THE HONG KONG INSTITUTE OF
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HKIS Annual Conference 2016

Kowloon East –
Building our Future Model City

10th September 2016
Ballroom, JW Marriott Hong Kong,
Pacific Place, 88 Queensway, Hong Kong

Kwun Tong

Kai Tak

Kowloon Bay

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Message from Guest of Honour

Mr Paul MP CHAN, GBS, MH, JP
Secretary for Development, Development Bureau
HKSAR Government

I offer my heartfelt congratulations to the Hong Kong Institute of Surveyors for hosting its Annual Conference 2016 with the theme of "**Kowloon East – Building our Future Model City**".

Kowloon East is transforming into a vibrant core business district (CBD) under the Energising Kowloon East Initiative. With the policy announcement in 2015 that Kowloon East will become a pilot area for exploring the development of a smart city, the potential for Kowloon East is boundless. Building a smart district goes beyond the effort of the Government. It is important that all stakeholders feel excited and collaborate, leveraging each other's experiences and expertise. This conference provides a unique platform for sharing the latest advancements in technologies and ideas for co-creating our future model city – sustainable, livable and smart.

Land is the most precious resources in our pursuit of prosperity and good living. Increasing land supply tops the agenda of my Bureau, and the Government has been adopting a multi-pronged strategy to increase land supply in the short-, medium- and long-term. Given that Kowloon East (which includes Kai Tak, Kwun Tong and Kowloon Bay) is largely occupied by industrial buildings, its potential to transform into Hong Kong's second CBD is a promising source of land supply. When planning and designing Kowloon East, we aim at not only meeting people's needs and expectations on basic housing and employment opportunities, but also creating a clean, green, and accessible district with ample space for cultural and leisure activities conducive to a healthier and happier city life.

You are welcome to join us in Kowloon East to co-create Hong Kong's future as a world-class smart city, where innovation, creativity, energy and opportunities meet, and exciting aspirations materialise.

Lastly, I wish this conference every success.

Paul MP CHAN
Secretary for Development, HKSAR Government

Message from the President

Sr LAU Chun Kong
President
The Hong Kong Institute of Surveyors

On behalf of the Hong Kong Institute of Surveyors, I welcome you to the HKIS 2016 Annual Conference. Thank you for your support to the Institute.

The conference theme is Kowloon East – Building our Future Model City. Smart city development has been chosen as the theme of the HKIS Annual Conference for three consecutive years, which underscores its importance to the entire business community and society. CBD2 is in the making with effort from both the government and the private sector. There are many other development projects taking place and many are on the drawing board, which will continue to fuel the growth of Hong Kong.

We have shifted our focus this year to uncovering solutions such as the possibility and feasibility of developing smart city grids and infrastructure in new areas of Hong Kong. Our expert speakers from both the government and private sectors will explore different topics ranging from government policy, technology to commercial development.

Hong Kong is a world city and one of the best cities in the world to do business. Maintaining such reputation comes with great challenges and responsibilities. Other thriving Asian cities are trying to challenge Hong Kong as Asia's best city to do business. Our competitors have been formulating different policies and making significant investments so as to attract talents and enhance competitiveness. Singapore has emerged strongly economically after the Global Financial Crisis. In 2015, Singapore was the only Asian City in the Forbes 2015 ranking of Global Smart Cities, and it was ranked third for the liveability of 28 cities in the APEC region, which was also the highest in Asia in the PricewaterhouseCoopers "Building Better Cities" study. We will benefit from experiences of two distinguished speakers from Singapore. Dr Victor KHOO, Deputy Director of Land Survey Division of the Singapore Land Authority will discuss how government agencies benefit from the Singapore Government initiative to create and maintain high-resolution nationwide 3D mapping. Mr TEOH Hai Pin, Senior Director of DP Architects Pte, will show us conceptualisation and master plan of the Singapore Sports Hub, a multiple award winning project.

We are fortunate to have many other experienced and bright experts from both public and private sectors to share their insights to us today. From the Hong Kong Government, we have Ms Bernadette LINN, JP, Director of Lands of the HKSAR Government; Mr C K YIP, District Planning Officer/Kowloon of Planning Department of the HKSAR and Ir WONG Wai Man, Project Manager (New Territories East) of Civil Engineering and Development Department. From the private sector, we have Dr IEONG Meikei, Chief Technology Officer of Hong Kong Applied Science and Technology Research Institute; Mr Donald CHOI, Managing Director of Nan Fung Development Limited and Sr Augustine WONG Ho Ming, JP, Executive Director of Henderson Land Development Company Limited. On behalf of the Institute, I would extend our sincere gratitude to all the distinguished speakers for sharing their valuable perspectives with us.

The Institute is also grateful for our distinguished guest of honour, Mr Paul MP CHAN, GBS, MH, JP, Secretary for Development, Hong Kong SAR Government, for taking the time to join us today.

I would also like to express our appreciation for all our honoured guests, speakers, moderators, sponsoring organisations, and the organising committee for contributing to the success of the HKIS 2016 Annual Conference. I hope you will find the conference add to your wealth of knowledge and that you can also connect with existing and new acquaintance. Thank you again, and please enjoy the conference.

Sr LAU Chun Kong
President (2015-16), The Hong Kong Institute of Surveyors

Conference Programme

Time	Programme/Topic	Speaker
08:30 – 09:00	Registration	
09:00 – 09:10	**Welcome Speech**	**Sr LAU Chun Kong** President The Hong Kong Institute of Surveyors
09:10 – 09:40	**Opening Keynote Speech**	**Mr Paul MP CHAN, GBS, MH, JP** Secretary for Development Development Bureau, HKSAR Government
09:40 – 09:45	Group Photo with Guest-of-Honour by **Sr LAU Chun Kong**	
09:45 – 10:10	**Coffee Break**	
10:10 – 10:35	**Developing a Smart City through Collaboration**	**Ms Bernadette LINN, JP** Director of Lands Lands Department, HKSAR Government
10:35 – 11:00	**Kowloon East as a Future Model City? – A Planning Perspective**	**Mr C K YIP** District Planning Officer/Kowloon Planning Department, HKSAR Government
11:00 – 11:25	**Adoption of Smart & Green Initiatives in the Development of the Anderson Road Quarry Site**	**Ir WONG Wai Man** Project Manager (New Territories East) Civil Engineering and Development Department, HKSAR Government
11:25 – 11:35	**Q & A**	Moderator: **Sr Bay WONG** Past President, The Hong Kong Institute of Surveyors Director, Hong Kong Green Building Council
11:35 – 11:40	Souvenir Presentation to Speakers and Moderator by **Sr KWOK Ngok Chung, Dick**	
11:40 – 11:50	Souvenir Presentation to Sponsors by **Sr LAU Chun Kong**	
11:50 – 13:10	**Lunch**	

Time	Programme/Topic	Speaker
13:10 – 13:35	**Mapping Singapore in 3D**	**Dr Victor KHOO** Deputy Director Land Survey Division, Regulatory Cluster Singapore Land Authority
13:35 – 14:00	**Technology Considerations for Smart Cities**	**Dr IEONG Meikei** Chief Technology Officer Hong Kong Applied Science and Technology Research Institute
14:00 – 14:25	**Hub Ecology – Creating an Ecosystem of Connectivity, Accessibility and Inclusivity**	**Mr TEOH Hai Pin** Director DP Architects Pte Ltd
14:25 – 14:35	**Q & A**	Moderator: **Sr Paul HO** Past Chairman, HKIS Quantity Surveying Division Principal Lecturer, City University of Hong Kong
14:35 – 14:40	Souvenir Presentation to Speakers and Moderator by **Sr KWOK Ngok Chung, Dick**	
14:40 – 15:00	**Coffee Break**	
15:00 – 15:25	**Creating Wealth and Sharing Happiness – Envisioning Kowloon East**	**Mr Donald CHOI** Managing Director Nan Fung Development Limited
15:25 – 15:55	**Can the Market Alone Make Kowloon East a Smart City?**	**Sr Augustine WONG Ho Ming, JP** Executive Director Henderson Land Development Company Limited
15:55 – 16:05	**Q & A**	Moderator: **Sr Eureka CHENG** Planning & Lands Advisor / Consultant Meinhardt Infrastructure & Environment Ltd
16:05 – 16:10	Souvenir Presentation to Speakers and Moderator by **Sr KWOK Ngok Chung, Dick**	
16:10 – 16:15	**Closing Remarks**	**Sr KWOK Ngok Chung, Dick** Chairman Annual Conference Organising Committee The Hong Kong Institute of Surveyors
16:15	End of Conference	

Speakers and Papers

Ms Bernadette LINN
Director of Lands
Lands Department, HKSAR Government

BIOGRAPHY

Ms Bernadette Linn joined the civil service as an Administrative Officer in 1989. She was Deputy Secretary for Education from 2005 to 2008, Deputy Secretary for Financial Services and the Treasury from 2008 to 2010, and Private Secretary to the Chief Executive from 2010 to 2012. She has been Director of Lands since 31 July 2012.

Ms Linn holds a Bachelor of Arts Degree from the University of Hong Kong and a Master's Degree in Communication Studies from the University of Michigan, Ann Arbor.

Ms Linn currently sits on the Hong Kong Housing Authority, the Hong Kong Housing Society and the Town Planning Board as member.

ABSTRACT

Developing a Smart City through Collaboration

The transformation of Hong Kong into a Smart City has attracted considerable attention in the last two years. In his 2015 Policy Address, the Chief Executive announced that the Government would use Kowloon East (KE) as a pilot area to explore the feasibility of developing a Smart City. Data is at the core of most Smart City initiatives. The development of integrated geographic information system (GIS) is essential to the development and the continuous growth of a Smart City. To this end, the Financial Secretary announced in his 2016-2017 Budget Speech that the Government shall refine the existing GIS and explore ways to align and integrate the spatial data in Hong Kong with a view to fostering IT application and development.

The success of Smart City-related initiatives hinges upon the joined-up efforts of all bureaux/departments and the community. The Director of Lands would like to share with the conference what Lands Department is doing to support these Smart City initiatives, how different stakeholders could collaborate with one another and the challenges ahead.

Keywords: smart city, spatial data, spatial data infrastructure, collaboration, Lands Department, LandsD, CSDI

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Developing a Smart City through Collaboration

Introduction

Hong Kong is an international world city with population over 7 million. Demand for better quality of life and sustainable development has been growing, especially in the past decades. With technology advancement particularly in Information, Communication and Technology (ICT), the focus of transforming Hong Kong into a Smart City[1] has been evolving. In light of fierce competition in the global arena, the Chief Executive announced that the Government would explore the feasibility of turning Kowloon East into a showcase for smart city[2]; and the subject has attracted considerable attention in the last two years.

The goals of the smart city are to make better use of information technologies to improve the economy, environment, management of a city and the quality of life of people living in the city. A smart city must be equipped with an essential infrastructure. According to the International Institute for Management Development World Competitiveness Yearbook[3], Hong Kong ranked first in technical infrastructure in both 2012 and 2013. Our world-class ICT infrastructure, comprising excellent Internet connectivity, high mobile penetration rate of 229% and widespread, free public Wi-Fi services, provides us with a sound foundation to adopt emerging technologies such as Internet of thing (IoT), cloud computing and big data analytics, making Hong Kong well-positioned to pursue smart city development.

A smart city can be powered by data collected from all shapes and sizes of sensors on streets, utilities (e.g. gas and telecommunication), lampposts, car parks, and buildings. With the data collected, we would be able to forecast more accurately, provide better services and raise our city intelligence.

The success of the smart city initiative relies heavily on three essential "IN" elements: infrastructure, information and intelligence.

Lands Department (LandsD), being the survey and mapping authority, is responsible for the continuous provision of accurate and up-to-date territory-wide geospatial related products to continue our support for the full spectrum of applications from visualization to analysis both within and outside the Government. To take forward the smart city initiative, LandsD is ready and well prepared to make significant contributions in the '3-IN' areas of a smart city.

LandsD's '3-IN' Inputs to Support Smart City Initiative

a) 1st IN – INfrastructure

The establishment of backbone infrastructure is the first essential step to lay the groundwork for smart city initiatives. The well-developed ICT infrastructure in Hong Kong allows collection of a plethora of data along with the wider use of sensors and all IoT related activities. In collaboration with the Office of the Government Chief Information Officer (OGCIO), LandsD renders assistance and advice in land administration to support the strengthening of this ICT infrastructure.

An increasing demand in both the Government and private sectors for spatial data illustrates the importance of location information to support better decision-making in a smart city. Positioning infrastructure and spatial data infrastructure provide a foundation for common positioning reference; data and technical standard framework allows spatial data to be collected, shared, integrated and disseminated. LandsD has been contributing to the establishment and maintenance of the territory-wide geodetic network and supporting the Development Bureau (DEVB) in taking forward the "Common Spatial Data Infrastructure" (CSDI) initiative that ultimately contributes to the development of a spatially enabled smart city in Hong Kong.

(i) Data Centre

Data centres are critical infrastructure for the new digital economy. With the increasing use of cloud computing and big data analytics, we expect continuous growth in the demand for data

centre services. Hong Kong is a prime location for setting up data centres in the Asia Pacific region. The Data Centre Risk Index[4] ranked Hong Kong as the safest Asian city for data centres three years in a row from 2011 to 2013. Moreover, the International Data Corporation ranked Hong Kong as the most suitable location in Asia Pacific for setting up data centres in 2013.

The Government is committed to promoting the development of data centres in Hong Kong by providing suitable land for high-tier data centres. Since 2010, the Hong Kong Science and Technology Parks Corporation has made available some 19 hectares of land in Tseung Kwan O (TKO) and Tai Po Industrial Estates for developing high-tier data centres. The Government in 2012 reserved three sites of about one hectare each in TKO for high-tier data centre development. The first site was sold in October 2013 and the remaining two are planned for disposal in the next few years.

Moreover, OGCIO has implemented a concessionary scheme to encourage development of data centres by conversion of old existing industrial buildings and redevelopment of industrial lots since June 2012.

In assisting OGCIO in implementing the measures, LandsD has issued Practice Note (No. 3/2012 as varied by 3/2012A and 3/2012B) setting out the requirements and necessary supporting documents for lease modification or waiver applications under the measures. OGCIO provides technical advice to LandsD in the processing of applications, advising appropriate terms and conditions for the waivers and the modified leases.

(ii) Building Design for a Smart City

To take forward the Smart City initiative in Kowloon East (KE) which is used as a pilot area to explore the feasibility of developing a Smart City as announced in the 2015 Policy Address, the Energizing Kowloon East Office (EKEO) has looked into ways to achieve the initiative and sought policy endorsement to include specific building design requirements in the land sale conditions for private development sites in KE. LandsD has collaborated and closely liaised with EKEO to prepare the land sale documents.

The building design requirements to be incorporated into the Conditions of Sale include:
• higher greening ratio (i.e. 10% over the normal requirement);
• to obtain Provisional Gold Rating for green building design;
• installation of smart water metering system; and
• provision of electrical vehicles (EV) charging facilities for parking spaces.

