SUEZ

www.suez-asia.com

SMART & ENVIRONMENTAL SOLUTIONS ASIA

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FSC

Smart Resource Management plays a key role in the ecological transition

Co-building the Resourceful City with City Players

Since the end of the 19th century, SUEZ and its 90,000 employees commit to preserving the fundamental elements of our environment: water, soil, and air. SUEZ provides innovative and resilient solutions in water management, waste recovery, site remediation and air treatment. Through creating sustainable "smart cities", SUEZ supports the optimizing of municipalities' and industries' resource management and thereby improving their environmental and economic performance.

As a long-standing partner of city authorities, a leading player in the circular economy and a driver of the digital revolution, SUEZ believes that the city of the future must be resourceful, smart, circular, resilient, collaborative and inclusive, a city capable of drawing on its own resources to guarantee its future and to meet the aspirations of its inhabitants.

By 2050 there will be 9.6 billion inhabitants living on our planet, with most of them concentrated in cities. Rampant urbanization, combined with the effect of climate change, is putting increased pressure on resources, water, raw materials and energy. The principles of the circular economy and digital technologies are powerful accelerators for reinventing cities and imagining their future.

160 years	8.7 TWh	2.1 bn m³	10.22 MtCO₂
global experience	renewable energy produced	alternative water produced	avoided

Smart & Environmental Solutions
Your Preferred Partner
in the Environmental Protection Market

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At the very heart of all technological, economic, ecological and social paradigm shifts, companies evolve to become more competitive and innovative in the effort to achieve their sustainable development goals. This trend is driving more and more companies, like SUEZ, to invent new methods and develop new skills to better anticipate shortages or to help their customers to minimize costs.

In Asia, Smart & Environmental Solutions (SES) Asia has its business presence spread to Greater China and Singapore. Headquartered in Shanghai, SES Asia has integrated all digital-related product lines and businesses. Fully committed to working closely with Asia's innovation forces, SES Asia promotes the development of digital solutions, asset performance management, environmental quality monitoring services, air & climate services, and consulting services to a higher level.

Currently, SES Asia has its main operations in Shanghai and Singapore, which also serves as 2 delivery centers in Asia.

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Five Services of SUEZ Smart & Environmental Solutions (SES)

Digital & Decentralized Solutions	Asset Performance Management	Environmental Quality Monitoring(EQM) & Smart Agriculture	Air & Climate	Smart Cities & Consulting

SUEZ Asia
Smart & Environmental Solutions (SES)

Shenyang

Beijing Tianjin

Shijiazhuang

Qingdao

Nanjing

Chongqing Wuhan

Shanghai

SES Asia HQ and
China Delivery Center

Guangzhou
Zhongshan

Singapore

SEA Delivery Center

★ Headquarters and Delivery Center

⚠ Environmental Quality Monitoring Laboratory

Digital Solutions
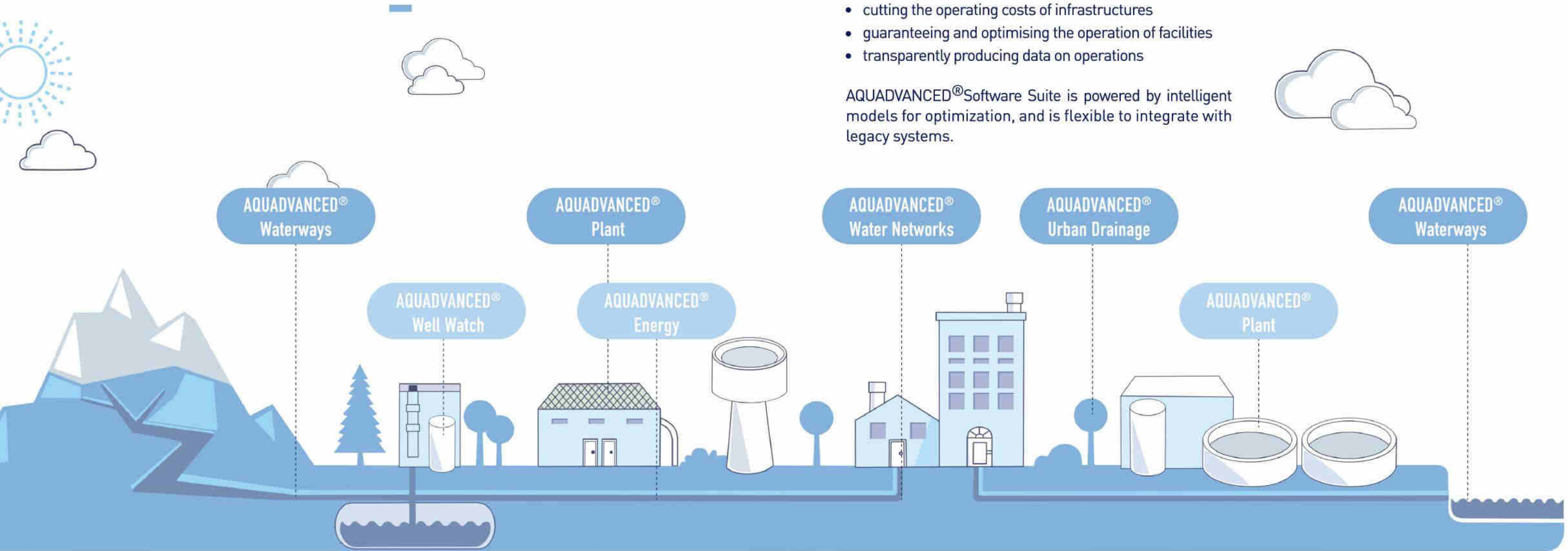# Smart Water Real-time Water Management Systems

AQUADVANCED® Software Suite

In developed countries, it is widely believed that almost 20% of the drinking water produced goes to waste, mainly due to ageing facilities. SUEZ has addressed this issue by developing the AQUADVANCED® software suite to digitalize and optimize the management of drinking water networks.

