27 Member States have been involved in the identified projects, with the highest number of organizations from **Spain, Italy and Netherlands**.

The highest number of organizations from China participated in projects related to **Water Management and Ecological Security** research theme.

The highest participation among Chinese organisations was observed **among Higher Education Establishments and Research Organisations.**

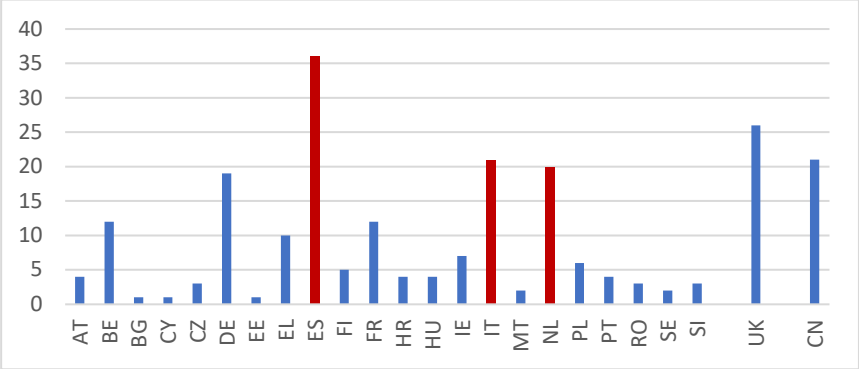


Figure 11: Participation in the EU-China collaborative projects per country

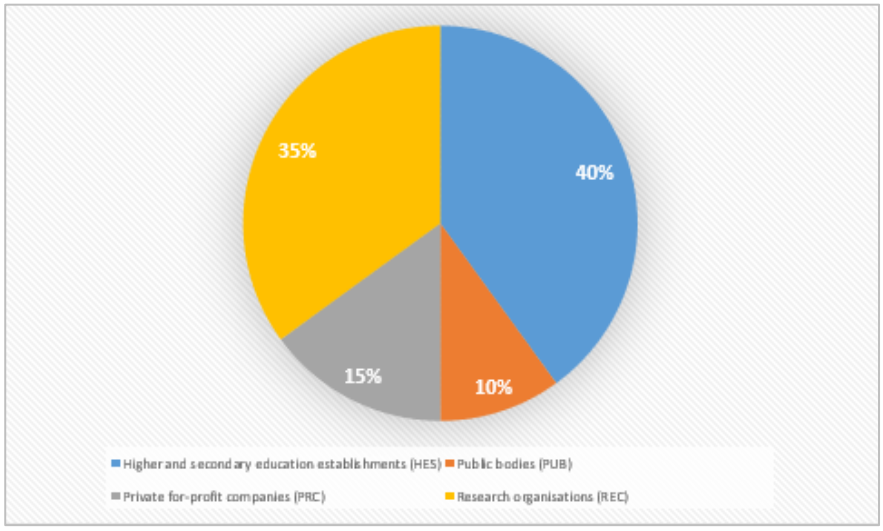


Figure 12: FP7 and H2020 - Participation of Chinese actors

Below we summarize the EU-China collaborative projects characteristics and compare them with EU funded projects and China internal funded projects:

Table 1: Summary of the characteristics of identified projects

	EU-China collaborative projects	Research and innovation projects funded under EU programmes	Research and innovation projects funded under Chinese programmes
Framework programme	H2020 (91%) FP7 (9%)	H2020 (56%) FP7 (44%)	NSFC (100%)[1]
Average budget value per project	EUR 8.8 million	EUR 4.9 million	EUR 278 274
Average budget value per organisation	EUR 380 000	EUR 490 000	EUR 278 274
Average number of participations per project	23 organisations	10 organisations	1 organisation
Average duration	52 months	39 months	52 months
Three most frequent funding programmes	H2020 - 3.5. (55%) H2020 - 3.2. (36%) FP7 – Environment (9%)	H2020 - 3.5. (25%) FP7 – Environment (20%) H2020 – 2.1. (20%)	Key Programme (58%) Joint Programme (42%)

[1] *Only NSFC programmes examined*

Reciprocity issues

According to the publication "Trust and reciprocity: the necessary ingredients for EU-China cooperation", since China's rise has become global in recent years, the EU's relationship with it has been rapidly changing, with most recently, the corona crisis further affecting that change. In particular, European Union Minister for Foreign Affairs Josep Barel notes that "*from an essentially bilateral relationship focused on economic cooperation, it has turned into a global relationship where deep cooperation co-exists with elements of sometimes open competition. The EU´s relation with China is so multi-faceted that European approach cannot be reduced to one simple prism. EU-China Strategic Outlook 2019*[2]*, endorsed by all EU member states, underlines that China is simultaneously a partner with whom the EU has closely aligned objectives; a negotiating partner, with whom the EU needs to find a balance of interests; an economic competitor in pursuit of technological leadership; and a systemic rival promoting alternative models of governance. These four elements need to blend into a coherent policy. Unity is a pre-condition for influence, since not even the biggest member state acting alone can influence a superpower*"[3].