(iii) Hong Kong Positioning Infrastructure

Location is a vital dimension to connect everything to our livings. With introduction of small but affordable Global Positioning System (GPS) receivers, we see greater breadth and depth in the connections among people and things.

Accurate location enjoyed in the smartphones and IoT devices supports smart applications. To improve the accuracy of positioning technology applied in these devices, LandsD has introduced a local satellite positioning system, namely the Hong Kong Satellite Positioning Reference Station Network (SatRef) since 2001. It covers the whole territory and delivers round-the-clock reference services for the Government and the community.

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Figure 1: Hong Kong Satellite Positioning Reference Station Network

(iv) Spatial Data Infrastructure

In the digital era, the ever increasing volume of information held by different parties in different forms results in information islands. This is akin to the communication problems arising from differences in languages, time zones and measurement units we sometimes face in our daily lives. Just as we try to overcome those communication problems by using a common language, time standard and unit conversion, we need to construct the information bridge to connect the information islands.

A common spatial language facilitates spatial data exchange and interactive application development. It facilitates convenient access to quality and up-to-date spatial information, application and services. It supports Smart City initiatives, innovation and technology development and decision making for sustainable development.

In the 2016-17 Budget[5], the Financial Secretary highlighted the significance of information and announced that the Government would refine the existing geographic information system (GIS) applications and explore ways to align and integrate the spatial data in Hong Kong, including the location and relevant information of facilities that are above and beneath ground level.

LandsD will support the DEVB in formulating the spatial data policy for the establishment of a CSDI.

Figure 2: CSDI removes barriers of using various geospatial data

b) 2nd IN – INformation

Information is the core element of smart city development. It forms the very foundation of smart applications to improve the quality of life and promote developments in our economy.

LandsD has been consolidating and disseminating its map products and various spatially enabled data to the Government as well as the community.

(i) Map-as-an-information-medium

Maps tell us much about the world in which we are living, including its political boundaries, natural resources, buildings and roads, climates, topography, and economic activities etc. They help us visualize locations and things.

Maps are also fundamental to public administration. LandsD has committed to provide accurate and up-to-date maps in a wide selection of themes, scales and formats to support the rapid and intensive development of Hong Kong.

To keep pace with market trends and needs, LandsD has applied state-of-the-art technologies in map preparation and expanded its product range in the last two decades.

With latest technologies such as unmanned aerial survey, terrestrial laser scanning and

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mobile mapping system, ground features can be captured effectively and efficiently. LandsD has adopted new digital mapping technologies to streamline the massive production of various maps and spatial data.

We have also launched a new dimension of digital map product, namely 3D spatial data. This sophisticated 3D data model provides more comprehensive information to describe our city, and renders good support to a series of innovative applications, such as 3D city-walk simulation, Virtual Reality (VR), Augmented Reality (AR).

To encourage more innovative uses of the Public Sector Information (PSI) by the public, LandsD joining hands with the OGCIO actively participates in the scheme of opening up public data, including various land administration, mapping and public facility data, etc.

(ii) Common Platform Breaking Information Barrier

On the basis of its expertise in the collection, collation, analysis, distribution and management of geospatial data as well as its experience in the setting up and development of GIS applications, LandsD has spared no effort to break the information barrier by effectively sharing geospatial data and related information collated and collected from various departments.

Geospatial Information Hub (GIH) developed by LandsD has underscored the benefits of a common web-based GIS platform since its launch in 2004. Government officers could use GIH to search and retrieve spatial data consolidated from various departments in a timely manner, which in turn enables informed decision made by the Bureaux/Departments (B/Ds) and supports swift responses. A large-scale revamping exercise for GIH to support advanced spatial analysis and serve seamless and smooth map is in progress, for completion in late 2017.

c) 3rd IN – INtelligence

Hong Kong is on the journey towards being smarter, i.e. more intelligent. LandsD has developed various smart applications with value added services and intelligence for different parties.

(i) Web Map Services Anywhere

LandsD has further extended the geospatial information service to the general public by launching the "GeoInfo Map" (www.map.gov. hk) in 2010. As a publicly accessible online map service, GeoInfo Map provides useful online geospatial information services for the public in an effective way. It allows users to search for locations and facilities in Hong Kong and obtain relevant geospatial information contributed by 26 government departments. "GeoInfo Map" has been well-received by the general public since its launch in May 2010, with over 6,000,000 hit counts per week.

The successful implementation of GeoInfo Map has paved the way for LandsD to develop and launch a variety of geospatial information services serving the community. In 2014 and 2016, LandsD respectively launched a mobile map app "MyMapHK" serving the smartphone users and a digital inclusion mobile map app "VoiceMapHK" serving the visually impaired. The MyMapHK service proves popular and the total number of download of the MyMapHK app has exceeded 139,000.

Figure 3: Lands Department's mobile map app – MyMapHK

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Our Challenges – Keep Abreast of Technological Developments

A smart city should go for continuous improvement in its infrastructure, information and intelligence. Keeping the LandsD's '3-IN' inputs abreast of technological developments is a great challenge. We will continue to closely cooperate with various departments, public organizations, research institutes, professional bodies, private sectors and the community to further enhance LandsD's '3-IN' inputs.

a) Way Forward – Collaboration within Government

From the land administration perspective, LandsD will continue to support OGCIO to foster Hong Kong as the prime location for data centres in the Asia Pacific region in order to develop Hong Kong into a hub for technological cooperation and trade. LandsD will also help the EKEO to optimize the land use in transforming KE into another Central Business District (CBD).

On spatial data standards, LandsD will closely work with various government departments in the Working Group on Data and Technical Standards of the CSDI to draw up guidelines, data definition and standards, technical specifications and implementation plan to facilitate spatial data alignment, sharing and applications.

To further improve the intelligence encoded in the maps, LandsD is undergoing the process to construct the pedestrian network model and develop a pedestrian routing application with built-in intelligence to support the EKEO's smart city initiatives – improving walkability within the KE area.

b) Way Forward – Collaboration with Research Institutes

LandsD has partnered with the Applied Science and Technology Research Institute (ASTRI) to explore the potential of applying the latest IoT and information technologies to acquire real-time parking information, in turn facilitating smart navigation and decision making by users. LandsD has also been collaborating with the Hong Kong Polytechnic University in

extending the developed positioning and referencing services to enhance the positioning technologies applied in smartphones.

Quoted from a motto by Helen Keller, the famous American author and political activist, *"Alone we can do so little; together we can do so much"*. LandsD will continue to collaborate with the stakeholders within the Government and in the community to support our smart city development.

Note:
1 Central Policy Unit, "Research Report on Smart City". (2015)
2 Office of the Chief Executive, HKSAR, "2015 Policy Address". (2015)
3 International Institute for Management Development, "World Competitiveness Yearbook 2013". (2013)
4 Cushman & Wakefield, "Data Centre Risk Index". (2011-2013)
5 Financial Services and the Treasury Bureau, "2016-17 Budget". (2016)

Speakers and Papers

Writer / Speaker :
Mr C K YIP
District Planning Officer/
Kowloon
Planning Department
HKSAR Government

Writer :
Mr K K LING, JP
Director of Planning
Planning Department
HKSAR Government

BIOGRAPHY

Mr C K Yip is a professional town planner with extensive experience including review of the Town Planning Ordinance, housing policies, review of Master Schedules of Notes and Definitions used in statutory plans, and planning for West Kowloon Cultural District and Kai Tak development.

Mr Yip is the District Planning Officer/Kowloon of the Planning Department of the Hong Kong Special Administrative Region Government. He oversees the district planning works for Kowloon.

Mr Yip obtained his degree in BSSc from the Chinese University of Hong Kong in 1990 and MSc (Urban Planning) from the University of Hong Kong in 1993. He is a member of the Hong Kong Institute of Planners.

Mr K K Ling is a professional town planner with extensive experience including planning for the new airport and the Tung Chung New Town, review of the Town Planning Ordinance, harbour-front planning and development, planning enforcement and prosecution, cross-boundary planning, and planning for new development areas.

Mr Ling is the Director of Planning, heading the Planning Department of the Hong Kong Special Administrative Region Government. He is also the Chairman of the Metro Planning Committee and Rural & New Town Planning Committee of the Town Planning Board.

Mr Ling obtained his degree in BSSc (1st Class Honour) from the Chinese University of Hong Kong in 1980 and MSc (Urban Planning) from the University of Hong Kong in 1983. He is Fellow of the Hong Kong Institute of Planners (FHKIP), Registered Professional Planner (RPP) and with PRC Registered Urban Planner Qualification. Mr Ling was the President of the Hong Kong Institute of Planners from 2007 to 2009.

ABSTRACT

Kowloon East as a Future Model City? - A Planning Perspective

In the intriguing history of urban development, there is a relentless pursuit for a model city, contemplated as an ideal urban form which can be replicated in the public realm beyond times and places. However, the experience in the pioneering idea of Garden City in the early twentieth century as well as the new town movement in Hong Kong has unveiled the truth that the idea of model city is by no means static but an evolving development strategy to ensure people's quality of life and sustained growth of the city, which is the ultimate concern of planners.

Once a major industrial node flanked by the airport, Kowloon East is undergoing remarkable transformation with the interplay of regeneration of the old industrial areas into CBD2 and the visionary development of Kai Tak, coupled with the Smart City initiatives being enthusiastically advocated by the practitioners in the wake of information and technological advancement. It calls for a sustainable planning framework and holistic strategy to integrate all these dynamics in formulation of a new form of model city for Hong Kong. This paper attempts to settle the thoughts and cast a rethink on the strategic development of Kowloon East from a broader planning perspective.

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Pursuit for Model City

City is the most fascinating platform for human activity. It is the place where we live and work, the space for social interaction, communication and recreation, and the engine upon which the economy thrives. The immense opportunities and challenges arising from the high concentration of developments and diversified activities in city have posed eternal questions to planners – What is our vision for the city? How can we devise a strategy to sustain its growth towards our vision? There are no quick and easy answers to these questions.

In the intriguing history of urban development, there is a relentless pursuit for a model city, contemplated as an ideal urban form which is worthy of imitation and replication in the public realm beyond time and place. The first vision for a model city emerged in early 20th century when Sir Ebenezer Howard in his pioneering work of "Garden Cities of To-morrow" postulated the idealistic picture of Garden Cities which are well-planned and self-contained communities with home and workplace surrounded by green belts (Figure 1), as an alternative to the overcrowded cities with deteriorated living conditions at that time. His central notion is, in present day terms, to promote liveability and economic prosperity of the city. The concept is simple but influential in that it sets off the most fundamental quest of modern planning for an ideal physically planned community. Despite the change in times, some key ideas like the relocation of the settlements and workforce outside urban core, and design for a balanced and green community remain recurrent themes in the planning for city development.

Figure 1: Conceptual Drawing of the Garden City Layout (Howard 1902, p.22)

Furthering the pursuit for well-planned community, Le Corbusier advocated robustly in his work on "City of Tomorrow" and "the Radiant City" in 1920s, featuring an urban layout developed vertically in the form of high density skyscrapers separated across open spaces, distributing population densities evenly whilst maintaining people's mobility with the provision of highly integrated and efficient urban transportation infrastructure (Figure 2). The ideas were widely adopted by urban planners and realized in the post-war period to quickly accommodate displaced residents from high density urban renewal programs in cities, with more emphasis on mass transit systems to enhance their mobility.

Figure 2: Artist's Impression of Le Corbusier's Contemporary City (Le Corbusier 1929)

The pursuit for a model city has gone beyond the physical aspect. As subsequently pointed out by Sir Peter Hall (2002) in his work on "Cities of Tomorrow", the true practice of planning is about having vision for social betterment rather than a mere technical exercise.

In the 1970s, the Hong Kong Government launched the Ten-Year Housing Programme for new town developments with the themes of decentralization and self-contained community. The attempt is to allow the new town to have both the merits of urban and rural living, with an orderly and functionally planned layout, served with modern transport and integrated living and economic activities. Since then, the development strategies for Hong Kong had evolved and adapted in response to the city's changing circumstances and

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public aspirations, from the early period which focused more on providing housing for the booming population, to the advocacy of sustainable development to balance social, economic and environmental objectives, and promoting smart city initiatives which prevail the urban development industry nowadays. All these experiences have unveiled the truth that the concept of model city is by no means static, but should feature a dynamically evolving, flexible and sustainable development strategy with the end-goal of ensuring people's quality of life and sustaining urban growth.

Back in 2007, the Planning Department mapped out the strategic planning framework for Hong Kong in the "Hong Kong 2030: Planning Vision and Strategy" Study. With the rapid advancements of information and communication technologies (ICT) in the past decade, it has been a worldwide trend to apply ICT in core city development in order to implement smart city concepts. To facilitate a smart growth strategy, the Planning Department has pursued a more visionary planning strategy transcending beyond 2030 for Hong Kong, with special emphasis on the promotion of a smart and liveable urban form that suits the context of Hong Kong. From a planning perspective, the strategy for Hong Kong should go beyond the realm of technological development and be a holistic strategy to foster a more sustainable, liveable and resilient city. It is our objective to implement the strategy in new development areas in the New Territories as well as the older urban areas of Kowloon East (KE).

Planning for Kowloon East

Situated in a prominent location in the developed urban area of Hong Kong, KE comprises the Kai Tak development (KTD) at the ex-airport and the business areas of Kowloon Bay and Kwun Tong with a total area of about 488 ha (Figure 3). Upon full transformation, the entire area will be capable of providing a total commercial/office floorspace of about 7 million m^2. With the interplay of regeneration of the old industrial areas and the visionary development of the KTD, the KE area has great potential to become a future model city of Hong Kong.

Figure 3: Location of Kowloon East

The transformation of Kwun Tong and Kowloon Bay was set in train when the industrial land in the areas were rezoned to "Other Specified Uses" annotated "Business" in 2001 to facilitate redevelopment for commercial and office buildings. In 2011, the Government announced the adoption of a visionary, co-ordinated and integrated approach to expedite the transformation of KE into an attractive, secondary Core Business District (CBD2), with an overall objective to increase the supply of Grade A office space to meet the continual demands of financial and business service sectors locating their headquarters and regional offices in Hong Kong as a bridging point to enter the Mainland market. In the wake of ICT development, the Government further announced in 2015 to take KE as a pilot area to explore the feasibility of developing a smart city, and the development plan will adopt smart city concepts in respect of information dissemination, traffic management, architecture design and facility management, refuse collection and waste treatment, as well as urban greening.

In tandem with the transformation of industrial areas, a general consensus has been formulated for KTD after extensive public consultation between 2004 and 2006, and the area is proposed to be developed as the "Heritage, Green, Sports and Tourism Hub" of Hong Kong, and a distinguished, vibrant and attractive place

by Victoria Harbour. It is sport-oriented, people-oriented, sustainable, environmentally friendly with a distinguished and attractive urban form.