It can help our clients tackle the following challenges:

- combatting losses due to leaks
- cutting the operating costs of infrastructures
- guaranteeing and optimising the operation of facilities
- transparently producing data on operations

AQUADVANCED®Software Suite is powered by intelligent models for optimization, and is flexible to integrate with legacy systems.

AQUADVANCED® Waterways

AQUADVANCED® Plant

AQUADVANCED® Water Networks

AQUADVANCED® Urban Drainage

AQUADVANCED® Waterways

AQUADVANCED® Well Watch

AQUADVANCED® Energy

AQUADVANCED® Plant
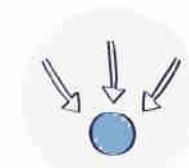
Resource

Pumping

Drinking Water Treatment & Production

Transport & Storage

Distribution

Collection

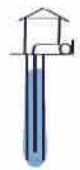Wastewater & Rainwater Treatment

Discharge Into The Environment

AQUADVANCED® Software Suite
For Water Cycle Management

Solutions for
DRINKING WATER

Solutions for
WASTEWATER & STORM WATER

AQUADVANCED® Well Watch
Real-time performance of wells

AQUADVANCED® Energy
Real-time energy management system for water distribution

AQUADVANCED® Water Networks
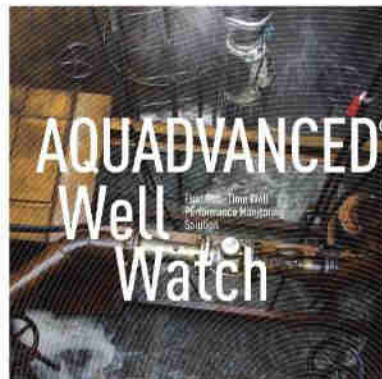Real-time performance of drinking water distribution networks

AQUADVANCED® Plant
360° optimization of water treatment plants

AQUADVANCED® Urban Drainage
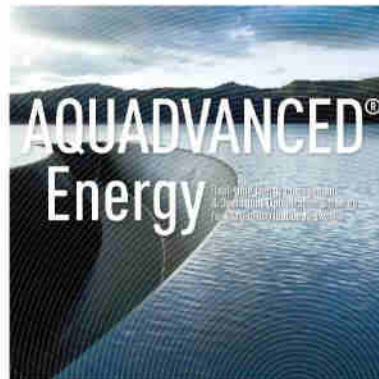Real-time management of sewer & stormwater system

AQUADVANCED® Waterways
Real-time hydrological and environmental management solution for surface waters

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Monitor and optimize the performance of wells and their pumps

- Comprehensive monitoring of ground water wells
- Real-time performance evaluation of wells and pumps
- Real-time surveillance on aquifer level variation
- Supervise, predict ageing and performance degradation of wells and pumps

Optimize in real-time management of drinking water supply system

- Water demand forecasts
- Adjust operating strategy based on peak and valley electricity prices
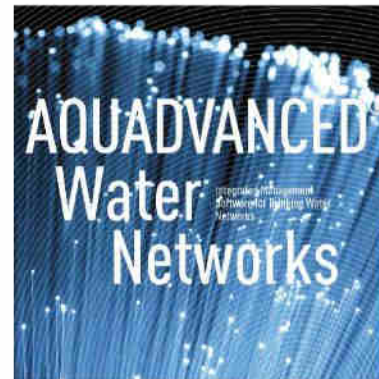
Optimize operational management of drinking water network

- Monitor the network daily and in real-time
- Reduce water losses (Non-Revenue Water)
- Monitor water quality

Optimize in real-time, 360° control of water and sanitation plant performance

- Effectiveness of interventions, operating costs and treatment process efficiency
- Predictive maintenance
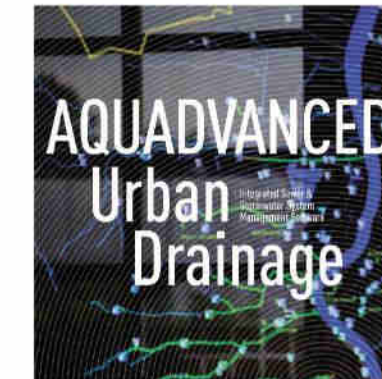
Optimize in real-time management of wastewater systems

- Real-time monitoring over drainage system
- Integrated on-line short-term accurate weather forecast
- Real-time flood and pollution risks prediction and warning
- Real-time dynamic automatic control and proactive response to flood and pollution risks
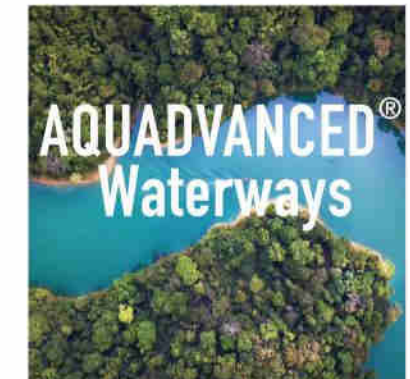
A modular solution adapted to the specific needs of local authorities and their territories

- Real-time monitoring of the risk of surface water pollution
- Flood risk anticipation and low-water management
- Economic and operational performance

AQUADVANCED® WATER NETWORKS

First industrial park in China

**combining artificial intelligence and models
to achieve water and wastewater refined management**

WHY

- Dynamic network performance KPI
- Online hydraulic model simulation for network operation support
- Network incident detection by machine learning

