

Canada Delegation 2012
Engineering the Most Livable City in the 21st Century
Young Members Committee and
Continuing Professional Development Committee
The Hong Kong Institution of Engineers

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Canada Delegation Report 2012 - Engineering the Most Livable City in the 21st Century

HKIE - YMC & HKIE-Continuing Professional Development Committee

CANADA DELEGATION 2012

Engineering the Most Livable City in the 21st Century



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Ir F C CHAN

President, HKIE

On behalf of HKIE, I wish to congratulate the successful YMC Delegation to Vancouver, Canada, under the leadership of Dr. Ernest TSANG and Ir Iman LAI. I believe that all delegates gained a lot of insight and exposure during the visit. Of course, I am delighted to attend part of the Delegation in Vancouver. The theme of the delegation visit is “Engineering the Most Livable City in the 21st Century”.

I am definitely impressed with the exchange with municipal government officials of the City of Vancouver, including the Senior Program Manager of their Sustainability Group. Vancouver is targeted to be the greenest city in the world by 2020. They cherish the extraordinary beauty of their natural surroundings, celebrate their diversity, and are working to build

a smart and green future. Their vision is to attract leaders and thinkers to invest and work in one of the best places on earth to live, work and play.

The delegates also exchanged with a number of Vancouver local institutions, including IEEE Vancouver Section, APEGBC and our HKIE Canadian Chapter in Vancouver. Such opportunities allow our young engineers to have direct conversations with our counterparts in Canada. Of course, visits made to various organisations, e.g. BC Hydro, VCCW, UBC are good eye opening and appreciation on green facilities and approach.

On behalf of HKIE, I would like to appraise YMC in organising this Delegation, selecting Vancouver as our learning objective, sharing their knowledge gained by publishing this report and giving presentation for other HKIE members to appreciate the wonderful Vancouver trip. My wholehearted admiration is on our YMC’s leadership and culture in teaming, designing, coordinating, implementing for an important event for our young engineers – a good model for developing our future professional engineers.



Ir Prof Reuben P K CHU, JP

Immediate Past President, HKIE

I write to congratulate the success of YMC Overseas Delegation 2012 to Canada. YMC has been organising Delegations to different parts of the world with objectives to appreciate engineering technologies abroad and widen young engineers’ horizon on overseas engineering practices to better serve the community. In today’s pluralistic society, our young engineers should be effective communicators and adopt an open-minded attitude towards different cultures and innovative ideas. I am sure the experience that all delegates have gained from this visit will be most useful to them for many years of their professional careers.

The theme of the Delegation is “Engineering the Most Livable City in the 21st Century”. Livability is the sum of the factors that add up to a community’s quality of life including the built and natural environments, economic prosperity, social equity, educational opportunity, cultural possibilities and so on. Vancouver is named as the world’s most livable city and scored highly in infrastructure and built environment, governance and empowerment and social well-being. It should be a good opportunity for our young engineers to explore the latest developments in Vancouver like green buildings and clean air initiatives etc.

In closing, I must say this is a fruitful trip that all delegates have acquired a good understanding as what we engineers can do in bringing quality living to the community. I look forward to seeing the delegation report published and inspiring other young members to embark on overseas missions to experience for themselves the impact of overseas exposure.

Messages





Ir Prof K K CHOY

Senior Vice President, HKIE

I joined the YMC Delegation to visit Vancouver from 4 - 11 March, 2012. The Delegation had prepared a well-planned itinerary that we were able to visit a number of representative places and important organisations of the city, and to understand well the city's green and sustainable initiatives and achievements.

We had visited those representative places indicating the theme of the city in respect of sustainability, green building and environmental protection. These places included: Whistler Olympic Village, Annacis Island Wastewater Treatment Plant, Seymour-Capilano Filtration Plant, VCCW, SEFC, CERC of the UBC, Vancouver City Hall, Ballard Power Systems, and BC Hydro. These visits had widened our knowledge in researches, planning, operations and maintenance for sustainability and green building works.

We had also attended a series of seminars and presentations on these subjects organised by local academics and professionals. In the discussions, we had valuable and constructive exchanges with the speakers and local participants.

I am very impressed that Vancouver is really a green city. It should be considered as one of the most desirable places to live in around the entire world. I now fully understand why many of my good friends choose to stay there and not to return to Hong Kong.

