China-Singapore Tianjin Eco-City

Smart City White Paper 2020

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Since 2009, pioneers from China and Singapore have created a vibrant green city on a saline-alkali land, pioneered a unique way of urban innovation. With more than 10 years of continuous planning and leadership, Eco-city has gradually formed a leading "ecological + intelligent" development model with a “1+3+N” technical architecture. The city is gradually realizing the vision of "all-element integration, all-dimensional connectivity, and all-domain coverage" of smart city supported by the data aggregation in all domains.

Under the guidance of the principle of "Indicator-leading and Application-oriented", Tianjin eco-city forms smart city KPIs based on what the citizens care most to adjust the direction and pace of smart application development. While creating excellent cases of smart applications, the city government is also taking the opportunity to quickly form a smart economy ecosystem with leading high-tech and AI industries. It is now drawing from its excellent smart application development experience over the years to form a batch of replicable and popularized smart development model and exporting new ideas, concepts, and practices of smart cities for the future.

1. Development Journey of Smart Eco-city

The smart development model has received full attention from the early days of Eco-city. Taking Singapore's successful experience of building a "smart nation" over the past 30 years as an important reference, Eco-city draws its smart development blueprint through continuous smart city master plans to get the intelligence grow together with the city.

In 2010, Eco-city formulated the first Smart City Master Plan, paving the way for the overall development of smart cities. In 2012, it published Smart City Action Plan (2013-2015), established the main tasks and breakthrough directions for the future development. In the same year, Eco-city was selected by the Ministry of Housing and Construction Development of China as the first batch of pilot smart cities. Since then, continuous development of urban ICT infrastructure and high-speed fiber network have laid a solid foundation for smart development of the city.

With the first batch of residents taking root in Eco-city, the smart development has entered a new stage. In 2015, Eco-city invited the Singapore Information Development Authority (IDA) to jointly develop the Master Plan for the Pulsating City. The Pulsating City concept (Sustainable, Enriching & Smart Experience, or SENCE in English) leverages Singapore's experience in government digitalization and the Smart Nation 2015 blueprint as an important reference to bring new impetus to the development of Eco-city in its fast expansion phase. During this period, Eco-city completed the full coverage of optical fiber network, underground pipe network, and smart vision systems, bringing smart development into the "fast lane". Smart applications with Singapore elements, such as smart lamp poles, e-citizen centers, and Eco-Pass for citizens, were deployed. The development at this stage not only improved the overall technical atmosphere of Eco-city, but also attracted many high-tech enterprises and tech talents to move in. It began to form a model of smart city construction that continuously improved residents' quality of life and could be replicated and popularized.

At the beginning of the second ten-year development, a two-wheel-driven development strategy, named “Upgrade version of ecological city" and “Innovative version of mart city“, was officially recognized as the core strategy of Eco-city starting from the year 2019. “Smart city” has then become the bright name card of Eco-city. As the population has raised and the digital economy has begun to develop, the improvement of living standard and the empowerment of innovation have become the core requirements.

Eco-city is since then dedicated to answer the question of how small and medium-sized emerging cities can embody the harmonious coexistence of people, economy, and environment through smart development and how to promote successful experiences to similar regions around the world. In 2019, Eco-city start to propose the concept of "all-area smartness" development mode guided by the smart city KPI system and master plans with the strategy of "indicators leading and planning control". The city published the latest version of smart city master plan, Eco-City Smart City Master Plan (2021-2023), in May 2021 to grasp the development process for future. In the next a few years, the city will start to build more intelligent and modern smart applications to provide an eco-city solution for the in-depth intersection of smart technology and production and life and to promote the integration and coordinated development of smart technology industries and smart cities.

Eco-City aims to build an “All-area smart city" and incorporates global advanced city development concepts and technical elements, making the city a beautiful home of happiness, harmony, innovation, and enjoyment. It is committed to providing the world with the most persuasive answers on how to use intelligence to promote harmonious coexistence between people and people, between people and economic activities, between people and the environment.

