



**CHINA
TOP SECTOR WATER
WATER TECHNOLOGY:
OPPORTUNITIES FOR
DUTCH BUSINESSES**

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**SUPPORTED BY EMBASSY OF THE KINGDOM OF THE NETHERLANDS IN BEIJING,
INFRASTRUCTURE & ENVIRONMENT**

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The business opportunity reports are a joint production of the Netherlands economic government network in China consisting of the Embassy of the Kingdom of the Netherlands in Beijing, the Consulates-General in Chongqing, Guangzhou, Hong Kong and Shanghai, and the Netherlands Business Support Offices (NBSO's) in Chengdu, Dalian, Jinan, Nanjing, Qingdao and Wuhan.

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Ministry of Infrastructure and the
Environment



Netherlands Enterprise Agency



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I

THE NETHERLANDS AND CHINA

In the past four decades, China has become the world's second largest economy, with the Netherlands as its second largest trading partner within the European Union. This massive achievement has lifted hundreds of millions of Chinese out of poverty and brought along China's current important role on the global stage.

At the same time, China's rapid economic rise poses new challenges. Combined with heavy industrialisation, massive urbanisation and the increasing consequences of climate change, China's environmental and societal prosperity are put to the test. Both water quantity (too much, too little) and water quality pose severe treats to the further development of the country and are therefore on top of the list of the Chinese government to act upon. As a consequence of these developments, a more collaborative, future-proof and integrated approach when it comes to water management is needed to guarantee long-term prosperity.

To help and find an integrated approach to respond to the increasing effects of urbanisation, pollution and potentially damaging impacts of climate change, a number of Dutch companies have started cooperation with Chinese companies, governments and institutes on a broad range of water-related projects during the last ten to fifteen years. By now, thirty-something reputable Dutch companies are active in China's water sector, each with their own specialism and worldwide experience. Most of the Dutch companies active in China focus on planning (integrative approach), monitoring and waste water treatment, and are mainly active in major cities in Eastern and Central China.

SUMMARY OF GENERAL DEVELOPMENTS AND OPPORTUNITIES FOR THE DUTCH WATER TECHNOLOGY SECTOR

In a country where the growing demand for water exceeds the supply, the Chinese water sector is facing great challenges. Especially in the north of the country, water shortages are expected to grow in the coming years, mainly due to the rapidly developing Chinese economy. At the same time, industry and agriculture needs more and more water to fulfil the growing demands of the population. Standards for drinking water have been raised to an international level, requiring local governments to upgrade their water purification facilities. Standards for waste water emissions are more and more severely implemented. The Chinese government realizes that to meet the increasing demand, liberalization of the water sector is needed, as well as the adaption of foreign technology and expertise.

Considering the strong points of the Dutch water technology sector, there are business opportunities in all parts of the production process (water extraction, treatment, distribution and use) as well as in (industrial) waste water treatment.

Facts and figures

With only about 6% of global freshwater resources, China needs to provide water to support its rapidly developing industrial sector, as well as 20% of the world's population. These factors have brought enormous challenges to China's water industry. Some more alarming facts:

- The per capita water volume in China is only one-fourth of the world average. The total used water volume is 604 billion cubic meters, with agriculture and industrial use as the top two sectors for water consumption.
- 400 out of 600 cities in China are facing water shortages to varying degrees, including 30 out of the 32 largest cities.
- Groundwater tables are depleting rapidly at a speed of about 1 meter per year due to over-exploitation.
- A lack of municipal waste water treatment is still a big driver of water pollution throughout China.
- Chinese water prices do not reflect its scarcity and are significantly below prices in countries with adequate water supply per capita.

The water shortages are most severe in northern China, where surface water diversion is excessive and groundwater is being depleted. Currently, agriculture accounts for 65% of China's total demand for water. Industrial and domestic water usage will account for the majority of demand growth, with agriculture's share of water use projected to decline to 50% by 2030.

II

CHINESE GOVERNMENT: INVESTMENT AND DEVELOPMENT PLANS

To cope with the challenges mentioned above, the Chinese government seeks solutions to expand water supply, improve water use efficiency and promote environmental protection and enforcement in China. Water sector policymakers are increasingly looking for economic tools such as proper pricing mechanisms and the elimination or modification of subsidies to support the sustainable management of China's limited water resources.

The government's solutions to the issues have been laid out in the "Water Pollution Prevention and Control Action Plan" launched in 2014, usually referred to as the 'Water Ten Plan'. This plan is the result of coordination and input of more than 12 ministries and government departments, and sets out 10 general measures to solve the water-related issues the country is currently facing.

The Water Ten Plan is probably China's most comprehensive water policy to date. Some key targets and actions are listed below:

- By 2020, China's water environment quality will gradually improve;
- To greatly reduce the percentage of badly polluted water bodies;
- To improve the quality of drinking water;
- To reduce the over-extraction of groundwater and control groundwater pollution;
- To improve the environmental quality of coastal areas;
- Improve urban water environment in key regions;
- By 2030, the overall quality of the ecological environment will be improved;
- By the middle of 21st century, the quality of the ecological environment should be fully improved and the ecosystem should realize a virtuous cycle.