HOW

- Basic platform deployment and real-time data connection for dynamic KPI calculation and network event management
- Online hydraulic model integration and optional module implementation
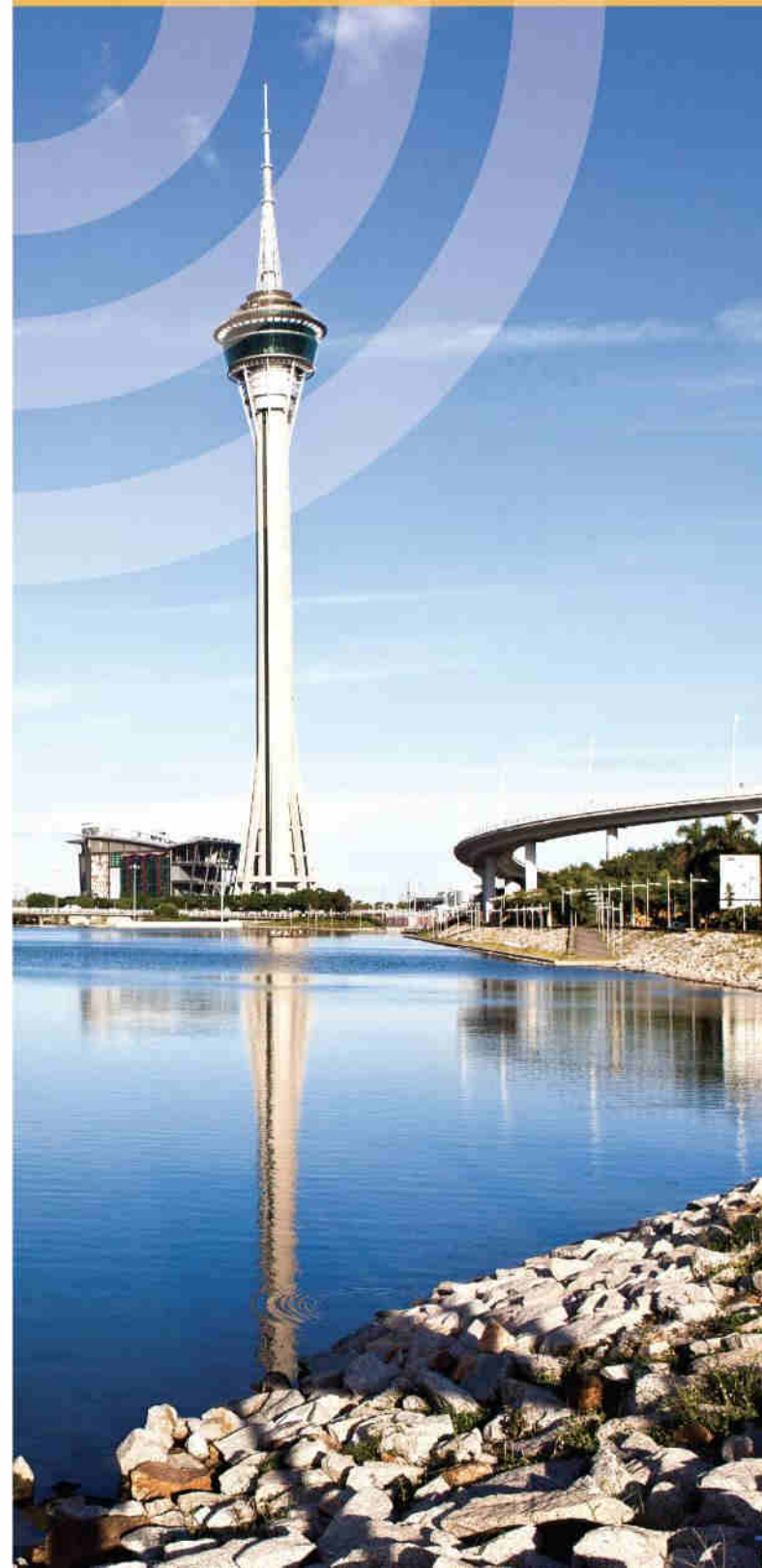- 1year implementation + 5 years maintenance

WHAT

- Simplify daily operation and improve operation efficiency
- Better customer service and public satisfaction
- NRW control, OPEX reduction

AQUADVANCED® ENERGY

Real-time optimization of energy algorithm

and automatic control of plant network pumping stations and valves

WHY

- Ensure operational efficiency and water delivery, maintaining operation through an automated system 24/7
- Bring down energy cost while maximizing operational performance

HOW

- Actual data (updated every 10 minutes) + water demand forecasts (updated every 30 minutes) + computation models = optimization schedules
- Reduce energy cost through optimizing pump combination, filling tank at lower electricity time-of-day, optimizing hydraulic path etc.

WHAT

- System goes live on 2019, the anticipated annual saving is 2.5 M MOP, which is 7% reduction of energy bill
- Real-time optimization of pumping schedules responding changes from maintenance to water demand
- Fully automatic operations with optimized set-points, pump controls and production plans sent directly to the SCADA

Chongqing

AQUADVANCED® URBAN DRAINAGE

China's first batch of national-level sponge city pilot projects

customized for the needs of Chongqing urban flooding control

WHY

- 1 of the first 16 National Sponge City pilot projects
- Full scale monitoring of stormwater system and sponge facilities
- Evaluate and monitor KPIs of sponge city
- Early warning of urban flooding

HOW

- Deploy AQUADVANCED® Urban Drainage Smart Solution
- Specific development to meet requirement of sponge city management
- Integrate on-line 2D model and radar forecast to anticipate flooding

WHAT

- "Real-time – Online – Continuous" performance evolution
- Rainfall characteristics analysis
- 2-hour early warning of urban flooding
- Events detection

