CEWP PI Lot 5
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Colophone

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Introduction

This CEWP PI Lot 5 Business Program Policy Report present the Policy Recommendations derived from the events and webinars undertaken within the program. The findings are supported by a number of background analysis documents and questionnaires circulated.

During these events and webinars, with a total number of 25 during 2018-2022, more than 175 presentations, mostly companies, have showcased the Best Available Technologies by a number of water challenges, or using business terminology, market segments. More than 1.700 water experts from governments, research and business have attended the events and webinars, and contributed to the discussions and also networked and made new contacts, before this was hampered by the pandemic.

The main focus has been on the water sector challenges in China, but comparison have also been made to similar challenges in Europe. In many ways, the situations are quite comparable.

Both in China and in Europe, the serious water sector challenges are fully recognized at Government level, in Europe condensed at EU level. The Chinese Government has in several, consecutive 5-year plans, and not least in the recent 14th 5-year plan confirmed its commitment to address the severe environmental challenges, with the water sector, regrettably, being at the forefront. In parallel, EU has via the EU Green Deal, and related initiatives like the Zero Pollution Action Plans and the recent launchings of the Drinking Water Directive and the Urban Wastewater Directive shown similar commitment to a fundamental change – a Green Transition.

And both in China and Europe, substantial budgets have been allocated for investments in the water sector. The CEWP Business Program has via its events, webinars and publications examined to which extent Best Available Technologies would be able to match the needs of the water sector. And also it has been examined to which extent the market at in general actually requests these technologies, by some also called State-of-the-Art Technologies.

In brief, the Best Available Technologies will be able to match the challenges – given they are properly used by capable staff and prioritized by operational organizations working under framework conditions which promotes long-term results. Unfortunately, many observations from the CEWP Business Program events and webinars point to huge uncertainty whether this is actually the case. In the analysis of this report, focus is therefore on the framework conditions of the operators, notably utilities as well as the Tender system and standards used for designing these, and, not least, the connection between these factors. As a starting point for the analysis, a value chain summarizing all the elements which eventually lead to the value created for society is presented.

As the observations from the events and webinars are only indicative, and the questionnaires circulated are only based on a limited number of responses compared to the scale of the Water Technology Market of China (and Europe), the Policy Recommendations primarily suggests this to be examined further. Having the right framework conditions for operators is in this context considered crucial to achieve long-term value creation for society and Sustainable Financing of the Water Sector.

Finally, in addition, the report draws up the main conclusions of the EUCCC Position Paper 2021/2022 and key findings and recommendations of the EU SME Centre, especially with regard to addressing market barriers. It is not unlikely that these conclusions would also qualify for Chinese companies working across the different, geographical regions of the enormous country, as well as for Chinese and other international companies working in Europe.

1. Setting the Scene: The role of Technologies and the Market in addressing Water Sector Challenges

Technology investments are crucial in achieving targets in the field of water management. Whether it is water supply, wastewater treatment, water reuse or sponge city initiatives, procurement and deployment of new technical equipment makes the actual change. Government targets and public planning creates the framework guiding the daily decisions and concrete steps of operators, but actual change requires either different ways of working, or new technical equipment – or, often, a combination.

Government targets constitute a key driver for the market functioning and its ability to deliver long-term value creation for society. Behind the Government targets, the water sector challenges as well as climate change are very important. Another key driver is pricing of the main resources, as this is core to forming the business cases for the stakeholders, both customers and suppliers. Digitalization is a key enabler, which ends of impacting both technologies offered by suppliers and requested by customers.

The wording "Market Functioning" is used in this document as a terminology on the transactions from investments (Government or private funds) to procurement of technologies, often via a Tender System based on selected standards. The Market Functioning encompasses a number of steps, shown here as a value chain with its detailed ingredients:

For a long-term value creation the effectiveness of each element is important – if any of these "fails to deliver", the long-term value may be lost. The report looks into these elements.

With the 5-year plans, budget allocations have been made in order to ensure procurement and implementation of technologies. The report looks into the efficiency of the market, and to which extent it leads to long-term value creation for society. An obvious comparison can be made to the allocation of the EU Recovery Funds.

1.1 Market Drivers – regulatory steps in successive 5-Year plans

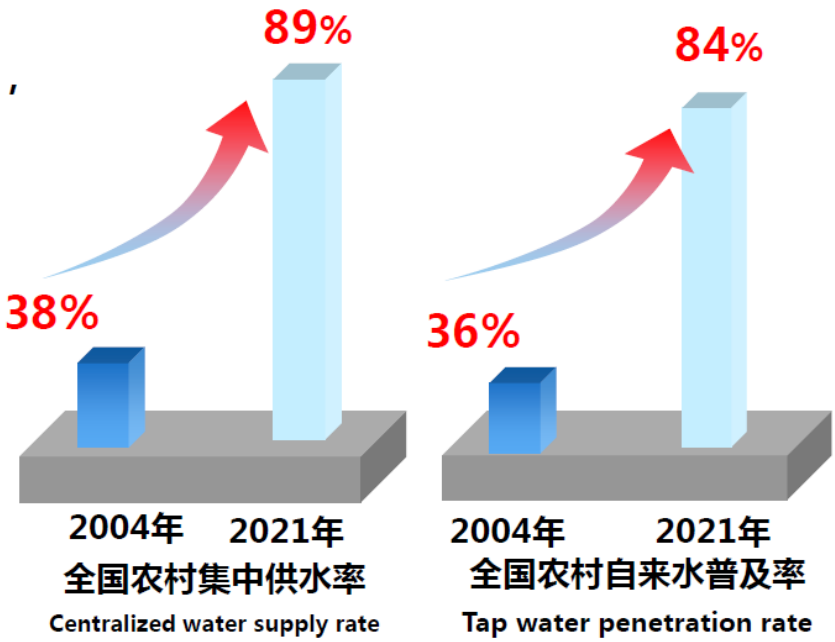
Regulatory steps constitute a key driver for market growth. The Chinese Market for Water Technology has seen a steady growth for decades, in particular following the 10th and 11th 5-Year Plans, and speeding up following the 12th and 13th 5YPs, in particular, with the environmental targets being furthered and consolidated by the 14th 5YP.

In the 13th 5-Year Plan, covering 2015-2020, the main targets were:

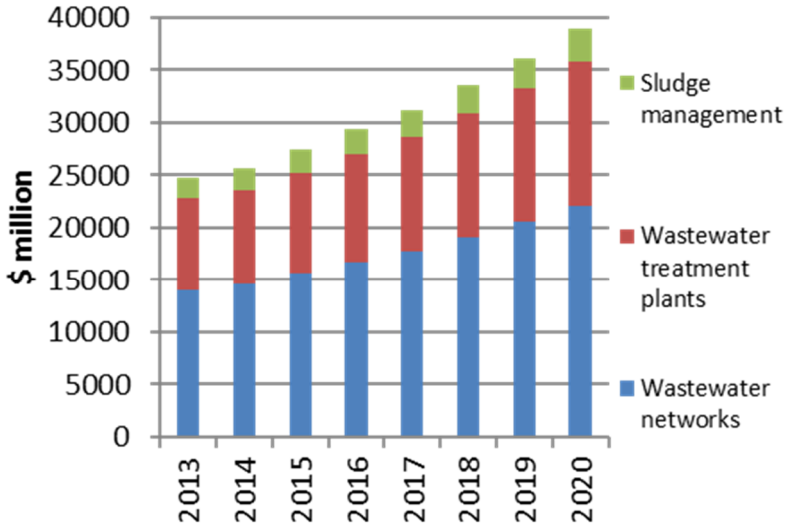
- Upgrade of municipal wastewater treatment
- New wastewater capacity
- Sludge management
- Wastewater reuse
- Installation of centralized wastewater treatment plants in all industrial parks
- All industries must meet the discharge standards in the 13th plan
- Cities to meet "Sponge Cities" Standards

According to China Water Risk, these targets were all reached within the scheduled time horizon!

Below the figure shows the achievements regarding Water Supply in China, where the SDG Goals were achieved already in 2019, 6 years ahead of the plan.



Also, the relation between the regulatory steps and market growth for wastewater treatment and sludge management is clear from the figure below:



1.2 The 14th 5-year Plan

In the following, the overall targets of the 14th 5YP as well as the main elements of the sector plans of the 14th 5YP is shown within water security / water resources supply and water quality /wastewater / industrial water sectors.

1.3 Overall KPIs of 14th 5YP

In the recently held Two Sessions the priorities on environment for the coming years were revealed. Below are the key areas mentioned in the report (reflects also extracts from the sector plans mentioned above):

- Take holistic steps to improve environment
- Carry out stronger actions to treat pollution in major rivers, lakes and bays and sustain progress on preventing and controlling soil pollution.
- Step up treatment of solid waste and new pollutants
- Implement measures to sort waste, reduce waste and boost recycling
- Improve policies to support environmental protection industries in conserving water and energy and recycling waste and used materials
- Adopt more region specific approach to environmental management
- Protect biodiversity and advance the development of a national park based nature reserve system.

It is worth noting that out of 20 KPI targets set in the 14FYP, only 8 are binding targets. Of the 8 binding targets – 5 pertain to "green ecology".

While there was a binding water pollution target (85% of surface water must be better than Grade III), there are NO GDP targets – either absolute nor growth rates – indicated in

the 14FYP KPIs for 2025. It just notes GDP growth: *"Keep it within reasonable interval, each year depends on the situation".*

No GDP targets set & 5/8 binding targets pertain to "green ecology", one of which is water. This sends out clear signals that meeting environmental targets in the 14FYP is key.

