BUSINESS ENVIRONMENT COUNCIL
商界環保協會

ENVIROSERIES

# Towards a Smart Sustainable City – Potential and Opportunities for Hong Kong

22 Nov 2017 (Wednesday) | 9:30am- 5:00pm | The Mira Hong Kong

## SUMMARY REPORT

**BEC ENVIROSERIES CONFERENCE**
**Towards a Smart Sustainable City – Potential and Opportunities for Hong Kong: 22 November 2017**
**SUMMARY REPORT**

## I) INTRODUCTION

BEC organised this conference on Smart Sustainable Cities in the light of the on-going debate and discussions in Hong Kong on how to become a smart city as well as the importance of environmental protection and a transition to a low carbon economy.

This followed on from BEC's contribution to the Government's development of a Smart City Blueprint in September 2017.

http://bec.org.hk/files/images/BEC_Topical_Digest/Issue_29/Topical_Digest_29_Smart_City_Consultation_R2.pdf

Government has now published its final Smart City Blueprint which to some extent reflects views put forward by BEC as to the connection between a smart city and achieving sustainability goals. We expect a discussion about becoming a smart city to continue and we hope that the content of this report will help shape that discussion

https://www.smartcity.gov.hk/doc/HongKongSmartCityBlueprint(EN).pdf

## II) EVENT SUMMARY

The conference brought the Government, business leaders, academics and environmental groups together to discuss the related problems, challenges and solutions on the subject.

The concept of a "smart city" and how this is linked to sustainable urban development, environmental sustainability in particular, was explored. Participants heard about Government policy and thinking in this area and how a smart city approach can help to achieve sustainability goals: minimising negative environmental impact, enhancing liveability and well-being, as well as capturing business advantage.

### Key Messages

- Developing a shared vision of Hong Kong as a smart sustainable city is important as every city is unique. There is no single vision. A clear if uncomplicated image reflecting this vision can help rally people around it, and will help determine the smart city initiatives needed.

- Safeguarding our environment and transitioning towards a low carbon economy should be a central part of this vision. This is about protecting the basic needs of Hong Kong people such as clean air, a land and marine environment free from waste, and a stable climate.
- Being smart is not simply about technological advances. It is about well-informed decisions relating to important aspects of the city such as mobility, energy generation & demand-management, and waste/resource management. It is also about use of technology for these purposes, for which there is huge potential.
- Hong Kong is in many ways an exemplar smart city, using its land space efficiently in particular through excellent mass transport as and also with near comprehensive mobile network coverage. There are on-going initiatives to enhance the efficient use of landspace for example in East Kowloon as well as piloting of technologies to manage vehicle movements like electronic road pricing.
- Collaboration amongst government bureaux, business, academia, looking at immediate and long term needs is crucial to developing Hong Kong further as a smart sustainable city.
- Data is of utmost importance for smart decision-making by both the private sector and government, and needs to be readily accessible if its benefits are to be optimized. Solutions need to be found to support greater openness and sharing of data, whilst safeguarding privacy and commercial confidentiality issues.

## III) Session 1: A Smart Sustainable City – From Energy to Air Quality

### Keynote Speech

**Dr. David Chung Wai-Keung, JP,**
**Under Secretary for Innovation and Technology, Hong Kong SAR Government**

*Dr. David Chung spoke about the Government's high level committee to develop and study Smarty City technologies that will be formed in near future.*[1]

1. It is very important to the government to improve people's everyday life and quality of living.
    - In order to better citizens' quality of life it is promoting green and intelligent building as well as waste management to reduce carbon emissions.
2. There are some challenges the new committee will face when designing a smarter city.
    - The government will need to utilize better data to tackle climate change and aging population.
    - Ideally real time city data will be collected, but this will be a challenge since Hong Kong is a vertical, densely populated city.

[1] LCQ1: Implementation of pilot projects relating to smart cities

3. The Chief Executive will chair an internal Steering Committee on Innovation and Technology[2], to steer collaboration and participation across bureaux and departments from the most senior level.
4. The government has already earmarked HK$700 million to push forward three infrastructure projects:
    - "e-ID" – an electronic identification for the Government's online services,
    - Installation of smart lampposts in the City, and
    - A big data analytical platform.
5. The speech concluded with Dr. David Chung stressing the importance of collaboration among government, business, academia, and non-profits.


[2] https://www.policyaddress.gov.hk/2017/eng/policy_ch02.html

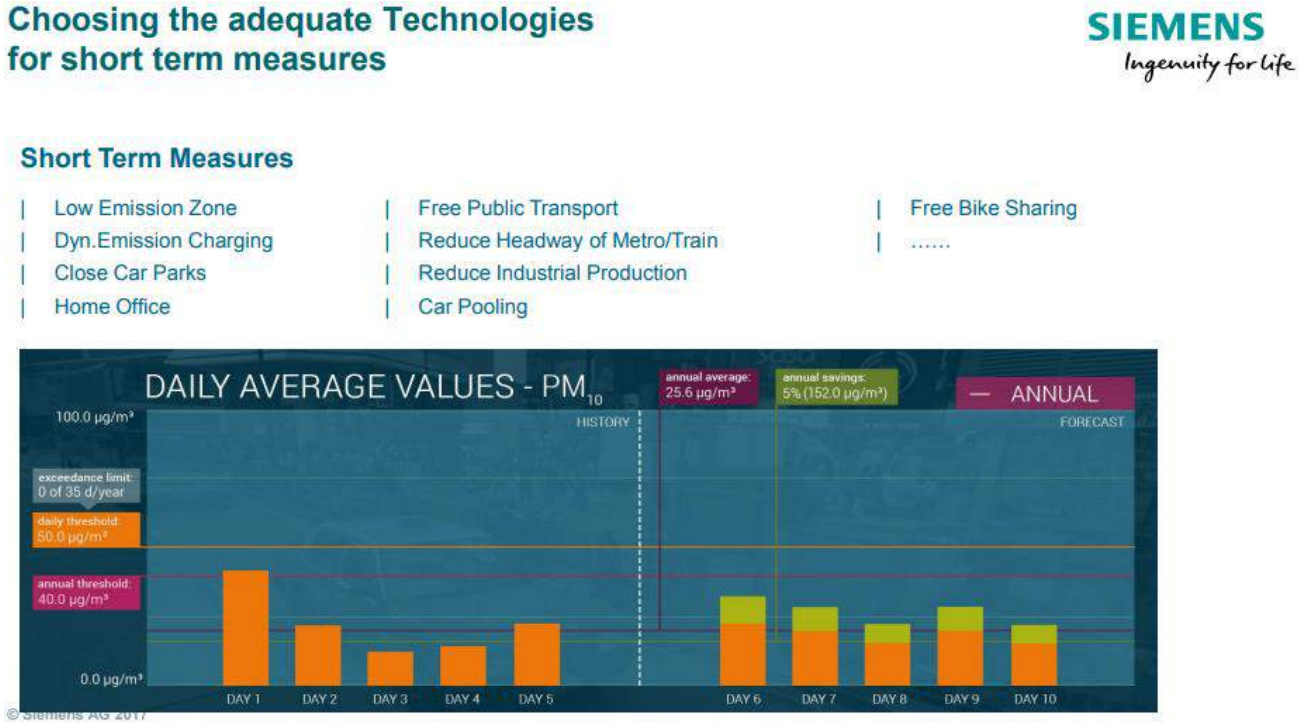
## Smart and Digital City Solutions – From global perspective to local application

**Mr. Klaus Heidinger,**
**Head, City IT Applications, Siemens Centre of Competence Cities, London**

*Mr. Heidinger gave various examples of Smarty City solutions and explained how there is no best Smart City practice. Every city is unique and requires a tailored approach – what works in one city may not work for others.*

1. A key component cities share is many people must be moved in a small amount of space.
    - A parking management system that allows communication between infrastructure and car has huge potential in the future.
    - Mr. Heidinger believes that children born today will not have a drivers' license in 20 years' time.
2. Cited London's campaign, *Keep London Moving*, which moves 700,000 passengers a day.
    - Trains run every 100 seconds.
    - 3,000 more people carried every hour.
    - 2nd fastest line in the world.
3. Apps like *Citymapper* can help encourage use of public transportation.
    - It connects various transportation systems into one system which is very useful for cities.
4. The biggest problem mayors' face today in related to greenhouse gasses and pollution.
    - Most cities are growing.
    - 70% of greenhouse gasses are related to buildings.[3]
    - 70% of air pollution comes from transportation.
5. Siemens developed *MindSphere* which allows machines and infrastructure to be connected to the cloud.
    - By connecting devices all around a city, cities are able to collect new information.
    - Incredibly helpful and accurate in monitoring and managing air quality.
    - The European Union is creating penalties for cities with high air pollution levels.
6. Air pollution will decrease by 2025.[4]
    - For this to happen people must move from cars to public transportation.
    - Governments should incentivize people to use public transport.