2. 2020 Smart City Achievements

Smart Citizen

Based on "people-oriented and application-oriented" concept , the city focuses on the creation of perceptible and comfortable public service scenario in areas such as transportation, community services, leisure, tourism, medical care, and education, which residents are highly concerned about.

At all traffic junctions within the developed area in Eco-city, real-time traffic is analyzed by AI empowered systems, traffic signals are dynamically adjusted according to the machine-learning algorithm to optimize the timing in real time. Without make any physical changes to the road, the traffic congestion time is reduced by 13% and the average passing speed is increased by 20% by end of 2020 since the deployment of the system in 2019. For residents who are willing to adopt a green way of travel, Eco-City has designed and built a series of "future bus stations" to allow driverless "panda buses" to shuttle through them, making the waiting time more comfortable and fun.

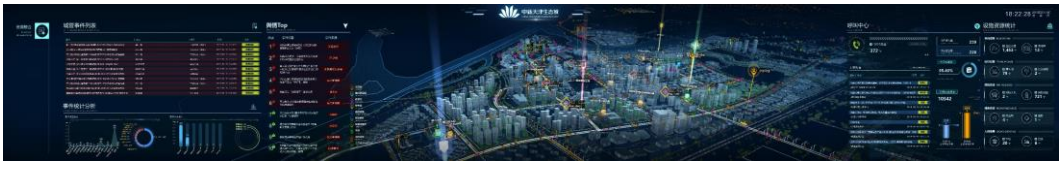
To address residents' concerns about high-altitude parabolic risks, the smart community implemented an all-round real-time monitoring system without dead spots and automatically captures the parabolic source. In the Sino-Singapore Friendship Library, which has become a fun spot for residents, the robots are managing the books. A robot can count more than 20,000 books in an hour, and sorting and returning books 10 times faster than that of manual work. In Eco-city, tap water, natural gas, heat supply, and reclaimed water can be provisioned, queried, paid, and fed back through the unified service app “5890”. With the arrival of winter every year, the "unattended intelligent heat exchanger" uses AI technologies to closely monitor the heating conditions of the residential area and accurately control the optimal temperature to each home.

Smart Economy

The smart city developments provide fertile ground for the application of cutting-edge technologies, creates wide range opportunities for the technology industry. In 2018, Eco-City and Huawei jointly established the Huawei Tianjin Binhai Innovation Center, helping the city become a smart industry collaboration site and a national high-tech industry demonstration base. The innovation center provides city industry cloud and software innovation cloud that have helped 391 enterprises and 3860 projects migrate to the cloud and trained nearly 10,000 university teachers and students till now. In 2020, Eco-City started to build a 5G application demonstration zone and an artificial intelligence application demonstration zone. It cooperates with China Mobile to build a 5G+AI lab to promote regional 5G industry development through the integration of application demonstration platforms (labs) and industry innovation platforms (incubators), and fully stimulate new drivers of industry development. It also sets up enterprise data graph to help provide professional services for enterprises in the city. By the end of 2020, the proportion of the eco-city pan-intelligent technology industry reaches 60%. Eco-city has successfully attracted a number of industry-leading enterprises, such as Huawei Marine, State Grid Ruijia, to settle in, the industry aggregation pattern has taken shape. Through smart city development, leading companies such as Huawei, Taiji, and Aishu, State Grid and Keppel Real Estate, are actively participating in the smart development, taking the eco-city as a pilot area for digital transformation and innovation.

Smart Government

Eco-city is using technology to support the urban development and maintenance with the key focus in improving the governance efficiency, forming a future-proven integrated development environment, promoting ecological environmental protection, and maintaining public facilities, etc.