In addition, the Chinese government's major document, the 13th Five Year Plan (FYP) (2016-2020) reflects China's heightened commitment to tackling environmental issues. The most notable new targets in the 13th FYP are related to surface water, soil, and air quality, as well as a cap on coal consumption. As direct market driver, the 13th Fifth Year plan contains elements aimed at increasing government spending in the water industry. The 13th FYP allocates funds to expand access to drinking water sources and for improvements to existing treatment disposal facilities.

In Premier Li Keqiang's work report on the 13th FYP, water is a major priority. Li acknowledges the "relatively poor" quality of China's water and the "severe" over-extraction of groundwater in some regions. China did not meet the goal laid out in the 12th FYP (2010-2015) to cap water consumption to 600 billion cubic meters, and instead had consumed 618 billion cubic meters by the end of 2015. Acknowledging the challenge of limiting consumption, the cap in the 13th FYP requires reducing water consumption per unit of the nation's GDP by 23% over five years.

The 13th FYP sets sewage treatment targets of 95% in cities and 85% in counties. It also places a cap on agricultural fertilizer and pesticides, limiting their use to current levels. In the 13th FYP, officials address the groundwater problem through acknowledging the scope of soil pollution and calling for a second pollution census, the first of which was completed in 2010. These water and soil targets are significant because they suggest a more holistic approach to environmental reform, given the focus on pollution that is less visible than city smog. Another major addition to the 13th FYP is the announcement of the release and implementation of a soil pollution action plan.

Accordingly, each ministry that is involved in water management also enacts its own 13th FYP for its own work. For instance, the Ministry of Water Resources (MWR) enacted a FYP on water conservancy work. Since the 12th Five year plan, more stringent water management is implemented in order to fulfil the goal of water security.

In the 13th FYP, water safety is still the most important objective. The water conservancy work in China historically focuses on flood control, as the country has many large rivers and the nation's main economic growth is taken place in the areas around rivers and deltas. But now that the national development strategy has shifted to put more emphasis on quality growth, water conservancy has been broadened to address the whole national water resource management.

According to MWR's new planning, water conservancy work will be focused on four key areas:

- 1) Water saving
- 2) Perfecting water conservancy development mechanisms
- 3) Improving water conservancy infrastructure
- 4) Protecting/restoring the water ecological environment

Another important feature is that the water conservancy work will also be aligned with other national strategic initiatives, such as the Belt and Road Initiative (BRI), Jing-Jin-Ji Integration and the Yangtze River Economic Belt Development.

To support the BRI, China will make efforts to facilitate knowledge sharing with other BRI participating countries, such as promoting service exporting on water conservancy surveying and consulting, project management, export of water conservancy equipment. In line with the Jing-Jin-Ji integration strategy, specific measures will be designed to ensure that urban planning takes water capacity and ecological protection into full consideration. This may involve setting up a stricter industrial entry and withdrawal mechanism, optimizing water distribution and improving water ecological system restoration by pro-active approach. With regard to the Yangtze River Economic Belt Development, the priority is to protect and restore the ecological system of the Yangtze River and align the protection efforts of the different cities and the different stakeholders along the Yangtze River.

It will also make great efforts to strengthen the protection of resource areas of drinking water, improve the flood control capability and optimize water resources distribution and allocation for all types of water use. At present, China has a system of river dikes and reservoirs that extend over 270,000 km and 85,000 km respectively.

During the period covering the 13th FYP (2016-2020), the Chinese water industry is forecast to continue growing strongly, mainly driven by the rising investment from governments in water pollution control projects. The annualized growth rate for industry revenue is forecast to be 14.6% in the next five years.

A large part of the central government's economic stimulus package will continue to be invested in water pollution control projects. This will directly and substantially drive the development of the industry in the next five years.

III

MARKET TRENDS AND DEVELOPMENTS

More enterprises will continue to enter the industry to meet the increasing demand from governments and private enterprises. Numbers are expected to increase at an annualized rate of 7.8% in the coming five years, while enterprise numbers are forecast to only increase by 5.6% per year. As firms grow larger in size, more enterprises will be able to operate in multiple regions and establish subsidiaries and additional offices.

As environmental protection is taken into account for the assessment of political achievements, more local governments will invest in supporting water pollution control projects. Local governments tend to invite submissions of specialized enterprises for pollution control through public bidding. More local governments will also start supporting the development of environmental protection enterprises, through financing, favourable tax policies, land approval and other related incentives.

More effective and cost-saving technologies for water pollution control will be developed and put into practice in the coming five years, as governments, enterprises and research institutes will all invest more in R&D activities. The development of more and improved technologies will also greatly benefit the industry's efficiency and profitability.

Many foreign players use advanced technologies, and many more are expected to enter the industry in China to meet the substantial demand for water pollution control services. Their entry will also enhance the overall technology level of the industry and intensify competition levels. The continued entry of foreign companies will therefore greatly benefit the industry and the environment in future years.

OVERVIEW OF CHINA'S WATER INDUSTRY PER SUBSECTOR

Water extraction

This sector is mainly controlled by state-owned enterprises with some involvement from foreign and private players. However, private and foreign companies are quite active in areas from the provision of technologies, services and equipment to water extractors. Examples are underground source identification services, extraction technologies and water source measurement.