[3] World Bank Report - Cities Contribution to Climate Change
[4] LSE study finds China's emissions likely to peak by 2025




7. The City Performance Tool (CyPT) program will utilise information from the sensors all over the city to create air quality forecasts. This can help with implementing preventive measures, rather than using corrective measures.
    - For example, when air quality is predicted to reach dangerous levels, different short term measures can be implemented such as free public transportation and closing parking spaces.

## Smart Cities in Asia – Structure and Approaches

**Mr. Eli Konvitz,**
**Director, Urban Development & Design, South East Asia, Atkins**

*Mr. Konvitz began his presentation showing the development of cities and associated technologies through time. He suggested that while every city faces challenges in becoming "Smarter", they vary from city to city, there is no one-size-fits-all magic bullet, and the appropriate levers are not always obvious.*

1. Cities must continually question if they really are Smart Cities, what they are trying to achieve and simultaneously consider their processes, solutions, and desired outcomes.
2. Many different definitions of a Smart City, but all share key themes:
    - Digital and physical infrastructure;
    - Comprehensive sustainable development planning – energy, water, buildings, mobility, social infrastructure, public realm;
    - Citizens vs government/top-down vs bottom-down; and

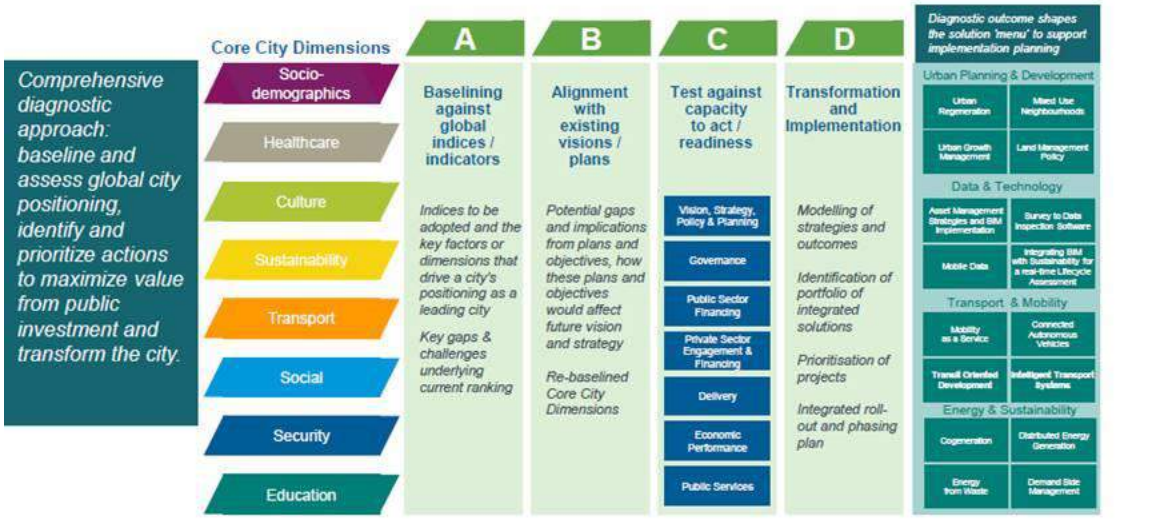
- Transparency, consultation, feedback.

3. Smart Cities could address multiple problems including:
    - Environmental – sustainability, resilience, and access to resources;
    - Economic – competitive advantage; making the most of limited money through PPP, privatisation, new revenue streams; and
    - Social – citizens engagement coupled with responsive government.

Intelligent cities


ATKINS

4. With rise of technologically advanced Smart Cities we need to ask if this is a danger-free phenomenon.
    - Is the citizen a consumer of public services? Or is that citizen a thing to be managed for political or technical ends?
    - The creation of tremendous amounts of data creates needs to be responsibly used. Where cities were once considered places for anonymity, citizens in smart cities risk now becoming highly surveilled, with potentially wide-ranging effects on society.
    - How will we ensure desirable outcomes as humans are increasingly disintermediated and machines increasingly make decisions by communicating directly with other machines?
5. When designing Smart Cities we need to consider the purpose of urban infrastructure and understand it within the complex urban environment.
    - The window of opportunity for developing cities in Smart Cities is now – before major infrastructure is built.
    - A diagnostic approach allows considered development of priorities for investment and action:




6. Lessons learned:
    - Need to enable governance and political environment;
    - Integrated working from the outset;
    - Long-term thinking required;
    - Focus on desired outcomes;
    - Build and test scenarios;
    - Understand user and stakeholder ecosystem; and
    - Embrace complexity and a System of Systems approach.

## Smart City & People – the Human Dimension

**Dr Thomas Tang,**
**Former Managing Director of Kuala Lumpur Centre for Sustainable Innovation and Professional Corporate Executive on business strategy, market development and sustainable built environment design.**

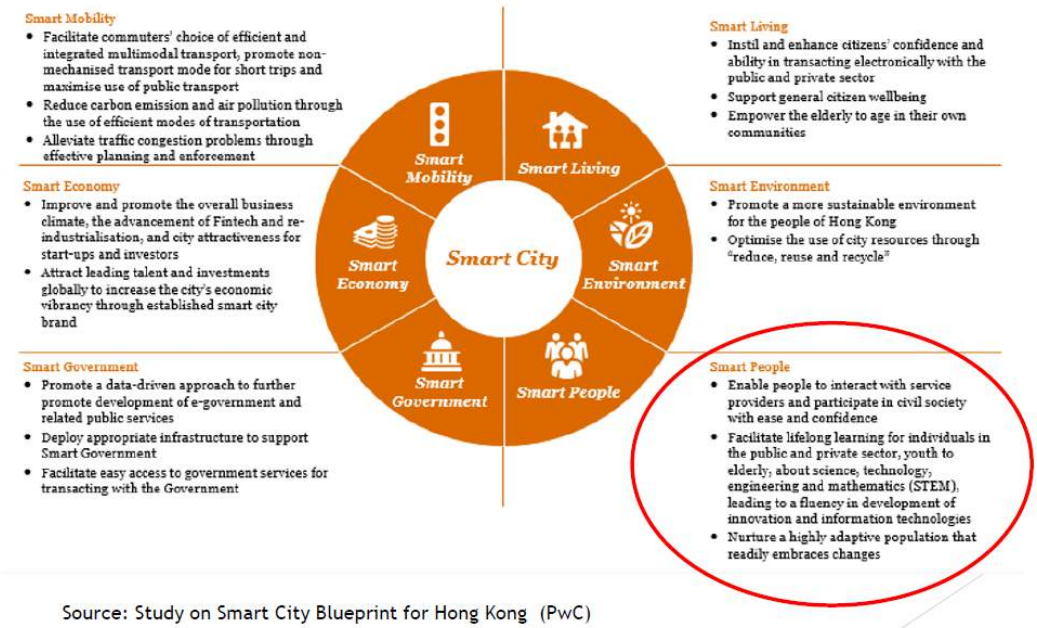
*Dr Thomas Tang explained when considering how to fit technology and smartness into a city it is crucial to determine where people fit in.*

1. A key theme for Smart Cities is Smart People[5]
    - Enable people to interact with service providers and participate in civil society with ease and confidence.
    - Facilitate lifelong learning for individuals in the public and private sector, youth to elderly, about science, technology, engineering and mathematics (STEM), leading to a fluency in development of innovation and information technologies.

[5] Report of Consultancy Study on Smart City Blueprint for Hong Kong

- Nurture a highly adaptive population that readily embraces changes.