In the pursuit of a liveable, smart and green city, apart from the various initiatives related to ICT, sustainable land use planning is crucial. To allow for provision of quality space for various activities, a sustainable land use framework has been prepared for KE with the development strategies focusing on the creation of capacity, opportunities and places.

Create Capacity for Growth

Developable land is limited in Hong Kong, and its development potential depends heavily on the supporting infrastructure, in particular transport. In spatial terms, we therefore advocate a development pattern that is oriented around mass transit stations in KE to facilitate efficient and environmentally friendly intra and inter-district travel. Such compact development pattern provides convenience to people, reduces unnecessary travel time, lowers carbon emissions, facilitates the exchange of information and ideas, and contributes to the vibrancy of the city. Apart from the three existing MTR stations at Kwun Tong, Ngau Tau Kok and Kowloon Bay, two new stations at To Kwa Wan and Kai Tak City Centre under the Shatin-to-Central Link are being constructed in the KTD. The major office cluster planned in the city centre around these two stations alone is able to create a critical mass for an office node with a total commercial GFA of about 0.9 million m^2.

A vital ingredient for the successful development of a CBD is the availability of high-quality internal and external connections to attract world class businesses to Hong Kong. These connections must be well planned, convenient, safe, reliable, and fully integrated into existing networks to maximize efficiency. The existing and planned MTR stations are situated at the periphery of KE. An Environmentally Friendly Linkage System (EFLS) has been proposed as a multi-modal linkage system which will link up various development nodes in KE including the commercial cluster in Kai Tak City Centre, the tourism node and open space at the end of the runway, two major action areas in Kwun Tong and Kowloon Bay and the MTR stations (Figure 4).

Figure 4: The Proposed Transport and Pedestrian Linkages in KE (CEDD 2013)

Apart from road-based transport, a comprehensive pedestrian network has been planned in KTD to link up with the surrounding hinterland areas through an integrated network of open space, at-grade connections, elevated landscaped walkway, footbridges, subways as well as underground shopping street. At the same time, comprehensive pedestrian studies are being conducted by the Energizing Kowloon East Office (EKEO) for Kowloon Bay and Kwun Tong Business Areas in order to create a walkable and convenient pedestrian environment to enhance accessibility from the two business areas to the MTR Stations, KTD and the waterfront. In particular, car-free pedestrian passageway to integrate with existing and planned open space network, e.g. the proposed Green Spine and Green Link as proposed in the pedestrian study for Kowloon Bay (Figure 5) will promote a green environment and provide a vibrant and attractive area at the heart of the urban area. In response to public aspirations for wider coverage of the cycle track network, the Government is studying the provision of a cycle track network with a proposed length of 13km along the waterfront of the KTD for leisure and recreational purposes.

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Figure 5: Pedestrian Linkage Proposal for Kowloon Bay Business Area (EKEO, 2015)

Create Opportunities

The physical setting of KE including the existing road and infrastructure network has posed constraints and great challenges in planning. However, through innovative planning strategies, it is possible to turn them into development opportunities and generate space for development or recreation. This is fully realised in the planning for Kai Tak River.

The Kai Tak River was once known as Kai Tak Nullah, which was the main drainage channel with a length of 2.4km for the collection of stormwater in KE. It flows from Wong Tai Sin, then passes through KTD before discharging into Victoria Harbour (Figure 6). With the public support gathered in the consultation in 2011-2012, the Government has planned to turn the nullah into an attractive green river corridor, along with leisure and public activities serving the community while enhancing the flood relief capacity of KE. To facilitate the transformation, the river and its adjoining areas have been rezoned to "Open Space" on the Kai Tak Outline Zoning Plan. To maintain a wider vista along the river, non-building areas have been reserved for the commercial and residential developments along the two sides of the river. In particular, a cascading building height profile has been adopted for the landmark commercial development embracing the river in the Kai Tak City Centre, and the provision of retail frontage towards the river will create a riverside vibrant and festive public gathering place in the heart of the City Centre, and foster a prominent image for the locality.

Figure 6: Location of Kai Tak Nullah/River (Harbourfront Commission 2010) and Artist's Impression of the Completed Kai Tak River within KTD (Government Press Releases 2014)

There is a keen competition of space above ground level among different uses, e.g. road, buildings, and open space. In particular, the existing road network constrains the provision of convenient pedestrian access. To overcome this, another innovative idea adopted in KTD is the provision of the Underground Shopping Street (USS), as adopted in some cities overseas (Figure 7). A comprehensive network of USS with a total length of 1.5km has been planned in KTD as a means to improve pedestrian connectivity between the KTD separated by Prince Edward Road East and the hinterland areas of Kowloon City and San Po Kong. It could act as a direct east-west pedestrian corridor linking development sites with the two MTR stations of Shatin-to-Central Link, i.e. To Kwa Wan Station and Kai Tak Station, offering an alternative commuting routing. More importantly, there would be shops and services and eating places along the USS, allowing users to enjoy a different and interesting experience. There are also opportunities to provide additional usable space for a whole array of activities – shopping, dining, artwork exhibitions, public events and cultural gathering place, particularly on the points of interception of the USS with the Kai Tak River and Lung Tsun Bridge Preservation Corridor – adding flavours to both the new development area and the more mature neighbouring districts which are also undergoing transformations on their own. The concept of developing a pedestrian connection with retail elements is generally supported by the local community. If successfully realised, the USS in KTD could set an example and

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open the door for more extensive underground space development in the territory.

Figure 7: USS in Shinjuku, Tokyo

Create Places

To promote a green city, a comprehensive network of open space has been planned for KE, particularly KTD. However, the provision of space is not equal to the making of a 'place'. It is important to create a place where different types of activities can be held to make the place really attractive and vibrant, and with unique identify. Hence, strong emphasis has been placed on place making in the planning for KE through integrated land use planning and urban design efforts. It is our aspiration to create a distinguished and attractive urban form by creating a unique town centre juxtaposed with high-rise office development, a unique residential neighbourhood and a major open space. A large regional open space "Station Square" with an area of 10 hectares encircling the Kai Tak Station will be the major focal point of the Kai Tak City Centre. Spanning across the City Centre, the Square links up the commercial cluster in the northeast with the Sports Park in the southwest and residential neighbourhood in the southeast. To achieve vibrancy and enhance the experience of pedestrians around the Square, a retail belt of 2-storey building is planned for the commercial and residential sites along the open space. In contrast with typical large shopping mall podium developments, this retail belt, with a total length of 1.7km, will provide a continuous retail frontage with shops and restaurants to serve the pedestrians in the Square. To help create a more intimate ambience for the retail belt, a colonnade design concept is adopted. The concept requires the provision of a setback on the ground floor of the building for the provision of public passageway with regularly spaced columns (Figure 8). As a unique building design feature to reminisce the old Chinese buildings, the colonnade design can help moderate wind and protect pedestrians from sun, rain and adverse weather, and bring back the old Kowloon atmosphere that Kai Tak once embraced.

Figure 8: Colonnade Design Concept in KTD (ArchSD)

The planning principle of creating focal points and nodes for different types of activities is also strongly advocated in KE. The overall identity and sense of place can be reinforced by the creation of strong regional and local nodes. For KTD, there are large-scale anchors of regional significance including the Sports Park in the western part, Tourism Node and hotel cluster at runway tip, Metro Park in the middle and Station Square with commercial nodes in the northern part (Figure 9). For the Kwun Tong and Kowloon Bay areas, two action areas for vibrant and creative uses have been identified for transformation into new development nodes and focal points of the two business areas. These nodes are well connected by transport infrastructure as well as a network of open spaces, and serve as important focal points for carrying out different types of activities in different times of a day or of a week. Among others, a variety of activities are planned to be situated at the waterfront, ranging from cycling along the open spaces on the waterfront to a highly active commercial and retail-oriented waterfront lined with restaurants and cafes. They will cast and shape the character of the city with different flavours and foster various experience for the users, and in the whole reinforce the image/planning themes of KE and creating a strong sense of place in the district context.

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Figure 9: Anchoring Nodes in KE

In planning for KE, we embrace several important planning principles: planning should be people-oriented with the need to respond to public aspirations; it should be flexible and forward looking, creating capacity to sustain the growth of city and make flexible responses in view of the changing circumstances; and it should be innovative to turn constraints into opportunities and making an attractive place for the people. Based on the planning framework, various smart city initiatives in respect of application of ICT have been actively pursued in the transformation of KE into our future model city. While there is no model city to follow or replicate in the process, based on the shared vision of the community and dedicated planning and urban design efforts, we can surely make a smart, green and resilient city of our own for the future generations.

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BIOGRAPHY

After graduated from the University of Hong Kong in Civil Engineering, Ir Wong Wai Man joined the Government of Hong Kong and ever since he has been involving in various aspects of the Civil Engineering field. In the earlier stage of his career, he involved in the design and construction of railway line and landfills. Subsequently, he involved in the planning, design, construction, operation and maintenance of the drainage and sewerage systems in Hong Kong, with more than ten years focusing on overcoming the flooding problems in NT North and the planning of green and sustainable river channels and flood mitigation measures.

In the last 8 years, Ir Wong was responsible for the planning, design and construction of the infrastructures for the new town development in Hong Kong. He is now the Project Manager of the New Territories East Development Office of the Civil Engineering and Development Department, and is responsible for the development in the North, Tai Po, Sha Tin and Sai Kung districts. Currently, the major development and infrastructure projects he is looking after include the Fanling North and Kwu Tung North New Development Areas, the development of the Anderson Road Quarry site, the Tseung Kwan O-Lam Tin Tunnel and the Liantang/Heung Yuen Wai Boundary Control Point projects.

ABSTRACT

Adoption of Smart and Green Initiatives in Development of Anderson Road Quarry Site

Anderson Road Quarry is an important facility for supplying aggregate, asphalt and concrete for the construction industry in HK since 1950s. Following the accomplishment of its historical mission, the 40 hectare quarry site will take up another new mission - land supply for residential development with 25,000 planned population to address the housing shortage problem in the territory.

In view of the special geographical location and as a piece of precious virgin land in urban area, it gives the opportunity to convert the site to an exemplary, sustainable and spongy living area by introducing smart initiatives. Smart mobility initiatives such as cycling network with shared/rental bikes, interactive bus-stop concept, smart phone Apps, etc were explored not only to encourage the residents to commute within the site in a smart, sustainable and healthy living style, but also to reduce vehicular transportation and emission.

Sustainable and total water management initiatives are fully explored to implement in this development as far as practicable. These initiatives include an artificial flood attenuation lake cum park, an underground stormwater storage tank, rainwater harvesting system, bioretention system, and porous pavement, with an aim to create a flood-alleviated, leisure, healthy and harmonious community. Some of the above are even firstly introduced in HK. Furthermore, the retained rainwater serves as a reliable source for water supplement for the revitalisation of Tsui Ping River downstream for environmental, ecological and landscaping enhancement for Kwun Tong area. Last but not least, feasibility of adopting the first public grey water recycling system in HK is also under examination to better utilise the water resource in a longer term.

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Adoption of Smart and Green Initiatives in Development of Anderson Road Quarry Site

Background

In the last 50 years, the economy of Hong Kong grows extraordinarily rapid. Accompanying with the rapid economic growth, a lot of large scale infrastructures works and building structures have been constructed and erected to support the development of city of Hong Kong. Since 1950s, Anderson Road Quarry is an important facility and plays a significant role in construction industry in Hong Kong for supplying aggregate, asphalt, stone and concrete.

Following the accomplishment of its historical mission, the 40 hectare vacated quarry site will take up another new mission – land supply for future residential and commercial development to accommodate 25,000 planned population with the aim of addressing the acute housing shortage problem in the territory.

Figure 1: Conceptual Development Layout of ARQ Site

Smart and Green Initiatives Adopted for the ARQ Site Development

The Anderson Road Quarry (ARQ) Site is a precious piece of virgin land of 40 hectare platform and another 40 hectare slope face in urban area of Hong Kong. It situates at the eastern side of Kowloon Peninsula in the vicinity of Tai Sheung Tok. In view of its dominant geographical location semi-detached with other current users and less conflicts with existing utility undertakers,

it gives the opportunity to develop the site into an exemplary and sustainable community for people living there with more smart, green and resilient living environment.

In general, three main categories of smart and green initiatives will be implemented in the ARQ Site Development, namely, smart water management; smart energy; and smart mobility.

Smart Water Management

Drainage Services Department's three prong approaches of flood control measures comprise interception at upper catchment, storage at middle catchment and upgrading of stormwater drainage network at lower catchment. In recent years with the rise in concern on sustainability without compromising the flood alleviation capacity in developing new areas, blue-green infrastructure should be considered as far as practicable to reduce the energy usage as well as provide natural areas to reduce the environmental impacts due to the urbanisation. It is worthwhile to have more blue-green infrastructure to reuse stormwater for reduction of potable water usage, to increase the green areas for the community for leisure and to optimise the infrastructure costs for drainage systems.

Smart water management initiative here refers to the best practice of stormwater management that integrates flood attenuation planning with landscape and urban design. The overall aim of adopting smart water management initiatives is to make urban hydrological systems function more like natural systems. The approach is to use natural infiltration systems such as grassed swales or bioretention systems to reduce the peak stormwater runoffs and reduce the loading of pollutants such as nitrogen, phosphorus and suspended solids contained in the stormwater. These smart water management initiatives recommended to be implemented in the ARQ Site Development include artificial flood attenuation lake; underground stormwater storage tank and bioretention system. Details of each recommended initiative are discussed below.

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Artificial Flood Attenuation Lake:

In order to reduce the loading of existing stormwater drainage system at the downstream of the ARQ Site at peak flow against potential flooding at low-lying area, measures shall be developed to attenuate the peak flow at upstream. Apart from underground stormwater retention tank, the idea of artificial flood attenuation lake not only serves the function of flood attenuation during rainfall period, it can also serve for recreational and irrigation uses during dry weather period. The proposed artificial flood attenuation lake will become a key landscape feature of the proposed Quarry Park.

The lake is designed to cater for 1 in 200 year return period rainfall intensity of the 12 hectare catchment and envisaged climate change effect such that the flood attenuation capacity would be around 24,000 m^3 and the lake surface area would be 10,000 m^2 at flooded condition. The lake can attenuate the peak flow from 7.4 to 1.7 m^3/s and hence, plays a key role in improving the drainage capacity of the downstream drainage facilities from the worst of less than 1 in 10 year to the average of 1 in 50 year.

Part of the collected water will be drained away immediately after the rainstorm at peak in order to maintain sufficient flood attenuation capacity for the next rainstorm. The remaining water will be retained inside the lake with proper treatment for recreational and irrigation functions at the Quarry Park. At normal condition, the volume of stored water would be around 7,000 m^3 and the depth of water would be around 0.7 m.

The non-submerged area or exposed surface of the artificial flood lake will become an open space in form of gentle sloping lawn area and landscape features for public enjoyment. To ensure the water quality suitable for the recreational uses such as water children play area facilities, an active water treatment facility is required to provide secondary treatment to the stored water, which will include chlorination and possible neutralisation and aeration to fulfill the current rainwater harvesting standard.