Through data integration, Eco-City streamlines its data and develops CIM (City Information Modeling) model to form the city's "digital twin" and gradually developed the "smart brain" of the city. On a map contains more than 20 layers, the location of more than 200 5G base stations, more than 300 smart elevators, and more than 200 smart fire hydrants, as well as emergency resources such as police stations, fire brigades, and hospitals are displayed in real time. By sliding screens on the ten-year development contrast theme, the visitors can witness the transformation of the eco-city from a salt-alkali barren beach to an eco-smart new city. In Eco-City, more than 4,000 cameras generate more than 1 million pieces of video data every day. Currently, the cameras provide services for multiple units and departments, such as public security, traffic management, urban management, environment, public transport companies, and city operation centers. During the Covid-19 control period in 2020, EcoCity deployed drones 236 times to conduct preventive and control patrol inspection throughout the whole area. Drones are also mounted with cameras, hyperspectral, and air quality sensors to perform complicated flight missions like sensing and analyzing the atmospheric environment of the area. In the field of public facilities management, the city has spent more than 10 years continuously accumulate underground pipe network data to form an integrated management and operation system of water supply, gas, heat, rainwater, sewage, communications, and pneumatic pipelines. On the big screen of the urban facilities management center, the 3D information of underground pipelines is clearly visible. 19 types of sensors, such as remote water meters, remote gas meters, and remote heat meters, are deployed throughout the city and continuously feed back real time status and maintenance information for the efficient management and fast response of facility related incidents reported.

3. Smart City Key Performance Indicators

In 2019, Eco-City invited experts from the China Institute of Standardization, Singapore Cooperation Enterprise, International Standards Organization (ISO) and local teams to develop a Smart City KPI System for Eco-City with both international perspective and local characteristics. Released at the 3rd World Smart Congress, the KPI system includes 30 indicators in six categories and 73 specific tasks, with target values to be achieved by 2020, 2025, and 2035. The KPI system raises the requirements for standardization and measurability of technology, plays the supporting role of all digital transformation efforts, and is used as the guidelines for smart city development in Eco-city.

The KPI system is based on the principle of "Planning ahead, Strengthening support, Outcome-oriented, and Systematic implementation" and takes into account both operability and foresightedness. Under a common goal of smart city, the KPI system controls the development direction of city digitalization, accurately grasps the current state of city digitalization, evaluate the digital application level in each field, and effectively promote all departments to actively carry out comprehensive and leading innovation development. Its main features include:

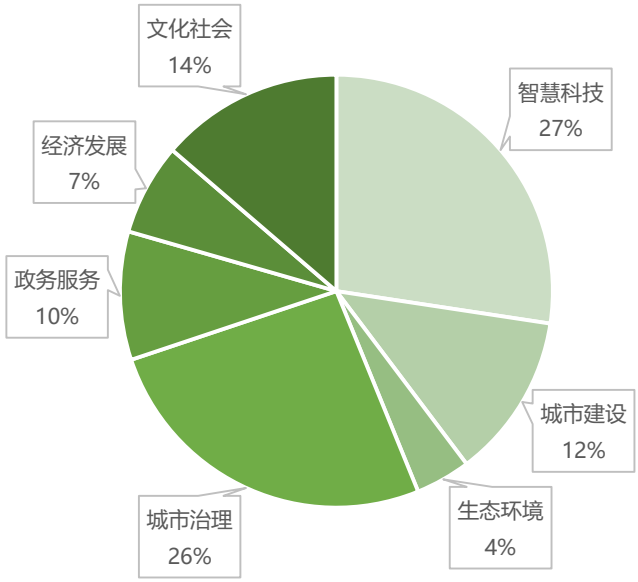
Planning ahead. The KPI system focus on pioneering and demonstrating. It takes careful reference of precedent and comparison of well-known domestic and overseas smart city schemes in regarding planning, visions and standards, to make sure that most of its indicators reach or even exceed the global standards. By 2020, the rate of sharing information resources among departments has reached 100%. By 2025, the coverage rate of 16 indicators, including the city information model (CIM), will reach 100%. By 2035, the coverage of 18 indicators, including the on-line monitoring and management of energy consumption of public buildings, will reach 100%.

Strengthening support. The KPI system strengthening solid support to serve eco-sustainable and green development within Eco-city. The system takes smart city scheme as an important means to realize urban sustainable development. Some indicators are chosen to maintain consistency and be interrelated with the existing city development indicators, which includes the real-time monitoring coverage rate of atmosphere, surface water and environmental noise, and the percentage of communities that links to online monitoring of domestic waste production system, etc.