## Smart City Themes and the Respective Policy Objectives




Source: Study on Smart City Blueprint for Hong Kong (PwC)

2. Smart Cities have a hierarchy of needs

## Hierarchy of Smart Needs

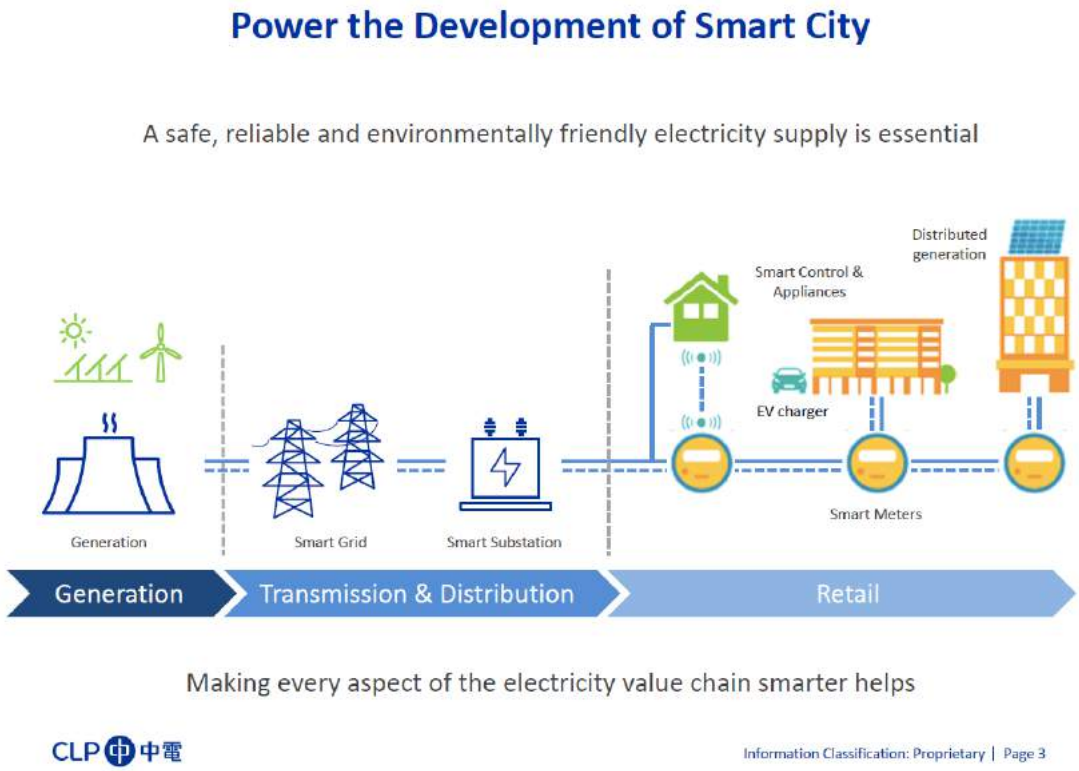

- Building for the future – every city wants to retain its position in the future. Smart city systems can be designed to accommodate future challenges like urban growth or ageing populations.
- Resilience – is about being able to cope and adapt to factors like climate change and to be able to respond to and recover from disasters like earthquakes, storms and disease.
- Quality of life – the citizens should be able to enjoy a high level of quality of life including well-being, health and work-life satisfaction
- Convenience – citizens find that initiatives such as smart mobility or smart living offer better convenience. Equally, citizens should feel that they are able to benefit from smart technologies regardless of gender, age, religion, race or disablement.
- Opportunities – These arise as open data becomes available; namely jobs or commercial opportunities
- Hygiene factors – dealing with public security, flooding, housing, food security etc.

3. People Centric Smart Cities need:
    - People need to feel safe
    - Property ownership or rental must affordable to the majority of the population
    - Connecting places will be important and we should be designing cities to incorporate carbon-friendly mobility modes such as walking and cycling to link up communities as well as driverless cars, carpooling and demand response transit.
    - Promoting a sense of belonging.
    - Uniqueness helps draw outsiders to want to come and visit a place and invest their time and money there.
    - An inclusive society is one that can accommodate intergenerational communities, where families can thrive and grow.
    - Ultimately, we need to appreciate that resources are finite and sustainability is best achieved by being stewards of the environment and using our resources wisely.
4. Smart City Enablers:
    - E-Government Services
    - Access to open data
    - Education and training for jobs of the future
    - Digital public infrastructure
    - Use of physical space
    - Funding
5. Living Lab models are important in taking ideas and putting them into practice
    - Platforms for user-centred products before they are commercially available
    - Appropriate mechanisms for social innovation
    - Partnerships can comprise government, companies and research institutes
    - Research on built environment and city management, urban mobility, IT, public safety, waste and water management and clean energy.
    - Members of communities are furthermore invited to contribute and shape the tested product.
6. Final remarks
    - Designing a smart city should incorporate people needs
    - Not every city is the same
    - Government enablers are key to this process
    - Corporate social innovation – a new paradigm for business
    - Role of living labs should be emphasized
    - Put people first

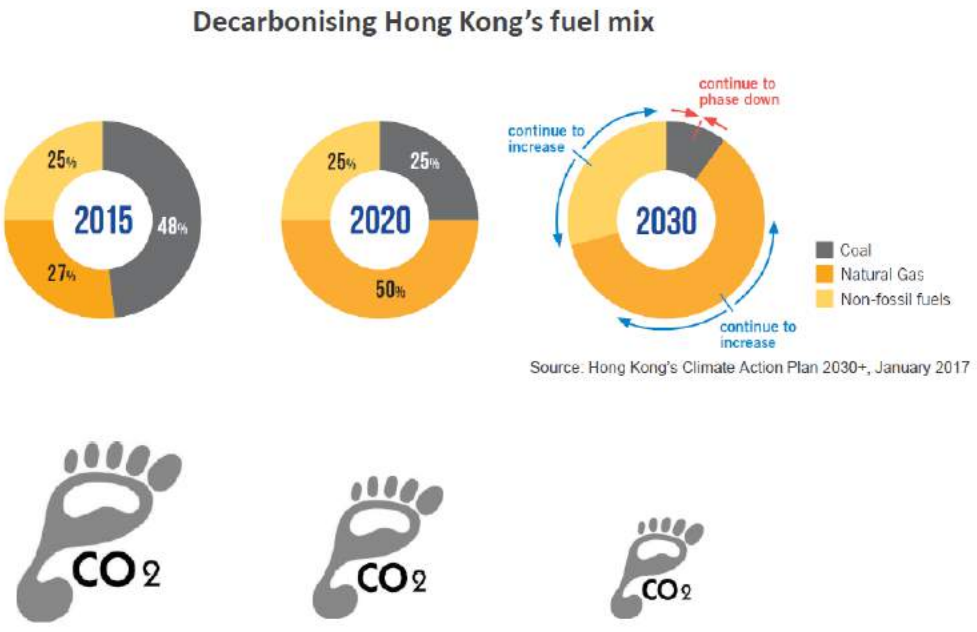
## Powering a Greener and Smarter Hong Kong

**Mr. Chiang Tung Keung,**
**Managing Director, CLP Power Hong Kong Limited**

*Mr. Chiang Tung Keung spoke about the necessity of an environmentally friendly electricity supply and how CLP Power is improving the grid. By using cleaner energy than resources like Coal, CLP Power plans to help Hong Kong significantly reduce its $CO_2$ emissions.*




1. Smart Cities share common building blocks:
    - Efficient utilization of resources
    - Infrastructure that is safe, reliable, and efficient
    - Smartly run technology infrastructure with abundant data
2. CLP Power has released the *Smart Living* mobile app which was launched in July 2017. It helps customers with opening accounts and even offers *Eco Rewards* and *Eco Living* lifestyle tips.
3. By late 2018, CLP Power will introduce new programs that encourage renewable energy including the "Feed-in-Tariff (FiT)" rates for electricity output from renewable energy (RE) systems. They will also issue RE Certificate for customers who prefer clean energy purchases.
4. By continuing to decarbonize Hong Kong's fuel mix CO2 emissions will decrease.