Wuhan

AQUADVANCED® URBAN DRAINAGE

Watershed-level smart platform

achieving real-time dynamic control

WHY

- To monitor the hydraulic and water quality in targeted water bodies
- Through meteorological and monitoring information to provide early warning and prediction signals for regional flooding and pollution incident
- To generate management and control strategies for targeted water bodies through dedicated algorithm and model embedded at AQUADVANCED® platform
- To optimize the operation and maintenance schedule for future operation

HOW

- AQUADVANCED® Urban Drainage smart solution platform
- Real-time monitoring
- On-line hydraulic and water quality modeling

WHAT

- First project to be commissioned in China by 2021
- China's first domestic watershed dynamic control project based on real-time online models

AQUADVANCED® PLANT
World's first real-time chemical dosage system
used in large scale water plant

WHY

- Reduce coagulant consumption, as well as annual operational cost
- Improve the operation by monitoring the process in real-time
- Integrate a process control module into the company's "Smart Plant" project

HOW

- Implement AQUADVANCED®Plant predictive module through tight cooperation between SUEZ and Chongqing Yuelai WTP
- Savings thanks to the module ensure an acceptable payback period

WHAT

- Module implementation from Jan 2018 to Jul 2018, 6 months in total
- Around 20% savings on coagulant dosage, estimated to be 1M RMB/year
- Water loss is decreased by 40% thanks to optimization of filtration process

AQUADVANCED® WELL WATCH
All-round online monitoring
and smart operation and maintenance of underground wells
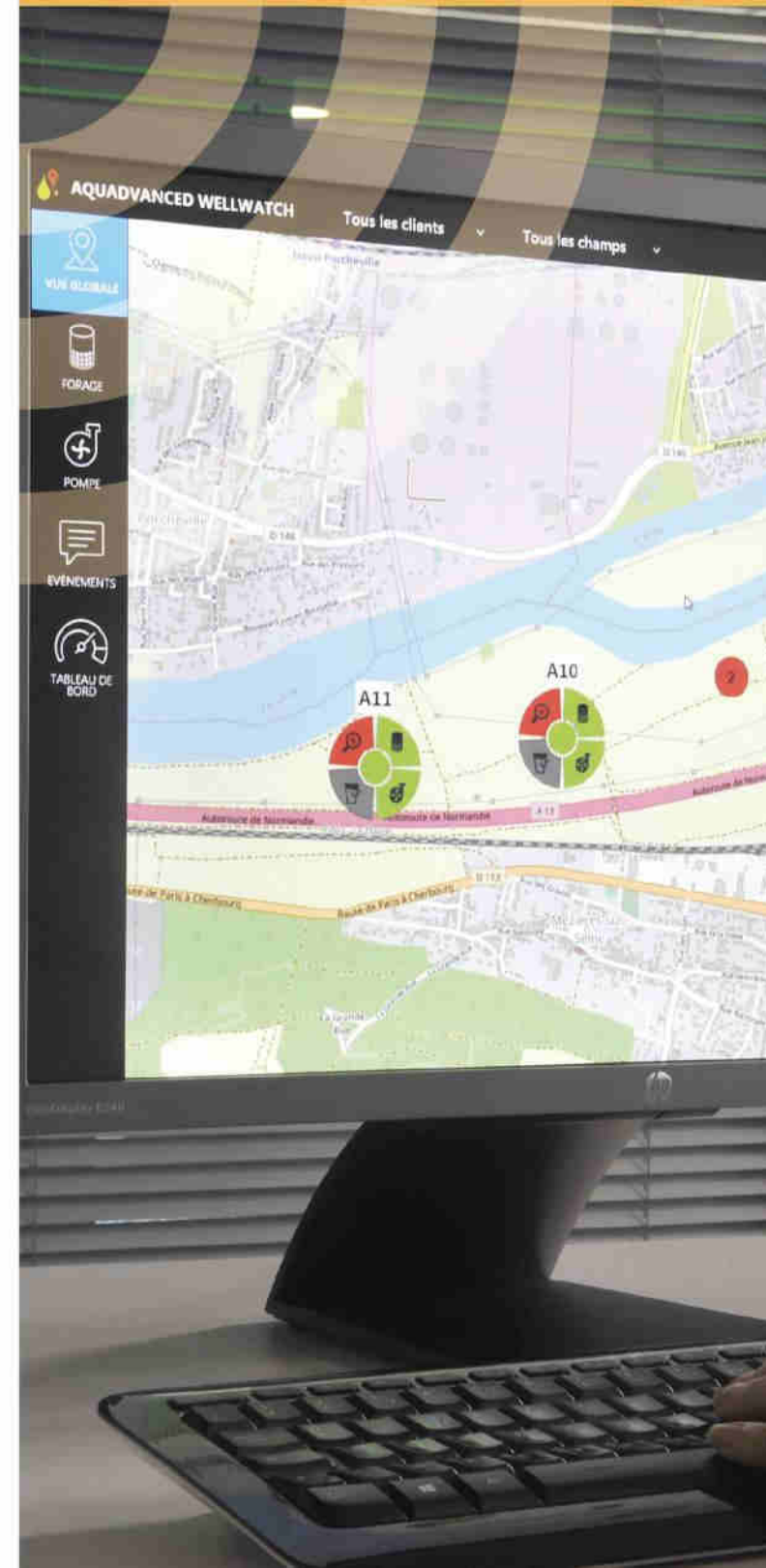
WHY

- Analysis of the operational data of groundwater wells
- Evaluate and monitor status of the wells (clogging, corrosion, etc.)
- Evaluate and monitor performance and efficiency of pumps