Outcome oriented. The KPI system is outcome oriented that focus on public participation. The system took reference from the concepts and experience from advanced countries that great attention should be put on citizen engagement to make sure that indicator driven consequential action plans continuously improve the citizen's sense of gain and happiness. For example, two indicators, namely "Yearly Online Public Participation in Urban Management Matters" and "Proportion of Public Participation in Green and Intelligence Systems" were set to encourage public participation.

Systematic implementation. The KPI system requires a systemic implementation to improve evaluation mechanism and supportive policies of the smart city development. The selection of KPIs follow the "implementable and pragmatic" principles, fully considering the local context and competencies, defining phased targets, action plans and key tasks, also setting up a systemic procedure which can be presented by a smart city Index. Moreover, Eco-city consequently establish an effective progressing mechanism including top-level design, annual assessment and continuous improvement, with a roadmap to implement the smart city project covered by every indicator.

智慧指标引领下按领域统计的智慧建设



The publish of smart indicators for Eco-city shows how cities, especially small- and medium-sized cities, can seize their own development characteristics and opportunities by using the development of a KPI system. The KPI system forms a new roadmap that meets the needs of the citizens and contains forward-looking standard models of the direction of future urban developments.

4. The Future Developments

2021 indicates the opening of the Nation’s 14th Five-Year Plan and the beginning year of "Digital China". Eco-city has stepped into a new era where the two themes of "Ecology" and "Intelligence" will become the main theme, helping the city rapidly grow into a unique new city of the future. Leading by the smart city indicators and the latest smart city master plan, Eco-city will start to create new leading experiences in the domains of "digital economy", "digital society", "digital government", and "digital ecosystem", and fully unleash the vitality of smart innovation.

In the digital government domain, a three-level urban management system will be gradually formed. Driven by the upgraded city brain, various urban governance issues will be quickly resolved within the management “grids” with the help of the CIM based systems; intelligent sensors in every corner of the city constantly send the real time signal of city's environmental status, which will then be displayed on the big screen of the city intelligent operation center. Latest technologies such as 5G network, V2X roads, and drones will start to support more and more urban governance scenarios.

In the digital society domain. "Value chain" based services will streamline various citizen service applications. In terms of smart tourism, Eco-city plan to launch smart tour stations throughout the region to allow tourists to enjoy convenient smart travel experiences. In the field of science and technology education, the reach-content science tour route allows young pioneers who are curious about science to participate in innovative experiments. In the field of comfortable living, the smart communities will gradually be connected together to form a smart dynamic area, which will naturally incorporate diverse interactive environments and elements into the flow of life. People in different ages, with different backgrounds could find the interesting "intelligent elements" beyond their living environment.

In the digital economy domain. The city will continue to implement the strategy of promoting high-tech industries through city level developments. By leveraging on the local “new infrastructure” developments such as 5G and V2X, the city could attract leading industries and high-tech start-ups and expand the industry chain. Eco-City is building itself into a platform for the development of the entire industry chain in the AI 2.0 era, finally realizing the development of intelligent technology industries and fostering a "Pan-intelligence" industrial cluster.

In the digital ecosystem domain. The big data transaction center will make city data a "production factor" that promotes the co-creation and sharing among the industry, university and research centers. The sharing of city-level technical resources such as AI tools, open data, cloud computing resources, and blockchain technology enables enterprises in the AI industry create more future-oriented smart scenarios and services. In addition, by set up more comprehensive policies, regulations, technologies, and security indicators, the city will ensure the oriented development in all sectors.

The future of the city is promising and is full of uncertainties. It calls for the brave explorers to find a bright way. In the future, Eco-City will leverage on the power of technology and innovation to grasp the pulse of the city, light up lives and make the city smart. Eco-City will continue to build on its own efforts to create harmonization between citizens, the economy, and the environment, and tell the story of an ecological and intelligent city to the world.