The visit had been very enjoyable. Apart from visiting those meaningful places and attending those fruitful seminars, our young delegates were able to make well use of the leisure time, arranging delicious food and interesting sightseeing for all of us. It was an unforgettable tour to me.

I congratulate Dr. Ernest TSANG and Ir Iman LAI for their effective leadership, and thank all young delegates for their hard work and contribution, such that the trip has been very successful.



Ir Raymond K S CHAN, JP

Vice President, HKIE

My heartfelt congratulations to YMC for the successful and rewarding organisation of the Delegation to Vancouver early this year. This provides an extremely valuable opportunity for our young members to broaden their technical horizon and to keep abreast of recent developments in that part of the world. I am indeed most impressed by all the preparatory work and the organisational capabilities of the delegates, under the very able leadership of Ernest and Iman. The series of local visits and seminars organised for the delegates, as well as the very informative fact sheets, could certainly enable the delegates to reap the most benefits from the trip. It has also gone a long way to better equip our young engineers to engineer Hong Kong as one of the most livable cities in the years to come. A job well done. Keep it up!





Ir Victor C K CHEUNG

Vice President, HKIE

I would like to commend YMC for having organised a very successful Delegation to Vancouver – one of the world’s most livable cities. I am most impressed by the concerted effort and enthusiasm of each team member in preparing for the trip. The itinerary was very well planned and much background research had been carried out on the various places to be visited before their departure. Every team member also shared various tasks to ensure participation by all. This arrangement enhanced the learning process and made the trip much more fruitful and meaningful.

Through this trip, our young

engineers had the opportunity to gain valuable insight on the latest environmentally sustainable technologies and engineering practices adopted in the impressive infrastructure and municipal facilities that made Vancouver a green and sustainable city. This trip has not only enriched their engineering knowledge but also broadened their horizons on the social and cultural aspects. Such valuable experience would no doubt help stimulate and inspire our young engineers in their pursuit of transforming Hong Kong into one of the world’s most livable cities. The experience gained through the learning and sharing process of this Delegation will also be beneficial to their professional career advancement.

I wish to congratulate Dr. Ernest TSANG, Ir Iman LAI and their team in accomplishing this successful mission for YMC.



Ir Peter Y WONG

Past President, HKIE

Twenty Five - 25

In 2004, I commenced with the lyric of the song ‘*In the Year 2525*’ by Zager & Evans in my congratulation message to the Hong Kong Branch, CIBSE for their 25th Anniversary celebration publication.

In my message, I pointed to the worsening skies, laden airs, rough waters and towering developments in our city and wondered where it would lead us to when man “(is) *taken everything this old Earth can give and he ain’t put back nothin’, whoa-oh*”.

I ended the message by vesting a cherished hope perhaps in the next twenty five years we would have enough young engineers coming forth to eradicate these rampant dashes exhibited by many.

I was wrong (albeit rare), it didn’t take 25. I noticed for several consecutive years YMC has been making trips to many cities overseas examining worthwhile examples in helping us to steer our own to a place of greener pasture. Fittingly, this year the trip was to Vancouver, one of the most livable cities on earth.

I was right (as always), the average age of the Delegation is about 25. That’s with mine thrown in for the computation.

That was a great trip. Places visited were interestingly diverse; arrangement was surgically precise; fun is timeless and endless. I enjoyed it and I felt like 25.

Thank you.





Ir Dr. Otto L T POON, BBS, OBE

Past President, HKIE

Similar to other metropolis, high percentage of energy used in Hong Kong is in buildings and infrastructures resulting in substantial carbon emission. With climate change high on the political and social agenda of many economies, there is no exception in Hong Kong and each and everyone of us must play a role to reduce energy consumption.

It is heartening to see that in the year of Rio+20, YMC organised a technical visit to Vancouver to inspire young engineers to learn and to develop innovative ideas on green building, and to promote the professional image of HKIE and Hong Kong engineers.

From the intensive programme and the meaningful exchanges with building professionals in Canada, it is evident that the Delegation had achieved its goals. I would therefore like to congratulate the Delegation, under the able leadership of Dr. Ernest TSANG and Ir Iman LAI, for this successful trip as well as being an ambassador for HKIE on the other side of the Pacific.