The industry is highly fragmented, which is a direct result of the geographically based administrative allocation of water rights to market participants in China. More concentration is found in the components and services markets, such as well drilling and high-pressure pump manufacturing. Concentration will also likely be seen in industries providing desalination technologies and equipment as China continues to promote seawater utilization at a larger industrial scale.

Water treatment

In this fragmented industry, many cities have their own primary water treatment plant, directly affiliated with the local government. Although the industry is dominated by state-owned entities, many private and foreign players are involved as designers, builders, operators and technology suppliers.

In 2007, the Chinese government lifted the restriction on ownership of water treatment plants, which resulted in a wave of industry participation by foreign and private entities. Public-private partnerships for water treatment are becoming increasingly common in first and second-tier cities.

Water distribution

Since 1978, the total length of pipelines has grown over 10 times, to a total length of around 400,000 km. With China's ongoing urbanization, the demand for water pipeline growth will certainly continue. However, China's water distribution systems are often unprofitable, because of old distribution networks (high leakage), no payment for water distribution, and inaccurate water meters.

Water distribution systems in China are operated by state-owned enterprises, which also dominate system design and construction. So far, foreign enterprises hardly participate in water distribution networks. Although regulations allow foreign investment as a minority interest in joint ventures with state-owned utility companies, low profit potential limits the inflow of private and foreign capital.

The greatest opportunities for foreign players in the water distribution market are in advanced technologies or expertise, such as high-efficiency pumps, advanced water measurement technologies, network leakage, detection and repair, and integrated monitoring systems.

Water use

China's water consumption is dominated by agriculture, but industrial and domestic consumption are expected to grow in importance. Total annual water consumption is projected to increase from 554 billion m³ in 2005 to 832 billion m³ in 2050. Market demand for water-saving technologies is growing, partly driven by regulatory requirements. In large cities, population growth continues to drive demand for drinking and industrial water use.

China's push for a green and sustainable economy provides an opportunity for firms to promote the use of advanced technology in this sector to help conserve water resources. One area with particular potential is irrigation improvement, which can conserve water, reduce environmental problems and boost food production. In addition, technologies used to decrease private water use are growing in importance. The greatest opportunities for foreign players seem to be in water saving technologies and equipment, and advanced irrigation technologies and equipment.

Waste water treatment

China's waste water treatment market is increasingly fragmented with more players, both domestic and foreign, looking to enter the market. An estimated number of over 3,000 active players of different sizes are currently operating in the market, with the ten strongest players estimated to hold less than 10% of the market share. Some of the domestic players are becoming innovative, while foreign players' technologies and products are still regarded as being superior to those of their Chinese counterparts.

In recent years though, with the growing wealth of consumers in China, southern, eastern and western provinces have seen a growth in the market for water treatment systems. Residential water treatment is emerging as the major solution among a growing number of consumers in second and third tier cities, who seek clean drinking water. The demand is growing rapidly throughout the country.

Demand for water pollution control services is mainly from governments at various levels who are increasingly responsible for handling greater levels of pollution across inland waters and underground water systems. However, due to stricter regulations on waste water discharge by factories, many industries are also increasingly looking for waste water treatment technologies to bring their waste water up to standard. Especially companies in power, coal, mining, metals & steel and chemical industries are feeling the heat of the environmental regulations and enhanced enforcement.

It is expected that these new regulations will boost the waste water treatment industry by 300 billion US dollars in the years 2015-2020. Types of waste water are diverse, depending on the industry, ranging from food processing waste water to waste water from coal washing. Some of these streams can be heavily polluted, which means that sophisticated methods and technologies are needed.

Water quality monitoring

It is expected that the demand for monitoring equipment will increase over the coming years, due to the water quality standards and the increased attention to water quality. This can be the water quality of surface water, ground water or water that is transported in the water mains, for instance. Authorities will be looking for ways to monitor water quality effectively and efficiently and to manage the data. This provides opportunities for companies specialized in water quality sensors, remote sensing and the combination with IT and data management.

Technologies used in water treatment

As early as 2000, the Chinese government started cooperation with private companies and financiers, including foreign players, in order to acquire water technology. Water officials have explicitly encouraged foreign participation in China's water markets, especially in waste water treatment projects.

The new standards for drinking water in 2012 are considered to be a real challenge for the industry given the current low levels of technology. This will thus drive the need for more advanced water treatment technologies and equipment, which represents a significant opportunity for foreign companies. It is estimated that around 1,500 water treatment plants will have to invest in a technology upgrade.

Water in China is mainly extracted from surface water (81%) and groundwater (18%). Faced with severe surface water scarcity and the groundwater overdraft problem, the Chinese government has shown great interest in promoting the utilization of rainwater and seawater, resulting in pilot projects across the country. For example, several desalination pilots have been started in coastal areas, such as Tianjin and Zhejiang.

In the field of waste water treatment, a wide variety of technologies are used in China. Physical waste water treatment technologies are cheap, but fail to remove the most harmful pollutants while biological technologies can substantially decrease waste contamination. Chemical treatment processes are necessary for China to meet water pollution reduction targets, but also contribute to pollution.