Indeed, this bias to the environmental vs economic targets was also the case in the 13FYP where despite tough challenges, China still managed to reach all nine mandatory environmental protection targets by the end of 2020.

Green Ecology	Reduction in energy consumption per unit of GDP (%)	--	--	[13.5]	Binding
	Reduction of carbon dioxide emissions per unit of GDP(%)	--	--	[18]	Binding
	Share of days with good air quality in cities at prefecture level and above (%)	87	87.5		Binding
	Share of surface water at or better than class III (%)	83.4	85		Binding
	Forest coverage rate (%)	23.2*	24.1		Binding
Security/ Safety	Comprehensive grain production capacity			>650mn. tons	Binding
	Comprehensive energy production capacity			>4.6bn. tons of coal equivalent	Binding

Since Chinas 14th Five Year Plan released last year in 2021 several ministries have released sector specific Five-Year plans in the end of 2021 and beginning of 2022. The sector specific plans are cross-ministerial plans and covers environmental protection within both water, air, soil and marine ecosystems as well as a specific sector plan for water security and a sector plan for overall monitoring of the environment.

The plans are released jointly by the National Development and Reform Committee (NDRC), Ministry of Ecology and Environment (MEE), Ministry of Finance (MoF), Ministry of Water Resources (MWR), Ministry of Housing and Urban Rural Development (MoHURD), Ministry of Science and Technology (MOST), Ministry of Agriculture and Rural Affairs (MARA) and Ministry of Natural Resources (MNR).

1.4 Water Security / Water Resources Supply

Water Security Sector Plan in 14th 5YP

Further promote industrial water saving and emission reduction

Increase the intensity of industrial water-saving transformation. Improve the water supply metering system and online monitoring system to strengthen production water management. Vigorously promote efficient cooling, washing, recycling water, wastewater-saving processes and technologies such as sewage recycling and replacement of high-water-consuming production processes, etc., support enterprises carry out water balance test, water-saving technological transformation and reclaimed water reuse transformation, and encourage enterprises to carry out water audit and water efficiency benchmarking meet the standards, promote the recycling of industrial water within the

enterprise, and improve the reuse rate. Implement water-saving reforms for enterprises that exceed the water quota standard in stages and within a time limit.

Promote comprehensive control of groundwater overexploitation

On the basis of determining the water level control indicators for groundwater withdrawal, scientific and rational use of land water, and reduce the overexploitation of groundwater through water saving, agricultural structure adjustment, water source replacement, etc.
Increase water supply through multiple channels, and continue to promote comprehensive control of groundwater overexploitation. Overexploitation of groundwater in the northern region, reduce groundwater overexploitation, increase water supply through multiple channels, and speed up groundwater supply
Source replacement, implement groundwater replenishment in over-exploitation areas, and gradually achieve a balance between groundwater extraction and replenishment. Promote the control and protection of groundwater overexploitation in key areas.

Increase the utilization of unconventional water sources

Strengthen unconventional reclaimed water, seawater, rainwater, mine water and brackish water in water-scarce areas, diversified, cascaded and safe use of water. Taking sewage resource utilization as an important part of water saving and open source content, accelerate the promotion of urban domestic sewage, industrial wastewater, agricultural and rural sewage recycling.
Promote the integration of unconventional water into the unified allocation of water resources, increase the proportion of unconventional water utilization year by year, and establish an incentive assessment mechanism. Overall use of recycled water, rainwater, brackish water, etc., are used for agricultural irrigation and ecological landscape.
Give priority to unconventional water for ecological water use. Aim at the world's advanced technologies and support the research and development of unconventional water utilization technologies and applicable equipment.

By 2025:

The groundwater monitoring and management system has been basically established, and the overexploitation of groundwater across the country has been alleviated. The overexploitation of groundwater in key areas such as Beijing-Tianjin-Hebei and Northeast China has been effectively curbed.

Digitalization and monitoring:

Strengthen the construction of water safety monitoring system:

Taking the basin as a unit, improve the network of monitoring stations such as hydrology, water intake measurement and soil and water conservation system layout, implement the upgrade and upgrade of national basic hydrological stations, and promote the application of new monitoring methods. Expand the scope of real-time online monitoring, increase the density of monitoring station network layout, and improve gridding.

Strengthen dynamic monitoring of underwater topography in important reaches and sections of rivers. Intensive groundwater monitoring increase the density and monitoring of monitoring stations in key areas such as groundwater overexploitation areas and ecologically fragile areas.
Monitoring of water coastline, water surface area and other elements, in important rivers, lakes, drinking water sources development of automatic monitoring capacity building. Speed up on-line monitoring and metering facilities for water intake by water consumers above designated size Construction, and improve the monitoring capacity of water intake measurement.

Strengthen the application of new monitoring methods. Make full use of high-resolution remote sensing satellites, radar, unmanned monitoring methods such as drones, unmanned ships, and underwater robots, and speed up the application of new technologies such as video and remote sensing.
Use innovation to improve the intelligent processing capability and business application level of remote sensing image data, speed up realize the full coverage of rivers and lakes, water conservancy projects, water conservancy management activities, etc.
Optimize and improve the water conservancy business network, water conservancy video consultation system, water conservancy blue letter and other infrastructure, strengthen the application of new-generation communication technologies such as 5G and Beidou satellites, and expand a large-capacity, wide-coverage, and easy-to-maintain IoT communication network. Strengthen the security situation of water conservancy network.

1.5 Water Quality / Wastewater / Industrial Water

Water Quality / Wastewater / Industrial water Sector Plan in 14th 5YP

Following substantial investments during previous 5YPs, China has set a lower target of 20 million m^3/d of additional wastewater treatment capacity to be built over the next five years. The number is less than half the previous five-year goal of 50.22 million m^3/d, reflecting the country's remarkable progress towards univerzalising services (municipal wastewater treatment coverage grew substantially from 32% in 1999 to 96% in 2019).
Earlier this year, China published new guidelines for wastewater reuse, raising the proportion of sewage which must be treated to reuse standards to 25% by 2025. This offers further evidence of the country's ambition to transition from capacity expansion to a greater emphasis on treated effluent quality. As part of the effort, China also aims to construct and upgrade 80,000km of wastewater collection pipelines over the next five years.

The State Council of China's general plan for energy conservation and emissions reductions – released earlier this week as part of the 14th five-year plan (2021-2025) – sets the stage for further optimiztion in the field of industrial water.
The plan calls for the country's energy consumption per unit of GDP to drop 13.5% by 2025 versus 2020, and for an 8% reduction in chemical oxygen demand and ammonia in wastewater by 2025.
Key industrial sectors, such as iron & steel and petrochemicals, are required to undertake energy-saving measures and raise wastewater resource recovery rates, with the aim of further reducing the volume of water consumed for every RMB10,000 of industrial value added by 16%, from 32.9m^3 in 2020 to 27.6m^3 in 2025.

In 2020, China's total water consumption reached 581.29 billion m^3, a decrease of 20.83 billion m^3 versus 2019. Around 90% of the reduction was due to industrial water savings

2. CEWP Business Program Activities and Outputs

The Overall objectives of the CEWP Business Program have been to:

- Present State-of-the-Art-Solutions
- Identify Market Barriers and Innovation Needs
- Facilitate Relation-building and Partnerships

The original plan was to achieve this via side-events organized at selected Water Technology Expos. However, this plan was severely hampered by the endemic, instead a number of webinars have been organized. Altogether, an estimate of 175 company technology presentations have been given during the Business Program events and webinars in 2018-2022, with a total of more than 1.700 attendees.

Further, a special focus was placed on analysis of Market Opportunities and Market Barriers and presented in the "CEWP Water Technology Market Report 2021". This report will in 2022 constitute the foundation for elaboration of a Policy Brief including a number of Policy Recommendations focusing on the "Market Functioning", understood as to which extent market transactions notably public tenders will lead to long-term value creation for society.

In 2019, the focus was on Industrial Water Use and especially Wastewater, whereas the plan to focus in 2020 on Urban Water (Sponge Cities and Wastewater) was delayed to 2021, and the focus in 2022 was on Rural Water (Water Supply and Wastewater/Sanitation for villages and small cities).

For 2021, a mixture of webinars and physical activities regarding Urban Water was undertaken in co-operation with Aquatech Shanghai (as organizer of expo and technical operator of webinars) and the EU SME Centre (promoting companies to take part in the webinars and acting as operator of the physical events @Aquatech Shanghai. Also, the EU SME Centre represented CEWP Business Program at a MWR Business event in Wuhan in June 2021. The program in 2022 for Rural Water in November 2021 at Aquatech Amsterdam.

