The Netherlands:

Your One-Stop-Shop to sustainable water solutions

The Dutch Water Sector

1 Dutch world renowned water technology

Water supply and sanitation in the Netherlands consists of three closely linked components:

- **Water supply** – water supply companies produce drinking water for the consumer, industry water and process water for the industry and irrigation water for agriculture and distribute this water to the various users;
- **Sewerage systems** - local authorities collect and convey household wastewater, industrial wastewater and rainwater in sewerage systems;
- **Wastewater treatment** - local water boards and private organizations treat wastewater before returning it to natural water systems, or to reuse it and pump it back into the supply chain.

The organizations responsible for these components rely on the cutting-edge techniques and technologies developed by Dutch research institutes and companies. And, to ensure that over the next decade they remain 'top of the bill' in matters related to water technology, the Dutch have placed innovation on top of their agendas. The Netherlands' success in building and maintaining this dynamic and complex water cycle rests partly upon in-country skills in the fields of economics, hydrology, ecology, technology and sociology. The quality of the system as a whole depends on the quality of each of its individual parts.

Part of the outstanding Dutch water expertise is the technologies that we present to you today. This One-Stop-Shop is offering the complete spectrum of expertise and technology for two of the components mentioned above, being water supply and waste water treatment. From meticulous Master Plans to the implementation of high-end technical solutions, the Netherlands China Water technology Platform (NCWP) will find you the right partner to talk to.

NCWP partners deliver innovative and patented water technologies for municipal, industrial and private clients.

2 Water Management

In an era of increasing contest for limited water resources a joint management of conventional and non-conventional water resources must be considered. Non-conventional water resources include re-use of wastewater or desalination of brackish groundwater.

Employing such water sources especially for non drinking purposes allows for lower costs and higher savings of potable water. Viable applications for "grey" water that realize these benefits include watering lawns, washing cars, flushing toilets or serving cooling systems.

The NCWP refers you to the right parties for support in the re-use and recycling of wastewater, groundwater recharge or development of brackish water resources. Thereby, saving water and money becomes an easy task.

2.1 Water demand management

Water demand management emphasizes the better use of water already mobilized by reducing physical and economic loss, optimizing and reducing water consumption and strengthening the

services of the water utility companies. China can profit from the in-depth knowledge of Dutch companies. We can help you accomplish substantial savings, with due attention to leakage control, prevention of illegal consumption and the development of demand reduction policies. Furthermore we assist in the improvement of the capabilities of water authorities, including the improvement of water pricing systems and customer service.

Freshwater is a finite and valuable resource that is essential to sustain life, the environment and economic growth. Bad management of surface and groundwater reserves can be catastrophic, especially so in arid climates. Protecting those resources for depletion, pollution and seawater intrusion is complex but nonetheless principal. That requires to take multiple stakeholders into account: economic interests in water extraction or aquaculture, political interests in cross-border water resources, environmental risks and the interests of abutting residents have to be considered. Integrating contrasting interests in legal and regulatory frameworks and simultaneously taking physical measures to remedy and prevent negative impacts forms the core of sustainable water resources management.

2.2 Water supply

Appropriate supply and treatment of drinking water is an essential safeguard of living standards and future growth. In the light of rapid urbanization, the supply of tasty and safe drinking water becomes an ever more pressing issue, especially in arid climates. Population growth, record-high drinking water usage and scarcity of water resources demand attention and action.
The Dutch water sector has world-leading expertise in all fields relating to Drinking Water: Master Plans to guide policy and investment decisions, design and construction of transportation and distribution systems, and the Operation and Maintenance of water utilities. The treatment of raw water is critical to achieve high-quality drinking water. Every source of water is different and demands tailor-made process-designs every time. The NCWP partners deliver those services to secure your drinking water in a sustainable manner.

Master Plans

Investment in drinking water supply needs to take long-term developments into account. Master Plans with a time horizon of up to 30 years are advisable to assess current organizational settings and opportunities. Based upon adequate assessment, decision support for investments, strategies and policies are developed to address future demands and challenges, allowing for various future scenarios.
The NCWP partners provide you with excellent Master Planning expertise, ranging from data collection to Master Plan formulation. Taking into account the demands and requirements of all stakeholders involved and formulating consistent and appropriate actions gives long-term guidance to the extension or restructuring of drinking water sectors. Dutch experts have gained experience in multiple settings on all levels of governments and private corporations, achieving sustainable benefits for our clients.

Drinking water treatment

Traditional treatment methods in use sometimes fail to address issues such as chloride or bacterial loadings, e.g. in rooftop drinking water tanks. To minimize risks to human health and the environment, the Dutch patented techniques and technologies allow for treatment with better results: tastier drinking water and less risks for human health and the biosphere. Application of patented Dutch technologies like Ultra Filtration, Reverse Osmosis (RO), Membrane Technology, Direct Sand filtration, UV-disinfection, and advanced oxidation realize these results at different stages of the water cycle: At seawater intake points and drinking water treatment plants but also at

the point of use. For example, energy efficient Reverse Osmosis (RO) systems produce perfect drinking water for households or hospitality, be it in network-connected locations or with rooftop tank systems.

Transportation and Distribution systems

Transportation and distribution systems for drinking water need to respond to the growing demand, especially in expanding urban surroundings. Economic and physical loss for the water providers is therein just as much an issue as insufficient availability of drinking water is to all consumers. From intake point to tap, the Dutch water sector possesses extensive experience and cutting-edge expertise in all related fields. Technological solutions to infrastructure expansions and maintenance, distribution modeling software and customer billing and services are all emphasized areas of expertise in the Dutch water sector.