Sponge Cities

As a result of increasing urbanization and climate change, cities in China face large issues when it comes to water in the city. The surface of the ground is sealed off by concrete or asphalt almost completely, which hinders infiltration drainage of rainwater into the ground. In the event of continuous or heavy rainfall, this can lead to flooding of urban areas, which can have large consequences for daily life in the city. To cope with these problems, in 2014 the central Chinese government has launched the Sponge City Construction programme, in which selected cities in China received funding for infrastructure that collects excess rainfall and integrates flood control in urban planning. In total, RMB 5.9 billion will be allocated during 2016-2018. How much a city receives depends on the size: 600 to 400 million RMB per city.

This provides opportunities for companies with expertise in design of resilient urban areas, implementation of the measures or with specific technologies related to urban water management. Sponge city pilot programmes are mainly managed by the Ministry of Housing and Urban-Rural Development (MOHURD), while receiving coordinated support from the Ministry of Water Resources, (MWR) and the Ministry of Finance.

The first batch of 16 pilot cities was selected in 2015 and, in 2016, another 14 cities were added as the second pilot batch. Since this year, sponge city pilot projects have spread to more cities, with financial support from provincial governments and local municipalities. There are 120 newly approved sponge city projects nationwide at different levels so far.

IV

INFORMATION ABOUT LEGISLATION

China's water industry affects a broad range of areas in Chinese society including health issues, pollution and natural resources. As such, the industry is regulated by a range of government organs, both at the national and sub-national level.

At national level, a number of Ministries are involved in the water sector, with different foci. Major players are the Ministry of Water Resources (surface water), Ministry of Land and Resource (underground water), Ministry of Environmental Protection (industrial water treatment), Ministry of Housing and Rural-Urban Development (municipal waste water treatment), and Ministry of Health (water purification). Each of these Ministries is represented at municipal level as well.

The water industry is subject to a number of laws that impact the extraction, distribution, use and treatment of water in China. The most important laws are: the Water Law, The Clean Production Law, the Appraising Environmental Impact Law, the Urban-Rural Planning Law, the Water Pollution Control Law and the Circular Economy Promotion Law. In addition to these laws, a wide range of regulations and other legal instruments, orders and standards guide water sector actors.

As water resources in China are state-owned, the central government grants water extraction rights to local organizations. In the past few years, the Chinese government has begun to codify the water rights market by introducing formal processes for water rights sales and related government supervision. This has resulted in the emergence of water concession rights markets. However, significant obstacles still remain, such as accurate monitoring and measurement of the volumes extracted at each level.

Apart from legislation, another important element of China's water regulatory framework is its environmental and water quality standards, which have been largely formulated to implement environmental protection and water resource laws. These include both water quality and discharge and emissions standards, such as:

Drinking water standards

On July 1 2012, the Chinese government raised the standards for drinking water, increasing the number of indicators to be tested from 35 to 106, working towards having China meet international drinking water standards. This measure is expected to lead to 600 billion yuan worth of investments to upgrade water purification facilities and residential water purifiers.

Discharge and emission standards

The Integrated Waste water Discharge Standard establishes the upper limit for 69 pollutant concentrations and the allowed water discharges for some industries. This applies to existing water treatment facilities and covers discharge management, environmental impact assessment, design and operational monitoring post construction.

A range of discharge and emission standards target specific industries including (but not limited to) the following:

- Chemicals
- Coal
- Electroplating
- Iron and steel
- Meat packing
- Municipal waste water treatment
- Pharmaceuticals
- Pesticides
- Pulp and paper
- Sugar
- Textiles
- Water Quality Standards
- Environmental quality standard for surface water
- Quality standard for ground water
- Standards for irrigation water quality
- Water quality standard for fisheries

V

REMARKS REGARDING DOING BUSINESS IN CHINA'S WATER SECTOR

This report aims to give a realistic overview of the opportunities in the water industry in China for Dutch companies. It is necessary to point out that operating in the Chinese market can be challenging. Success is determined by the local need for your product and services. Besides this, quite a number of water-related projects are implemented through government departments, on national, provincial and city level. This means that building up contacts with the local government organisation is essential, but this needs time. Having a local partner might help here.

The Dutch government network in China, consisting of the Embassy, four Consulates-General and six Netherlands Business Support Offices, can assist in establishing contacts with the Chinese government organisations. Please do not hesitate to contact the Dutch government network. You find a list of contact details on the last page of this report.