Figure 2: Photomontage of Artificial Flood Attenuation Lake

Underground Stormwater Storage Tank:

In addition to the artificial flood attenuation lake, another underground stormwater storage tank is proposed at the southern portion of the ARQ Site serving the similar function as the artificial flood lake for flood control. This retention tank will be situated underneath the Regional Open space. It will have a flood attenuation capacity of 60,000 m^3. The stormwater collected from the surface runoff of the ARQ Site during rainfall period will be temporarily stored in the tank. After each rainstorm, the stored water will be discharged to the downstream drainage system and then to the Tsui Ping River in a controlled manner. This controlled discharge of collected stormwater serves as a reliable source of water supplement for the revitalisation of Tsui Ping River downstream for environmental, ecological and landscaping enhancement for Kwun Tong area, especially in dry weather condition.

Bioretention System:

The first flush of surface runoff in urban / developed area usually contains high concentration of pollutants such as petrochemicals. Bioretention channels are used to convey stormwater in lieu of, or with, underground drainage systems, and to remove coarse and medium sediments as well as pollutants and nutrients from the stormwater.

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Bioretention system will be adopted in the ARQ Site Development as a pilot test. Bioretention systems are proposed at two locations within the ARQ Site – one is located alongside the footpath of the main road. Surface runoff from footpath flows into the bioretention channel of which its catchment area is around 4,000 m^2. The filtered water will be discharged into the natural water course at downstream. Another bioretention system is situated within the Quarry Park area catering for about 120,000 m^2 catchment area of the ARQ Site. The proposed bioretention system will collect the surface runoff from adjacent rock slopes. After filtering by the bioretention channels, the filtered stormwater will be conveyed to and stored in the artificial flood attenuation lake.
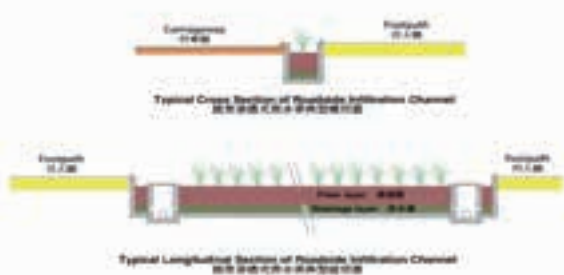

Figure 3: Typical Cross Section of Bioretention System

Total Water Management – Grey Water Recycling:
Owing to the high altitude of the ARQ Site – platform level at +200mPD approximately, provision of salt water supply facilities will require significant amount of pumping energy which is undesirable from the economic and environmental perspective. An alternative means of using reclaimed water from on-site treatment of grey water collected from the residential buildings, also as one of the smart city initiatives in waterworks, is proposed to supply flushing water for the ARQ Site.

Grey water from the sources of bathroom wash basins, baths, shower, kitchen sinks, clothes washers, etc. of residential premises in the ARQ Site Development will be collected via dedicated grey water collection pipework system. These grey water collection pipes will be laid underneath and along public carriageways and convey the collected grey water to the proposed grey water treatment facilities which will be situated underneath the same regional open space as the stormwater retention tank of the ARQ Site. The treated effluent, known as reclaimed water, will be pumped to the flushing water service reservoir located at high level of the ARQ Site via reclaimed water rising mains.

Use of reclaimed water as flushing water for public has yet been implemented in Hong Kong. There are a lot of challenges ahead for the implementation of the grey water recycling system. Apart from the review of the environmental impact assessment study, necessary amendment of existing legislation, incorporation of new land lease conditions, adoption of new building design and public education are the issues to be resolved in near future to facilitate successful implementation of the grey water recycling.

Porous Pavement and Green Roof:
Use of porous paving material is one of the green infrastructure provisions in the ARQ Site Development. The porous pavers would increase stormwater infiltration, improve groundwater recharge and reduce ponding from surface runoff. Another benefit is to reduce the heat island effect for the site which in turn reduces the temperature of the site. The porous paver would be applied on most of the major pedestrian footpath within the site.

Provision of green roof on government premises and encouragement of green roof on private developments are current government green policy to reduce heat island effect. To tally with this requirement, the proposed fresh and flushing water service reservoirs and fresh and flushing water pumping stations will be provided with green roof system.

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Figure 4: Photomontages of Green Roof Examples

Figure 5: Photomontages of Solar Panels

Smart Energy

Renewable Energy (RE) is a proven alternative to the burning of fossil fuels for power generation. To advocate the adoption of more energy efficient features and renewable energy technologies in government projects and installations, a unified policy has been established by the Development Bureau for all Works departments. All capital works projects, including the ARQ Site Development project will incorporate energy efficient features and renewable energy technologies into their design.

Solar energy is the common type of RE deployed in Hong Kong. For the ARQ Site Development, solar panels will be installed on the cover for the Public Transport Terminus (PTT) and the roof of the ventilation room of underground stormwater storage tank. Road lights and illumination for signs could be the main features for public carriageways in the ARQ Site to be powered by electricity generated from renewable sources.
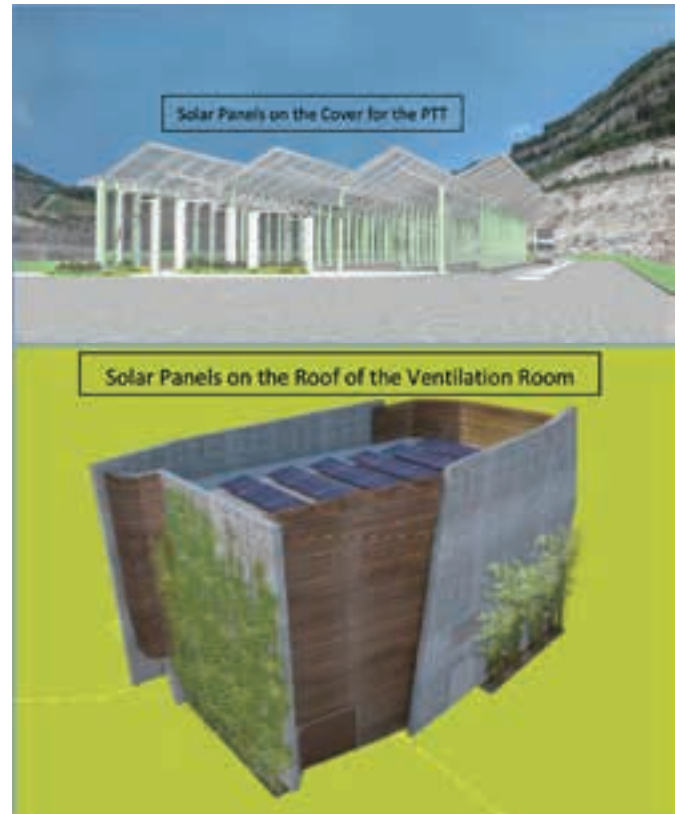
Smart Mobility

The concept of smart mobility is to create and promote a walkable city and to adopt environmentally friendly transportation mode for residents commuting within the new development area. It also fosters public transit oriented transportation by using information and communication technology in order to improve the quality of transportation service. There are two main elements of smart mobility for implementation in the ARQ Site Development, which include Pedestrian and Cycling Mobility; and Interactive Urban Mobility.

Pedestrian and Cycling Mobility:

To position ARQ Site Development as a smart model community, a well-planned pedestrian and cycling network with associated ancillary facilities is essential for providing a convenient and healthy method of active mobility on a daily basis.

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Provision of cycling network and ancillary facilities help to encourage residents to use bikes for internal circulation within the community of the ARQ Site so as to reduce the reliance of vehicular transport. This cycle track to be placed alongside the main roadways of the ARQ Site Development with single-two lanes ensures cyclists to be able to reach important nodes within the community blocks efficiently while maintaining a safe level of segregation between motorised vehicles and pedestrians, which is regarded as "dedicated cycle track". Apart from the implementation of the cycling mobility, pedestrian connectivity facilities including escalator and lift systems as well as access to the bus-bus interchange station at Tseung Kwun O tunnel toll plaza will be provided within the ARQ development and Sau Mau Ping areas to reduce the demand for short vehicular trips to relieve the pressure on the existing road network.

A Bike Share programme is being considered for implementation at the ARQ Site that boosts the community's health by shifting people from passive to active transportation at a relatively low cost. Daily commuters, cyclists, young riders, and inexperienced cyclists are all welcomed to use the shared bikes. An operator of the Bike Share programme will be required to monitor the Bike Share stations and re-allocate the shared bikes at areas with low stock. Smartphone App is a possible tool to enable the monitoring.

Though the initiative of pedestrian and cyclist mobility is commonly implemented in many cities around the world, we still face a lot of challenges ahead in Hong Kong. Demarcation of management and maintenance responsibilities of the facilities; and administrative control and regulatory measures are always crucial issues to be resolved. Operation of the shared bike programme and provision of private bike parking are also challenges for the successful implementation of this smart mobility initiative. It is believed that there are possible solutions to tackle the difficulties by making reference to those successful precedent cases locally and overseas.

Figure 6: Layout of Dedicated Cycle Track

Interactive Urban Mobility:
Hong Kong, as a city with a substantial number of public transit ridership and an intricate transportation system, has not yet formed a comprehensive interactive mobility system that brings together all travel modes, transport-related services, and mobility concepts in Hong Kong. Well-developed system of providing travel information helps building a smart community.

When future residents move around the community of the ARQ Site, real time travel information gathered from different travel modes can be accessed through the use of smart apps or interactive signage at the bus stop to enhance overall transportation efficiency. Synchronised city-wide information will also be available for residents travelling outside the ARQ Site.

Figure 7: Interactive Mobility Features

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Conclusion

The ARQ Site Development will demonstrate Hong Kong as a place that builds exemplary communities for its residents. A community that even more than "smart" is "wise" by engaging both the future and the past. A community that seamlessly integrates new technologies in support of timeless world class urbanism to efficiently promote the safety, pride and well being of its residents.

Revolution and evolution always face a lot of resistance and challenges. To success, it is of paramount importance to foster culture change in the community by collaborating with each other within the government to undertake the responsibilities for operation, management and maintenance and to review the need for legislation amendment, the existing design guideline, the current policy of development and the existing organisational structure.

With devoting collaborative efforts to building smart new community, it is expected that even more smart and green initiatives could be implemented in other new development areas under planning and design stages, and could build up Hong Kong to be a more green and smart city.

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BIOGRAPHY

Dr Victor Khoo is the Deputy Director in Land Survey Division of Singapore Land Authority (SLA). He received his Ph.D. and Master of Engineering degree from Nanyang Technological University (NTU), Singapore and his Bachelor's degree in Land Surveying from the University Technology of Malaysia (UTM). Prior to his appointment in SLA, he was involved in various GPS, geospatial related and satellite remote sensing research projects for a period of 8 years. He held appointments as Associate Scientist in the Centre for Remote Imaging, Sensing and Processing (CRISP) in NUS and Research Associate in the Spatial Information Laboratory, School of Civil and Environmental Engineering, NTU. Victor is a Registered Surveyor; a professional surveyor, registered under the purview of Land Surveyors Act administered by Singapore Land Surveyors Board. Currently, he works in diverse geospatial related subjects that encompass the collection, management and dissemination of survey and mapping data. His areas of interest include Differential GNSS, Cadastral Surveying, 3D Mapping and Spatial Data Infrastructure.

ABSTRACT

Mapping Singapore in 3D

Singapore Land Authority (SLA) led a whole-of-government (WOG) initiative to create and maintain a high-resolution nationwide 3D map to support the increasing needs in government agencies for up-to-date 3D data.

Today, our built environment has become more complex due to increasing multiple land use. Extensive developments have gone deep underground (e.g. rock cavern development) and high above ground. With this vast amount of overlapping land information, two-dimensional (2D) maps are no longer adequate to represent the complex 3D environment that we now live in.

The 3D mapping project is divided into two phases, which involved airborne and ground-based data acquisition and data modelling. The entire project is expected to be in completion in three years. To date, SLA has successfully completed the first phase which is the airborne data acquisition and data modelling for the whole country. The project is currently into the second phase whereby street-level data acquisition is robustly progressing on the roads. Moving forward the detailed ground-based 3D data such as roads, bridges, tunnels, and street furniture will complete the whole 3D digital built environment and form a seamless 3D virtual Singapore experience, leading to diverse range of endless possible applications, e.g. city planning, asset inventory management, tree management, autonomous vehicle, heritage preservation, wind simulation, development planning and many more.

Ultimately, this 3D national mapping project produces high resolution survey-accurate 3D map data that supports the increasing needs of government and agencies in operation, planning and risk management. The project is the key component in creating Virtual Singapore that will support the development of our Smart Nation.

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Mapping Singapore in 3D

Introduction

Singapore Land Authority (SLA) is a statutory board under the Ministry of Law. SLA's mission is to optimise land resources for the economic and social development of Singapore.

Formed on 1 June 2001, SLA manages about 12,000 hectares of State land and about 5,000 State properties, ranging from residential to commercial, industrial and institutional. We continue to seek creative ways of putting vacant State land and properties to interim use for economic and social purposes, and apply advanced technology to collect and market land-related information.

SLA manages and maintains an effective and efficient property registration system. We are also responsible for the management and maintenance of the national land survey system, which defines the boundaries of properties. SLA also spearheads the use of geospatial information through a national collaborative environment where geospatial data, policies and technologies are established and defined to foster innovation, knowledge and value creation for the Government, enterprises and community.

In May 2014, a major stride was achieved to extend the data beyond two-dimension (2D) into the third dimension (3D), when SLA successfully accomplished the aerial surveying across the entire island. This endeavour of data acquisition marked an entirely new chapter and perspective in the local geospatial industry. SLA designed a whole-of-government (WOG) approach, with the idea of "develop once, use by many", aimed at developing the first high resolution survey-accurate 3D national map to improve and support the increasing needs of government and agencies largely in operation, planning and risk management.

Traditionally, survey and mapping data of agencies in Singapore are captured and stored in planimetric form or 2D. Today, the built environment has become more complex than ever due to increasing multiple land use. Extensive development has gone deep underground (e.g. rock cavern development) and expanding upwards above ground. With this rapid increasing amount of overlapping and interlocking circumstances, 2D maps are no longer adequate in addressing the many urban challenges and were ineffective in representing the complex 3D environment that we now live in.

Increased Demand for 3D Data:

SLA conducted a campaign to seek inputs from government agencies on their needs for 3D mapping information. A total of 11 agencies expressed interest and needs for 3D map data in their operation. The Public Utilities Board (PUB) and the Civil Aviation Authority of Singapore (CAAS) in particular have both expressed utmost support for the project due to their urgent needs for 3D map data to support their daily operations and already have plans to acquire such data. A few agencies, such as the Urban Redevelopment Authority (URA) and the Media Development Authority (MDA) have already embarked on creating 3D city models for planning purposes in localised areas. In addition, some agencies have already started to adopt 3D requirements in their operations, i.e. Building Information Modelling (BIM) from the Building & Construction Authority (BCA), the Housing & Development Board (HDB) and the Urban Redevelopment Authority (URA).