5. The company offers energy audits to assist customers identify energy wastage and improve energy efficiency. Its managers also help businesses project the energy consumption of future projects so energy efficiency can be optimised.
6. The company is a strong supporter of "Smart People" by supporting STEM education at all levels. It provides the "Engineer in School" programme to secondary students, and offer academic collaboration and scholarships to Universities.

## IV) Panel Discussion 1

**Moderator: Dr Raymond Yau, BEC Board Director and General Manager, Technical services and Sustainable Development, Swire Properties Limited**

**A Smart Sustainable City – From Energy to Air Quality**

*Much of the discussion revolved around how a growing city could be sustainably developed. Opportunities for Hong Kong to be a smarter sustainable city were debated as were the roles government and business should play.*

**Q: The Business Environment Council sent a position paper to the government regarding Hong Kong as a Smart City. Is a Smart City a means to an end of sustainable development and prosperity?**

- Historically there is definitely a correlation between growing cities and further harming the environment.[6] It is important to set frameworks for smart growth, but it is difficult. Budgets, finance models, and regulation are needed. Cities can be sustainably developed, but as a society we must make a commitment to do so. Cities often know exactly what to do but these measures are often controversial like an emissions tax.
- Sustainability is a major objective of a smart city but not the only objective. Cities must learn how to balance all the objectives of society in a sustainable manner. Funding is critical but even more so government must ensure that funding is going to the right areas.

**Q: What is the number one opportunity for Hong Kong going forward?**

- Hong Kong's number one goal should be to keep its citizens healthy. Hong Kong should turn towards a low carbon economy by doing what is necessary staying committed to its environmental targets.
- The circular economy should be further developed and need to implement reverse supply chains. It is crucial that growing cities like Hong Kong increase liveability by addressing issues like walkability.

**Q: What are the benefits of City Performance Tools (CyPT)? How can CyPT be best used?**

- Siemens has been developing CyPT for two years and has successfully found a way to see how technology affects pollution.[7] Every city is unique so there is no best set of performance tools to follow. Siemens has found that building automation has the best investment return. Many cities are reluctant to hand over data which hinders their ability to best deploy CyPT.
- It is always important to question the models. If inaccurate information is entered then the models will be flawed. Analysts must also apply the common sense test to all CyPT.
- Atkins is creating simulations tools to model the financial costs of severe storms which allows cities to be better prepared if they occur.

**Q: Moving forward will there be similar thinking for what a smart sustainable city looks like?**

- It is unlikely that there is a single image of a smart city because every city is different. There is no right answer and, rather than an image, a diagram or abstract image would more accurately capture a smart city.
- Hong Kong is especially unique because it has avoided urban sprawl. Most cities have urban sprawl which challenges mobility, and they must focus on servicing a large area with public transportation. Cities that are experiencing urban sprawl should focus on building vertical cities to reduce the sprawl.

[6] National Geographic - Urban Threats
[7] Siemens - City Performance Tool

- The themes - green and simple - can be commonly applied to a smart city. Simple is always beautiful. Smart cities should also be convenient for people.

**Q: What is the role that needs to be played by government in making Hong Kong smarter?**

- Being a mayor is like being CEO of a large company, and CEOs have all the companies' data to make informed decisions. Unlike CEOs, mayors are receiving delayed data. Cities need to make their data public and encourage SMEs to make use of the data and create innovative solutions to various issues.
- It is incredibly inefficient to withhold data. By putting the citizen at the heart of the matter, and not the technocrat, cities can quickly analyse the data. Doing this would also require changing the mindsets of the technocrats.
- The world is going towards more open data. Businesses and governments are wary to release all data due to privacy concerns, but if properly anonymized it should be done. Hong Kong was a leader in digital thinking with concepts like the Octopus Card, but has recently been regressing. In this ever evolving field is it important not to be content.

## V) Session 2: Smart Mobility for a Sustainable City

### The future of sustainable energy and transport

**Mr. Robin (Yuxiang) Ren**
**Vice President, Asia Pacific, Tesla Inc, San Francisco**

*Mr. Robin Ren explained how Tesla's mission is to accelerate the world's transition to sustainable transportation and energy. After starting with high-end cars it is now expanding to mass production mid-range cars and its new Semi truck with 500 miles range.*

1. Tesla has created the most connected car with a smart app and back-end remote service diagnostics by the Tesla team as well as Autopilot, Tesla's driver assistance solution. The car's software also updates automatically at regular intervals improving features, safety and performance.
2. Electric vehicles can be integrated into the Smart City ecosystem. In many places energy rates are higher at peak times so consumers are incentivised to use electricity at off peak time. The car can be programmed to charge when demand and prices are lower.
3. Tesla is involved in power pack production. These commercial power storage systems allow for energy to be stored at off-peak hours and deployed in peak hours to ease demand among other uses.
4. The company envisions a vertically integrated sustainable energy future since it is involved in the production of energy generation, storage, and electric transportation.

5. They are instituting a closed loop battery recycling system. This allows the materials of used batteries to be recycled to raw materials for future use. Battery recycling programs can save at least 70% on CO2 emissions.[8]


## The Future of Mobility: Clean, Convenient, and in the Service of Humanity

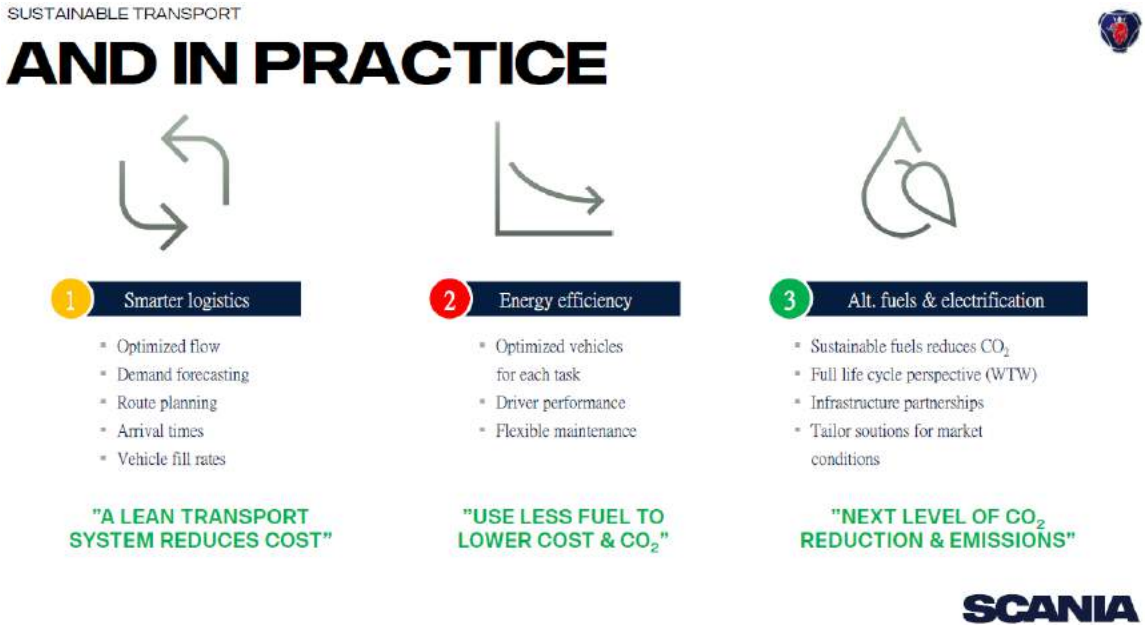
**Mr. Alexander Mastrovito,**
**Head of Sustainable Transport Solutions – Scania Asia & Oceania, Scania Group**

*Mr. Alexander Mastrovito detailed how new technology and business models in the commercial vehicle sector are ensuring reduced energy consumption. With the overall objective being reducing $CO_2$ emissions, many of the new developments are helping the industry meet that objective.*