VI

MAJOR COMPANIES IN THE CHINESE WATER SECTOR

Some of the major Chinese and foreign companies active in the Chinese water sector are:

- Beijing Capital Co., Ltd., a company in the field of water supply and waste water treatment: www.capitalwater.cn
- Beijing Enterprises Water Group, Ltd., a company focused on waste water treatment: www.bewg.com.hk
- Sound Group, a private company, leading turnkey water and waste water treatment solutions provider: www.soundgroup.com/english/
- Sino French Water Development Co. Ltd., water production, full services, municipal sewage treatment, industrial water treatment services and investment: www.sinofrench.com
- Veolia Water China, water production and water distribution: www.veoliawater.cn
- General Water of China Co., Ltd., water treatment projects: www.generalwater-china.com
- China Water Investment Co, Ltd., state-owned company in water industry investment and relevant value-added services: www.chinawatergroup.com
- Tianjin Capital Environmental Protection Ltd: waste water treatments in Tianjin: www.tjcep.com

Main sectoral associations are:

- China Urban Water Association: www.cuwa.org
- China Water Health Association: www.zgjks.org
- China Water Network: www.h20-china.com

VII

ADDITIONAL RESOURCES

China Water Risk is a non-profit initiative, which launched the web portal chinawaterrisk.org in 2011. This website offers access to relevant information on research, government policy, regulations, sector analysis, etc. in the field of the water sector.

For more information on the industry:

- National Bureau of Statistics of China, www.stats.gov.cn
- China Environmental Network, www.chinaen.org
- Ministry of Environmental Protection, www.zhb.gov.cn

VIII

OVERVIEW OF REGIONAL OPPORTUNITIES

BEIJING – EMBASSY OF THE KINGDOM OF THE NETHERLANDS IN BEIJING

The Beijing Water Authority has stated in their 13th Five Year Plan (2016-2020) that in 2016 Beijing will invest 31.5 billion RMB (4.2 billion Euro) to spend on fixed water infrastructure and will focus on the following aspects:

- Improving water quality in the urban and rural areas by improving and extending sewage treatment and integrated river basin management;
- Increasing the amount of water recycled and water saved by water-saving measures and promoting water saving methods, by guiding companies to invest in developing water-saving technologies;
- Strengthening the collaboration with Tianjin City and Hebei Province to ensure water availability and water quality in all areas;
- Reinforcing security against floods by implementing security guidelines, implementing the Sponge City concept, upgrading flood control infrastructure and governance;
- Reforming institutional mechanisms and regulatory systems;
- PPP Project package at Two Rivers Section (the area between the North Grand Canal and Chaobei River): there are 17 projects that aim to treat the water environment in this area with a total investment of CNY 2 billion. For the North Canal ecological belt section, there is one sponge city project, which is North Canal water treatment plant, with an investment of CNY 2 billion.

Tongzhou New City

A total of 55 sponge city construction projects are planned in Tongzhou district, the total investment will be around CNY 5,715 billion. These projects include Grand Canal mud removal and cleaning projects, pump station renovation projects, building new living communities with sponge functions, green belt projects along Eastern 6th ring road and public green ground projects. Some key construction projects will also include sponge features into its design and building process, such as projects of the future administrative areas, Universal Studio, Tongzhou Campus of People's University and Beijing Film Academy and the new Eastern Railway station of Beijing.

Xiong An New District

Xiong An New District is a state-level new area (April 2017) in the Baoding area of Hebei, about 100 km southwest of Beijing. Its main function is to serve as a development hub for the Beijing-Tianjin-Hebei (Jing-Jin-Ji) economic triangle. Additionally, "non-core" functions of Beijing are expected to migrate here, including offices of some state-owned enterprises, government agencies and research and development facilities. The construction of the area is described as part of the "millennium strategy". Unlike other "new areas", Xiong An's development takes place under the direct oversight of top leaders.

The future city will be a city with many water elements, by taking full advantage of “Baiyangdian”, the large lake and wetlands covering 360 square kilometres. The city will be designed as a city co-existing with water. Water and greenland will account for 50% of city’s landscape. As the first step, water cleansing of Baiyangdian is now on the top of the agenda of central government, as one of three national key lake treatment projects, (The other two are respectively Erhai in Yunnan Province and Danjiangkou between Hubei and Henan Province). There will also be dredging and water refilling projects.

MWR has agreed to divert water with quality at grade II from reservoirs in Taihang Mountains to supply to the new city. Regarding the city’s infrastructure, the city will use unified underground tunnel systems to realize city water as well as public utility supplies. The China Academy of Urban Planning Development (CAUPD), with which Netherlands is seeking strengthened cooperation, is engaged in the master plan of Xiong An new city, but the specific planning details are still at the confidential stage and are not available to outsiders.

CHONGQING – CONSULATE-GENERAL OF THE NETHERLANDS IN CHONGQING

Chongqing Municipality

The Chongqing local Water Authority has identified six main umbrella projects for the next Five Year Plan (2016-2020): the construction of key water facilities (reservoirs), improvement of the water supply to rural areas, flood control and mitigation, improvement of farmland irrigation, improvement and protection of water quality, and improvement of the water management system. Specifically, the municipality will:

- Increase the efficiency of water consumption by increasing the recycling of industrial waste water, controlling leakages, and improving sewage.
- Increase the capacity for water supply by completing two large water reservoirs and multiple medium and smaller ones.
- Increase the accessibility of tap water in rural areas
- Install equipment to help forecast flash floods and construct flood control facilities
- Prevent riverbank soil erosion by restoring and protecting the river land ecology
- Install hydropower facilities in rural areas
- Install equipment to measure and monitor the water quality and construct multiple water quality laboratories.