List of knowledge-based products:

Market Reports:

- A comprehensive introduction to the Chinese Water Tech Market.
- An overview presentation of the Chinese Water Tech Market.
- Background paper on water use efficiency in the European Food and Drink sector 2019
- The CEWP China Water Market and Technology Outlook Report 2021

Summary Reports and PPTs:

- Reports and PPTs of Business Program Events and Webinars (In total 15 events and webinars, several with 2 or even 3 different sessions, so actually a total around 25 unique events)

List of events and webinars (See Annex for details)

- May 3rd-5th, 2018, IE Expo, Shanghai, China
- June 27th-28th, 2018, CWEC Expo, Shanghai, China
- November 7th, 2018, side-event at HLM, Beijing, China
- December 4th, 2018, SLUSH, Helsinki, Finland
- April 12th-13th, 2019, Qingdao, China
- April 14th, 2019, IE Expo, Shanghai, China
- November 5th-6th, Aquatech, Amsterdam, Netherlands
- November 8th, 2019, side-event at HLM, Guimaraes, Portugal
- November 7th-8th, 2019, Business Expo, Guimaraes, Portugal
- November 11th-12th, EUPIC Twin Fair, Chengdu, China
- November 13th-14th, EUPIC Twin Fair, Qingdao, China
- March 16th, 2021, webinar
- March 30th, 2021, webinar
- April 29th, 2021, webinar
- May 18th, 2021, webinar
- June 2nd-4th, 2021, Aquatech, Shanghai, China
- June 9th, 2021, MWR Expo, Wuhan, China
- November 2nd-4th, 2021, Aquatech, Amsterdam, Netherlands
- March 29th, webinar
- April 19th, webinar
- May 24th, webinar

3. The Market for Water Technologies

3.1 Market prognosis, Market outlook

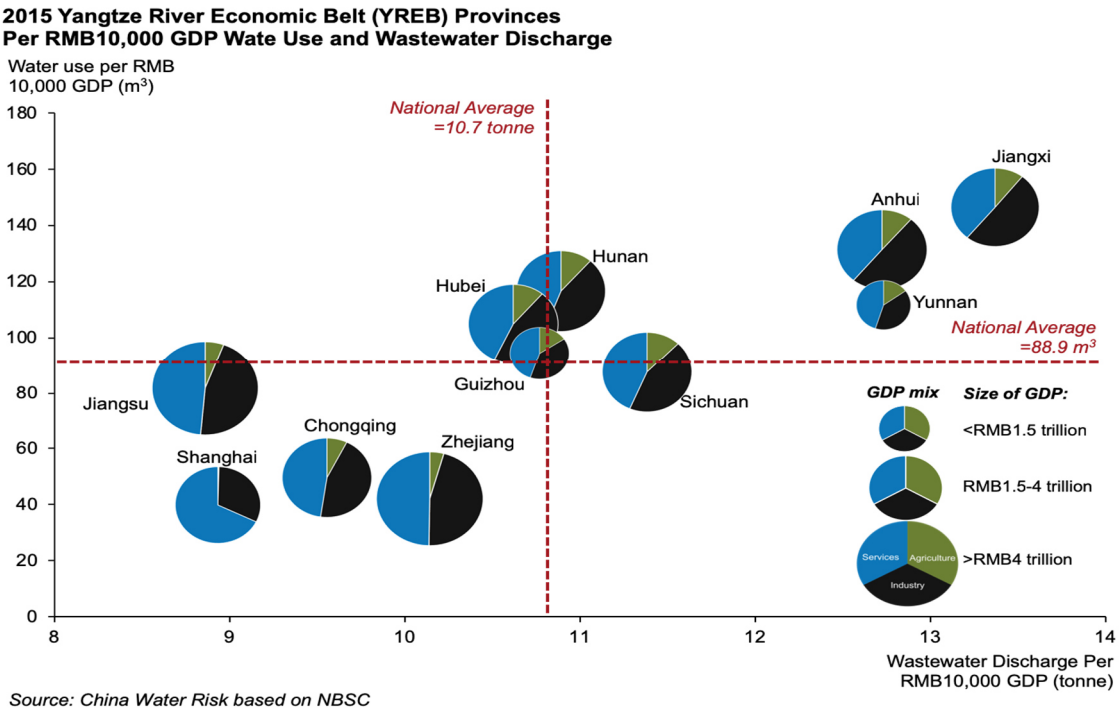
According to several estimates, the Chinese Market for Water Technologies is predicted to become the World's largest within a few years.

A report, Analysis of the Current Situation and Development trend of China's Water Industry Market (an abstract of the report, in Chinese, can be found in the annex), made by Qianzhan Industry Research Institute (https://bg.qianzhan.com/), one of the Chinese most influential and authoritative research institute, estimates that the water market will keep steady growth with the support of national policies. aThe growth rate is expected to be 10% during the 14th Five-Year Plan period (2021-2025), and in the year 2026 the sales volume of the water companies will achieve 562.5 billion CNY.

3.2 Technology Demands

Inevitably, it is a substantial simplification to give a short, and at the same time comprehensive overview of which technologies are in high-end demand at the Chinese market seen from the stand of European companies.

First of all, "China" seen in a "Market Context" has to be seen as a continent of its own with "28 countries and 4 city-countries" each having its own characteristiques, challenges and local regulation. These differences are to some extent visualized in this figure elaborated by China Water Risk:



As an example of a market opportunity report specific about China Industrial Wastewater Policy Overview and Opportunities for EU SMEs in Qingdao & Chengdu Area, a report was elaborated for CEWP by the EU SME Centre in 2019 (see annex).

For further details about specific Technology Demands, pls visit the CEWP Water Market and Technology Outlook Report 2021 (https://www.cewp.eu/sites/default/files/2022-02/CHINA%20MARKET%20OUTLOOK%202021.pdf.

3.3 Market Conditions Outlook – Competition, Barriers and Opportunities

Market positioning and competition inevitably varies in market segments and geographical regions. In general, the discussions and roundtables agreed with many findings in the Water Market and Technology Outlook Report 2021. It was emphasized, that the Chinese government has come up with regulation, improved water quality criteria and life cycle cost and that European SME´s needed to align themselves with how the Chinese side develop their water sector. This would include framing their value proposition in terms of lifecycle cost, risk management, regulatory compliance and operational optimization in general. Also worth noting is that climate change issues and energy efficiency is quickly getting more attention in the Chinese water market.

From the roundtable discussions it appears that larger European companies (of which many are present in the Chinese market already- are fully capable to find a market position based on (i) offering state-of-the-art solutions, (ii) initiating the relation with the customers via customized offerings, and subsequent building of a partnership, (iii) via a dialogue and genuine interest in the performance and operations of the customers, and their actual use of the solutions, (iv) hereby gradually creating an interest in the more advanced, and costlier, state-of-the-art solutions.. European technology producers and consultants could aim at building networks and being sub-contractors to these larger European companies

In this way, a path towards promoting state-of-the-art solutions do exist. The important addition to this observation is the observation, that currently the tender system (in very general terms) do not constitute a framework which leads to market uptake of state-of-the-art solutions, instead tenders often end of promoting bulk solutions, which are not necessarily with the best long-term economic profile (cheaper capex, but very high opex[1], causing very high totex[2]), with strong resilience to climate change, or with inbuild orientation towards digitalization.

Obviously, absence from the market in more than 3 years (2020 and 2021, and expectedly also 2022) for non-established companies will imply a strong element of "starting-all-over-again" regarding market understanding, revitalizing partnerships, relations and network, as well as increased competition from local market players with new and improved solutions.

Having said this, other factors points to a more level-playing-field market, e.g. with solving problems related to IP-fraud improving and an overall better business environment for SMEs emerging. With SMEs often being the provider of new solutions, they are very important of technology transfers as a

[1] OPEX – Operational Expenditures

[2] TOTEX – Total Expenditures

contribution to prevailing water management challenges. In this context, it is in the interest of China to facilitate entry of such new players to the market.

Further, with the appetite for digitalized solutions continuously growing in the Chinese water sector, and strong interest in state-of-the-art technologies thriving, international companies able to identify the right market niche and having/developing the right understanding on how to adopt to local needs and conditions, can still to do very good business in China.

At the same time, despite the Chinese Governments' strong ambitions for improving the quality of the environment, including water, as reiterated in the targets of the 14th 5-Year Plan, the market functioning has developed at its own path and pace, with most tenders being made according to older standards, hereby de-facto favoring bulk/standard solutions rather than state-of-the art solutions.

To conclude, while exploring the vast scale and growth rates of the Chinese Market, companies will be recommended to be well-prepared and considerate about their anticipated market niche and market entry strategy. Further, to facilitate international technology transfers as a means to addressing the water quality and water supply challenges, improving market access for international companies is highly recommended.

4. Analysis

In this chapter, a summary of the observations and discussions at the events and webinars related to the three main themes of the CEWP Business Program is given.

The main themes were Industrial Water in 2019, Urban Water in 2021 and Rural Water in 2022. Due to the pandemic, no activities were undertaken in 2020.

Emphasis were on the following topics:

- What are Best Available Technologies and do they match the Water Sector Challenges?
- Are Best Available Technologies requested by the market, or what are barriers?
- Do the operators, notably utilities, work under framework conditions, which promotes long-term economic and environmental value creation

4.1 CEWP Focus Market Segment 2019: Industrial water use - Conclusions and Perspectives

In 2019, CEWP hosted four Business and Innovation Program Events and prepared/identified a number of background documents /1-5/ on industrial water use with the aim of helping European Companies in getting access to the significant Chinese Market for Industrial Water Technologies and of facilitating establishment of innovation-oriented relation-building between Chinese and European experts.

Based on the results of the activities it can be concluded that:

- Significant water scarcity hampers secure water supply to industries.
  Several industries are characterized by a potential to increase water use efficiency, among other due to weaker regulatory requirements and pricing of water and energy. Wastewater from

industries has a potential to be further treated among other due to very basic regulations or lack of enforcement of regulations. Regulatory requirements- at national and provincial level however will increasingly be strengthened in the coming years

- Significant upgrade of regulatory requirements.
  A number of legal and regulatory instruments at national and provincial level will be fully enforced in the coming years like *Water Ten Action Plan* and *Made in China 2025* (*中国制造2025*), which stipulates that by 2025 the water consumption per unit of industrial value added should be 41% lower than in 2015, causing a rise in the demand for industrial wastewater treatment and recycling systems.[3] At provincial level water quota and water pollution standards are in the process of being strengthened.