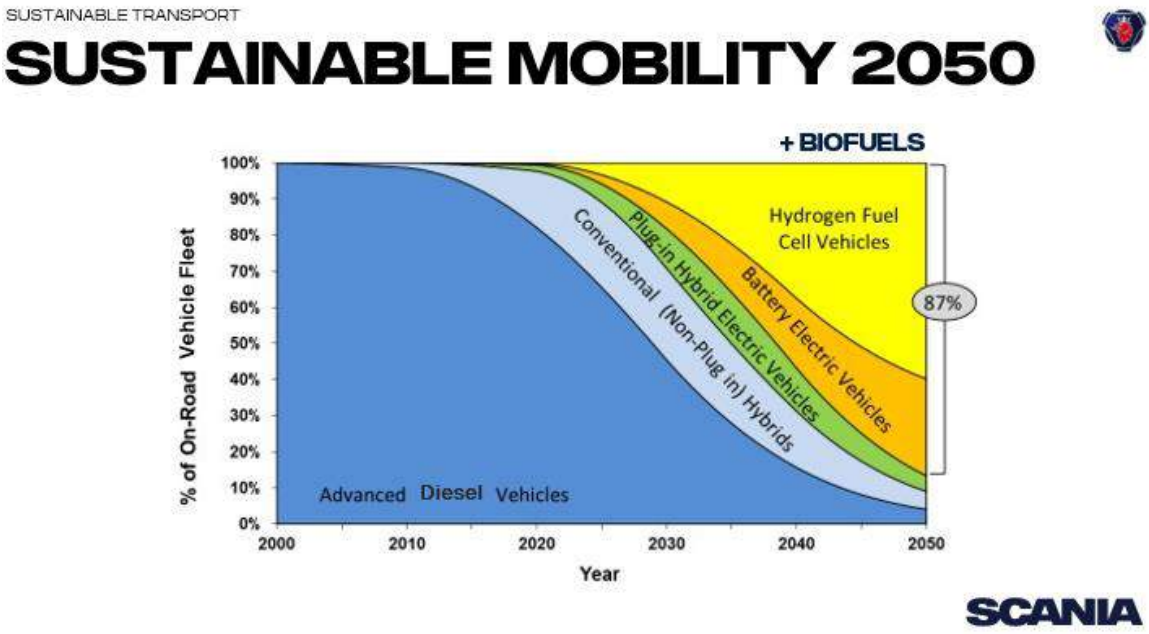
1. The six main disruptors of the commercial vehicle industry fall under new technology and new business models. The disruptors are:
    - Alternative fuels
    - Connectivity
    - Autonomous vehicles
    - Electromobility
    - Intelligent transport systems
    - Mobility as a service

[8] Tesla's Closed Loop Battery Recycling Program

2. The key changes Scania envisage going forward as part of a smart sustainable approach are as follows:




3. SCANIA's own initiatives include:
    - 300,000 connected vehicles which is 70% of their rolling five year fleet. This fleet drives 50,000 laps around the world every month. These fleets have shown up to a 20% reduction in fuel consumption. Connectivity is legislated in many parts of the world including the mainland, however it is not legislated in Hong Kong.
    - released the first heavy hybrid in Hong Kong. It is 16 tons and EURO VI compliant. Hong Kong has excellent topography for parallel hybrids and allows savings of 15%-40%. If there is no extra weight allowance like in the EU for the battery pack, uptake will be slow.
4. The commercial vehicle industry faces a fragmented landscape, and currently nothing beats diesel costs. Support fluctuates but is necessary in carrying out long term planning. Biofuels will be a part of the decarbonisation effort regionally.
5. A transition to smart sustainable mobility over the longer term may look as follows:




## A holistic approach for transforming Kowloon East to a green and smart neighbourhood

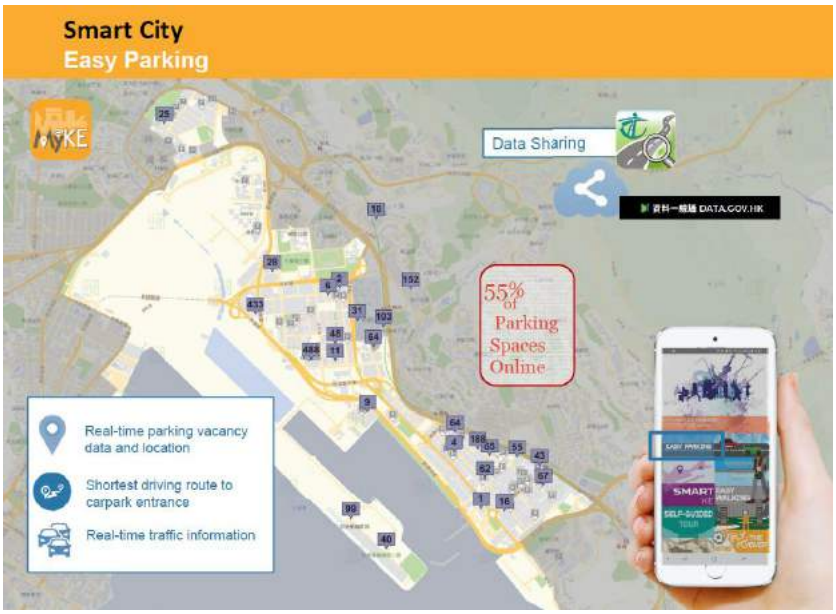
**Mr. Frank Wong,**
**Deputy Head of Energizing Kowloon East Office, Development Bureau, Hong Kong SAR Government**

*Mr. Frank Wong explained how the Development Bureau is taking a "quick win" approach. This approach favours small changes that allow immediate gains rather than large public works that take 5-6 years at least.*

1. The Development Bureau uses "CBD²" to describe their energizing of Kowloon East. This stands for Connectivity, Branding, Design, and Diversity.[9]
2. They have been improving the environment of the neighbourhood by adding additional greenspaces and parks.
3. A total of 56 quick win and short-term traffic improvement works have been completed. These include better located pedestrian crossways as well as widening of pedestrian crossings and footpaths. The government has also collaborated with artists to face-lift back alleys with artworks to attract more pedestrians to use them.
4. The Development Bureau is using Kowloon East as a Smart City Pilot Area to conduct Proof of Concept Trials (POC). These trials include:
    - Smart crowd management system
    - Walkable Kowloon East Mobile App
    - Kerbside loading/unloading bay monitoring system
    - Illegal parking monitoring system

[9] Hong Kong's CBD²

- Smart waste bin system
- Multi-purpose smart lamppost
- Real-time roadworks information
- Energy efficiency data system


5. The POC multi-purpose smart lamp post includes an internet of things (IoT) backbone, universal power and communication connection for IoT devices, modular design to suit site-specific requirements, co-use mechanism to facilitate multiple users, and data collection and dissemination platform.

## VI) Panel Discussion 2

**Ms. Maya de Souza, Senior Manager – Policy Research, Business Environmental Council Limited**

**Smart Mobility for a Sustainable City**

*This panel featured people on the forefront of autonomous vehicles as well as Smart City planning. Much of the discussion focussed on what is happening in the mobility sector and how the sector can help Hong Kong become smarter.*

**Q: What are the most critical developments needed to take us to a smart sustainable Hong Kong?**

- Hong Kong is missing a vision. It does not need to be complicated, but people need to be able to rally around it.
- It is not realistic to leave it to private enterprises to drive change; the responsibility rests with public and private sector.
- Mindsets need to change - collaboration of stakeholders is crucial for expedient and more comprehensive outcomes.
- To help these stakeholders succeed data must be shared.

**Q: There are moral and legal aspects related to autonomous vehicles. Who is liable when an accident occurs?**

- Mr. Ren with Tesla explained how new the technology is and final decisions have not been made. Tesla is working closely with many governments, but governments and industry need to work together to answer the question. Mr. Mastrovito with SCANIA Group noted that the manufacturer should take responsibility.

**Q: What technological changes are most important?**

- Increasing connectivity will change the landscape in Hong Kong. It is important to incentivize low emission technology. Great advances could be made in automation of ports which will keep Hong Kong ports competitive with others in East Asia.
- It is important to think about the individual context of a specific area since it is difficult to strike a balance between stakeholders. Different stakeholders approach problems from different angles which creates a more robust picture of the issue at hand.
- Two very large problems Hong Kong faces are pollution and congestion. Sometimes a solution to one problem can exacerbate the other. It is desirable to design win-win solutions that deal with both issues.[10]

[10] Smarter Congestion Relief in Asian Cities

**Q: What do cities with autonomous vehicles look like?**[11]

- Greater use of autonomous vehicles will allow cities to reclaim road space by reducing parking lots since autonomous vehicles will constantly be on the move.
- If autonomous vehicles become more affordable than public transportation the consequences could be catastrophic. There might be a mass migration to autonomous vehicles since they deliver riders door-to-door. This could create a rapid growth in emissions, congestion, and even obesity.
- City planners need to stop designing roads in 2D. This way of city planning is a major cause of congestion. The future of a Smart City includes a 3D city so different modes of transportation do not clash with each other – even possible to put roads underground.