Shaanxi Province

In its 13th Five Year Plan (2016-2020), the local Water Authority plans to invest RMB 289 million (EUR 37 million) in the development of 96 water projects. It focuses on constructing hundreds of kilometres of new water lines to divert rivers and on the construction of multiple larger and smaller water reservoirs. Some projects are also scheduled for starting construction during the next Five Year Plan (2020-2025), which leaves more room for

cooperation with foreign organizations. To accomplish its tasks the local governments will undertake the following projects throughout Shaanxi province:

- Construction of water supply lines, pumping stations, and water tunnels.
- Construction of water reservoirs, constructing and extending dams, and installing hydropower facilities
- Construction of diversion spill holes and spillways
- Increase the efficiency of irrigation of rural areas
- Control soil erosion along the riverbanks.

GUANGDONG PROVINCE – CONSULATE-GENERAL OF THE NETHERLANDS IN GUANGZHOU

Guangdong Province is one of the most developed regions in China. If Guangdong would be an independent economy, it would rank 16th in the world. Water resources are therefore of utmost importance to this province, and fortunately, being close to Pearl River, Guangdong managed to maintain its water needs by using surface water to supply agriculture, industrial production and domestic needs.

According to the provincial ‘13th Five-Year’ plan, there are 88 water conservancy projects in the pipeline and the total investment scale is RMB 180.3 billion.

There are a few areas that show potential for collaboration:

Sponge City Development

Being on China’s southern coast with a sub-tropical climate, Guangdong is challenged by extreme weather such as typhoons and floods. Guangzhou, the capital, has planned to transform 80% of its developed areas to meet relevant ‘sponge city’ standards by 2030. The nearby cities of Shenzhen and Zhuhai have been picked up as one of 30 national sponge city pilots. Large investment is expected. In 2016, the Netherlands Embassy in Beijing and the Netherlands Consulate in Guangzhou together with Zhuhai Housing, Urban-Rural Planning and Development Bureau co-hosted a joint seminar on Sponge City, aiming to increase the links between China and Netherlands in the field of water management.

Saltwater Intrusion

In addition to urban floods, many cities in Guangdong also face saltwater intrusion near the river mouth of Pearl River. This has been a threat to the water security of nearby cities, in particular Zhongshan, Zhuhai and Macau.

Risk Assessment on Sea Level Rise

Guangdong is facing an increasing risk of sea level rise due to climate change. According to the 2016 Sea Level Report published by the State Oceanic Administrations, Guangdong's coastal regions may see a 0.065-0.170 metres rise in the next 30 years. This is considered to be alarming for airports and many other properties located right on, or near, the coast. The Guangdong Government will look for partners to run projects to better understand the water and climate risk in the region, and find ways to mitigate these risks and build resilience.

SHANGHAI – CONSULATE-GENERAL OF THE NETHERLANDS IN SHANGHAI

- During the 13th Five Year Plan, Shanghai is focusing on new water resources development by completing Qingcaosha Water Reservoir at Yangtze Estuary, improving the tap water capacity and quality by building and renovating 20 water plants, renewing pipelines of 3300 km, establishing the water environment protection system by building 12 sewage plants, water-saving society development by deducting the water consumption per ten thousand Yuan GDP by 46.7% compared to the 12th Five Year period and cutting off 78.2% of underground water excavation compared to last five years.
- Shanghai plans to achieve the following goals in the 13th Five Year Plan:
 - o Increase its supply capacity by building and expanding 10+ tap water plants with modern technology;
 - o Carry out the advanced treatment renovation of the intake water from Yangtze River;
 - o Renew pipelines, 2600 km;
 - o Build and renew 28 drainage systems in the urban central area.
 - o Increase the sewage treatment rate to 95% by improving the sewage collective networks in the new urbanized areas; building, expanding and renovating 30+ sewage plants with advanced technology;
 - o Complete the sludge processing in sewage plants and sludge treatment reaches 90%;
 - o Commencing the collection and treatment of initial precipitation.
- Besides the upgrading of drinking water system, Shanghai is also setting up the scheme for promoting River Chiefs system in 2017. The scheme will tackle the key task in five aspects:
 - o guaranteeing drinking water safety;
 - o stepping up network construction of sewage treatment plants;
 - o promoting elimination of agricultural polluting sources;
 - o strictly controlling industrial pollution;
 - o deepening comprehensive improvement of the ecological environment;
 - o strengthening protection and construction of the water ecosystem.

In total there are nearly 90 projects designed during the 13th Five Year Plan period, of which 70% needed investment. The cleanup campaign involves dredging rivers, removing floating pollutants, building separate sewage and rainwater systems, and demolishing illegal structures on riverbanks. The key figures of the tasks include:

- o Shanghai has 1,864 polluted and smelly waterways, stretching for more than 600 kilometres across the city, which must be cleaned by the end of 2017, and water quality needs to meet the country's Grade V standard by 2020.
- o Adding 21 square kilometres of water surface in the 13th Five-Year Plan period. The city's water surface rate will be increased from the current 9.77% to 10.1% by 2020.
- o There are 259 monitoring sections and 117 water functional areas in sub-districts or towns needing to pass the water quality examination.
- The Water Group of Shanghai Municipal Investment (Group) Cooperation (SMI), a fully state-owned enterprise, is dominating the local water market by serving over 70% of the population of Shanghai. Overseas companies intending to enter this market need to approach SMI, which controls most of water works and sewage plants in Shanghai.