- Industries faces significant policy risks.
  Regulations from water authorities only relates to water, while other factors as energy efficiency, energy pricing and resource efficiency (circular economy), as well as procurement and standards are left to other authorities to regulate. For industries this gives difficulties and uncertainties in predicting policy changes, by industries known as policy risks. This makes decisions on investments in cleaner and more resource-efficient technologies difficult. Future impacts from Climate change is likely to lead to increases of water and energy prices and likely implementation of smart electricity grids. This again will lead to increasing demands for energy-efficient water technologies. Altogether, the lack of cross-sector co-ordination leaves the industries with significant policy risks.

- Market focus on "Buy Cheap" prevents "Buy Clever".
  Currently, the Chinese water technology markets are primarily dominated by low CAPEX[4] as the key competition factor. Inevitably, this leads to long-term relatively high OPEX costs and high reinvestment needs, especially in the context of increasing regulatory demands and increasing prices. Therefore, investments made following the low CAPEX approach may lead to low resilience to these changes and accordingly low long-term value.

- Digital Transformation is gaining momentum, but unevenly implemented.
  Digital transformation has enormous potential for both improved efficiency and effectiveness and the Chinese IT sector is seeing this potential. Authorities will gradually discover this and relate future regulatory requirements to these possibilities for improving the environmental situation. For industrial production as well as wastewater treatment, digital transformation will offer substantial opportunities for improved management of production, activities and asset management. Similarly, wastewater treatment plants will see significant opportunities following digital transformation.

- Tenders for B2G doesn't promote Technologies for the Future.
  In many cases, current tenders may not reflect these upcoming changes, rather they are based on the solutions of yesterday. Tenders should be made in co-operation with business partners,

[3] http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm, http://english.www.gov.cn/policies/latest_releases/2015/04/16/content_281475090170164.htm

[4] CAPEX – Capital Expenditures = Financial Costs when procuring

who are fully updated about the upcoming changes and opportunities – consultancy companies. It is questionable whether today's Design Institute can fulfill this role. Lack of Financing constitutes a serious barrier for procurements focusing on long-term value.

- Overall Conclusion: Current Market Functioning leads to short-term focus.
  As a final conclusion the Chinese industrial water market can be considered quite conservative and driven mainly by regulatory requirement. Demands for low cost technologies, which can comply with the regulatory requirements and only to a limited extent by costs of resources (in particular water and energy), dominates the market requests.

Perspectives for business and innovation

The Events identified niches where European Companies may get access to the significant Chinese Market for Industrial Water Technologies. Some niches are already there today and others will develop with stronger regulation as well as increasing resource prices. In the following, the short term and more long-term perspectives for European companies in the Chinese market are listed:

Short term perspectives and niche-market opportunities

- Water conservation, reclamation, water reuse and recirculation driven both by national and provincial level regulations. The market demands technologies both for local industrial water reclamation and reuse within the industry itself and in larger water reclamation schemes. There may be a niche here for decentralized reclamation schemes and technologies, as large centralized systems are expensive due to the high piping costs.

- Industrial water pollution control in particular in Industrial parks. China is relocating many of its industries like chemical and pharmaceutical industries into parks with the same type of industries. While the present regulation is quite basic there may be strengthened regulation of wastewater discharge also including specific hazardous chemicals.

- Pre-treatment of industrial wastewater discharged to municipal wastewater systems could be another niche. Heavy metals and hazardous chemicals end up in municipal sludge and prevents the reuse of sludge as fertilizer in agriculture- a procedure which is practices in many European countries.

- Digital transformation has enormous potential both for improving efficiency and effectiveness and the Chinese IT sector is seeing this potential, implying technology transfer into the industrial water market, aiming on one hand to document compliance with regulations in a longer perspective also in reducing production costs and reuse resources within the industrial plant site.

- To be successful, EU Companies will have to find the niches in which their expertise and premium technology are valued and there are clients with the financial resources to procure their services. If companies are doing it right, the opportunities will outweigh the challenges. Such niches could be energy optimised sludge and wastewater treatment, resource reuse and industrial parks water and wastewater technology and resource use.

- Doing it right means in selected niches requires and understanding of who the real clients and key partners are and which actions need to be taken at which stage of the procurement process; from profile raising and intelligence gathering to positioning, partnering, tendering and the delivery of projects

Long time perspectives

- Climate change and increasing resource costs and circular economy will have a large impact on a future industrial water market in China. European Companies will have an advantage as these drivers in addition to strong regulation are increasingly driving the European market today. CEWP events provides a forum for dialogue on how these drivers may also in the future drive the Chinese market including the regulatory requirements, management procedures and new technologies needed. Maintaining and extending the dialogue between China and Europe on this topic seem crucial for the development of these future markets and for Chinese water management.

For more information, see link in annex.

4.2 CEWP Focus Market Segment 2020-2021: Urban water - Conclusions and Perspectives

The Urban Water Webinar Series organized by the CEWP Business Program during 1st half of 2021 concluded that challenges facing the Water Sector could to a large extent be addressed, if already existing technical solutions and services were fully utilized. Needs for technological innovation still exists, with the main needs being systemic innovation improving sector integration and allowing for a holistic approach to the full water cycle, e.g. in order to facilitate increased reuse of water.

In addition, state-of-the-art solutions offers stronger resilience to climate change and a better take-up of the potential related to digitalization and circular economy. Digitalization will allow for significant larger amounts of data to be analyzed, hereby de facto leading to actual realization of the intentions behind various concepts about integrated approached developed within the water sector during recent decades. Circular economy-based solutions will in particular imply a stronger integration of water and energy, hereby leading to new business models to be developed.

While state-of-the-art solutions are in general costlier, they have a significantly better Operational and Maintenance costs profile, whereas bulk solutions using simpler technologies are cheaper to procure. However, a.o. due to lack of adequate financing models, economic frameworks promoting long-term sustainability as well as inadequate regulatory frameworks, the cheaper solutions are preferred during a majority of most tender processes. Further, lack of pricing based on true costs of water and energy, as well as total cost of ownership, also adds to the picture of inefficient use of funds in the water sector.

Introduction:

In total, four webinars constituted the full series. They were followed by an aggregate of more than *300 participants from 20 countries*, mostly but not only China and European countries, explored the management of the Urban Water Cycle in Europe and China. The webinars presented experiences and

case studies and discussed various aspects of Urban Water Management including: blue-green and sponge cities, efficiency of water infrastructure, digitalization and water sector carbon footprint[5]. The webinar series were followed up by a physical event at Aquatech Shanghai in June 2021 as well as a presentation given by the EU SME Centre at the business exchange meeting at Water Expo China in Wuhan also in June 2021.

The *Setting the Scene speeches* as well as the *Company Technology presentations* referred to the following main drivers: *climate change, increased water demand from urbanization and industrialization, and pollution due to inadequate wastewater treatment and inefficient enforcement*. The main enablers referred to were: *digitalization and circular economy inspired solutions*.

In particular, the link between water and energy solutions were central to most webinars. The present discussion report builds on the webinar reports and *take away messages* from the roundtables, the chair and rapporteurs' observations of the key results of the webinars as well as good experiences presented by the speakers of the webinars. The roundtables organized in each webinar focused on the framework conditions, which would be necessary to implement the technologies available, and forms the basis for the recommendations presented in this report.

Another main conclusion was the market functioning, which besides a few cases involving large players with capacity to independently establish their own long-term perspective on the market and technology perspectives of, say, 2030, indicated serious efficiency gaps between national, environmental and water security targets and adjoined budget allocations, and the actual market transactions via tenders.

Eg. the market functioning overall doesn't support long-term economic efficiency, resilience to climate change, cross-sector perspectives notably energy use efficiency or update of digitalization.

A third, main finding relates to the "Sponge City Market", where mechanisms to ensure the technical findings of Lot 3 CeCoSC – that optimal long-term value creation to society needs combinations of so-called 3PA and BGI and synergies with other sectors - to be retained at "the market". In other words, that this overall, cross-sector approach is retained when "translating" urban planning and investment schemes of this field into individual, budget expenditures. And also to allow for exchange of international experiences by involving international consultants during the initial stages – screening, scoping, strategy and priority setting, public planning and eventually investment schemes.

In the following, the main observation points regarding the two prominent enablers, digitalization and circular economy are presented.

Observations on digitalization.

China and Europe are both aiming at developing new digitalization solutions to improve the efficiency of their urban water management, however in different contexts. Overall, Chinese cities sees increasing urbanization (with the 14th 5 Year Plan setting a target for 2025 of 65% compared to todays' 61%) and construction of new, urban areas, compared to a stronger focus on retrofitting existing urban areas in Europe.

Digitalization in the water sector has a big potential and digital water technology is largely already available and the water sector is already using it and benefitting from digital transformation. To get the full benefit of

[5] Presentations, recordings of the webinars and webinar reports can be found at https://www.cewp.eu/waterurban

digitalization, a focus on human interaction with technology is still very important and training is needed for those who work with and operate the technology. To many people in the water sector, digitalization is still approached using an "analog" mindset, aiming at optimizing water management, rather than using a "digital" mindset with the aim to transform water management.

Digitalization has entered all water subsectors, including water quality and water quantity management in water supply and waste water systems, leak detection, flood management and early warning, irrigation systems and catchment management.

Digitalization technology is fast developing at all stages of the water management cycle including monitoring and metering systems of data, data collection systems, data management systems and intelligent information systems.

Availability of sensors with a potential for real time monitoring is essential for fast management response both in e.g. flash flood early warning and management and in water quality and quantity protection and management. However, sensors (or other monitoring equipment) able to detect advanced, chemical parameters in real-time on-line are in most cases still to be innovated.