**Q: How do different apps communicate with each other eg on parking? Is there an integrated platform?**

- We live in a multi-app world, and it is important to share and collaborate among companies.
- Companies must follow various privacy laws and if they release data it often must be anonymized.
- Companies can find it difficult to strike the right balance between sharing data and the corporate benefits from proprietary data. SCANIA tried to get their application programming interfaces (APIs) into Hong Kong Science and Technology Park (HKSTP) but it takes time to anonymize the data. It may be that the data is less useful due to the anonymization.
- The private sector is usually better at analysing the data, but the government needs to take the lead in decided the appropriate open data format.

**Q: How can a Smart City be developed using a pilot program?**

- Hong Kong needs to re-examine its laws and regulations, especially those that have a bearing on the topics being discussed eg innovation in transportation and energy. Existing legislation can at times be more detrimental than beneficial.
- It is essential to work with the general public to gain support. There need to be proof of concept trials to try out different ideas and determine which ones are most effective.
- The Development Bureau can help pull the various departments within the bureau together on different initiatives.
- It seems like Hong Kong is not leading the pack anymore. Cannot put too much blame on government since all stakeholders are partially responsible. However there are not many incentives for the private sector to devote resources to the space at the moment.

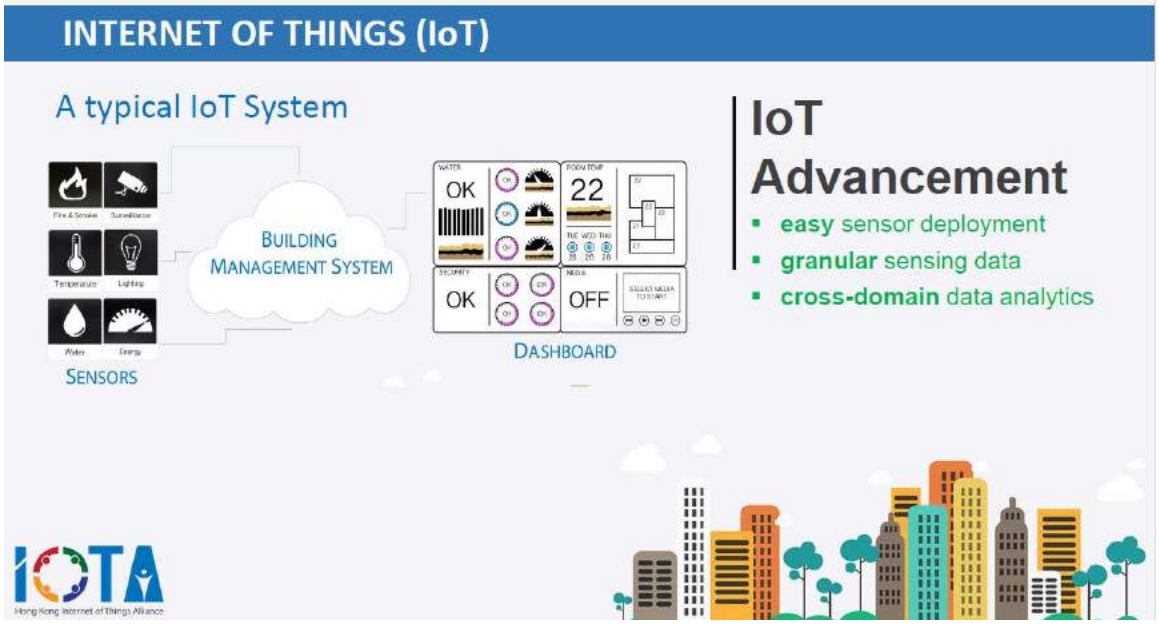
[11] Smart Nation - Singapore

## VII) Session 3: Smart Decision-making: using data and engaging the public

### Architects of the Future: Turning Garbage into Gold with Dumb Data

**Dr Ernest S. Lo,**
**President, Hong Kong Internet of Things Alliance**

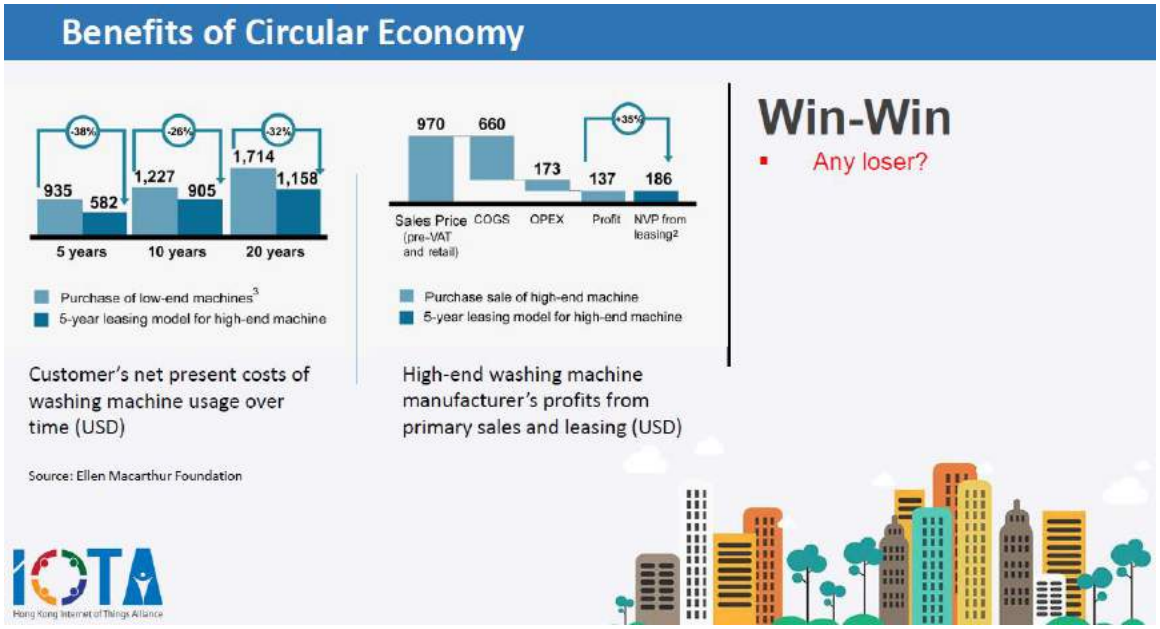
*Dr Ernest Lo detailed how the Internet of Things (IOT) coupled with extensive use of sensors will provide detailed and useful data. He took the view that the IOT will be instrumental in reducing the amount of wasted energy and can help reduce wasted physical resources too.*




1. Explained the relevance of IOT to the SDGs including responsible consumption and climate change, as well as life below water, life on land and affordable clean energy.
2. The commercial sector in Hong Kong consumes 65% of the electricity. This costs the sector about HK$32 billion a year. Just a 10% reduction in spending by "scavenging wasted energy" would equal savings of roughly HK$3 billion a year. The advancement in IoT can certainly help reduce wasted energy.[12]
3. New regulations are often unpopular with businesses and consumers. The benefits of IoT is that it allows for Win-Wins that save costs and help increase energy efficiency. Helps inform investment and support prioritisation, as well as measuring impact supporting strategic decisions.
4. IoT drives new sustainable business models relevant to enegy and waste. Software-as-a-Service (SaaS) with Hardware-as-a-Service (HaaS) can help the reach of smart meter manufacturers and HVAC solution providers. A leased washing machine with IoT technology can detect key components wearing, monitor usage, and create

[12] Deepening Energy Saving in Existing Buildings in Hong Kong

predictive alerts for users and companies. This can help machines last long and be used in more efficient ways.




5. Sensors can also be used to support effective waste management, and some cities are beginning to use them eg Barcelona.
6. Innovation takes place when it is viable (makes business sense), desirable (meets people's demand) and feasible (technologically available).