SICHUAN PROVINCE, NETHERLANDS BUSINESS SUPPORT OFFICE CHENGDU

In Sichuan province, in the 13th Five Year Plan on the Water Resources, there are in total 5 major tasks:

- Saving water: the use ratio of non-irrigation water should be larger than 0.5.
- Water resource development: the capacities of water elevation and diversion will be 5 billion cubic metres. The total usage of water province-wide should be within 32.2 billion cubic metres. The new effective irrigation area should be 8 million mu.
- Flood control, drought prevention and disaster reduction: the systems of flood control, drought prevention and disaster reduction will be in place at the end of 2020.
- Water ecological protection
- Water conservancy management reform.

LIAONING PROVINCE, NETHERLANDS BUSINESS SUPPORT OFFICE DALIAN

As one of the main industrial bases in China, there are many heavy polluting industries located in Liaoning province. Over the years, these industries have seriously damaged the environment. The Liaoning government is taking this issue very seriously by increasingly restricting pollutant discharges of polluting enterprises. Those that fail to meet government requirements will be forced to stop production or operations.

In 2015, the State Council issued the 'Water Pollution Prevention and Control Action Plan' also called the 'Water Ten Plan'. After implementation, the demand for polluted water treatment comes mainly from governments, and the water pollution control pressure is still huge.

The Liaoning government will continue to invest heavily in pollution control in order to ensure emission reduction from heavy polluting industries. Until now there are around 300 water treatment plants in Liaoning province. The government plans to reach a water treatment rate of 95% in 2020 by building more water treatment plants and introducing new technology for existing plants. In addition, Liaoning government is also paying attention to strongly increasing the control of the agricultural and rural pollution. Since the year 2016, when building, rebuilding and expanding large-scale livestock and poultry farms, the companies are obliged to install facilities for rainwater and sewage shunting and water treatment.

By the year of 2020, the Liaoning government strives to improve the overall water quality of 50% of the rivers in the province, and enhance the environment quality and ecological system. Currently, the local government and companies are very eager to find solutions and technologies for sewage treatment, industrial water treatment and re-use, nitrogen removal for rivers, waste water treatment for rural areas and efficient expertise management for water treatment plants.

Furthermore Dalian has been appointed as one of the Sponge City Pilot cities in China. The Sponge City Pilot Zone is still under construction. In relation to this sponge city policy, the Dutch company, Hanging Water Tank, opened their Sponge Building Demonstration Project in June 2017, in cooperation with their local partner.

Until now, there are already lots of exchange between Liaoning and the Netherlands on the water treatment industry. Several Dutch companies have already visited Liaoning many times looking for cooperation opportunities, and several Liaoning companies, government departments and institutes also visited the Netherlands. We believe there is more room for exchange and cooperation in the future.

SHANDONG PROVINCE – NETHERLANDS BUSINESS SUPPORT OFFICES JINAN & QINGDAO

Shandong Province is the 3rd economic power and 2nd most populous province in China, while it has a very serious shortage in water resources. The water resources per capita are only 315 m³, less than 1/6 of nation's average and only 1/24 of the world's average. Therefore, water-related issues have been given high priority in the development of social welfare and the urbanization in Shandong.

By the end of 2015, the annual water supply by public facilities in Shandong reached 4.64 billion m³, covering a population of 41.1 million (total 97 million) with a daily consumption of 135.7 litres per capita. The total length of water-supply pipelines hit 60.279,7 km. Shandong will make continuous investment in the period 2015-2020, which has been elaborated in the 13th Five Year Plan. For example Shandong plans to invest over RMB 9 billion in building up new water-supply facilities, expanding existing facilities and upgrading old ones; and invest

another over RMB 8 billion in new water-supply pipelines and upgrading the old network. Regarding water pollution, a series of increasingly strict laws and regulations were put into effect against water pollution in recent years, such as the “Action Plan of Water Pollution Prevention”, also known as Water Ten Plan, and ‘River Chief System’ which means the appointed river chief (normally local governor) should take full responsibility for the degradation of the river’s eco-system. These legal measures have been substantially contributing to prevention of water pollution and illegal waste water discharges, and businesses have more obligations and willingness to invest in waste water treatment facilities to minimize their environmental impact and keep legality.

Moreover, the water consumption in agricultural industry takes a considerable part in the total water consumption, due to the traditional irrigation mode – flood irrigation, which is still very popular in Shandong. Agricultural water-saving irrigation, for example dripping irrigation is increasingly expanding in greenhouses and open field cultivation within the province, however, there is still much room for further improvement.

Last but not least, academic cooperation in water sciences between Shandong and Dutch knowledge institutes has been achieved. The Dutch water sector has a world reputation in fundamental sciences as well as applied sciences in water, such as water/land remediation, seawater erosion in coastal areas, model calculation, design and consulting of wetlands/ecosystems, and more exchanges and cooperation can be expected.