Mapping Methodology

The project is implemented in two phase base on the mapping platform, the aerial data acquisition and ground mobile data acquisition.

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The scope of work covers 4 main areas as follows:
• 3D Data Acquisition - aerial and ground-based imagery and laser scanning;
• 3D Data Modelling – orthophoto, terrain models, building models and road models;
• 3D Standards and Databases – according to international open source standard, CityGML; and
• Data Maintenance.

Two survey aircrafts were deployed to carry out data acquisition; one aircraft was fitted with a LiDAR (Light Detection and Ranging) sensor and measuring a minimum of 5 points per square meter. The point clouds captured by the LiDAR are used to produce high resolution surface model and terrain model.

Another aircraft was equipped with an oblique camera system. This state-of-the art five camera system captured both vertical and oblique images. Approximately, 50,000 images were captured and used in the 3D modelling of buildings. The images also were used to provide façades visualisation to the 3D buildings.

The project produced 4 main map products, the digital terrain model, photo map (or orthophoto), 3D buildings and 3D road models. The open source information model (data schema), known as the CityGML from OGC (Open Geospatial Consortium) was used for data modelling and data management in this project. CityGML is an open data model and an XML-based format for the storage and exchange of data.

Usage of 3D Map Data

In risk management, the high resolution Digital Terrain Model (DTM) generated from the airborne laser scanning data is used to produce flood risk map. Authority uses the floor risk map in the management of flooding to model and anticipate flood-prone areas and reduces the impact of flooding and storm surges.

In civil aviation, accurate 3D building models and terrain are critical for flight planning and airspace safety assessment. The availability of these 3D data enables the authority to enhance the design process of flight paths and monitor obstacles surrounding the airports. These 3D height data of existing buildings are important

in the planning and definition of airport zone and help to optimise land use in airport zone. Fundamentally, these data are also needed to fulfil the International Civil Aviation Organisation (ICAO) requirements of Electronic Terrain and Obstacle Data (eTOD) for global civil aviation industry.

Multiple usages of the laser scanning data have been identified across different stakeholders in the parks management domain. These include information in tree height, number of trees estimation, trees' risk classification, and tree information for carbon accounting, which will significantly improve the trees management programme.

The high granularity of 3D building models created allowed accurate estimation of how much one building's rooftop is exposed to sunlight and assessing the suitability of installing solar panels on building's roofs. Besides the estimation of the insolation of buildings, it is also vital to estimate thermal comfort, i.e. the detection of buildings that are exposed to too much sunlight, potentially resulting in overheating. Rooftop garden or vertical green would be deemed good solutions for this situation.

Currently, SLA is developing its 3D Cadastre system to better capture and represent property ownerships. Traditionally, cadastre information which is in 2D and topographic data are distinct information, however, in recent years, there is an increasing need to integrate the two for decision-making. This is mainly driven by the need to know exactly the features on ground in relation to the legal boundaries and ownership. More importantly, the surface that differentiates between above and below ground would be modelled in 3D. This will provide a seamless fabric that is crucial towards the realisation of 3D Cadastre. With Singapore's limited land resources, more underground developments are envisaged and to support the planning of underground space utilisation, 3D Cadastre will required such 3D map data as one of its main components.

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Accurate 3D map data enables the planning authority to carry out large scale urban simulations more effectively. Coupled with their various planning and urban design rules, the planners will be able to simulate different scenarios on buildings and visualise their impact to the surrounding environment. For example, planners can conduct shadows analysis on proposed developments to determine how public spaces can be shaded for better comfort.

In the area on security and civil defence, 3D representations are used to enhance situational awareness. For instance, the close-to-reality 3D environment allows security agencies to plan evacuation routes and perform inter-visibility studies from one place to the other, and this has greatly ensures the safety of citizens.

Going Forward

The project is currently into the second phase where street-level data acquisition is robustly progressing on the roads. Moving forward, the detailed ground-based 3D data such as roads, bridges, tunnels, and street infrastructure will complete the whole 3D digital built environment and form a seamless 3D virtual Singapore experience.

Due to the fast and dynamic development in urban environment, 3D map data has to be regularly updated. It is essential to built up capability and equipped ourselves with the various ground-based rapid data acquisition technology i.e. the terrestrial static laser scanner and mobile vehicle-based laser scanning system. Both systems will ensure high quality data are being collected, and most importantly, data consistency with the existing dataset. Apart from that, the updating source will come from Unmanned Aerial System (UAS), localised as-built survey carried out by agencies, and detailed BIM models.

The project has provided reliable and extensive 3D information for the agencies to meet Smart Nation's objectives. With the common, reliable and consistent 3D map data available, SLA is able to facilitate collaboration amongst government agencies thereby achieving better and more effective whole-of-government solutions.

Speakers and Papers

Dr IEONG Meikei
Chief Technology Officer
Hong Kong Applied Science and Technology Research Institute

BIOGRAPHY

Dr Ieong joined Hong Kong Applied Science and Technology Research Institute (ASTRI) as Chief Technology Officer in January 2016. Before his appointment, Dr Ieong has held various leadership positions in Taiwan Semiconductor Manufacturing Company and IBM Research. He holds a PhD degree in Electrical and Computer Engineering from University of Massachusetts, Amherst and an MBA degree from the MIT Sloan Fellows Programme at MIT School of Management.

Dr Ieong brings his rich international experience in managing large complex research and development projects, marketing, commercialisation. He has published more than 100 papers in journals and conference proceedings and more than 80 patents and has received more than 2,000 citations.

Dr Ieong has received many awards over his career such as IBM Master Inventor Award, IBM Outstanding Technical Achievement Award, and IBM Corporate Award. He is an IEEE Fellow in recognition of his leadership and contributions to Complementary Metal-Oxide-Semiconductor (CMOS) Device Technology.

ABSTRACT

Technology Considerations for Smart Cities

Smart City targets to improve the efficiency of city operations and the quality of life for residents. It involves technology consideration of management platform, network infrastructure and Internet of Things (IoT). In this session, ASTRI will introduce its major initiatives and efforts in enabling a Smart City. As the largest R&D Centre in Hong Kong, ASTRI takes Smart City as one of its strategic research directions and focuses on developing smart city technologies such as Smart City Technology Platform, next generation network, cyber security, big data analytics, artificial intelligence, etc. ASTRI has also established a number of joint R&D centres with stakeholders of smart city ecosystem such as device manufacturers, infrastructure and platform companies, government, service providers and end users. We also aim to apply a series of ASTRI's technologies to enable a smarter airport. At the same time, we are carrying out a smart mobility project with Energizing Kowloon East Office (EKEO) to enhance drivers and pedestrians experience. Other projects that will be shared in the presentation include health monitoring devices, next generation network standards for low power, low data rate, long range applications, Smart City Technology Platform, GIS solution for smart city navigation and IoT security and privacy.

Speakers and Papers

Technology Considerations for Smart Cities

Enabling a Smarter World

Today, more than half of the population on Earth lives in urban areas. Modern cities face many challenges and resources are under severe strain. Below are two snapshots, 2010 and 2050 of the "An Urban World", a visualization of the world from the years 1950-2050 released by Unicef. As urban population grows, the circles get bigger. As urban population gets denser, the circles shift from green to blue, yellow and magenta. By 2050, 70% of the world's population will be urban.

Figure 1: Countries and territories with urban populations exceeding 100,000 in 2010

Figure 2: Countries and territories with urban populations exceeding 100,000 in 2050

Meanwhile, the advancement in Information and Communications Technologies (ICT) has fundamentally changed the way we live. Our citizens expect more and more as they see what new technology can deliver. Companies will increasingly look for smart infrastructure and smart environments, before deciding where to locate. We need to provide them with those environments: we can't afford not to.

ICT Infrastructure for Smart City Applications

ICT has been recognized as the true enabler of the smartness in every aspect of the smart city paradigm. Every smart city application is enabled by layers of ICT technology. At the bottom of the layer is those devices and sensors, which are connected through different network technologies, and values are protected and generated by security and intelligent technologies. Investment in ICT will surely boost the competitiveness of a city.

Figure 3: ICT Infrastructure for Smart City Applications

Hong Kong Applied Science and Technology Research Institute (ASTRI) is the designated ICT research institute in Hong Kong. In later sections, I will give examples on technologies connectivity, security and intelligence and how they can lead us to a smarter world.

Connectivity

Citizen will expect a city to provide state-of-the-art connectivity to support various applications. Smart meters, wearable devices, and other Internet of Thing devices (or IoT devices) require the network to support massive devices in a low cost and low power way. Video streaming and analytics and virtual reality (VR) require the network to provide greater data rate for enhanced mobile broadband experience. Internet of vehicles (IoV) for vehicle-to-vehicle (V2V) and vehicle-to-Infrastructure (V2I) require the network to have low latency responses for critical communication.
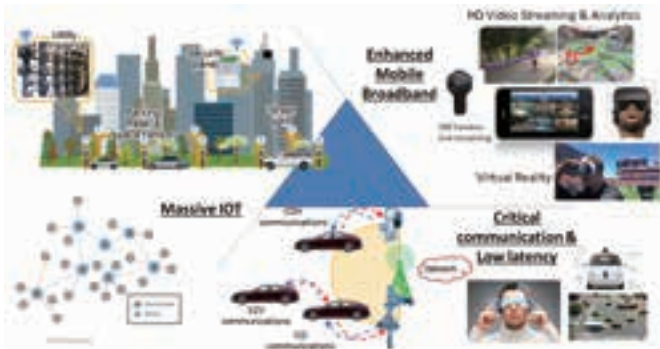
Speakers and Papers

Figure 4: New Connectivity for New Applications

ASTRI: Enhanced Mobile Broadband Technologies

ASTRI is well recognized by partners in the industry to provide end-to-end Long-Term Evolution (LTE) commercial grade network solution, from network system, to radio and to terminals. To support the higher data rate for high-definition (HD) and VR video streaming, we have demonstrated massive multiple-input and multiple-output (MIMO) solution at this year's Mobile World Congress (MWC) in Barcelona. To support other network functions, we are also developing solutions on Network Functions Virtualization (NFV), Centralized-Radio Access Network (C-RAN), and Mobile Edge Computing (MEC).
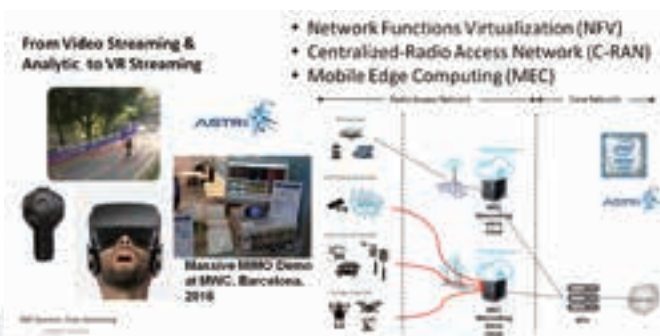

Figure 5: ASTRI: Enhanced Mobile Broadband Technologies

ASTRI IoT Platform & Management System

For smart city applications, our IoT platform and management system has been deployed in several cities in China. Our solution can provide control and monitor of solar-powered light and sensors wirelessly. Besides, it supports fault management and alarm reporting and significant reduce the maintenance costs by 40%. Our partners are deploying the system in more cities.

Figure 6: ASTRI: Enhanced Mobile Broadband Technologies

Narrow-Band IoT (NB-IoT): Emerging Cellular IoT Technology

NB-IoT is a technology standardized by the 3GPP standards body. This technology is a narrowband radio technology specially designed for IoT. Special focuses of this standard are on long range coverage, low cost, long power with 10 years of operation with single battery and connections of millions of devices. Technical details are being worked out by major companies, and research institutes. The standard is finalized in June this year. ASTRI is working with partner on NB-IoT trial and developing NB-IoT system on chip (SOC) intellectual property (IP). We are also active in facilitating standard setting. We hosted the next NB-IoT Work Group meeting together with our partners in Hong Kong in June this year.
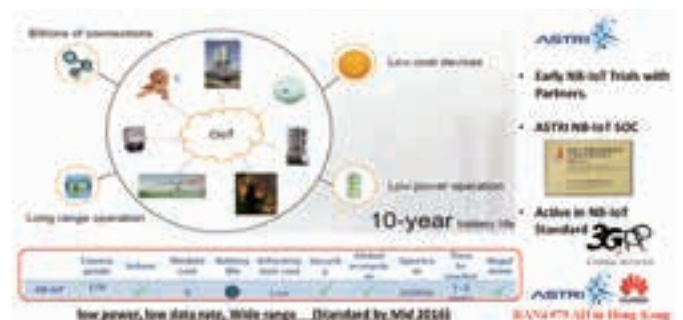

Figure 7: Narrow-Band IoT (NB-IoT): Emerging Cellular IoT Technology

ASTRI Critical Communication: From D2D to IoV

For critical communication, we have demonstrated a device-to-device (D2D) communication in Mobile World Congress (MWC) this year. The technology will be extended to support IoV for V2V and V2I

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communications. We have also created a demo on In Car Gateway & IoV at the Hong Kong Science Park early this year.

Figure 8: ASTRI Critical Communication: From D2D to IoV

Security

ASTRI has established the ASTRI Security Lab (ASL) to provide high-level, impartial cyber-security services to financial institutions, finance-related government agencies and financial technology (FinTech) companies as well as smart city applications. Our world-class R&D team conducts research in cloud-based encryption, authentication technologies and investigates the latest cyber attacks and exchanges knowledge on our Cyber Threat Intelligence Sharing Platform. We have developed cyber security research and training system, which is called Cyber Range.

Figure 9: ASTRI Security Lab (ASL)

Intelligence

To support the HKSAR Government's strategy in leading Hong Kong into a smart city, ASTRI is working with the Energizing Kowloon East Office (EKEO) to pilot smart parking and smart community in Kowloon East as a showcase for city-wise deployment.

The Smart Parking pilot involves a scalable cloud-based server hosted by ASTRI. Its correspondence software stack will collect real time parking information from car park providers in the area, and provide relevant information such as user enquiry on nearby or a specific car park availability, parking info, update traffic, map information, as well as providing the user auto navigation to the destination.

The Smart Community pilot will deploy an integrated seamless indoor and outdoor navigation system, covering some outdoor areas such as pedestrian's pathways, alleys, bridges, and some indoor premises such as shopping malls. The system will also provide other services such as enquiry on nearby information and broadcast real time special notice.

Figure 10: Smart Community

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Figure 11: Smart Parking

Looking Forward

Forming an ecosystem is crucial to the success of the smart city. In view of this, ASTRI has established a number of joint R&D centres with stakeholders of smart city ecosystem such as device manufacturers, infrastructure and platform companies, government, Airport Authority, service providers and end users. Through the collaboration of ASTRI and our partners in the smart city ecosystem, we target to drive innovation to enable HK become a smart city.