HOW

- Installation of necessary sensors for flow, level, pressure, and power consumption
- Monitoring data integrated in AQUADVANCED® Well Watch for continuous surveillance and analysis
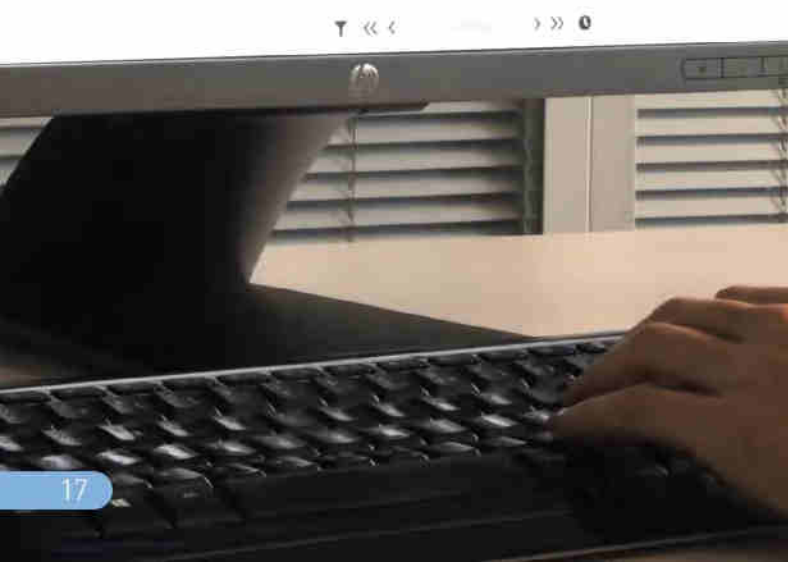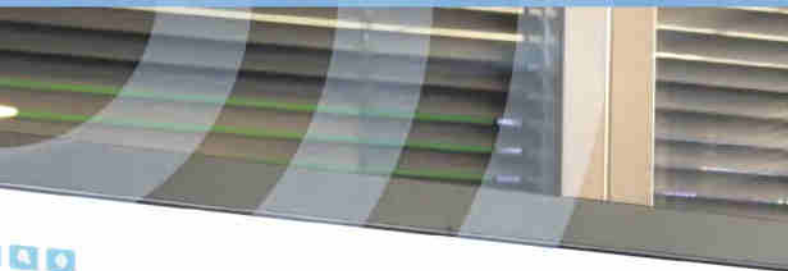
WHAT

- Complete monitoring of wells operation
- Continuous surveillance on operational KPI of the wells
- Continuous surveillance on efficiency and power consumption of the pumps

AQUADVANCED® URBAN DRAINAGE
Smart management of stormwater network
real-time decision support system for Singapore

WHY

- Real-time operational advisory platform to assist operators at Marina Barrage
- Monitoring of stormwater network & anticipation of flash floods
- Water quality monitoring and modelling of reservoirs and waterways
- Real-time monitoring of reservoir operations and transfers

HOW

- Deployment of AQUADVANCED®Urban Drainage
- Tailor-made dashboards that meet operator's requirements
- Integration of a wide variety of sensors, radar, and CCTVs to monitor stormwater networks and water quality in reservoirs and waterways
- Integration of various 1D-Hydraulic and 3D-water quality models to enable anticipation of floods in the city and water quality anomalies in the reservoirs

WHAT

- Real-time decision support system for operations at Marina Barrage
- Seamless integration of multiple data sources, models, and presentation of actionable items to operators
- Auto-detection of water quality anomalies based on live sensor readings
- Real-time computation of rainfall return-periods and fast-rising water levels to enable flash flood anticipation

ADVANCED METERING INFRASTRUCTURE (AMI)
Using smart metering data
to induce customers to save water
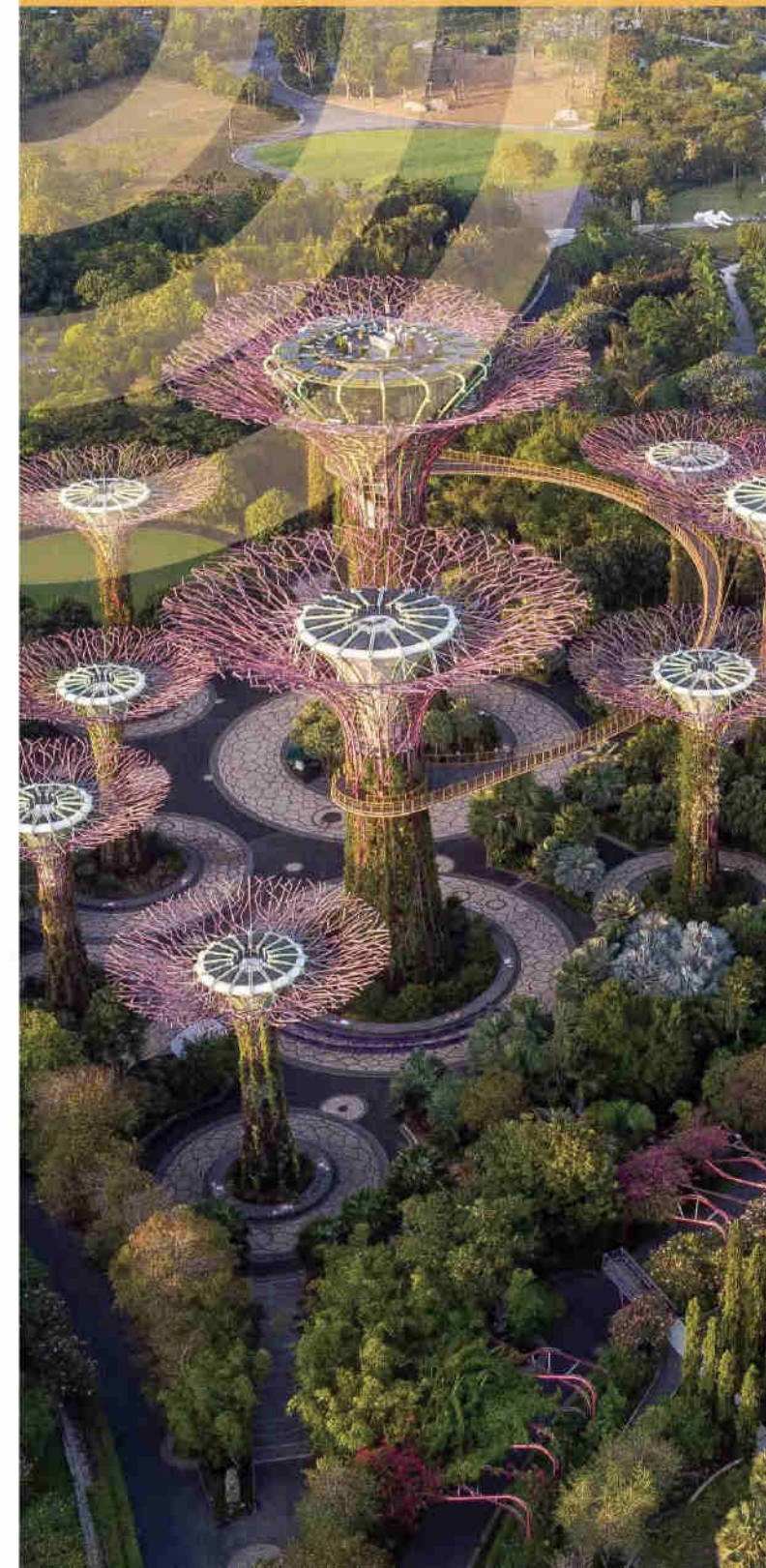
WHY