Ir Edmund K H LEUNG, SBS, OBE, JP

Past President, HKIE

Once again, it is my privilege to have been invited by YMC to be one of their Delegation advisors.

Seeing is believing, and I always believe that the best way to learn is to see engineering systems operating in other parts of the world. It impacts technical knowledge, and it gives a wider perspective to the issues we thought we have excelled in Hong Kong.

I am most glad to see the successful visit to Canada this year. In many ways, Canada is similar but different from Hong Kong. We started with the British system, but now we are both international leaders. We share the same desire for fast economic development, while ensuring high quality and good reliability. Where we differ are

in the climate, and in density of population. It is the opportunity to observe similarities and differences that make the Delegation worthwhile and interesting.

Hopefully the findings of similarities and differences will be recorded and disseminated through the published report and the debriefing session, so that the knowledge and observations can be shared with other young engineers, to add to their experience and understanding of diversity.

I take this opportunity to congratulate Dr. Ernest TSANG, Ir Iman LAI and their team for accomplishing this arduous task of organising and participating in this Delegation, to find out more about the issues of Innovation, Technology and Synergy. I am sure they found it both informative and enjoyable. I would also hope that this good tradition of Delegation will continue and prosper, availing more opportunities to other young members, and preparing them for the future.





Ir S T CHAN

Chairman, the Continuing Professional Development Committee , HKIE

I am most impressed by the vigor, enthusiasm and thoroughness of the YMC in organising the Delegation. No doubt, the Delegation is one of the most important activities from YMC's long list of activities every year.

The theme this year is "Engineering the Most Livable City in the 21st Century" to echo HKIE applying frontiers of technology for quality living. The chosen destination is Vancouver, Canada, which targeted to be the greenest city in the world by 2020. Vancouver currently enjoys an international reputation as the world's most livable city, reinforced by *the Economist*. The theme of the Delegation is timely in view of the Hong Kong recent study on Regional Cooperation Plan on Building a Quality Living Area which is to transform the Greater Pearl River Delta Region into a low-carbon, high-technology and low-pollution city cluster of quality living through the compilation of a

long-term co-operation blueprint for the three sides, i.e. Guangdong, Hong Kong and Macau. The visit gave our young engineers an opportunity to get first-hand information on how Vancouver embarking on their plan in different areas covering green building, green mobility, clean water and air. I am sure the delegates must see and learn a lot from the visit, not only widening their horizons but also equipping themselves for contributing to build a better Hong Kong. The delegates must eager to share their findings not just from the visit but also the several months of hard work in organising the Vancouver visit and other local seminars/visits with our members. This event helps our young engineers have global outlook for their career development and maintain their competitiveness.

This explains why the Continuing Professional Development Committee is most willing to provide the financial support to this meaningful event. I am sure the delegation report will be informative and insightful to our young engineers.

Lastly, I must congratulate YMC in particular Dr. Ernest TSANG, Ir Iman LAI and their team for their success in organising the Vancouver visit.



Ir Gary C W KO

Chairman, the Professional Assessment Committee, HKIE

"I don't believe one grows older. I think that what happens early on in life is that at a certain age one stands still and stagnates," said TS ELIOT, arguably the most important English-language poet of the 20th century. If ELIOT had joined the YMC Delegation to Vancouver between 4 – 11 March 2012, he would not have said this! Sixteen YMC delegates and four young-at-heart advisors have visited an average of three sites per day in addition to three exchanges with various professional organisations within this eight-day trip.

YMC has organised another Delegation of theme "Engineering the Most Livable City in the 21st Century" this Session. Vancouver has ranked high in the worldwide list of "livable city" for more than a decade and it was also acknowledged by Economist Intelligence Unit as the first city to rank among the top-ten of the world's most livable cities

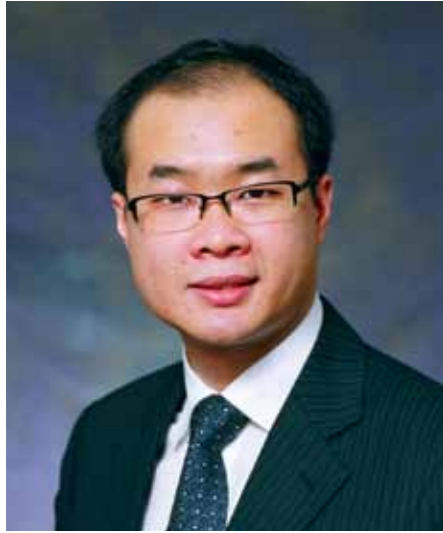
for five straight years in 2011. Being an advisor who has assisted in the selection of the delegates, I am privileged to spend a couple of days with the Delegation to visit interesting places including green town planning site, state of art sewage treatment plant and filtration plant. I have also had the opportunity to meet and exchange views and experience with other people in different professions in the part of the world that I have not visited for over ten years.