The table below presents a Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis for reciprocity issues with the purpose of contributing to the re-enforcement and support of the development of cooperation projects by decision makers.

Table 2: Reciprocity issues

SWOT analysis for reciprocity issues			
Strengths		**Weaknesses**	
Europe	• To promote and apply European Environmental standards contributing to a rapid uptake of environmental practices that will have an impact on the achievement of Sustainable Development Goals • To promote and apply the existing successful management models for natural, rural and urban watersheds and for different business players (e.g. water and energy) in order to test their effects and accumulate experience.	Europe	• By the time negotiations are achieved, Chinese Research and business companies have acquired sufficient European knowledge and take advantage of the inner technological capacity to gain a competitive position. • The lack of international cooperation projects between EU-China may have long term impacts on the relative performance of European R&I systems since this is an entry port for future economic relations when

[2] https://ec.europa.eu/commission/sites/beta-political/files/communication-eu-china-a-strategic-outlook.pdf
[3] https://eeas.europa.eu/headquarters/headquarters-homepage_en/79355/Trust%20and%20reciprocity:%20the%20necessary%20ingredients%20for%20EU-China%20cooperation

	• To promote and apply biodiversity surveys and advanced restoration technologies and methods to help water managers in adapting to global/climate change pressures.To promote and apply the existing successful management models for natural, rural and urban watersheds and for different business players (e.g. water and energy) in order to test their effects and accumulate experience. • To promote and apply biodiversity surveys and advanced restoration technologies and methods to help water managers in adapting to global/climate change pressures.		compared to, for example, the US;[4].
China	• To apply existing technical standards and monitoring and assessment technologies in China to improve its technologies and standards. • To learn from foreign technologies and promote the implementation of ecological water flow goals within the basin.	China	• By the time negotiations are achieved, European Research community and business companies have developed a non-willing to cooperate mode, making it difficult to set up cooperation projects. • The lack of international cooperation projects between EU-China may have long-term impacts on the relative performance of Chinese R&I systems since this is an entry port for article acceptance and learning of the Chinese research community.
Opportunities		**Threats**	
Europe	• To quickly test, apply and upscale new technologies developed, taking advantage of the rapid Chinese upscale capacity.	Europe	• Legislative obstacles for European researchers to have access and collect data in China. • European businesses have intellectual property rights problems

[4] *Preziosi, N., Fako, P., Hristov, H., Jonkers, K., Goenaga, X. (eds) Alves Dias, P., Amoroso, S., Annoni, A., Asensio Bermejo, J.M., Bellia, M., Blagoeva, D., De Prato, G., Dosso, M., Fako, P., Fiorini, A., Georgakaki, A., Gkotsis, P., Goenaga, X., Hristov, H., Jaeger-Waldau, A., Jonkers, K., Lewis, A., Marmier, A., Marschinski, R., Martinez Turegano, D., Munoz Pineiro, A., Nardo, M., Ndacyayisenga, N., Pasimeni, F., Preziosi, N., Rancan, M., Rueda Cantuche, J.M., Rondinella, V., Tanarro Colodron, J., Telsnig, T., Testa, G., Thiel, C., Travagnin, M., Tuebke, A., Van den Eede, G., Vazquez Hernandez, C., Vezzani, A., Wastin, F., China – Challenges and Prospects from an Industrial and Innovation Powerhouse, EUR 29737 EN, Publications Office, Luxembourg, 2019, ISBN 978-92-76-02997-7, doi:10.2760/445820, JRC116516.*

	• Take advantage of Chinese technological capacity, mainly in the ICT field, to rapidly digitalise knowledge on monitoring and restoration support systems to jointly address problems of global concern. • Assessment of the legislative pieces on water that impediments European Researchers and companies so that concrete barriers can be taken to the negotiation table (most of the legislation are not relevant in the current technology set and cause delays and communication problems). • Strong negotiating capacity from the European side, involving renegotiation of past EU-China agreements		when entering the Chinese market due to non-operational capacity for inspection and control of copying (industrial and technology espionage) • No free access to enter public procurement rules; there is a need for involvement of Chinese partner in Joint Venture. • Difficult procedure to get a license to operate in China.
China	• To establish a river biodiversity database quickly and accurately based on European frontrunner experience, • To research the biodiversity restoration technologies for rivers that possess different features in cooperation with the EU. • To establish ecological monitoring and assessment indicator system and assessment measures, which are applicable to the features of domestic rivers and possibly to be included in state regulation system. • To help water managers in adapting to global/climate change pressures reduce reliance on foreign-based technologies.	China	• Competition between European and Chinese companies for Chinese market • Chinese stakeholder community preference for working with external expertise from European countries • Intellectual property rights problems due to copying (industrial and technology espionage)

This report has identified the common areas of interest for both Europe and China in the field of Water, as well as reciprocity issues, that these geographic areas should have in mind when developing new policies and financing instruments. In the context of the climatic crisis and Covid-19 pandemic, it is important to state that whether we will use the cooperation as a tool to assist humanity to achieve Sustainable Development Goals, or whether we will use economy as an excuse for not engaging in further cooperation remains to be decided by policy leaders. Scientists, entrepreneurs, innovators and society can only contribute if policy makers are ready to understand the need for joint actions to resolve so important issues as climate change and lack of water and sanitation for all. These complex challenges can only be closer to the correct path if we cooperate.