These developments will offer opportunities for Dutch companies who have excellent products and services to contribute to above-mentioned businesses, including but not limited to:

- the fast expanding water supply facilities
- waste water treatment and water remediation
- agriculture water-saving solutions
- academic cooperation in fundamental sciences and applied sciences

JIANGSU PROVINCE, NETHERLANDS BUSINESS SUPPORT OFFICE NANJING

The Jiangsu Five Year Plan is very explicit about the development and maintenance of the water resources in various fields in the Jiangsu Province. The Five Year Plan states it wants to implement “the most stringent water resources management system” and carry out water-based water production and waster-based city management, strengthen the “three red line” management system for the total water consumption control, water efficiency control, water function area to limit pollution and it wants to control the total water consumption. In the Five Year Plan it is outlined that it wants a water-saving transformation of high water consumption industry, strictly comply with water drawing permit and water resources paid use system and speed up the construction of water-saving society and water-saving city, the last the so-called Sponge City concept.

Areas of opportunities and focus of the Provincial government in the water sector in Jiangsu include:

Water pollution control

Automatic monitoring systems

- To strengthen the water pollution control in industrial areas
- o Construction of the sewage storage, temporary garbage storage facilities at the ports and terminals
- Strengthen the sludge treatment and disposal
- o Speed up the construction of regional urban sewage treatment plant sludge comprehensive utilization or permanent treatment and disposal facilities
- Strengthen the manure pollution control of livestock and poultry breeding
- o Strengthen the comprehensive utilization of livestock and poultry manure pollution
- o The existing large-scale livestock and poultry farms in the non-prohibited areas should be equipped with faecal sewage storage and treatment facilities according to the scale of cultivation and pollution prevention and control

Water ecological protection

- Promote the construction of the sponge city
- o The use of filtration, retention, storage, purification, emissions and other measures to achieve that the city drainage and water logging capacity will increase the effective reduction of runoff pollution and improve the efficiency of the use of rainwater resources to build a healthy urban water ecosystem
- o Promote sponge city demonstration area construction, and the constructions of sponge parks and green land, buildings and communities, roads and squares.
- Strengthen the construction of ecological fisheries
- o Strengthen aquaculture pollution control
- o Actively promote the use of artificial feed, and gradually reduce the use of frozen miscellaneous fish feed
- Carry out water ecological restoration
- o Strengthen wetland protection and repair
- o Protection of the Yangtze River Basin, the Huaihe River Basin, Taihu Lake, Hongze Lake, coastal tidal zone

Water resources management

- Accelerate the establishment of water resources carrying capacity monitoring and evaluation systems
- Scientific protection of water
- o Comprehensive control of total nitrogen in coastal areas

- o Development the control plan of Total Amount of Phosphorus Nitrogen in Taihu Lake Basin
- Strengthen water environment monitoring and early warning
- o Optimize the province's surface water, groundwater, coastal waters, drinking water sources, urban water and other monitoring network, add monitoring points in cross-border rivers, rivers to the sea, and the rivers to the Yangtze River. Improve the overall function of the water environment detection network.

HUBEI PROVINCE, NETHERLANDS BUSINESS SUPPORT OFFICE WUHAN

With the BRI initiative, more efforts now go to ASEAN countries to build dams and flood control projects. There currently is not much cooperation with European countries, since the end of EU-China integrated river management project. The main reason is a lack of funding.

The Yangtze Water Resource Commission (CWRC) is interested in the cooperation with the Netherlands in the following fields:

- Water quality monitoring (both equipment and software): An initial discussion was held last year with Rijkswaterstaat on the possible use of Dutch water quality monitoring devices and software in a pilot project in the Yangtze River. The Yangtze Hydraulic Bureau under CWRC is currently working on this project;
- Legislation on Yangtze River issues: a delegation from CWRC visited the Netherlands early 2017. They were impressed by the cross-municipality coverage of Water Board / Authority in terms of water administration. Yangtze Water Administration and Safety Supervision Bureau under CWRC would like to further introduce the European legislation to Yangtze River management;
- Fish passage design: Fish passage is an important ecology issue to be considered when a dam is built. Yangtze Eco Hydraulic Engineering Institute under CWRC would like to develop cooperation on the ecologic renovation of fish passage around the dam area.

The Hubei Provincial Department of Water Resource organises training overseas for their management staff and engineers from R&D institutes. They are interested in considering The Netherlands as a destination for training in the fields of flood control and water management.

The Wuhan Water Resources Bureau launched a water themed investment programme in 2017. It aims to further improve its capacity in four fields: flood control, drainage, sewage and drinking water supply. A number of infrastructure projects will be implemented in the next five years from 2017 to 2021, including dike solidification, pump station upgrading, new sewage plants as well as renovation of tap water plants. This investment programme focuses on the improving infrastructure construction with Chinese technology and know-how. At present, hardly any foreign expertise is involved.

CONTACT DETAILS OF THE DUTCH ECONOMIC NETWORK IN CHINA

If you have any general questions leading from this report or are looking for additional information, please contact Ms. Anne te Velde, Counsellor Infrastructure and Environment at the Dutch Embassy in Beijing. Her email address is anne.tevelde@minbuza.nl.

Or if your question is regarding a specific region in China, please contact the closest government office:



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