- Natural resources are at the heart of Singapore's concerns, making water management a national priority
- To boost water conservation efforts in Singapore and meet the vision for a Smart Nation where people are empowered by technology to improve quality of life
- To gain a deeper understanding of households' water usage patterns and habits, as well as what motivates water-saving behaviours to design and implement water saving programmes in a more targeted manner

HOW

- PUB has collaborated with SUEZ using SUEZ's long-range smart metering and smart water technologies in a pilot project since 2015
- Smart meters fitted with VHF transmitters were deployed to residential households and commercial/industrial households
- It relies on smart metering solutions to collect hourly consumption data from households, data analytics to make sense of it and customer engagement to motivate usage of the mobile app
- With the data collected, a gamified mobile application was created to motivate and increase awareness on residents' water usage

WHAT

- The programme provided residents with information regarding their daily and hourly water usage and patterns through an innovative mobile application. This helps to raise awareness on water wastage and how to better manage their consumption
- SUEZ provided PUB with maintenance and operational information of the AMI as well as metering data computed by in-house Data Analytics tools (forecast, patterns, savings, residual volumes, etc.). With these data, PUB can customise engagement strategies to help customers toward water conservation
- The project has been extended to commercial and also industrial customers

Asset Performance Management

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With the increasing demands of better operational performance and results, the future of the water service business will shift from a method-driven to a result-driven approach. SUEZ's asset performance management solutions integrate 160 years of profound water operation experiences, intelligent operation management tools and digital solutions and other cutting-edge technologies to provide customers with tailored, integrated network operation management services based on performance results.

With the help of efficient intelligent tools and a mature network operation management system, SUEZ SES provides clients with professional operation and maintenance management services on drinking water supply **and** wastewater networks. **SUEZ SES helps clients to greatly improve the operational performance, by:**

- reducing non-revenue water and network leakage
- guaranteeing water quality of the water supply network
- avoiding inflows, infiltration, and pipe network misconnection
- reducing dry season overflow and flooding
- improving the performance of network assets
- ensuring the operational efficiency of network assets
- optimizing capital use efficiency
- reducing operational costs

Ice Pigging   **iDroloc**   **Galia**   **SewerBall**

Asset Performance Management Solutions
## for Drinking Water Supply

Ice Pigging

Ice pigging is a breakthrough technique for cleaning the inside of pipes using slush ice, to improve customer service and decrease operational cost

- No excavation, no extra pumping costs
- Can be completed in 2-3 hours
- The water consumption is reduced (Can be as low as 1.5 times of the pipeline capacity compared with the traditional flushing using 3-4 times of the pipeline capacity.)
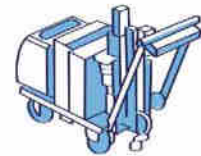
Idroloc

This technique can easily and accurately locate leaks on various water pipelines and is suitable for working conditions where other leak detection methods cannot work effectively, especially for large-diameter pipes, plastic pipes and low-pressure pipes

Asset Performance Management Solutions
for Wastewater Networks

Galia

It is a smart modular wastewater network maintenance management system which is designed specifically for the day-to-day management of wastewater network maintenance based on the network operation methodology

- Intelligently assessing the risk level of each of the pipe sections
- Integrating and maximizing the use of various kinds of network-related data, like GIS, CCTV, historical maintenance data, etc.
- Generating optimized plan of network maintenance and cleaning
- Realizing close-loop and transparent management of the maintenance activities on the wastewater network
- Drastically reducing emergency episodes and impacts such as flooding, overflow, etc.