Reference:

UNICEF, 2012 – An Urban World http://www.unicef.org/sowc2012/urbanmap/#

Speakers and Papers

Mr TEOH Hai Pin
Director
DP Architects Pte Ltd

BIOGRAPHY

Mr Teoh Hai Pin graduated from the University of Sheffield, UK in 1985 with a Diploma in Architecture RIBA II (commendation in Design). In the subsequent year, the university conferred on him the Master of Arts in Architecture.

He joined DP Architects in 1991 as a senior architect to take charge of the Pontiac Marina mixed development. He subsequently completed other projects in Singapore such as Parkview Square, Ritz Carlton Hotel, VivoCity (in collaboration with Toyo Ito), and most importantly, the nationally significant, multiple-award-winning Singapore Sports Hub, the subject of many international documentaries and media coverage.

Mr Teoh was responsible for the conceptualisation of the master plan of the Singapore Sports Hub. He was part of the original consortium team who successfully bid for the project in 2008, leading the design for all the community buildings and facilities, including the Water Sports Centre within the Singapore Sports Hub.

Among his overseas works are M&C Tower in Ho Chi Minh City, The Palm Springs in Beijing, and master plans for residential developments in Beijing and Guangzhou. He is also responsible for the master planning of Sino-Singapore Guangzhou Knowledge City Core Area, which was awarded the Silver Award in Urban Design at the Singapore Institute of Planners' Planning Awards 2015. His current projects include Our Tampines Town Hub and a number of large-scale residential and commercial developments in China.

ABSTRACT

Hub Ecology – Creating an Ecosystem of Connectivity, Accessibility and Inclusivity

Hub ecology is fundamentally about community interaction and community integration within the environment. This ecological framework that focuses on connectivity, accessibility and inclusivity will spread from the national level, to regional and town levels, to the smaller neighbourhood precinct level. The breadth and depth of the framework seeks to ensure that all collective needs of our population are catered for, and for social engagement and enrichment to be optimised.

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Singapore Sports Hub – A Hub Ecosystem that Bridges Sports and Community

The Singapore Sports Hub master plan exemplifies how a unique centralised mixed-use ecosystem can be successfully developed, integrating sports, leisure, entertainment and lifestyle destinations. It is a unique take on sports legacy, with a huge emphasis on the everyday and creating a sense of place.

The master plan is deeply informed by the specifics of Singapore's context, climate and culture. A key project in Singapore's urban redevelopment and sports facilities master plan, Sports Hub closely stitches together the sporting facilities, various public spaces and the adjacent neighbourhood, generating active public life in this ecosystem.

Singapore Sports Hub will act as a catalyst for the emergence of sports in Singapore and will provide a stimulating platform to elevate the Singapore sporting ecosystem on a regional and global scale, the integrated lifestyle hub ecological framework will herald exciting sustainable living environments in the near future.

Singapore Sports Hub

The design of Singapore Sports Hub sets a new benchmark in the typology of integrated sports, leisure, entertainment and lifestyle development, through the creation of a hub-ecosystem, synergising sporting, community, retail and leisure spaces within one site. From the outset, the Sports Hub has been planned for long-term legacy usage, where the focus goes beyond providing premier sporting venues for major events, but equally central to its conception, is to be relevant to encourage greater community participation, establishing a new model of adaptability, optimisation and social integration. Architecturally, it allows us to explore refreshing issues of identity, imagery and scale related to monumentality of sports and stadia development like our distinctive dome form, while balancing it with social-centric notions of humanised settings of shade and sheltered plinth edges of more intimate spaces and finer grain expressions.

Figure 1: A key principle was to develop a dynamic sports-driven hub ecosystem that will continue to be purposeful even without major sporting events

Location and Scale of Sports Hub Site

In comparison to many Olympic and sports development sites, the compactness of the 35ha land demonstrates Singapore's unique urban trait of high density development, where new dimensions of intensification, optimisation and integration in sports-centric developments are examined. Key difference also lies in that most of these Olympic parks are required to be designed with the major events and large surge of human traffic in mind, taking place within the short span of 16 days, with retrofitting and redevelopment taking place after. In the case of Sports Hub, the project is planned with everyday use as the one of the key focus, with the ability to accommodate surge of traffic for major events and overlays. This requires refreshing takes of how facilities are organised in a relative high-dense where horizontal and vertical mobility are carefully planned to address key functionalities as well as maintain quality environments, with purposeful climatic considerations of shade-and- shelter as well as landscape routes to ensure an overall pleasant setting and experience. To further enhance those efficient and effective planning principles, the Sports Hub is also well connected via main expressways and rail system to key transport hubs within the city to allow easy accessibility and convenient travelling.

Speakers and Papers

Figure 2: Comparison of Sports Parks globally

Figure 3: Singapore Sports Hub Masterplan

An Inclusive and Active Destination

Singapore Sports Hub is designed to be a symbol of sporting excellence and an active centre for Singaporeans. It embodies national aspirations and civic pride through the monumental dome of the National Stadium, and connects with the way Singaporean live and encourages everyday participation through a dynamic range of programmes and facilities integrated throughout the site.

Above:

1. National Stadium
2. OCBC Aquatic Centre
3. Skate Park & multi-storey car park
4. Basketball Courts & multi-storey car park
5. OCBC Arena
6. Arena Park
7. Offices
8. Kallang Wave Mall (South)
9. Stadium Roar
10. Splash-n-Surf & Kallang Wave Mall (North)
11. Stadium Riverside Walk
12. Beach Volleyball
13. Water Sports Centre
14. Singapore Sports Museum & Visitor Centre
15. OCBC Square
16. Sports Hub Library
17. Stadium MRT Station
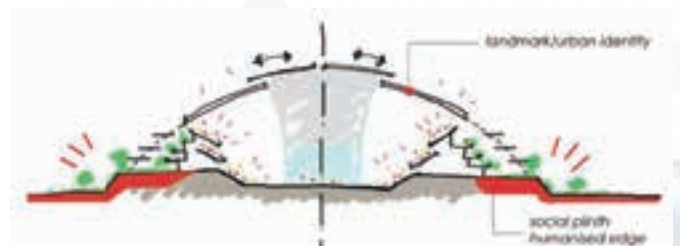18. Singapore Indoor Stadium

Social Plinth

Figure 4: Unifying protective canopy + Social plinth

Speakers and Papers

The master plan devises a low-rise social plinth to integrate various functions into three connected levels and to act as a social connector space. This 2km-long human-scale structure which the dome sits on is designed to harmonise with the scale of the surrounding communities, creating an intimate atmosphere from up-close. The contiguous, active social plinth is a unifier of the site-wide facilities, providing shelter as well as humanised connectivity throughout the site. The façade of the social plinth features a vertically louvred screen that creates a visually striking surface that changes depending on lighting conditions and viewing position. The façade treatment dematerialises the block, mitigating the scale of the setting designed to elevate the awe-inspiring stadium dome.

Everyday Civic Spaces

Sports Promenade

Figure 5: The active social plinth is a unifier of the site-wide facilities, providing shelter and humanised connectivity

Exemplifying the integration of sports and leisure is an unconventional circulation spine called the Sports Promenade which wraps around the stadium. It is the transitional space between the interior and exterior, allowing visitors easy access to all means of transportation while providing a rain and sun-protected space.

Strategically, this 900m elevated and sheltered connector links the National Stadium to various key sports venues,

lifestyle destinations, public rooftop spaces and green spaces within the hub. It is a thoughtful response to Singapore's tropical climate, and also offers breathtaking views towards the city and the waterfront. On event days, the Sports Promenade becomes the gathering space for before and after the game. On non-event days, it serves as an exercise area with a jogging track and fitness centres which are accessible all year round. It creates a new kind of urban and public space, and allows natural ventilation with maximum porosity and movement across the site.

The Sports Promenade is a large, fully-sheltered outdoor civic space that circles the stadium. This 900m sports and recreational space physically links the public to the National Stadium, and to key surrounding programmes and green roofs, offering stunning views to the city and the waterfront. The Sports Promenade responds clearly and efficiently to Singapore's tropical climate. It not only provides shelter from rain and sun, but also acts as a central connector to all major facilities within the Sports Hub. On event days, it serves an all-weather holding space for spectators; on non-event days, it is a vibrant recreation space for everyday use, with jogging path and fitness corners.

Stadium Roar

Figure 6: The grand steps leading to Stadium Roar outdoor plaza provides a setting for ceremonial arrival to the stadium

The main entrance of the National Stadium, this outdoor plaza forms a spectacular civic space for ceremonial arrival. It is a 5,000sqm open space which is aligned with the stadium roof opening and the axis towards the city's skyline, providing spectacular views of the city.

Stadium Roar, like OCBC Square, is one of many open spaces for the community to enjoy and also performs as crowd holding areas to manage pedestrian movement during event days.

Speakers and Papers

Stadium Riverside Walk

Figure 7: Stadium Riverside Walk provides an outdoor social and activity space

Designed with the community in mind, the waterfront promenade provides a place for people to engage in the city, sports and play. The unobstructed waterfront setting of approximately 250 meters provides a vantage point for a breathtaking view of the city and is a playground for waterfront activities such as beach volleyball. Legacy components from the previous stadium were integrated into the landscape design. The 10-meters long beach made up of sediments accumulated over the years brings the waterfront closer to the people and existing rain trees from the previous site were transplanted back to frame the waterfront area. Beyond just a sports facility and hub, spaces were intentionally created to provide places for the community to interact. The lawn under the shady trees is an ideal location for a picnic and the beach steps allow the public to enjoy and relax along the riverfront. Accessibility to the Sports Hub is another key design consideration. The waterfront promenade is designed as a continuation of the island-wide park connector that links Kallang Basin to Marina Bay and to the adjacent neighbourhoods.

OCBC Square

Figure 8: OCBC Square is one of the main entrances to Sports Hub

OCBC Square links to Stadium MRT station and is one of the main entrances to the Sports Hub and the waterfront promenade. This 16m-high sheltered space provides a sense of arrival with its spatial quality and forms a focal point and multi-purpose event plaza. From here, through an extensive network of canopies, visitors are led to other facilities under shelter. The space is flanked by the retail mall, Sports Hub Library and Singapore Sports Museum and has the capacity to hold 10,000 people.

Recreational Community Facilities

Kallang Wave Mall

Figure 9: The Kallang Wave Mall features Singapore's tallest indoor rock-climbing wall

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Kallang Wave Mall is a 41,000sqm commercial retail space integrated with sport, lifestyle and entertainment. The mall is a social space to shop, dine and play. Besides diverse retail offerings, it provides facilities for leisure activities including Singapore's tallest indoor rock-climbing wall and a water park on its roof.

Easily accessible by public transport and connecting pathways, the mall contributes to the overall vibrancy and sustenance of Sports Hub as a leisure lifestyle hub for the community.

Splash-N-Surf

Figure 10: Splash-n-Surf water park

Part of the hub's rooftop network of community sports and facilities, the water park is conceived as a fun and attractive destination. The venue provides various water-based recreational activities and attractions, and is expected to be a popular stop for families and the general public.

Sports Hub library & Singapore Sports Museum

Figure 11: Sports Hub Library, an information resource centre for sports enthusiasts

The Sports Hub Library is an information centre for sports professionals and enthusiasts, providing print, multimedia and online resources on sports, health and fitness. The library also hosts a variety of educational and interactive programmes.

The Singapore Sports Museum is dedicated to the history and cultural significance of sport. It houses permanent exhibits that document the history of sports in Singapore as well as a collaborative space with Sport Singapore to showcase temporary exhibitions. The museum will feature education and engagement programmes to promote sports knowledge and learning.

Speakers and Papers

Community Sports Facilities

Figure 12: Playground, basketball courts and skate park

Integrated within the network of the sports hub is a series of active rooftops that provide the setting for a diverse range of community sport facilities including hard courts, skate park, fitness corner, jogging track, lawn bowl pitch and children's playground. These rooftop facilities are connected with the purposefully designed Sports Promenade to create vibrancy and fulfil the Sports Hub's ambition to encourage participation.

Designed for Legacy
Singapore Sports Hub is a key public destination in the nation's sports facilities master plan. A contemporary iconic architectural expression for Singapore, the Sports Hub fulfills different sports, leisure and social functions. The urban design plan provides a framework for the long-term – both for sporting events and daily use – and includes public transit stations that connect the hub to the larger network. It also successfully identifies a mixed-use environment so that it becomes a dynamic component of the Singapore city centre.

Singapore Sports Hub addresses the changing definition and role of sports in our society. It provides world-class facilities for sporting events, while at the same time encouraging interaction and engagement that transcend a purely spectator activity. The suite of spaces and functions creates a lively venue that endorses a multiplicity of activities year-round. In envisioning the role of a national sports hub to be more than just a single venue, the design team has created an iconic destination that is more than just a static set-piece, but one that actively engages with the country.

Evolving Unique Hub Ecologies for Sustainable Environments
The rise in the various sports, community and town hubs speaks of the emergence of a new ecological framework that not just examines the intricate relationships between the community and with their surrounding environments, it generates refreshing models of integration; interrogating the issues of density and optimisation, with the evolving re-imagination of our social realms.

Starting with the Singapore Sports Hub, DPA is fortunate to embark on a few other hub proposals across Singapore and the followings are short anecdotes of these exciting ventures into these hub ecologies, seeking for new solutions for more sustainable living environments.

Figure 13: Our Tampines Town Hub – A pioneering model of truly integrated community, sports, cultural & civic development

Singapore Sports Hub Masterplan
DP Architects, Arup & AECOM

Speakers and Papers

Mr Donald CHOI
Managing Director
Nan Fung Development Limited

BIOGRAPHY

Mr Donald Choi is currently the Managing Director of Nan Fung Development Limited and is responsible for the active management of the real estate core business. He has over 30 years of design and real estate experience on a variety of projects ranging from single residence to whole community planning with extensive and in-depth knowledge of the industry.

Mr Choi has worked in North America, Asia and China. He is familiar with both public and private projects financing, procurement and implementation methods. Project types have included housing, hotel, resort, retail mall, office, exhibition centre, airport, school, and urban infrastructure. Clients have included HK Government, Airport Authority, MTRC, KCRC, URA, Public Works Canada, British Columbia Buildings Corporation, NGOs and the private sector.

Prior to joining Nan Fung, he was Director of Foster and Partners and the Authorised Person – Architect for the Hong Kong International Airport Passenger Terminal (HKIA Silver Medal Winner) and the majority of infrastructure projects at Chek Lap Kok. The airport was awarded the Top Ten Construction Projects in the World and has won numerous awards including the Best Airport in the World since its opening in 1998.

Mr Choi received degrees from Rhode Island School of Design, London Business School, and Columbia University. From 2008 – 2010, he was the Chairman of Architects Registration Board, HKSAR.