## Big Data: Big Challenges or Big Opportunities for Power Utilities

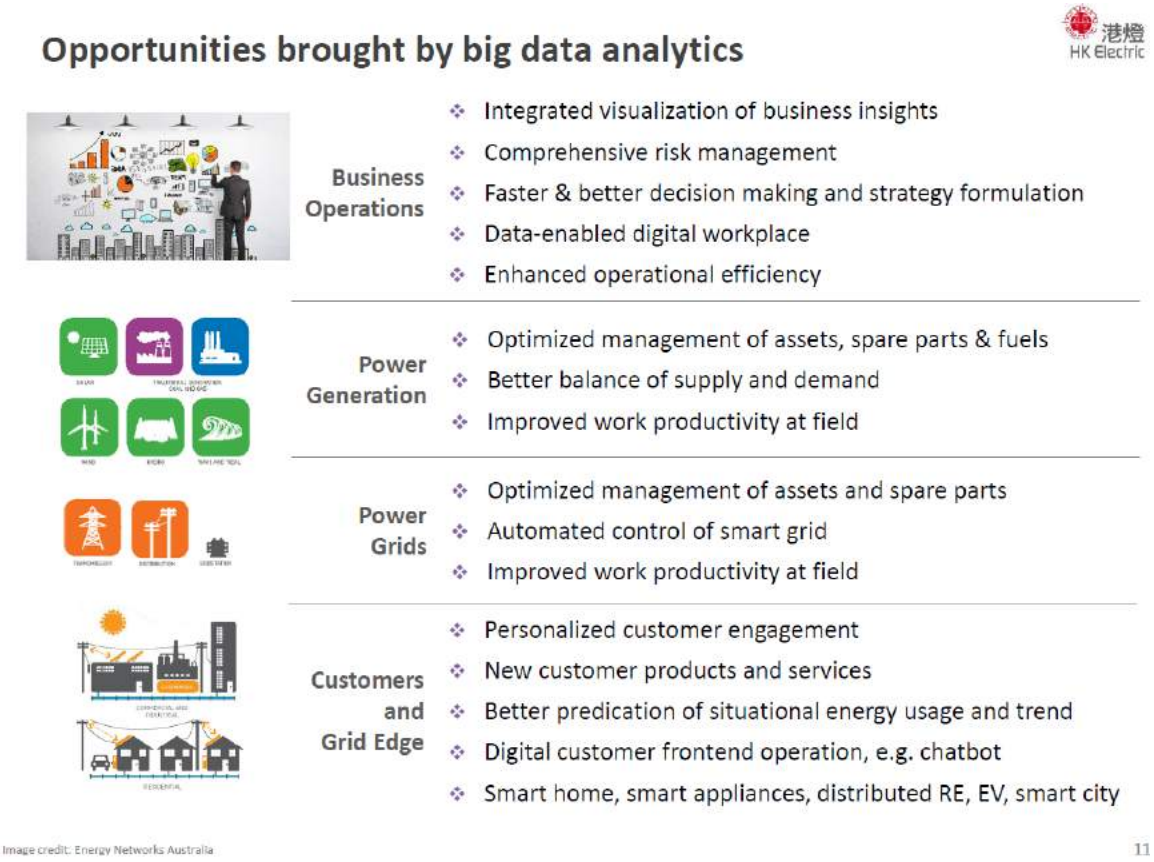
**Mr. Leung Wai Kin,**
**Senior Manager (Customer Business Development), The Hongkong Electric Company Limited**

*Mr. Leung Wai Kin elaborated on the extensive amount of data that utilities produce, and the potential for data usage by utilities.*

1. There are Five Vs of big data:
    - Volume – scale of data – 2.5 Exabyte/day is created. 90% of todays' data was created within the past two years.
    - Velocity – speed of data – 50 TB/sec data traffic on global internet by 2018.
    - Veracity – Certainty of data – 1/3 of business leaders do not trust the information they use to make business decisions.
    - Variety – Diversity of data – 90% of generated data is unstructured.
    - Is it possible to comprehend the big data and unlock the 5th V – Value?

2. Big data along with appropriate analytics can support “intelligent decisions”. According to IBM 82% of CFOs value integrating enterprise wide data but only 24% believe their team is up to the task. Also 44% of the highest performing CFOs combine internal and external data to produce insights.[13]

3. Big data brings opportunities for utilities. It brings customer benefits in terms of personalised and new energy services, a more reliable and resilient infrastructure, and better balance of supply and demand as well as infrastructure planning.

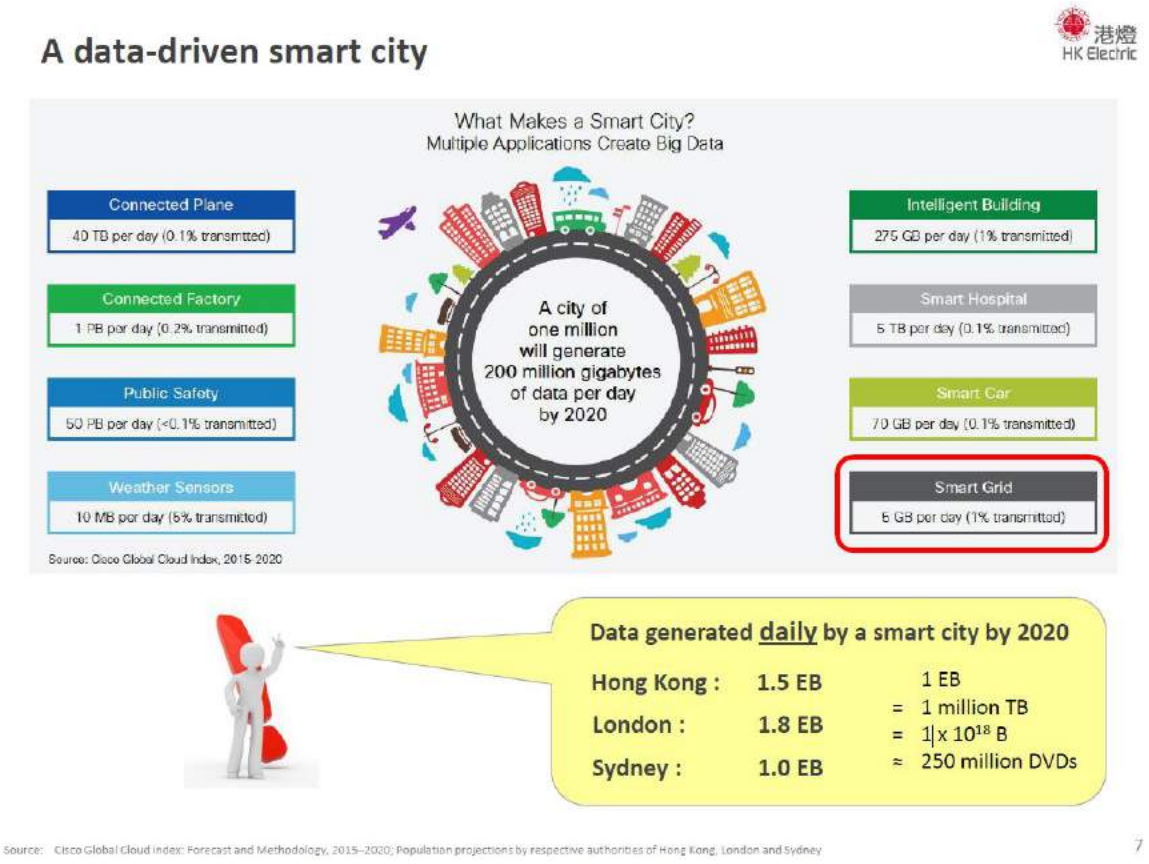



4. With increasing amounts of data in everyday life it is increasingly important to have good data governance, maintaining confidentiality and cybersecurity.

5. There are five simple no-regret initial steps businesses can take to unlock the value of data:
    - Decide whether to improve existing business or look for new ventures?
    - Where can data-driven services create value? Take stock of data.
    - Get inspirations from leading organization and different landscapes.
    - Assess strengths, weaknesses, threats and opportunities.
    - Build up excitement, belief and targeted capabilities.