SewerBall

SewerBall is a dynamic sewer network inspection tool that identifies and localizes non-sewage water and is a groundbreaking solution to better protect the environment

- Analysis of 4 physico-chemical parameters
- Exclusive patented intelligent algorithm
- A fast, secure, and cost-effective pre-diagnosis to improve knowledge of the networks
- Allowing us to identify risks of stormwater and avoid overflow into the natural environment

IDROLOC
Using innovative leakage testing method

to reduce physical losses, major contributor to NRW

ICE PIGGING
Adopting breakthrough pipe-cleaning technology

to improve network water quality and customer satisfaction

WHY

- Reduce physical losses, major contributor to NRW
- Use of an advanced technology for on-site detection: helium gas
- Applicable to difficult sectors where conventional methods fail

HOW

- Performance-Based Scheme: fixed entrance fee (lump-sum) + service fee based on the performance (upper limit)
- Also possible: just a demo (minimum lump-sum fee = 1-week operation)

WHAT

- Operation completed from Aug 5th to Aug 16th 2019
- In total 7 leaks have been localized and repaired
- The total leaking volume detected has been 123 m³/h

WHY

- Improve network water quality and customer satisfaction by removing sediments, biofilm, Fe/Mn etc.
- Comparing with traditional cleaning method, ice pigging has the characteristics of low risk, less water usage and high efficiency etc.

HOW

- Sign contract with Taiwan local partner, to provide ice pigging service to the client
- Pipe cleaning plan was made after enough communication with the client and onsite investigation
- A 5-ton ice pigging rig and two technicians were sent by SUEZ to do onsite work

WHAT

- Operation form 1st Aug to 31st Oct 2019
- Around 20km pipes have been cleaned
- Pipe diameter from 100mm to 300mm, material DIP, HDPE etc., located in Taipei and Xinbei city

Environmental Quality Monitoring

A quality benchmark and front-runner among third-party laboratories conducting environmental quality monitoring

SUEZ Environmental Quality Monitoring (EQM) was established, following SUEZ's 100% equity acquisition in April 2019 of ALS's environmental testing laboratory business in China. This is an extension of the ecosystem and value chain of SUEZ's environmental business. Through synergies and resource sharing with the SUEZ family of companies, SUEZ EQM has comprehensively enhanced the technological innovation and competitiveness of its core offerings and fully improved its service quality and efficiency with Chinese customers. By actively participating in environmental and smart city initiatives, SUEZ EQM has become a contributor to environmental improvement and smart urbanization, as well as a quality benchmark and front-runner among third-party laboratories conducting environmental quality monitoring.

EQM Services

Environmental standards and compliance monitoring (soil, sediment, water, air, and noise)

Site investigation and site risk assessment, detection, and analysis

Contaminated site remediation and remediation acceptance effect analysis

Monitoring of groundwater, surface water, drinking water, wastewater, sea water and other types of water

Monitoring of ambient air, exhaust gas, workplace air, indoor air, noise, wipe samples, etc.

Solid waste, hazardous waste, and leaching toxicity analysis

Analysis of farmland, agricultural products and various plant samples

Our Expertise of
Environmental Quality Monitoring Services in China

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4
full-service environmental testing labs in Shanghai, Beijing, Guangzhou and Zhongshan

7
offices in Chongqing, Wuhan, Shijiazhuang, Tianjin, Qingdao, Shenyang and Nanjing

23
provinces served, including 2 special administrative regions, 4 municipalities and 5 autonomous regions

1,000
cities across China received environmental monitoring and consulting services

2,000
client accounts nationwide

7,500 m²
covered for environmental testings

150,000
samples annually evaluated

CNAS accreditation of ISO/IEC 17025 lab and CMA certification

Major Projects and Achievements

- Tianjin "8.12 explosion" site survey project
- Changzhou Foreign Language School Site Survey Project
- Shanghai Disney Site Survey Project
- Shanghai World Expo site survey and restoration project
- Investigation project of bottom mud, sea water and surrounding soil in Bohai Bay oil spill

16
years of rapid, organic growth and market expansion

320+
experienced professionals and lab technicians

2,000+
testing parameters

20%+
hold senior and mid-level technical proficiency titles

100+
parameters for organic pollutants and volatile organic compounds (VOCs)

15%+
more than 15% of technicians are in technology innovation and research and development

200+
parameters for semi-volatile organic compounds (VOCs)

Air & Climate Management

As a leader in environmental services originated from Europe, SUEZ not only provides water and waste management for cities and industries, but also develops sustainable air and climate management solutions through active innovation.

SUEZ Smart and Environmental Solutions combines artificial intelligence and digital solutions to develop the AIRADVANCED® Digital Platform, which is an advanced data platform for real-time management of air quality and emission of environmental data. Based on real-time air quality monitoring in a certain area, it provides decision-makers with customized alert and management functions.

1

DATA COLLECTION

- Collect large amounts of data in real-time
- Combine other external data sources
- Data verification and calibration standardization
- Big data storage/cloud service

2

DATA REPORTING

- Visualize real-time data in GIS
- Integrate data into indicators (e.g. air quality index)
- Data display interface
- Mobile client to view information

3

ADVANCE ANALYSIS

- Space and time trend graph
- Statistical analysis, R voice development program (open source)
- Variable correction (traffic information, weather information etc.)
- Interpolated data analysis

6

AIR QUALITY IMPROVEMENT/EMERGENCY

- Emergency situations
- Improved plan
- Maintenance plan, asset management
- Decision support tools
- Communication tool

5

INFORMATION AND COMMUNICATION

- Automatic report generation
- Information communication and delivery
- Information sharing, data transmission interface (API)
- External screen presentation

4

EVENT DETECTION

- Early warning system 72 hours forecast and network monitoring
- Event alert/notification
- Pollution source identification, tracking analysis
- Decision/task execution