Operation & Maintenance

The evident shift towards privatization of water utilities and changing legislation alter the operating environment in China. New investments in Build and Operate contracts introduce more and more private parties. The Netherlands water sector has rich experiences with such developments and the NCWP allows you to find the right partner for technical assistance or actual operations contracts. Maintenance of existing distribution systems is crucial to prevent water losses and optimize the use of networks. The infrastructure in this respect is just as important as the institutional functioning of water utilities. Utilities and all levels of government require strengthening their institutional capacities. Staff training and development, system development and technical assistance in planning and implementation are flagship fields of expertise of the NCWP partners.

2.3 Waste water treatment

Wastewater is an inevitable consequence, wherever water is used. The necessity of collection and treatment for wastewater is evident. Environmental legislation is set to impose ever-stricter requirements on the quality of released effluent. As a result, wastewater treatment is becoming an ever more important aspect of the management of scarce water resources. Dutch technology and know-how enhance the efficiency of wastewater treatment. Current processes can be designed more economical and with effluent of much better quality. High-quality effluent does not pose risks to human health or fragile environments, making it a non-conventional water resource. Therefore, optimal wastewater treatment is essential to increase water savings and improve environmental conditions. Dutch equipment and expertise have set world standards. Increased cost-efficiency and reduced environmental impacts generate sustainable benefits for our industrial and municipal clients.

Municipal waste water

Besides the collection of wastewater, Dutch expertise has significantly improved the treatment of municipal wastewater, especially biological treatment, to increase its effectiveness and safety. It is mostly distinguished as primary, secondary, and tertiary treatment, for all of which the partners of NCWP have developed patented technologies that substantially improve those processes.
The decreased size and costs of installations make their use in small or un-connected locations, e.g. for resorts or industrial estates, feasible and economic. Bio-filter technology eliminates odor emissions, making applications in direct proximity of residential areas possible. Tertiary effluent, treated with Membrane Bio Reactor (MBR) or UV disinfection processes is safe and effluent ready to use for irrigation and other display purposes. Well-designed and maintained installations can reduce the use of chemicals for treatment and even fertilizers when effluent is used for irrigation. That reduces overall costs as well as negative environmental impacts.

Industrial waste water

In industrial settings, smart wastewater treatment has great potential to produce safe and re-useable effluent. The specific characteristics of wastewater from different industries demand tailored solutions for optimal results. Your Dutch partners of the NCWP master those processes with patented technologies and decades of experience in designing and building ever more efficient installations. Depending on the type of wastewater, techniques of aerobic and anaerobic Biological Treatment, Ultra Filtration, RO, De-Toxification, Neutralization or Ion Exchange among others are carefully designed and applied to treat the most divers types of pollution. With combined processes, the resulting effluent can achieve sufficient purity to re-use it as process water even in the food industry, reducing operating costs and enhancing profitability. The Netherlands continue to invent innovative technologies, e.g. in anaerobic and aerobic treatment, adding to the stock of Dutch world-leading expertise.

Process Water

Next to consumption, the uses of water are countless in industry and non-industry applications. The requirements of water quality are just as divers. Exactly that diversity allows differentiating the treatment and sourcing of water. That prevents unnecessary expenditures and saves important amounts of water. Treating water with chlorine for example is not only redundant but also even disadvantageous for irrigation or lawn watering. Furthermore, chemical treatment, although sometimes necessary, can affect materials by promoting corrosion and impact surroundings through odor nuisance. The Netherlands water specialists apply techniques and technologies that avoid externalities and significantly improve cost-benefit relations. Many of those technologies have been patented and are in worldwide demand.

Non-industry applications

Scarce and expensive potable water is often used for purposes that do not require water of such high quality. Water usage for water displays in public spaces, watering of lawns, many household purposes other than consumption or air-conditioning systems are just a few examples. Dutch technology enables you to use alternative sources of water on the one hand and address specific requirements of applications on the other. As an example, consider algal and bacterial infestation in public water displays or cooling systems. Ultraviolet (UV) disinfection, Direct sand filtration and Activated carbon filtration prevent infestations without resorting to chemical treatment and the accompanying odor nuisance. Targeting the treatment method towards the intended purpose bears significant savings and substantially better fit between quality and purpose. The patented technologies of NCWP partners therefore open new opportunities to save money and water.

2.4 Industrial applications

Industrial applications of process water need to satisfy the most divers requirements. Whether water is used in cooling systems, as boiler feed, for transportation of vegetables, cleaning of bottles or rinsing and washing, the quality of water must be appropriate. Through decades of experience, the Dutch water sector has unrivalled know-how in industries all over the world. We know how to arrive at the most cost efficient solution while achieving optimal results. Consider in-plant recycling of process water, which often has huge potentials for savings. Employing technologies of Ultra filtration, RO, Continuous sand filtration, Ultraviolet (UV) disinfection or biological treatment allows for apt water quality to make re-use possible. But also the production of pure water for primary usage, e.g. in the food industry, is one of the major fields of expertise of our partners.

Operation & Maintenance

New investments in BOT (Build Operate Transfer) contracts introduce more and more private parties. The Netherlands water sector has rich experiences with such developments and the NCWP allows you to find the right partner for technical assistance or actual operations contracts. Maintenance of

existing distribution systems is crucial to prevent water losses and optimize the use of networks. The infrastructure in this respect is just as important as the institutional functioning of water utilities. Utilities and all levels of government require strengthening their institutional capacities. Staff training and development, system development and technical assistance in planning and implementation are flagship fields of expertise of the NCWP partners.