Overall outcomes of the Study

The study provides information regarding:

- Common areas of interest between EU and China with links to key policy objectives and priorities of:
  - The 15-year medium to long term S&T programme (chapter 8.3)
  - EU Green Deal Policy Areas (chapter 9)
  - Horizon Europe Clusters and Intervention Areas (chapter 8.2)
  - EU-China Strategic Outlook priorities (chapter 9)
- Relevant funding schemes in the context of Horizon Europe and the upcoming 14th FYP (chapter 8).
- Good practice examples of the EU-China collaboration (chapter 7.3)
- Important trends and considerations regarding EU and Chinese funded water R&I projects.
- Cooperation research needs and gaps in key areas between Europe and China per research theme (chapters 8.4 to 8.9)

Main conclusions and recommendations

Intra-European R&I collaboration in the field of water primarily relates to the Water and Urbanization and Water Management and Ecological Security research themes. **This finding demonstrates EU internal knowledge needs in these areas that could be jointly addressed with China, taking advantage of the rapidly upscale Chinese capacity and of ICT front runner knowledge.**

Water Management and Ecological Security is the area in which a higher number of Chinese partners are involved**, clearly demonstrating the Chinese research needs in these areas and the recognition of European front-runner knowledge**. It should be emphasized that this cooperation area is clearly in line with the UN decade of Restoration 2020-2030.

The nature of project cooperation was cross-sectorial and multidimensional. In some cases, the cooperation aimed towards the development of novel technologies and solutions for the water sector, while in other cases, the goal was to further explore the modalities and opportunities for future R&I cooperation in the sector.

H2020's SC5 and SC2 funding programmes and their successors**, Cluster 6 and Cluster 5 from Horizon Europe, are aligned with the priorities of China's funding schemes within the water sector as seen under the 13th FYP and initial indications of the 14th FYP (MoWR first call).**

Multi-stakeholder, integrative and cross-sectorial approach to the identification and implementation of solutions in the water sector, such as the proposed Water4All initiative under Horizon Europe, can provide for a strong impetus for the EU-China collaboration, offering the possibility for more frequent contacts between the actors, and supporting in further joint identification of new projects. Water4All integration from Chinese side would request financial commitment from Chinese Ministry of Science and Technology or from the Ministry of Water Resources. The funds allocated by each country are used to finance the participation of country consortium participants.

Key areas of the EU and China water sectors under current funding schemes and the funding schemes to be established for the next period to initiate in 2021:

- Climate Action (water conservation)
- Environment (ground water pollution, urban water bodies management)
- Resource Efficiency (management of water resources)
- Water security (energy production, preservation of ecosystems)
- Sustainable agriculture (irrigation innovations, animal waste management)

Organizations from China received EU contribution in all identified FP7 projects and only in one H2020 project, which highlights the need for better coordination between Europe and China supporting system for research projects. This particularly relates to considerations related to competitive **calls under Horizon Europe, which may lack Chinese funding, deeply**

impacting the implementation capacity of projects and having cascading effects on the whole partnership and project objectives.

The lack of international cooperation projects between EU-China may have long-term impacts on the relative performance of European R&I systems since this is an **entry port for future economic relations. This is an important implication because compared to other regions, the cooperation projects assist the development of Chinese framework conditions that may provide a competitive advantage to EU businesses in their efforts to access the Chinese market. Therefore, it is strongly recommended that water is included in the International cooperation dimension of Horizon Europe, with dedicated calls in Horizon Europe Work programme 2023-2024.**

Based on the results from the workshop sessions on the alignment of funds of the China Europe Water Platform (Budapest and Guimarães), which included stakeholders from the business, research and policy fields and taking into consideration the SRIA of PIANO project, it was concluded that **a set of flagships initiatives should be developed.**

During these stakeholder consultations, participants recognized and expressed the **need for a Coordination and Supporting Action (CSA) that would provide support to long-lasting cooperation between Europe and China in the field of water in order to address SDGs.** This partnership would allow **pooling resources, coordinating efforts and developing and assisting the implementation of a coherent R&I programme of a flagship initiative, as well as summarizing policy recommendations, contributing to awareness-raising of the impacts of water footprint, promoting mutual learning exercises and studies on standardization and guidelines.** Arising from this CSA, five Research and Innovation Action should be developed (details provided in chapter 8.9) on the following themes:

- Water Management and Ecological Security (WMES)
- Water and Urbanization (WU)
- Rural Waters (RW)
- Water and Energy (WE)
- Business

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