Consulting

CAPABILITIES

- Hydraulics & modeling
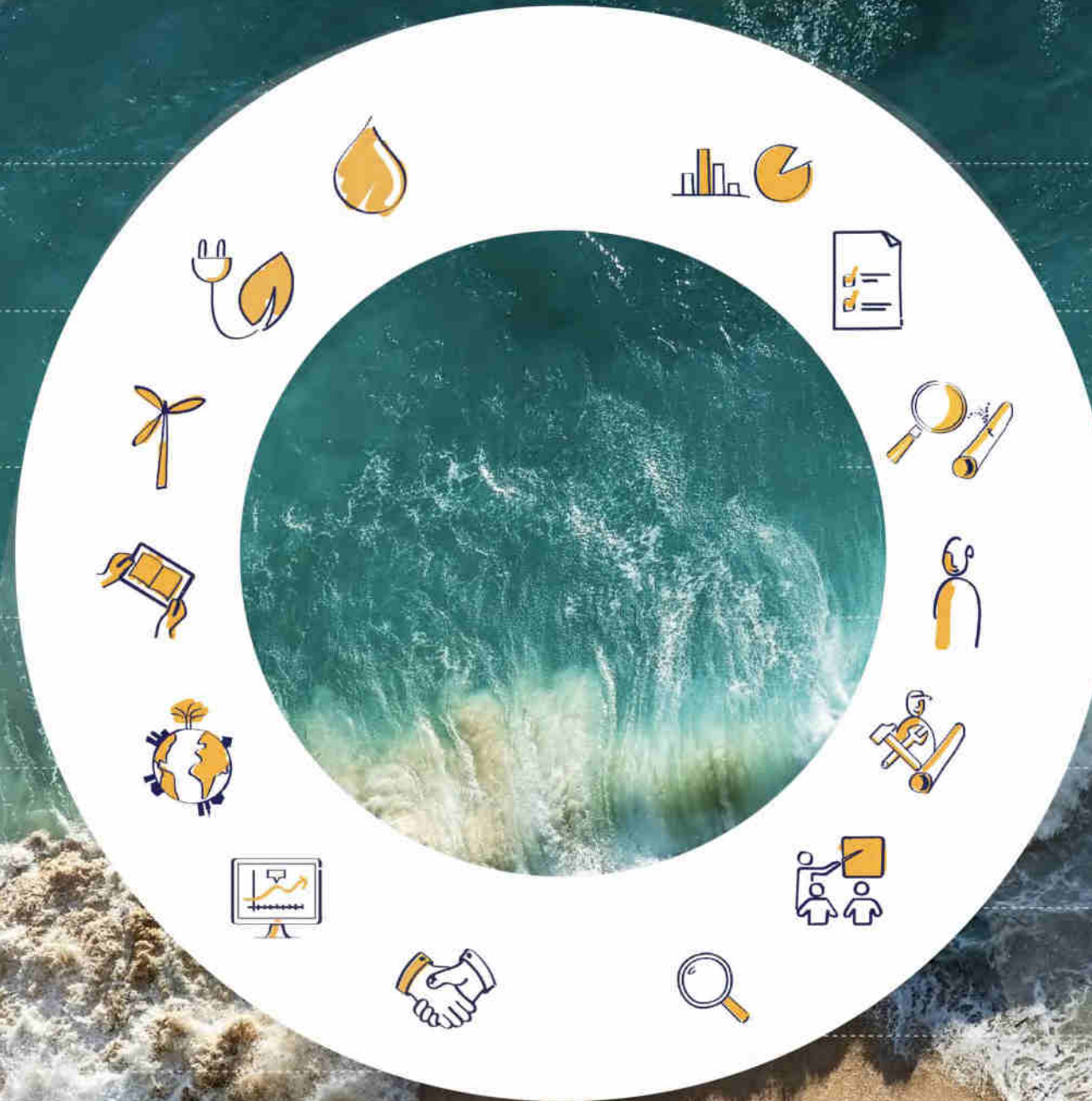- Civil engineering & electricity
- Energy
- Environmental & regulatory studies
- Urban planning & eco-districts design
- Data management, digital platform design & development
- Public finance

ACTIVITIES

- Strategic studies
- Planning (ex-master plans, climate strategy)
- Supervision (infrastructure design-> work supervision)
- Project management
- Technical assistance
- Training & capability building
- Due diligences

ECO-WETLAND
First ever in China's industrial park
to integrate wetland to treat wastewater

WHY

- Achieve comprehensive improvement of ecological protection, water purification and landscape functions
- Further improve the water quality of industrial wastewater treatment , meet the ecological water demand for SCIP internal water system, and assist in achieving the goal of "near zero emission"
- Transform and upgrade wetland management mode through advanced management platform

HOW

- "Zone Libellule": wetland design experience based on industrial wastewater environment characteristics and wetland self-purification capacity
- Wetland digital management platform: automatic control of various hydraulic facilities based on real-time data and simulation

WHAT

- Effective water quality improvement: stable key pollutants removal rate, TN removal rate approx. 60%, TP and ammonia approx. 50%, and COD approx. 20%
- Stably treat 10,000m³/d industrial wastewater and 15,000m³/d river water, assist in promoting green circular economy
- Pronounced improvement in wetland biodiversity, help SCIP become industry leader in terms of regional habitat condition

SCIP BIC
Environmental steward program
transforming SCIP towards best-in-class industrial park

WHY

- Secured SCIP vision 2030 of worldwide Best-In-Class industrial park
- SCIP / SUEZ JV creation to transform SCIP towards Best in Class from four pillars:
  - Institutional organization & management
  - Efficient and circular use of resources
  - Low-carbon growth
  - Asset protection

HOW

- Assess status quo from environmental performance and operational efficiency
- Set up KPIs from: water, waste, flood management, energy & carbon, mobility, resilience, air quality, innovation, and digitalization to identify opportunities and priorities
- Set up short / middle & long-term transformation roadmap

WHAT

- Smart Operation Center for real-time monitoring, scheduling, operation, early warning, back tracing, etc.
- Innovation as market leader, growth enabler, game changer to attract & retain talents and improve operational efficiency