*Digital solutions will challenge the existence of silo´*s and current institutions set-up in urban water management. With increasing ability to perform *data crunching* at an unprecedented scale, the current institutional and geographical boundaries will increasingly constitute a barrier for efficient solutions. Vested interests in existing structures will be a special element to adress. Of particular importance is the connection of the silos for water supply and waste water treatment and the integration among decision makers.

Procurement of digital water solutions may not be well specified in tenders. ISO 55000 and other related standards can be used to make the demand/requirements for the IT water solutions more precise. This is particular important in multi-stakeholder water management systems like e.g. catchment system with many different management needs.

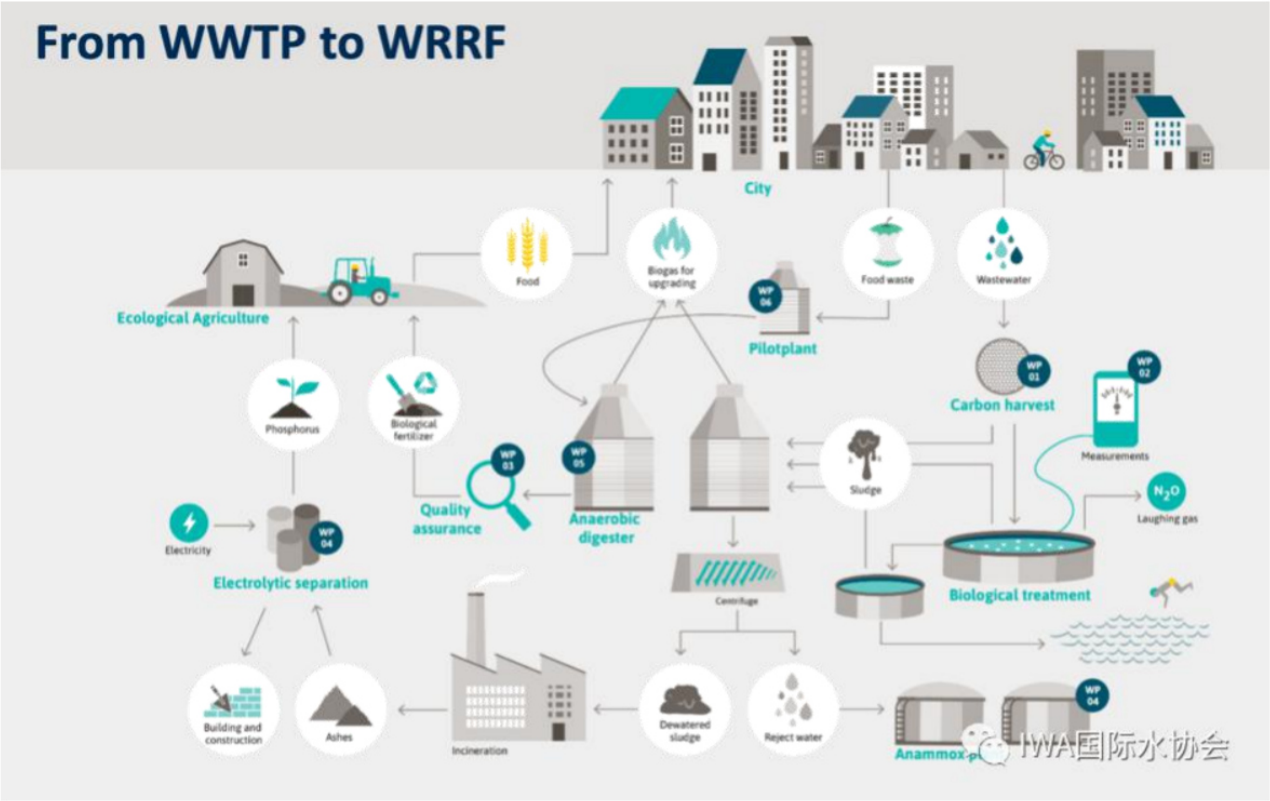
Asset management. Major water companies such as Beijing Water Enterprises, Sound Group etc, have rapidly increasing inventories of assets and are developing more advanced asset management systems. Most of the
maintenance is still done in fairly manual labour-intensive ways. There is great interest in introducing more advanced automated systems and predictive strategic asset management solutions. However, the low labour costs mean that even the most efficient state of the art cost saving methods used in the EU could be more expensive to run, let alone install, compared to current practice. With rapidly rising labour costs and more labour safety and protection this equation is shifting and there is increasing potential for intelligent asset management offers.

Observations on circular economy.

Circular Economy has become prominent in both European and Chinese policymaking. Chinese and European perspectives on a circular economy share a common conceptual basis and exhibit many similar concerns in seeking to enhance resource efficiency. The Chinese perspective on the circular economy is broad, incorporating pollution and other issues alongside waste and resource concerns, and it is framed as a response to the environmental challenges created by rapid growth and industrialization. In contrast, Europe's conception of the CE primarily has an environmental scope, focusing more narrowly on waste and resources, and opportunities.

In Europe circular economy approaches are also emerging as an approach to reduce the emission of CHG´s. Globally 4% of all electricity is used in the water sector to supply water for human consumption, food and industrial production and waste water treatment. An increased efficiency of the urban water cycle will make more water available but also reduce the emissions of CHG´s and make more resources in waste water available for reuse.

Trends in Europe are towards integrated water and waste water systems, reduction of energy use and CHG emissions per volume of water managed and an emerging integration of water and energy systems. In China energy use and CHG emissions per volume of water managed has been increasing due to a.o. more extended treatment. The potential to reduce the CHG emission and the recovery of resources is considered to be significant, although validated are not available.



Circular economy-based solutions in the water sector have a big potential and technologies are largely already available and the benefits in terms of water and resource savings and reduction of CHG´s has been demonstrated in many countries including Europe. Key elements of reducing the carbon footprint and saving resources in waste water treatment systems are: Increased process control, variable operation of pumps etc. depending of the load, carbon harvesting for biogas production, deep process control and knowledge and combined heat and power installations and can even make waste water treatment and water supply systems energy-positive.

A move from the concept of Waste water treatment Plants to Water Resource Recovery Factories to save resources has been promoted primarily in research and demonstration projects, however is increasingly emerging as a new concept in advanced larger water organizations.

Circular economy solutions are increasingly supported by digitalization technology including monitoring and metering systems of data, data collection systems, data management systems and intelligent information systems.

Integrated water and energy and resource reuse systems increase the outcome of Circular economy solutions and may reduce the impact of the existence of Silo´s among institutions involved in urban water and energy management. Of particular importance is the connection of the silos for water supply and waste water treatment and the integration among decision makers. In these sectors.

Procurement of water and energy solutions may not be well specified in tenders. standards can be used to make the demand/requirements for the solutions more precise. This is particular important in multistakeholder water management systems like e.g. catchment system with many different management needs.

Water supply and waste water treatment organizations are natural monopolies and may need incentives and/or regulations/goals from regulatory bodies to take actions in investing in reduction of carbon footprint and recovery of resources.

Investments in Energy savings, energy production from biogas and utilization of water borne energy may in some cases have short pay- back time. Ring-fencing the economy of water and waste water organizations is a necessary condition for keeping the savings in their own organization. Also, in case a waste water treatment plan can be made energy positive, it should possible for water organizations to sell/provide their energy surplus to the energy network or other energy users.

In connection with the webinar on Carbon Footprint, two background reports were made:

Circular Economy in the Wastewater Sector

https://www.cewp.eu/sites/default/files/2021-05/CEWP_Whitepaper_Circular%20Economy%20of%20Water%20in%20Waste%20Water%20Treatment_final.pdf

China Carbon Neutrality 2030/2060 in the Water Sector

https://www.cewp.eu/sites/default/files/2021-05/China%20WW%20carbon%20neutrality%203060%20path%20and%20solution%20report_NORDIQ0428.pdf

Main findings from the events:

- Digitalisation brings up the importance of breaking down the silos which has been addressed multiple times – both from a regulatory framework point of view and from a customer point of view
- More untapped opportunities will request an organizational change that digitalisation could possibly bring
- The conceptual move from WWTP to Water resources recovery factories has been not only promoted primarily in research & demo projects, but also in advanced larger scale water organisations.
- The implementation and stage execution of the environmental focuses of the 14 FYP is key to reaching several government targets.
- In both seminars, the Setting the Scene speeches as well as the Company Technology presentations used the same main drivers of climate change, increased water demand from

urbanization and industrialization, and pollution due to inadequate wastewater treatment and inefficient enforcement as main references for the challenges facing the water sector.

Conclusion drawn:

The urban water management webinars supported the observations made in other CEWP seminars and workshops that challenges facing the Water Sector could to a very large extent be addressed, if already existing solutions were fully utilized. Needs for technological innovation still exists. However, the main needs are for systemic innovation improving sector integration allowing for water supply and wastewater management to be monitored, analyzed, planned and managed by the same organizations, e.g. in order to facilitate increased reuse of water.

While state-of-the-art solutions are in general more costly, they have a significantly better O&M cost profile, whereas bulk solutions using simpler technologies are cheaper to procure. However, due to lack of adequate financing models, economic frameworks promoting long-term sustainability as well as inadequate regulatory frameworks, the cheaper solutions are preferred. Further, lack of full pricing based on true costs of ownership, also adds to the picture.

For more information, pls see link in annex.