[13] IBM Study: Big Data Equates to Big Advantage in CFO Effectiveness

6. Businesses do not need big fancy data analytics tools, but they do need to focus on their own needs. It is important to start with individual companies pain points and build problem statements from there. In this rapidly evolving environment it is suggested to start small but crucial to go fast. A business cannot make high-quality decisions slowly – speed does matter in business nowadays.
7. Going forward HK Electric will take an active role in contributing to Hong Kong's smart city transformation, while it explores win-win big data opportunities and new services for customers and the community.
8. His closing remarks concluded that HK Electric sees big challenges with big data, but they see *bigger* opportunities.




## Using 3D Spatial Analytics to inform Urban Planning

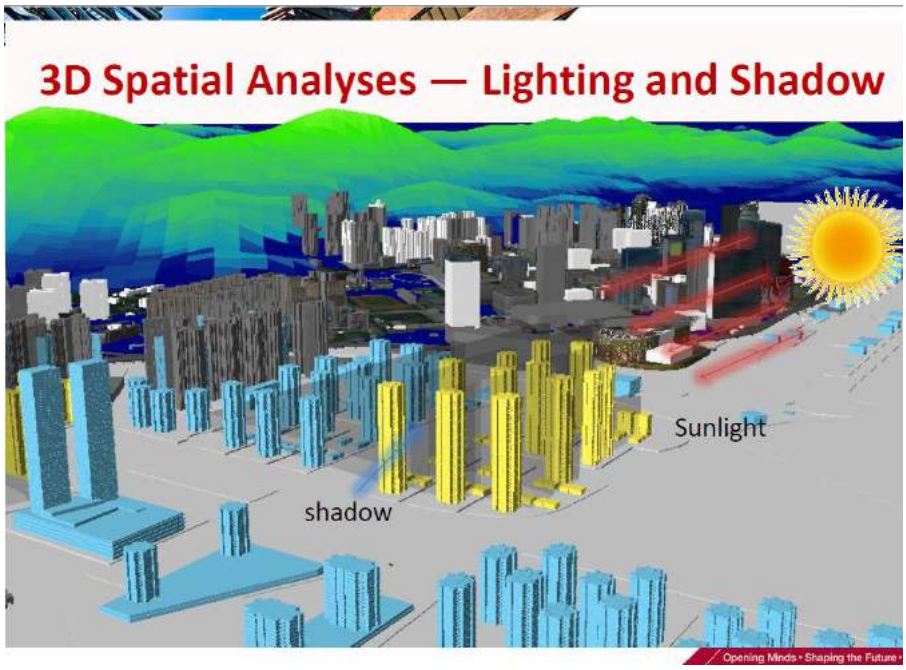
**Professor Geoffrey Shen,**
**Chair Professor of Construction Management and Associate Dean of Faculty of Construction and Environment, The Hong Kong Polytechnic of University**

*Professor Geoffrey Shen explained by way of a case study how data can be used to develop evidence-based 3D spatial analyses, which enable engagement of the public in decision-making.*

1. The common features of a "Smart City" are :

"leverage information and communication technology and use innovative solutions to address issues in a city including governance, economy, mobility, environment, living and people; which aims at improving the quality of life of the citizens and enhancing the sustainable growth and competitiveness of the city."

2. Attributes of SMART Cities in his view are:
    - Sustainable – economic, social and environmental consideration
    - Meaningful – recognizing alternative ways to use resources
    - Adaptable – be able to respond to changing circumstances
    - Resilient – responsive, resourceful, recover from disasters
    - Technology-enabled – people first, supported by ICT, ownership and commitment
3. Hong Kong is an international metropolis with 7.32 million people on 1104km$^2$, and there is a strong need to make more efficient use of our scarce land resources. This project aimed to provide new methodologies to facilitate rational discussions on changing land development density in hyper-dense cities.
4. It sought to investigate the viability of minor relaxation of maximum plot ratio/building height restrictions of 21 sites in KTD through 3D spatial analyses. The analysis took into account shadow and solar exposure, skyline, visual impact, wind ventilation, and air temperature.




5. It was able to show that under all but one of the scenarios the actual social-environmental impact was very low.

6. The research institute for all projects:
    - Applies rigorous methods

- Uses innovative technologies
- Generates objective findings
- Facilitates rational discussions
- Supports scientific decisions
- Provides insights for policy research

## VIII) Panel Discussion 3

**Moderator: Mr. Tony Miller, BEC Board Director and Senior Consultant of Sun Hung Kai Properties Limited**

**Smart decision-making: using data and engaging the public**

*The panel discussed the various benefits of big data along with some challenges in particular as to privacy. It was debated how to appropriately publish sensitive data and how more value could be generated from data, including through if use of standardized formats.*

**Q: Does big data lead to better decision making?**

- It will come down to if there is enough or not enough data, not necessarily big or small data. Data as a whole will be a tremendous help in cities public decision-making.
- There is a vast quantity of data and stakeholders need to smartly extract the essence of data.[14]
- Google DeepMind, a machine learning unit, was successfully able to reduce energy use at a data centre by 40%.[15] Artificial Intelligence (AI) has also successfully been applied to the food industry to correctly predict demand for certain types of food and help reduce food waste.

**Q: Is there a platform for sharing data?**

- It depends on the type of data. If the data is privately owned by companies, there isn't a platform for sharing as companies may decide not to share it.[16]
- Currently, research students in Hong Kong have to use data from the United States due to limited availability of data in Hong Kong.[17]
- The regulatory framework is a major factor in determining the availability of open data. Many countries have data protection laws to take into consideration.

[14] Big data: The next frontier for innovation, competition, and productivity - McKinsey Global Institute
[15] Google DeepMind
[16] Sharing Data Is a Form of Corporate Philanthropy - Harvard Business Review
[17] Open Data Partnerships Between Firms and Universities: The Role of Boundary Organizations

- However some United States utilities, for example, share anonymized smart meter data, under certain protocols. This sharing of data helps the sector standardize the data of customers to make for easier analysis.[18]
- If properly anonymized public health data from government and private hospitals can prove very valuable to the health of citizens.[19]

**Q: How can organizations collect human behaviour data?**

- This data is very sensitive, and everyone has a strong position on the issue. People should have the choice on being tracked.[20]
- It is very easy to collect environmental data for example $CO_2$ levels, traffic data, occupancy sensors etc. But it is important to publish in standard format so all organizations can analyse it and make use of it.

**Q: Who are the big winners from big data?**

- Large companies with internal analytic departments are best positioned to benefit from the explosion of big data.
- However, companies still need to find end-users for the analytics output.

**Q: How can big data be used to influence the public?**

- Big data can be beneficial in managing risks like natural disasters, but politicians may not be able to use it correctly.
- Big data is not needed for every modern issue. Many time simple data analytics can be useful in many ways to engage the public in a dialogue on issues.

**Q: Can consumers benefit from big data?**

- Does not matter if data is big or small, entrepreneurs can make use of it.
- Millions of consumers every day benefit from smartphone apps in the sectors in transportation and food delivery, that use data but not necessarily big data.

**Q: Singapore has a one-stop portal for public data-sets.[21] What about the creation of a one-stop portal for *all* public data, including some from academia?**

- To create a one-stop portal there need to be standardised formats and datasets (application programming interfaces, APIs).
- The Hong Kong government has started one, but it is not a full set of data.
- Even for people within the government it can be difficult to extract the data from other departments, and they sometimes hire external consultants for studies without being able to share data with them.

[18] Data Collaboratives: Matching Demand with Supply of (Corporate) Data to Solve Public Problems
[19] Data Sharing for Public Health: Key Lessons from Other Sectors
[20] Private Data and the Public Good
[21] Data.gov.sg

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Hong Kong's CBD[2]

Smart Nation - Singapore

Studies on Smart Cities

LSE study finds China's emissions likely to peak by 2025

Atkins - Future Proofing Cities

National Geographic - Urban Threats

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Smart Mobility

Tesla's Closed Loop Battery Recycling Program

Smarter Congestion Relief in Asian Cities

Further Reading on Big Data – A collection of articles and government websites

Deepening Energy Saving in Existing Buildings in Hong Kong

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Private Data and the Public Good

Data.gov.sg

Smart City Consortium - How can Hong Kong Overcome the Bottleneck of IoT Development?

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