

Macao Funding Scheme for Key R&D Projects 2020

Application Guideline for Projects of Smart City

Integrated Technology Development and Application

I. Background

Smart city is a new concept and model that uses Internet of Things (IoT), cloud computing, big data, geographic information technologies and other new-generation information technologies to promote the smartification of urban planning, construction, management and services. It is important to the implementation of the country's development strategy towards urbanization and the bolstering of its cities' ability to achieve sustainable development. The country has, in recent years, released a series of strategic plans addressing different aspects of smart city development. They range from infrastructure, industrial development to civilian application of information technology, information security, and so on. Related indexes and blueprints have been announced in many provinces, autonomous regions and cities, including those in the Guangdong-Hong Kong-Macao Greater Bay Area, and they will soon be used and implemented.

The Macao SAR government mentioned smart city development in the Policy Addresses delivered these years. The 2020 Policy Address considers the acceleration of urban planning and Macao's smart city development as key initiatives of the government administration. It mentions the construction of a smart city with a focus on promoting the application of artificial

intelligence in governance, customs clearance, medical services, tourism and transport system, to further integrate information technologies into the city's modernization process. The establishment of the State Key Laboratory of Internet of Things for Smart City in Macao, approved by the Ministry of Science and Technology in 2018, laid a solid foundation for the training of professionals, scientific R & D, related application and demonstration among others in terms of smart city development, contributing to the city's ever-increasing influence home and abroad.

Considering the Macao SAR's development needs and to facilitate the integration of information technologies into the city's modernization process, Macao's Science and Technology Development Fund (FDCT) proposes, based on the city's characteristics, this key R & D project, developed with the expertise of mainland experts and taking into the opinions of Macao's researchers in relevant areas. FDCT hopes that through the project, Macao's strengths will be put to use in an organized way to meet the country's needs, and it will help enhance Macao's scientific R & D capability, fostering Macao's due economic diversification through technological innovation. It is also expected to help enhance the smartification of its urban construction and modernization of its governance while increasing citizens' happiness and satisfaction in support of the development of smart cities and the International Innovation and Technology Hub in the Greater Bay area, thereby contributing to China's development into an innovative country.

II. Overall Objectives

To improve Macao's information technology R & D capability in and promote the application of information technologies in such areas as urban management, industrial development, civil services, community management, in line with the city's positioning as "a center, platform and base" and its development direction, to advance the management of the city as well as increase resource use efficiency and residents' quality of life for the city to become an innovative international city in favor of the construction of a world-class smart city cluster within the Guangdong-Hong Kong-Macao Greater Bay Area.

III. Research Fields

The Guideline addresses applications regarding three research fields. They are public services-oriented smart city modeling and simulation as well as artificial intelligence application; comprehensive power and energy IoT operation and control as well as security technologies and their application; key technologies for complex systems integrating human and artificial intelligence and smart objects as well as their application in respect of smart transport system. Projects in any of these fields should be executed in no more than 3 years.

1. Public services-oriented smart city modeling and simulation as well as artificial intelligence application

Projects in this field study technologies for multi-granularity perception, big population data analysis, socially-aware computing for urban services, dynamic knowledge graph completion, multi-scale city modeling, and mixed-reality and simulation

technologies. They also focus on the development of smart city resilience simulation decision-making and service platforms, the application and testing of smart decision-making and analysis in terms of urban public safety, disaster prevention and management, emergency occurrences as well as provision of smart tourism services based on temporal-spatial big data. It can support no fewer than 5 typical mixed reality and simulation scenarios, in addition to offering smart services such as prediction of human traffic density, congestion easing and emergency alert service.

2. Comprehensive power and energy IoT operation and control as well as security technologies and their application

Projects in this field involve the design of IoT-based comprehensive power and energy systems and studies of such key technologies as holistic perception, precise operation and control, emergency response, recovery and protection technologies concerning the systems. They also use energy load data together with big data for energy supply and use modeling as well as for precise profiling, management and control of supply and demand. Besides they include studies on cyber-physical-social comprehensive energy systems and their digital twins' modeling methods and analysis paradigms; development of new smart management platforms for the systems; massive application and demonstration of the platforms in boosting energy use efficiency and in anomaly detection, fault identification and ensuring security of the systems. This should increase the efficiency of the target systems' comprehensive energy use by 10% and the accuracy of their anomaly detection and fault identification by more than 90%.

3. Key technologies for complex systems integrating human and artificial intelligence and smart objects as well as their application in respect of a smart transport system.

Projects in this field study complex traffic environment perception and scenarios understanding methods as well as the models of computable traffic systems integrating human and artificial intelligence and smart objects in addition to edge computing using human-computer collaboration intelligence. They should build new generation smart transport system platforms based on hybrid augmented intelligence and apply them in typical scenarios in key urban areas. The model of urban integrated transport system should involve over 100,000 human, machine and object elements, and the efficiency of perceptual and cognitive computing should be improved by over 30% while the perception accuracy of human, computer and object elements in typical traffic scenarios should be over 90%.

IV. Application Requirements

Every applying entity should file the application for its work in the form of a project that covers research topics in any of the fields stated in this Guideline. The entity should apply for each of its projects as a whole and the projects should in principle cover all the required performance indicators. Unless otherwise specified, a project should include no more than three topics. The entity leading the project should be a local one but we encourage cooperation with entities from outside Macao. Every project should be undertaken by no more than 6 entities, and the people in charge of the project and the research should be eligible for full-time work in Macao.

The maximum application amount for each project is MOP150 million.

V. Experts Involved in Drawing up the Guideline

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