ABSTRACT

Creating Wealth and Sharing Happiness – Envisioning Kowloon East

Hong Kong GDP annual growth rate averaged 5.36 percent from 1974 to 2015 and Gross National Income (GNI) per capita reached $57,650 (purchasing power parity international dollars) in 2015 which is ahead of USA's at $56,430. Despite Hong Kong's economic success, Hong Kong people are generally unhappy. In the World Happiness Report 2016, Hong Kong ranking is 75, substantially behind Singapore ranking of 22. Development imbalance has undermined the harmony and happiness of our community.

This presentation discusses the private development role in creating wealth and why we need to view development as a public good. Putting people first in the smart-city infrastructure for Kowloon East will not only allow wealth to be created but also enable the sharing of happiness among all members of our community. The use of innovative technology to solve some of Hong Kong's urban problems and the right collaborative platform to build a livable city are the future of Kowloon East. We need to have a paradigm shift to remove barriers between public and private and empower ordinary people to make use of our city's resources to improve their quality of lives. A happier and healthier life style is possible through our common vision and joint effort.

Speakers and Papers

Creating Wealth and Sharing Happiness – Envisioning Kowloon East

Hong Kong GDP annual growth rate averaged 5.36 percent from 1974 to 2015[1] and Gross National Income (GNI) per capita reached $57,650 (purchasing power parity international dollars) in 2015. Hong Kong GNI per capita ranking is 16 in the world, behind Switzerland, ranking 15 at $61,930, and ahead of USA, ranking 17 at $56,430.[2]

Despite Hong Kong's economic success, Hong Kong people are generally not happy. In the World Happiness Report 2016[3], Hong Kong ranking is 75, substantially behind Singapore ranking of 22 and even lower than one of the historically war-torn and ethnical complicated Balkan states – Croatia with a ranking of 74.

According to the Global Wealth Report 2015, "the top 1% of wealth holders now own half of all household wealth",[4] i.e. the top 1% of the world's richest population hold the same wealth as the rest of the 99% global population. Hong Kong has generated huge wealth in recent decades and Hong Kong adults with wealth above US$1 million in financial assets excluding primary residences are estimated to increase 54% from 107,000 in 2015 to 165,000 in 2020.[5] However, the growth of Hong Kong wealth has not really alleviated the poverty situation in the city with poverty rate stood at 19.6% or 1.32 million poor population (pre-intervention) and 14.3% or 0.96 million poor population (post intervention – recurrent cash) in 2014.[6] The wealth and income inequality in our society which is known to have the highest ownership of Rolls-Royces per capita in the world is alarming and one of the reasons for Hong Kong tensions and unhappiness.[7]

The Gini-coefficient which measures the income disparity has rose higher and higher and reached 0.537 in the last Hong Kong census[8], much higher than the 0.45 about thirty years ago. Hong Kong housing is ranked the least affordable out of 367 markets in a survey by Demographia International[9] and Hong Kong premium office rental price surpasses that of London and New York and is the most expensive in the world.[10] The gap between the rich and the poor has grown unabated in the past; we need to find a new development model for Hong Kong to correct such imbalance and regain harmony and civic pride in our society.

The development of Kowloon East presents opportunities for Hong Kong to explore the smart-city concept and showcase how private and public can work together to create wealth and share happiness among the community. We need to have a paradigm shift to view development as public good and change our mindset on the boundary between private and public by creating a truly collaborative platform to allow participation from all stakeholders in our city development and management. Using revolutionary technologies, smart infrastructure, innovative business models that go beyond B2B, B2C, P2P, etc., and adapting collaborative development planning and urban services management tools, ordinary citizens can be empowered with resources to contribute in our city future and improve their quality of life in a sharing economy. The Kowloon East ecosystem can be a place where development is based on a people-first principle and collaboration is the wining game.

Creating Wealth in Kowloon East

With the creation of 2.5 quintillion bytes of data globally every day[11] and the proliferation of internet of things (IoT), making cities 'smarter' and its management more participatory to cater for the changing needs of people and ensure economic vitality is already a global trend. The traditional cities are being transformed by data-driven smart infrastructure to reduce inefficiency thru real time optimization with participation from all stakeholders. For example, a transparent intelligent traffic management system reduces traffic congestion and CO_2 emission, therefore, enhances road side air quality for livability and walkable urbanism. Transport on demand and real-time ridesharing thru concept like autonomous smart pod car networks, Uber or driverless robo-taxi which recently hit the public roads in Singapore presents wealth creation opportunities. The changing commuters' behavior and how to utilize the coming surplus resources from unused road surface and empty car parking garages provide further possibilities for new businesses. Peer-to-peer accommodation thru a platform like Airbnb releases

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hidden wealth in the community is just the tip of the iceberg on how unrecognized potentials in a sharing economy can be realized as well as how traditional businesses, including real estate, are being disrupted. Exchanging and storing value thru mobile payment and cryptocurrencies like Bitcoin or other Blockchain decentralized ledger system will alter our concept of money and ownership which is most prevalence in Millennials and no doubt will become the norm for their children. The demographic change with Hong Kong population, both male and female, ranking 1st in longevity in the world[12] but with a shrinking workforce, has altered how work is performed and jobs demand in the future. There are new values and consumers' behavior as well as changing life style that demand different business success stories and how wealth can be created. The recent popularity of Pokeman Go by merging the real world with the virtual world demonstrates the untapped potential of augmented reality to enhance the experience of our physical urban spaces. Linking the user behavior at the data collection interface with consumer behavior and exploring the application of gamification to motivate people, like it being used in various loyalty programs but in a much larger urban services scale, can monetize data by providing needed services and products in a win-win manner.

Productivity gain thru technology efficiency and novel value creation not only provide financial benefit to the community but can nurture and attract talents which is one of the key ingredients for wealth creation. The two examples below succinctly remind us the important of talents in wealth creation. Foxconn in Shenzhen has been Apple's main assembly partner on the iPhones but its share of the iPhone US$549 retail price is only 1.8% or $10 whilst Apple's share is 58.5%.[13] The other example is the acquisition of WhatsApp by Facebook in February 2014 for US$19 billion while Sony shares were valued similarly at about US$19 billion. However, the numbers of employee for each company at the time were shockingly different with 55[14] at WhatsApp and 140,900[15] at Sony. It is clear that in wealth creation it is more about having talented people than maintaining the status quo. Working hard is no competition for working smart. The need to attract talents and creating an environment for working smart is self-evident in the huge

investment for the newly built smart districts and cities like Songdo International Business District in Korea and Masdar City in United Arab Emirates. In an open and sharing economy, Kowloon East must build an urban economics that allows participation from ordinary people and offer job opportunities to allow talents to fulfill their potential with innovative ideas.

Sharing Happiness

In the 21st-century knowledge-based sharing economy, the ability to attract talents are the key to success and wealth creation. People enjoy convenient livability in their environment. The Millennial generation cares about how the digital mediated urban spaces can become a people's place where they can network and become actively involved in charting their future. Sustainability is on their minds and leading a happy life rather than holding a normal job is their goal. In an age of longevity where 100-year life will become the norm[16], it is important for us to realize that the old fashion traditional 3-stage life – learning, working and retiring, will be irrelevant in the future. People will have multi-staged life with new life stages demanding different social institutions and services. We need a flexible urban framework at Kowloon East that allows changes and provides options for balanced living according to one's own preference.

In term of sustainability, Hong Kong is endowed as a compact city with relatively low energy consumption and new smart infrastructure investment will continue to enhance convenience and provide friendly urban services to fulfill people's needs if we know what are the needs. The concept of Hong Kong as a livable city and development as a smart city is one of government key objectives and our Financial Secretary had allotted 8 pages in the Hong Kong 2014-15 Budget to emphasize Hong Kong's priority in developing a livable smart-city.[17] Since 1998, the government has promoted the development of a world-class information and communications technology (ICT) infrastructure network under the Digital 21 Strategy and one of the visions is to "empower everyone through technology" and in "securing digital inclusion for all groups."[18] The Digital 21 Strategy latest update, "Smarter Hong Kong, Smarter Living", promotes the use of smart city infrastructure

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with sensors deployed in city management for data sharing and informed decision making. Hong Kong has one of the highest mobile network penetration rate in the world at about 228%[19] so the vast communication infrastructure hardware and mobile network already exists. What is needed is to ensure Kowloon East future management make use of the collective resources and incorporate the bottom up self-organizing insights of the district users. Breaking the entrenched top down approach to development planning and public services management would ensure community engagement and happiness.

With the right social institutions, enabling government policies, and open collaborative platform, Kowloon East has the potential to become the smartest hub of Hong Kong and serve as an exemplar of smart urbanism by spreading knowledge in the community and beyond. The recent launch of the "Smart Parking Mobile App" to inform drivers of available vacant parking spaces in Kowloon East is just the beginning of how technology can be used to improve efficiency in a collaborative economy. With more sensors which can involve opportunistic sensing, ad hoc sensors deployment, or crowd-sensing throughout Kowloon East, useful data can be collected to satisfy individual preferences and create business opportunities for independent producers to participate in the making of collective goods. Making urban resources and information transparent and available is empowering people to be in control, i.e. achieving self-satisfaction and happiness. By building and opening up the collective smart-city platform to ordinary people, new insights and business opportunities are possible. A sharing economy starts with a sharing culture and technology is to serve all people and not only the selected few. The merging of physical spaces and cyberspace is revolutionary and a new visualization of our public realm is possible. All sorts of possibilities exist for Kowloon East to develop into a giant inclusive learning organism for creating wealth and sharing happiness. The key is to avoid being trapped within our individual limitation. We need to open our minds to the collective wisdom; there is only 'unlimited limit' in what Kowloon East can become if we are willing to change.

Note:
1   Data from GDP Annual Growth Rate reported by the Census and Statistics Department, HKSAR
2   World Development Indicators database, World Bank, 1 July 2016
3   World Happiness Report 2016, edited by John Helliwell, Richard Layard and Jeffrey Sachs
4   World Wealth Report 2015, Credit Suisse AG Research Institute, p4.
5   Ibid, Table 1 Number of Millionaires in 2015 and 2020, p43.
6   Government of the Hong Kong Special Administrative Region, Hong Kong Poverty Situation Report 2014, p31.
7   For a more detailed discussion on why Hong Kong's wealth gap has grown, please refer to Leo F. Goodstadt's book "Poverty in the Midst of Affluence: How Hong Kong Mismanaged Its Prosperity" published by the Hong Kong University Press, 2013.
8   2011 Census, HKSAR Census and Statistics Department
9   12th Annual Demographia International Housing Affordability Survey: 2016
10 Jones Lang LaSalle Inc., The JLL Global Premium Office Rent Tracker Q1 2016
11 IBM, "What is big data?", https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html accessed 26 August 2016. At present time, the rough estimation is that data created in two days would equal to 90% of all existing data since humankind has existed.
12 Expectation of life at birth (years) from data released by Japan's Health and Welfare Ministry on 27 July 2016 showed Hong Kong ranking No.1 for male at 81.24 (2nd Iceland and Switzerland at 81, 3rd Japan at 80.76] and for female at 87.32 (2nd Japan 87.05, 3rd Spain at 85.58).
13 Mark Selden, Pun Ngai, and Jenny Chan, "The politics of global production: Apple, Foxconn and China's new working class", The Asia-Pacific Journal, Volume 11 Issue 32 Number 2, August 2013, p8.
14 Wired Magazine article at http://www.wired.com/2015/09/whatsapp-serves-900-million-users-50-engineers/
15 Sony CSR Report 2015, Employee Data at the end of March 2014, p53.
16 For the 100-year life analysis, please refer to Lynda Gratton & Andrew Scott's book "The 100-Year Life" published by Bloomsbury Information, 2016.
17 HKSAR The 2014-15 Budget, pp46-53.
18 IBM China/Hong Kong Limited, Smarter Hong Kong, Smarter Living, Consultancy Services for the Digital 21 Strategy Review for the Office of the Government Chief Information Officer, Strategy Report, September 2013, p64 and p5.
19 HKSAR, Office of the Communications Authority, Key Statistic For Telecommunications in Hong Kong dated 31 July 2016, showed at May 2016 there were 16,684,735 mobile subscribers.

Speakers and Papers

Sr Augustine WONG Ho Ming, JP
Executive Director
Henderson Land Development Company Limited

BIOGRAPHY

After graduating from the then Hong Kong Polytechnic studying General Practice Surveying, Sr Augustine WONG Ho Ming joined a leading real estate consultancy firm and was handling valuation of properties. He is the Executive Director of Henderson Land Development Company Limited. His main duties include acquisition of development sites by private negotiation, public auction and public tender, negotiation with the government on conversion of agricultural land to building land and town planning applications.

He is Fellow of The Hong Kong Institute of Surveyors, as well as a registered professional general practice surveyor and holds a Master's Degree of Science in E-Commerce for Executives and a Master's Degree of Economics.

He is currently Member of The Statistics Advisory Board, Member of The Appeal Board on Public Meetings and Processions, Member of The Real Estate Services Training Board of Vocational Training Council and Convenor of The Legal Sub-Committee of The Real Estate Developers Association of Hong Kong. He was Member of The Long Term Housing Strategy Steering Committee, Member of The Hong Kong Housing Authority and its Commercial Properties Committee and Subsidised Housing Committee, Member of The Land and Building Advisory Committee, Member of The Estate Agents Authority as well as The Chairman of The Licencing & Practice Committee, Part-Time Member of The Central Policy Unit and Member of Commission on Strategic Development Committee On Economic Development And Economic Cooperation With The Mainland, Member of Estate Agents Appeal Board.

ABSTRACT

Can the Market alone make Kowloon East a Smart City?

Kowloon East is an area mixed with new and aged buildings. Vacant development sites are also available in the new Kai Tak area. We should be able to see all the state-of-the-art hardware in the new and future office buildings in the area. However, the challenge will be how the aged buildings can be modernised. In respect of aged buildings under single ownership, this should not be a problem. The market force will give sufficient economic incentives to the owners for carrying out the upgrading and renovation works. For aged building under strata title ownership, it will be difficult for the invisible hands to help. There may be legal and physical constraints even if the owners wish to carry out renovation works. In Kwun Tong industrial area, a large number of multi-owned old industrial buildings can be found. We need to think about what we want these multi-owned old industrial buildings to be in the future. If necessary, what new policies or legislations are required to facilitate the transformation. More encouragements by the government in land policy, transportation and town planning are inevitable.

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Can the Market alone make Kowloon East a Smart City?

If we want to build a model city or smart city, the first thing to do is to define exactly what we want to achieve. There are different definitions of a smart city.

"With the rapid growth of information and communication technologies, there is a growing interest in developing smart cities with a focus on the knowledge economy, use of sensors and mobile technologies to plan and manage cities."
Source: Challenges and Opportunities to Develop a Smart City: A case study of Gold Coast, Australia by Bhishna Bajracharya, David Cattell, Isara Khanjanasthiti

"A smart city is a city seeking to address public issues via Information and Communication Technology (ICT) – based solutions on the basis of a multi stakeholder, municipally based partnership."
Source: Mapping smart cities in the EU, European Parliament

Coming back to Kowloon East, according to the Energizing Kowloon East Office, its Vision is: Kowloon East should become another premier CBD of Hong Kong to support our economic growth and strengthen our global competitiveness.