4.3 CEWP Focus Market Segment 2022: Rural water

Almost the entire rural population in China have now gained access to enough clean water. China fulfilled the SDG for water supply in 2019, six years earlier than the global target date. Health issues related to water supply safety has been improved - including microbial contamination, fluoride and brackish water. Also access to tapped water has been improved significantly at the rural level. Both the central and provincial governments have supported this impressive development.

The plan is to increase the coverage from 83% to 88% in the rural areas. Other plans include improved water source control and restriction of use, standardization of water supply systems, improve management systems, reform of pricing structure and financial mechanisms and also support to ageing infrastructure.

Different investment policies are applied in Chinese regions depending on regional needs. User participation has been introduced, as well as safety management systems and a subsidy funds established to secure maintenance of installed systems. A supervision system and inspection mechanism has been established as well as a hot-line to the Ministry of Water Resources.

The challenges and targets of the 14th 5-year plan includes an increased supply and coverage in the rural areas as well as securing water for the development of small scale rural industries.

Two main groups of challenges were mentioned:

Guarantee degree of China's rural water supply is still to be improved

- Existence of regional development disparity
- The problems of rural water supply still exists
- The overall level of rural water supply guarantee in China still needs to be continuously improved.

The demand of rural residents is increasing

- Increase of drinking water demands with the improvement of people's living standard
- Increase of rural water demands for the rural secondary and tertiary industry development
- Improve of drinking water standards
- The target of the 14th 5-year plan is to increase the coverage from 83% to 88% in the rural areas. Other plans include improved water source control and restriction of use, standardization of water supply systems, improve management systems, reform of pricing structure and financial mechanisms and also support to ageing infrastructure.

Among challenges for operators – Water Supply and Wastewater – include:

- High energy consumption
- High maintenance cost
- Problems in meeting the high standards and large consumption of chemicals
- No space to expand footprint, problems with sludge handling etc.
- Low system knowledge - need remote reading and remote control
- Want to improve their water network and reduce Non-Revenue Water.

Digital solutions using sensor technologies and modelling tools can significantly improve the management and control of drinking water supply sources, waste water treatment systems and improve flood protection. Standardization systems like ISO 55000 has shown to be a valuable tool to help clients prioritize e.g. their maintenance needs.

Nature based systems like wetlands to treat waste water (both the water phase and sludge) has shown their efficiency globally. Different systems exist with e.g. reeds and trees as the main biomass produced and sludge phase dried and used in agriculture. Application of air into the constructed wetlands increase their treatment capacity and reduces the area of the systems per person equivalent to up to 25%.

From the roundtable discussion it appears that European companies are fully able to find a market position based on offering state-of-the-art solutions, but initiating the relation with the customers via customized offerings, and subsequent building of a partnership, via a dialogue and genuine interest in the performance and operations of the customers, and their actual use of the solutions, hereby gradually creating an interest in the more advanced, and costlier, state-of-the-art solutions.. European technology producers and consultants should aim at building networks and being sub-contractors to these.

It is, however, not possible to copy solutions from one region to another regions (one size does not fil all and that lack of data on locations of e.g. pipes makes it difficult to apply some digital solutions. Further, it should also be noted that there are advantages in cooperating with smaller water companies as they are still quite experienced and has less cooperative political constraints and is more interested in practical solutions.

4.4 Concluding on the Value Chain elements

We will end the Analysis chapter with an overview of the elements of the Value Chain:

The Value Chain of the Water Sector can in a simplified version be presented as follows:

Drivers – Financing Investments – Tenders and Procurements – Operations and Monitoring – Value Creation

For each step, there is a risk of initiatives loosing efficiency (costs of initiating an initiative are relatively high), effectiveness (initiatives not leading to a result) or efficacy (the results of an initiative doesn't deliver the right result).

In the context of the CEWP Business and Technology program, our activities and analysis at their core looks into if current market functioning actually deliver the anticipated targets, and at which costs, and if the market allows for cost-efficient state-of-the-art solutions with huge resilience to future change eg. climate change are actually available at the market.

Without these being in place, investments may risk being without adequate efficacy or having low cost-effect ration, in other words it is very expensive to achieve the desired results.

Drivers may be Public Target Setting eg. via 5-Year Plans, Profit-driven decisions of private stakeholders eg. industries and utilities emphasizing Asset Management, or new technologies, eg. digitalization. Also, energy prices reflecting true cost of operations as well as an internalization of external, undesirable effects, eg. climate change, has proven to have the potential of seriously driving change in the water sector. In China, as documented in this report, the 5-Year Plans constitute a very significant regulatory driver for the water sector.

Financing the Investments in the water sector typically originates from Government budgets, utilities or private sector. They follow different structural ways, in some cases the investor and the one actually spending the more is the same, eg. in industries, while in other cases, especially related to government budgets, the funds are distributed across eg. provinces, cities or utilities depending on the concrete case. In any case, some sort of procurement, i.e. interaction between the investor (customer) and the supplier takes place.

Procurements at a "market" is the transaction stage, where the funds of the investor is changed into some sort of solution, which could be advisory services, hardware or software. The market could bevia a direct providing of solutions without any competition, or via an open competition. In the water sector, this is often via bidding procedures following certain rules. Importantly, at this stage the demands of the investor initially formulated in terms of targets is translated into a requirements specification based on one or several standards. Exactly this process of formulating the specifications constitute a stage, where the efficacy may lose value, eg. if the standards hasn't been revised according to either public policies or availability of state-of-the-art technologies, or if the standards only relates to a given sector, not taking into account eg. energy efficiency of water technologies.

Operations and Monitoring

Following procurements of any type of solutions, it is important to look into the use of these at the operational stage. Here, effectiveness of the investments may be reduced substantially, eg. if the competences of the staff of the operator are not sufficient, e.g. when procuding digital solutions without having digital competences at all relevant levels of the organization. Other examples include lack of incentives for the organization to effectively apply the solutions, eg. if economic incentives of a utility doesn't reward a utility to make full use of equipment related to reduction of non-revenue water (water leakage), due to that the utility itself are not allowed to keep increased incomes. Globally, it constitute a huge efficacy problem, if utilities don't have the right incentivized framework conditions in terms of a ring-fenced economy and the ability to get pricing right. Particularly important to mention is the importance of getting pricing right: energy costs have the potential to be a key driver for efficacy in the water sector, but this is lost if prices are substituted. Also, seriously important for having a strong value chain is the ability of a utility to implement a true-cost-of-ownership approach in its economic operations. This may be a key reason for not building sufficient interest on the operator side to procure state-of-the-art solutions with low, long term operational costs compared to the cost profile of bulk solutions.

At the end of the day, not monitoring market efficiency and effectiveness of investments and initiatives implies a huge risk of budget resources spend not leading to a desirable effect profile to the investor. To public money spend this means long-term costs being unnecessarily high.

Value Creation

The choice of technical solutions have huge implications for long-term value creation for the end-users, society and industries. The effectiveness of the steps in the value chain are all important, and it is therefore important to carefully examine these. This may be easier said than done, as each step very likely represents different authorities within different ministry lines and different levels of society (national-province-districts-cities etc.)

Many observations point to, however, that there in a long-term perspective is a tangible benefit to society if choosing the (often) costlier state-of-the-art solutions over the cheaper, bulk solutions, both in China and in Europe.

Value Chain Element	Assessment
Market Drivers and Enablers	Ambitious political targets. Drivers and Enablers leads to significant new technologies. Increasing energy prices calls for high efficiency. Digitalization offers huge potential. Carbon neutrality still not a huge factor in water sector.
Budget Allocation and Requirements from Financers	Huge budget allocations takes place. Private financers pay increasingly higher attention to long-term performance of technologies. EU Taxonomy regulation puts pressure on investments of utilities.
Elaboration of Technical Specifications	Best Available Technologies exists for most of the Water Sector Challenges, but do not constitute the bulk of market transactions. Strong indications that standards for tenders are not up to date with state-of-the-art technologies.
Procurement of Technologies	A very mixed picture. Customers with the right framework conditions as well as scale and leadership shows increasing focus on the newest and most digital technologies. Other customers act according to buy cheap-not clever.
Framework Conditions for Utilities	Utilities having ring-fenced economy and autonomy in decision-making able to deliver long-term value for society. However, utilities without this framework work under short-term perspective, with bad long-term performance. Investments based on grants not Sustainable Financing.
Asset Management and Use of Technologies	Growing interest for Asset Management among larger utilities, who are capable of utilizing the potential of digitalization. However, small and medium utilities and operators are not all capable of operating in a high-efficiency manner.
Long-term Value Creation for Society	Large players with capable of operating new, digital solutions and with economic framework conditions, which promotes Sustainable Financing promotes long-term value. Other players and bulk-oriented markets will lead to low water use and treatment efficiency, high operational costs.

4.5 Formulation of Tenders

In the questionnaire, the answers related to Tenders gives a very mixed pictures, reflecting an overall conclusion, that it can not be taken for granted that they will facilitate Best Available Technologies, will ensure transparency or be easily accessible, or that they will promote long-term value creation for society. The answers are shown in the following table:

Question	Options for answers	Percentage responded
Do Tender Systems facilitate Best Available Technologies? (BAT)	Yes, in more or less all cases	30%
	Yes, in some cases, but the systems ignore long-term costs and durability of the technologies	30%
	No, in most cases the systems prioritize technologies, which are not up to date with BAT	27%
	Do not know	13%

Question	Options for answers	Percentage responded
Do you consider Tender Systems to be accessible and transparent?	Yes, in most cases	30%
	This varies very much, locally Tenders can be difficult to access or in-transparent	38%
	No, in most cases they are not	21%
	Do not know	11%

Question	Options for answers	Percentage responded
Do Tenders related to water supply infrastructure investments have different quality standards and requirements in different provinces and cities?	Yes, there are huge variations	33%
	Yes, but of minor scale	25%
	No, standards are the same in all provinces and cities	17%
	Do not know	25%

Question	Options for answers	Percentage responded
Do Tenders allow for Customized Solutions applicable for specific, local Circumstances (as opposite to Standardized solutions causing over/ Undersized designs of Water Infrastructure)?	Yes, to a high degree	39%
	Yes, but only to some degree	42%
	No, not very much	5%
	Do not know	14%

The results of the questionnaire should be considered with care, as they only relates to a relative small number of respondents (37 out of the approximately 400 recipients of the Business Program maillist, close to 10%) compared to vast geographical scale encompassed by this report.