It goes on to say that:

To meet our vision of developing a "Smart City", we will carry out a pilot study in Kowloon to examine the feasibility. We will seek ways to transform the areas into a sustainable CBD by making use of smart data and technology, creating a low carbon green community and enhancing walkability and mobility, such as providing high-quality municipal management and public services; disseminating information to public and collecting views in digital format; implementing green building and greening; using technology to enhance pedestrian and vehicular accessibility with a view to making the area a better place for work and play.

In a nutshell, I think a smart city can be gauged in the following aspects:

Hardware:	Design, sustainability, environmental friendly
Software:	High technology and eco-management system
Connectivity:	Eco-transportation, walkability
Diversity:	With comprehensive public services
Cultural:	Preservation

Taking Kwun Tong as an example, what will we wish to see as a smart city? Kwun Tong was an established industrial area and we have seen gradual redevelopments of modern offices and hotels intermingled with aged industrial buildings. Even for the aged industrial buildings, the actual user are no longer predominantly factories. Most of these aged industrial buildings are being used as office, restaurants, shops, service trades and even sub-divided residential units. Moreover, with the special waiver for industrial buildings more than 15 years old, there have been renovation of whole blocks of industrial buildings in the area. However, such special waiver scheme was expired at the end of March this year. Thus what will Kwun Tong look like after 10 years if there are no new initiatives from the government? Are they what we wish to see?

In the general public's mind, if Kwun Tong is a smart city, it should be as follows. There should be modern buildings equipped with state-of-the-art IT facilities. Internet ready is a must. Building management systems are integrated and the information such as carpark vacancy can be shared by users in the area and not just the building. More green and environmentally friendly facilities, such as green roof, low carbon emission air-conditioning systems etc. will be provided. Pedestrian system linking all buildings and eco-transportation system such as mono-rail will serve people there. Buildings will use a lot of environmentally friendly materials. The aged buildings should be renovated if redevelopment is not justified. Different users such as recreational facilities, restaurants, outlets, sport facilities, services and offices will be the dominant users in the area. The road networks will be planned again to relieve the current congested traffic jams and conflicts between

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people on wheels and people on feet. All these depend on one single factor – Action. If there are no actions by the owners or the government, we won't be able to see a new Kwun Tong CBD.

On the Government side, a lot of actions have been taken to promote the transformation. For example, most of the areas have been rezoned from "Industrial" to "Other Specified Uses (Business)"; Special waiver for qualified industrial buildings at nil premium; Designating Kwun Tong as the pilot area where nil premium will be charged for pedestrian systems linking buildings together. With all these measures, we have seen more redevelopments and refurbishments of old buildings in the area. All these buildings or redevelopments have one single common factor – Single Ownership. For buildings or sites under single ownership, the market force is able to mobilise the owners to take action. Provided there is reasonable return, the private sector will respond. If the redevelopment value of the site for industrial use is higher than the existing value, then the owner will pay premium for modification of the lease to allow office use. Even if the existing use value is higher than the redevelopment value, the owner should have applied for the special waiver for conversion to office at nil premium before the expiry of the policy.

The problem is in those buildings which are under strata ownership situation. Even worse, most of these buildings are more than 10 storeys and the plot ratio of the existing buildings are not far away from the maximum plot ratio of 12 allowed under the outline zoning plan. The following preliminary assessment will illustrate the situation:

Assumed Plot Ratio of the Existing Aged Industrial Building = 11
Maximum Plot Ratio under Outline Zoning Plan = 12 [Other Specified Uses(Business)]
Average Costs of Acquisition of the
   Existing Building $60,000 per sq. m.
Construction Costs for the
   Office Building $40,000 per sq. m.
Modification Premium $45,000 per sq. m.
Professional Fees and Interest $10,000 per sq. m.
Total Costs of the
   New Office Building $155,000 per sq.m.

The total costs of $155,000 per sq. m. without any profit element is already slightly higher than the sale price of modern office buildings in Kwun Tong area. It may be argued that in very prime location in the area, the sale price may be close to such figure of $155,000 per sq. m. However, the average costs of acquisition may also be on the low side if it is in prime location. Moreover there are uncertainties in acquiring up to 80% of the total shares in the old building or the assembly exercise may take a long time. From the individual owners' point of view, after accepting the $60,000 per sq. m. purchase price, where can they go? There will not be sufficient "industrial" buildings or office buildings elsewhere for them to relocate. Again, the average price of office buildings in secondary location may be easily higher than $60,000 per sq. m. Thus it is not difficult to conclude that the market force alone is not able to get rid of these fully developed old industrial buildings in Kwun Tong.

If the above conclusion is correct, then how serious is the problem? A preliminary study has been done to look at the ownership and age of the existing buildings in Kwun Tong. The followings are the key findings:

Total Number of Buildings and Sites:	297
Age under or at 25 years:	81 buildings and 13 sites
Age over 25 years:	203 buildings
Amongst those over 25 years:	49 buildings are single-owned 154 buildings are multi-owned
Amongst those Multi-owned Buildings:	31 buildings are within 10 storeys 123 buildings are over 10 storeys

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Buildings age under or at 25 years and development sites

Single-owned buildings age over 25 years

Multi-owned buildings age over 25 years

Roughly slightly more than half of the buildings by number or by area in Kwun Tong are under multi ownership and will continue to deteriorate if no new measures are introduced.

Further studies have been carried out on 4 existing typical buildings in the area and the findings are summarised as follows:

Case 1: Kwun Tong Industrial Centre

Site Area	:	16,613 sq. m.
Age	:	36 years
Existing GFA	:	173,627 sq. m. (Plot Ratio = 10.45)
No. of Storeys	:	13 storeys plus 1 basement
Total No. of Units	:	1067 and 257 car parks
Remarks	:	Redevelopment is not financially viable nor feasible because of the ownership fragmentation

Case 2: East Sun Industrial Building/New East Sun Industrial Building/East Sun Industrial Centre

Site Area	:	9,898 sq. m.
Age	:	49 years (East Sun Industrial Building) 38 years (New East Sun Industrial Building) 38 years (East Sun Industrial Centre)
Existing GFA	:	84,845 sq. m. (Plot Ratio = 8.57)
No. of Storeys	:	11 or 12 storeys
Total No. of Units	:	147 and 99 car parks
Remarks	:	Redevelopment is not financially viable nor feasible because of the ownership fragmentation

Case 3: Wong's Building

Site Area	:	929 sq. m.
Age	:	52 years
Existing GFA	:	6,228 sq. m. (Plot Ratio = 6.7)
No. of Storeys	:	8 storeys
Total No. of Units	:	9
Remarks	:	An owner has owned 2 floors or 20% in undivided shares and redevelopment is difficult

Case 4: Choy Lee Factory Building

Site Area : 513.7 sq. m.
Age : 52 years
Existing GFA : 2,654 sq. m. (Plot Ratio = 5.17)
No. of Storeys : 6 storeys
Total No. of Units : 6 (Became single owned in 2014)
Remarks : The area of the site is too small. As revealed by the media, it was used for domestic use

In order to bring the transformation of Kwun Tong forward, it is necessary to introduce new measures such as follows:

1) Change in Premium and Waiver Fees Policies

 a) Is it possible to take into account the value of the existing premises in the premium assessment as the before value?

 b) Alternatively, concessions will be given to cases if certain criteria can be fulfilled. For example, concessions, such as 1/2 of full premium, can be given to industrial buildings more than 30 years old but in reasonable repairing conditions. The requirement of reasonable repairing condition is to encourage owners to spend money in up keeping the old buildings.

 These may encourage private sector to carry out redevelopment and reduce the number of old buildings.

2) Involvement of Urban Renewal Authority (URA)

 If redevelopment of aged buildings is desirable from public's point of view but the market force alone cannot make it happen, Urban Renewal Authority should consider to step in. Urban Renewal Authority has concession in premium assessment for change of use. Based on the previous example, if nil premium is charged for URA projects, the total costs will be around $110,000 per sq. m. and the redevelopment project can be financially viable. Obviously, there will be social impact on large-scale displacement of occupiers in the existing "industrial" buildings. There will be great political pressure to be faced by the government. However, with careful planning and other measures assisting the occupiers, such resistance can be resolved.

3) Land (Compulsory Sale for Redevelopment) Ordinance Cap. 545

 It may be possible to amend the Ordinance to the effect that it will be easier for a private developer to carry out redevelopment. For example, the minimum percentage of ownership for application to the Lands Tribunal may be reduced to lower than the current 80% for aged industrial buildings subject to certain additional criteria. Again the social impact of the displacement of existing occupiers should not be ignored. The government may need to shoulder some of the relocation burden by building new "industrial" buildings for rental purposes.

4) Subsidies

 Subsidies to owners of multi-owned buildings to carry out improvement works should be considered if redevelopments are not feasible. It is controversial that public money is used to upgrade private properties. Nevertheless if we have made up our minds to have a smart city, this is the cost that the public should pay. Otherwise, there will still be more and more aged sub-standard industrial buildings in Kwun Tong.

Where there's a will, there's a way. The transformation of Kwun Tong to a smart city is definitely not an easy job. But if it is what the general public would like to see and we have the determination, we should think outside the box.

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BSOMES Building Services Operation and Maintenance Executives Society

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HKICON Hong Kong Institute of Architectural Conservationists

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IFMA Hong Kong Chapter

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PLANNING DEPARTMENT 規劃署

AIA|HK A Chapter of The American Institute of Architects

CIOB THE CHARTERED INSTITUTE OF BUILDING

香港建造商會 Hong Kong Construction Association

THE HONG KONG ASSOCIATION OF PROPERTY MANAGEMENT COMPANIES 香港物業管理公司協會

HKIA 香港建築師學會

HKIFM The Hong Kong Institute of Facility Management 香港設施管理學會

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UCL

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Introduction of the HKIS

The Hong Kong Institute of Surveyors ('HKIS' or 'the Institute') was founded in April 1984 and had 85 founder members. The Institute was statutorily incorporated by virtue of the Hong Kong Institute of Surveyors Ordinance in January 1990 (Cap. 1148). In July 1991, the Surveyors Registration Ordinance (Cap. 417) was passed and a Registration Board was set up to administer the registration of surveyors.

The Hong Kong Institute of Surveyors is the only surveying professional body incorporated by ordinance in Hong Kong. The Institute strives to maintain a high professional standard and requirements amongst members including setting standards for professional services and performance, establishing codes of ethics, and determining requirements for admission as professional surveyors. The Institute imposes a mandatory requirement for all members to upgrade skills through continuing professional development.

As a reputable and responsible professional body of surveyors, the Institute has always maintained vigorous assessment standards for entry to the profession and has also maintained high professional and ethical standards of member surveyors, through the various codes of professional practices, the code of ethics, and continuing professional development. The Institute has taken on an important and responsive consultative role in government policy making particularly on issues affecting land, property and construction. The Institute plays an important role from time to time in giving advice to the Government on issues such as land supply, unauthorised building works, building safety campaign, property management, town planning and development strategies, construction quality and housing.

The HKIS membership has now grown to over 9,000. As at 30 August 2016, the number of members reached 9,375, including 6,216 Corporate Members consisting of Fellows and Members – distinguished by the initials FHKIS and MHKIS; 73 Associate Members – distinguished by the initials AMHKIS; and 3,086 training grade members.

To qualify as a corporate member of the Institute, surveyors must possess a recognised academic qualification; complete supervised professional training within strict guidelines for a minimum period of 24 months, followed by an Assessment of Professional Competence (APC).

The title "Surveyor" embraces a number of disciplines involved with land and its development with land and buildings, covering an extremely wide scope. Some surveyors work in private practices and others may work for a landowner, developer, building contractor or government departments and related bodies.

The Institute consists of six divisions and one Young Surveyors Group:

1.   Building Surveying Division
2.   General Practice Division
3.   Land Surveying Division
4.   Planning and Development Division
5.   Property and Facility Management Division
6.   Quantity Surveying Division

A **land surveyor** measures and records the shape and position of the land, defines the boundary and sets out the legal boundaries of the sites. A **general practice surveyor** advises on the best use of the land, assesses the feasibility and viability of the proposed development project as well as the valuation, marketing, sale, leasing and management of completed developments. A **planning and development surveyor** further advises on the possible change of zoning, the likely environmental impacts and makes suggestions on preliminary development contents. A **quantity**

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surveyor is concerned with the building contractual arrangements and cost control, and will evaluate the likely cost of the development project and advise on the most suitable kind of contract for the project. A **building surveyor** is involved in the project management of building development proposal, holistic maintenance management of building and overall control of private buildings under relevant legislation. A **property and facility management surveyor** provides a comprehensive range of services in real estate management.

The Institute has established and continues to expand its presence in the international scene through participation in various international platforms as well as reciprocity relationships with other national surveying bodies and through membership in relevant world bodies and international organisations to maintain its professional edge at international level. The Institute is one of the 3 founding members, apart from the Singapore Institute of Surveyors and the Institution of Surveyors, Malaysia, of the Surveyors' Alliance Asia which was inaugurated in November 2004.

The Institute has reciprocal agreements with:

• Australian Institute of Quantity Surveyors (AIQS)
• Australian Property Institute (API)
• The Building Surveyor's Institute of Japan (BSIJ)
• Canadian Institute of Quantity Surveyors (CIQS)
• Chartered Institution of Civil Engineering Surveyors (ICES)
• China Association of Engineering Consultants (CAEC)
• China Engineering Cost Association (CECA)
• China Institute of Real Estate Appraisers and Agents (CIREA)
• New Zealand Institute of Quantity Surveyors (NZIQS)
• New Zealand Property Institute (NZPI)
• Singapore Institute of Surveyors and Valuers (SISV)

HKIS is a member of the following international organisations:

• International Cost Engineering Council
• International Society for Photogrammetry and Remote Sensing
• International Valuation Standards Council
• Pacific Association of Quantity Surveyors
• World Association of Valuation Organisations
• World Organisation of Building Officials

The Institute continues to increase its importance and standing both locally and internationally. Through maintaining both a high professional standard of the Institute and the members locally and keeping in pace with the professional levels internationally, the Institute is marching towards another step ahead of the summit.

Organising Committee

CHAIRMAN

Sr Dick KWOK   Vice-President

MEMBERS

Sr George CHEUNG   Building Surveying Division
Sr Joanmi LI   Building Surveying Division and Young Surveyors Group
Sr Tony CHAN   General Practice Division
Sr Cliff TSE   General Practice Division
Mr Matthew CHAN   Land Surveying Division
Sr Natalie CHAN   Land Surveying Division
Sr Eureka CHENG   Planning and Development Division
Sr Victor NG   Planning and Development Division
Sr Peter MA   Property and Facility Management Division
Sr Joseph CHONG   Quantity Surveying Division
Sr SC TSE   Quantity Surveying Division
Sr Simon WONG   Young Surveyors Group

EMCEE

Sr Karen NG   General Practice Division