However, they still give quite clear indication of market and value chain in-efficiencies, which in turns implies huge, long-term operational costs for society in delivering water and wastewater services, and with an undesirably low effect, which should be analyzed further.

In this context, the framework conditions for the operators, notably utilities constitute a very important focus area for review of water sector functioning.

During 3rd quarter 2022, the CEWP Business Program will publish thematic reports on the full results of the questionnaire as well as a report on Sustainable Financing of the water sector.

In the next chapter, the Draft Policy Recommendations are introduced.

5. Policy Recommendations

5.1 From Analysis to Policy Recommendations

In the first part of this chapter, the main conclusions and observations from the Analysis Chapter will be summarized and translated into a number of suggestions, and finally presented as the Draft Policy Recommendations. In this

5.2 Improve Technology Transfer to support Green Transition

Use of new solutions are essential to facilitate the Green Transition. Technology Transfers from other sectors and other markets constitute a proven road to a successful Green Transition. During these years, technology transfer from other sectors regarding digitalization holds huge potential for improving operational efficiency. However, developing new solutions requires investments form public or private sources. For private companies to invest in solutions for the water sector, reducing policy risks are extremely important. Policy Risks are especially related to uncertainties about when Public Authorities will imply specific regulations, hereby also changing the market playing field. For the Chinese Market, the long-term practices embedded in 5-Year Plan is a strong tool for reducing policy risks, if this is also translated into upgrading standards used for design of tenders accordingly. Without ao. such changes, the market will still request bulk solutions instead of the costlier, but much more effective state-of-the-art solutions.

A suggestion could be to select technologies / market segments are of particular importance and carry out a "service check" of the entire value chain.

Technology transfer from other markets, in other words, access of international companies with relevant technologies to the Chinese market is essential. Beginning with challenges related to language difference, EUCCC in its annual Position Paper (latest version covering 2021/2022) documents a number of market barriers for international companies established or considering to establish in China. Some years back, IP-fraud constituted a significant problem, however this has now ceased due to important changes in the legal framework and court system. Among current challenges for companies considering to establish in China, the requirement of having documented proof-of-technology cases from within China constitute a significant barrier. Also highly important to mention is the important role played by standards used for designing requirements specifications used in bidding rounds.

Also for this topic, a "service check" of the actual content of key standards should be examined, both for the technological requirements related to the water sector, but especially also requirements related to the energy efficiency of the products.

5.3 Increase Public Value Creation from investments in Water Sector

Next to the impact of the "Market Functioning" on which type of products are procured following bidding rounds, and which companies actually has access to the market, as outlined in Policy Recommendation #1, it is of outmost importance for Public Value Creation from investments in Water Sector to follow to which extent the procured solutions are used in an efficient manner.

Especially to factors may decrease the public value of investments: lack of competences in the organization of the operator and lack of economic incentives to prioritize efficient use of the procured technologies.

Lack of competences could eg. be within digitalization. Efficient used of digital solutions requires adequate competences of the staff to ensure efficient use. A "Technology Fix" approach to addressing problems via procurement of new solutions, which sounds good, but takes place without sufficient assesments of the assumptions for effective use of the technologies, may easily result in decrease of public value of the investment. This is typically happening in operational contexts, where the economic incentives framework for the operator isn't established in a comprehensive manner.

A suggestion could be to review this framework for the public operators undertaking procurement of new technologies.

Lack of economic incentives to prioritize efficient use of the procured technologies relates to the operators not having sufficient internal pressure, strategy or competences to make full use of procured technologies. An example is water leakage, which can often, and very surprisingly, be found an areas with severe water scarcity. The reason that water leakage of 20-70% (global cases) can be found in the lack of economic incentives for the utilities responsible for water supply. Some time, they have stronger incentives for addressing water supply by increasing the water resources brought to the system, instead of reducing water leakage – which is the "resource-related name" for the term non-revenue water, which is the "utility economy name". In the situation, where the utility doesn't have a "ring-fenced economy" allowing it both to define the prices, but also to retain the income generated from turning unpaid water losses eg. illegal tapping into revenue streams, the consequence is often neglect of water leakages. Another aspect of the lack of a ring-fenced economy is often the neglect of long-term economic costs of operations, which as a consequence has the lack of interest in economically efficient technologies. Again a structural reason for lack of interest in state-of-the-art technologies, which are typically more expensive to procure, but with much less long-term operational costs.

A suggestion could be to review the incentives structures and operational framework conditions for utilities and other water sector operators seen in the context of securing long-term sustainability, both environmental and economic.

5.4 Reduce Carbon Footprint of the Water Sector

The Carbon Footprint of the Water Sector is a factor often not addressed by the sector itself, however it may add up to a substantial amount of greenhouse gas emission contributing to climate change, and in turn to worsening the challenges within the water sector, in particular water scarcity and floods following cloudbursts. Climate Change Adaptation, especially Sponge City programs, progresses quite well, but regrettably, however, the water sector itself has not turned a reduction of its footprint into a systematic approach covering all parts of its value chain. The energy use of the sector, in particular via electricity use, is estimated to be at the scale of 2-10% of the total, national electricity consumption. This originates both from the water supply and the wastewater management side of the water cycle.

On the Water Supply side, inefficient use of water as well as water leakages are substantial drivers of greenhouse gas emissions – unnecessary amounts of water hereby have to transmitted and distributed, requiring electricity for pumps, treatment and filtering etc. In other words, this is not only waste of money, but also a driver for climate change, with no public value created, only extra problems.

Accordingly, a shift from a supply-side to a demand-side approach to water resources management is suggested.

On the Wastewater Management side, greenhouse gas emissions occurs both in the shape of carbon dioxide (CO2), methane (NH4) and nitrous oxides (NO2), which each requires different measures, but which altogether is technically possible within not just energy-neutrality, but actually within energy-producing set-up. Technologically, a shift from WWTP (Wastewater Treatment Plants) to WRRF (Wastewater Resources Recovery Facilities) is possible. In many places, standards for design of tenders only relates to outdated technologies not taking energy efficiency into account, and combined with public target for wastewater only applied within sector topics notably water quality, the end result may easily be public expenditures spend on improving water quality leading to adding to climate change problems. And probably at the same time not even leading to application of the newest wastewater treatment technologies eg. digitalization.

Altogether, a review of procurement procedures and standards within the scope of the entire water-food-nexus is suggested.

5.5 Draft Policy Recommendations

At this stage, it is premature to develop precise Policy Recommendations, which points to specific actions to be taken by specific authorities and with specific outputs at policy level.

Therefore, the Draft Policy Recommendations of the Business Program consists of a number of suggestions for specific topics to be examined in detail.

The draft Policy Recommendations are suggested as follows:

- *Reg. Geographical Variations in Tenders: "It is suggested to examine to which extent Public Tenders on Water Supply Infrastructure facilitate the use of Best Available Technology at the same level in all Provinces, Cities and Countries across China and Europe"*
- *Reg. Customized Solutions: "It is suggested to examine how Customized Solutions (Instead of standardized solutions to all use cases) applicable to specific, local circumstances can be promoted"*
- *Framework Conditions for Utilities: "It is suggested to examine to which extent Utilities operating the Water Infrastructure are working according to framework conditions, which ensures a focus on long-term economic and environmental sustainability including Best Available Practice within Asset Management"*
- *Reg. Water Leakage: "It is suggested to examine to which extent Public Tenders on Water Supply Infrastructure apply most strict requirements to ensure reduction of Water Leakage by applying Pressure Zone Management, District Meter Areas, and state-of-the-art technologies regarding pipes, valves, fittings and meters*
- *Reg. Wastewater Treatment and Energy Efficiency: "It is suggested to examine to which extent Public Tenders on Wastewater Treatment Infrastructure apply most strict requirements regarding becoming Resource Recovery Plants in order to ensure contribution to Climate Neutrality in the Water Sector by applying Energy Efficiency in Wastewater Treatment Plants and addressing all Greenhouse Gas Emissions"*
- *Reg. Digitalization: "It is suggested to examine to which extent Public Tenders on Water Infrastructure by ensuring uptake of the possibilities for increased efficiency and impact stemming from Digitalization"*

The suggestions have been circulated as part of wider questionnaire in June 2022, send to the CEWP mail list of companies, government representatives, researchers etc., where 27 provided their response.

	Do you find this suggestion relevant?			
Theme	Yes, very much	Yes, but not so important	No, not much	Don't know
Geographical Variations	53%	22%	8%	17%
Customized Solutions	60%	32%	3%	5%
Framework Utilities	60%	32%	0%	8%
Water Leakage	68%	19%	0%	13%
WWT and Energy	59%	27%	0%	14%
Digitalization	65%	27%	0%	8%

Obviously, these answers are therefore only indicative, however some of the results seems rather clear and point to huge relevance regarding both the questions (for all details, visit www.cewp.eu) and in particular the policy recommendations.

6. Annexes

Annex 1- List of Events and Webinars organized by the CEWP Business Program, 2018-2022

2018							
Date	**Venue**	**Theme**	**No. of participants**	**No. of presentations**	**Cooperating organizations**	**Links**	**Products**
May 3-5th 2018	IE Expo Shanghai	Business opportunities for European companies in China	60	7	EU SME Centre, IE Expo	Invitation: https://www.cewp.eu/access-chinese-market-water-technologies Outputs: https://www.cewp.eu/business-workshop-ie-expo-shanghai-2018-how-do-water-business-china	
June 27th-28th 2018	CWEC Expo, Qingdao	Rural Water and Business opportunities for European companies in China	200	8	CWEC	Outputs: https://www.cewp.eu/cewp-access-program-activities-cwec-qingdao-international-water-conference	3 sessions

						https://www.cewp.eu/cewp-held-several-events-during-qingdao-water	
November 8th, 2018	Side-event at Annual High-level Meeting, Beijing	PPP	150	4	MWR	Outputs: https://www.cewp.eu/cewp-high-level-meeting-day-1-closes-successfully	
December 4th, 2018	Side-event at SLUSH, Helsinki	Digitalization	30	6	ELY	https://www.cewp.eu/registration-now-open-business-event-digitalization-water-slush-helsinki-4th-december	
2019							
Date	**Venue**	**Theme**	**No. of partici-pants**	**No. of presenta-tions**	**Cooperating organisations**	**Links**	**Products**
April 12-13th 2019	Qingdao	Industrial water use	170	22	EU SME Centre, WSSTP, EUPIC	Invitation: https://www.cewp.eu/business-event-industrial-water-use-food-sector Outputs: https://www.cewp.eu/information-meetings-qingdai-and-ie-expo-shanghai-april-2019	1 program
April 14 th 2019	Shanghai IE Expo, side event	Industrial water use and technology	30	8	EU SME Centre, WSSTP, EUPIC, Enterprice Europe Network	Invitation: https://www.cewp.eu/business-event-industrial-water-use-food-sector Outputs: https://www.cewp.eu/information-meetings-qingdai-and-ie-expo-shanghai-april-2019	1 program
November 5th 2019	Amsterdam Aquatech Expo sideevent	China Water Market Outlook	50	2		Invitation: https://www.cewp.eu/newsletter-upcoming-cewp-events Outputs: https://www.cewp.eu/chinese-water-market-dos-and-donts	
November 6th 2019	Amsterdam Aquatech Expo sideevent	Launch of Urban Water 2020 Program	50	2	Aquatech, Lot 3	Invitation: https://www.cewp.eu/newsletter-upcoming-cewp-events Outputs:	

						https://www.cewp.eu/launch-urban-water-2020	
November 2019	Guimaraes	Ready for China	75	8		Invitation: https://www.cewp.eu/take-part-cewp-business-and-innovation-program-2019-market-segment-theme-industrial-water-use-your	
November 11-12th 2019	Chengdu EUPIC Twinfair	The Chinese market for industrial water use and technology, B2B and Matchmaking	150	12	EUPIC	Invitation: https://www.cewp.eu/business-event-industrial-water-use Outputs: https://www.cewp.eu/sites/default/files/files/Final%20Draft%20Report%20from%20EU%20China%20Water%20Developmner%20Forums%20in%20Chengdu%20and%20Qingdao%20November.pdf (this version will be changed as it is in bad shape)	1 program, 1 report, 2 background documents
November 13-14th 2019	Qingdao EUPIC Twinfair	Industrial water use and technology, B2B and Matchmaking	150	15	EUPIC	Invitation: https://www.cewp.eu/business-event-industrial-water-use Outputs: https://www.cewp.eu/sites/default/files/files/Final%20Draft%20Report%20from%20EU%20China%20Water%20Developmner%20Forums%20in%20Chengdu%20and%20Qingdao%20November.pdf (this version will be changed as it is in bad shape)	1 program
2021							
Date	**Venue**	**Theme**	**No. of partici-pants**	**No. of presenta-tions**	**Cooperating organisations**		
March 16th 2021	Webinar	Water management in development of Blue-Green cities	40	7	EU SME Centre, Aquatech, RAI, European Commerce, IWA, Lot 3	Invitation: https://www.cewp.eu/business-webinar-water-management-development-blue-green-cities Outputs:	1 program

						https://www.cewp.eu/webinar-blue-green-cities	
March 30th 2021	Webinar	Efficiency of Urban water infrastructure	80	10	EU SME Centre, Aquatech, RAI, European Commerce, IWA, Lot 3	Invitation: https://www.cewp.eu/business-webinar-efficiency-urban-water-infrastructure Outputs: https://www.cewp.eu/efficiency-water-infrastructure-presentations	
April 29th 2021	Webinar	Smart water management in the whole urban water cycle	65	11	EU SME Centre, Aquatech, RAI, European Commerce, IWA, Lot 3	Invitation: https://www.cewp.eu/business-webinar-smart-water-managing-whole-urban-water-cycle Outputs: https://www.cewp.eu/smart-water	
May 18th 2021	Webinar	Carbon Footprint in the urban water sector	40	7	EU SME Centre, Aquatech, RAI, European Commerce, IWA, Lot 3	Invitation: https://www.cewp.eu/business-webinar-carbon-footprint-water-sector Outputs: https://www.cewp.eu/carbon-footprint	
June 2-4 th 2021	Aquatech Shanghai	Digitalization, Circular Economy	80	6	ELY Centre EU SME	Invitation: https://www.cewp.eu/digitalisation-water-sector-aquatech-china-2021 https://www.cewp.eu/digitalisation-water-sector-join-seminar https://www.cewp.eu/join-seminar-about-circular-economy-and-water-sector-aquatech-china-2021 Outputs: https://www.cewp.eu/aquatech	2 events
June 9, 2021	MRW Expo, Wuhan	Urban water-sponge cities, waste water treatment, water reuse, leakage	100	13	EU SME Center Report from Aquatech Shanghai	Invitation: https://www.cewp.eu/cewp-business-exchange-meeting Outputs: https://www.cewp.eu/review-cewp-	

						business-exchange-meeting	
November 2-4 rd 2021	Aquatech Amsterdam	China Market Outlook	65	4		Outputs: https://www.cewp.eu/chinese-water-market-and-technology-outlook-2021-side-events-aquatech-amsterdam	2 events
2022							
Date	**Venue**	**Theme**	**No. of partici-pants**	**No. of presenta-tions**	**Cooperating organisations**		
March 29th 2022	Webinar	Roundtable-CEWP Market and technology outlook	35	5	EU SME Centre, Aquatech, RAI, European Commerce, IWA	Invitation: https://www.cewp.eu/index.php/webinar-series-chinese-market-rural-water-technologies-0 Outputs (se et stykke need i teksten): https://www.cewp.eu/index.php/webinar-series-chinese-market-rural-water-technologies	
April 19th 2022	Webinar	Water supply and wastewater infrastructure in small-medium sized cities	50	10	EU SME Centre, Aquatech, RAI, European Commerce, IWA	Invitation: https://www.cewp.eu/april-19th-webinar-small-scale-water-supply-and-wastewater-infrastructure-small-medium-cities-and Outputs: https://www.cewp.eu/index.php/small-scale-infrastructure-rural-areas Extra output: https://www.cewp.eu/white-paper-small-scale-water-supply-and-sanitation-rural-areas	1 program
May 24th 2022	Webinar	Improving water quality with better data	40	8	EU SME Centre, Aquatech, RAI, European Commerce, IWA	Invitation: https://www.cewp.eu/webinar-digitalization-water-quality-management-data-generation-value-creation Outputs: https://www.cewp.eu/webinar-	1 program

						improving-water-quality-management-better-data	
		Total	1.700	175			

Annex 2- Key References:

EU Chamber of Commerce China Position Paper 2021-2022
https://www.europeanchamber.com.cn/en/publications-position-paper

CEWP: Conclusions and main findings from events about Industrial Water (2019):
https://www.cewp.eu/sites/default/files/files/Final%20Draft%20Report%20from%20EU%20China%20Water%20Developmner%20Forums%20in%20Chengdu%20and%20Qingdao%20November.pdf

Report specific about China Industrial Wastewater Policy Overview and Opportunities for EU SMEs in Qingdao & Chengdu Area, this report was elaborated for CEWP by the EU SME Centre in 2019:
https://www.cewp.eu/sites/default/files/files/event%20files/Industrial%20Wastewater%20Report_(6th%20September%202019).pdf

CEWP: Conclusions and main findings from events about Urban Water (2021):
https://www.cewp.eu/sites/default/files/2021-11/CEWP%20Webinar%20Series%202021%20Draft%20Consolidated%20Report%201406211%20HEDIS.pdf

Presentations and interventions at CEWP webinars and events: https://www.cewp.eu/news-events

Circular Economy in the Wastewater Sector

https://www.cewp.eu/sites/default/files/2021-05/CEWP_Whitepaper_Circular%20Economy%20of%20Water%20in%20Waste%20Water%20Treatment_final.pdf

China Carbon Neutrality 2030/2060 in the Water Sector

https://www.cewp.eu/sites/default/files/2021-05/China%20WW%20carbon%20neutrality%203060%20path%20and%20solution%20report_NORDIQ0428.pdf

China Water Risk: https://www.chinawaterrisk.org/resources/analysis-reviews/looking-for-water-in-chinas-14fyp/

Global Water Intelligence, Global Water Market 2017 https://www.globalwaterintel.com/products-and-services/market-research-reports/global-water-market-2017

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