Despite limited resources and experience the logistic arrangement of the Delegation is professional. I must praise the selection of the location of hotels, the design of traveling route both inside and outside the city and the varieties of food chosen. Every detail has been well planned and implemented. The itinerary is tight but enjoyable.

To conclude, may I share all delegates a quote from Thomas JEFFERSON who once said "Nothing can stop the man with the right mental attitude from achieving his goal, nothing on earth can help the man with the wrong attitude."

Lastly, I would congratulate YMC in particular Dr. Ernest TSANG, Ir Iman LAI and their team to have organised this successful Delegation.





Dr. Ernest K W TSANG
Delegation Chairman,
Chairman, YMC, HKIE

I write to congratulate the success of the YMC Overseas Delegation to Canada 2012.

This Delegation is one of the most remarkable events for YMC, with an aim to nurture young members of HKIE. In organising this Delegation, young engineers acquire professional knowledge through a series of seminars, visits and exchanges, held both locally and overseas. Moreover, young engineers can gain wider international exposure through this Delegation, which I deeply trust will become a significant chapter in their training towards becoming engineering leaders in the future.

This Delegation selected a brilliant theme, "Engineering the Most Livable City in the 21st Century" and chose thoughtfully Vancouver, Canada as its destination. It is because around the globe, enhancing environmental quality is becoming ever more important in urban development. Vancouver, recognised as one of the cities with the highest quality of living, certainly has much for us to

learn. This Delegation focused its studies on three major aspects, namely clean air, clean water and green building. Throughout our time in Vancouver, we are admired by the contributions Canadian engineers make in building this beautiful city. As their counterparts in Hong Kong, I deeply believe their experience is valuable to us in adopting their best practices in our local projects.

I would like to express my sincere thanks to the Continuing Professional Development Committee for its financial support. My gratitude also goes to our sponsors for their generous contributions.

I would also like to express my gratitude to our advisors. Their guidance, encouragement and support to this Delegation are indeed heartening. My special thanks goes to President Ir F C CHAN, Senior Vice President Ir Prof K K CHOY, Past President Ir Peter Y WONG and Chairman of the Professional Assessment Committee Ir Gary C W KO for taking the time off from their busy schedules in joining our trip.

I must also express my appreciation to the delegates, for what they have done for YMC, HKIE and the engineering community at large. Putting this Delegation together was a great endeavor. It required teamwork, dedication and commitment. There were times when we encountered challenges, disagreements or frustrations. Yet, we stayed as a team, we overcame and through the process, we developed friendship. I congratulate all delegates in achieving such a great deed.

Last but not least, my heartfelt thanks to Delegation Manager Ir Iman LAI, Deputy Delegation Managers, Mr Jerry CHAU and Ir Kenneth CHEUNG for their contributions and leadership in this Delegation. Without them, this Delegation would not have happened.

To close, I take the opportunity to encourage young members to join the YMC Overseas Delegation in the coming years. It is indeed a rewarding journey one can only truly find out by experiencing it personally.



Ir Iman W M LAI
Delegation Manager
Deputy Chairman, YMC, HKIE

Engineers are responsible for building communities and improving quality of living for citizens. While battling for a sustainable environment, what we young engineers could do to save our planet? With the theme of "Engineering the Most Livable City in the 21st Century", the YMC Overseas Delegation 2012 to Canada was organised to inspire young engineers to think proactively our role in building greener communities. It also echoed our President that we young engineers could apply frontiers of technology for quality living.

On behalf of the delegates, I would like to thank the Continuing Professional Development Committee and sponsoring companies for their generous financial support to make the Delegation a success.

I would also like to thank the overseas organisations for hosting us and giving us an insight into green building, clean water and clean air policies and practices being implemented in Canada. Particular

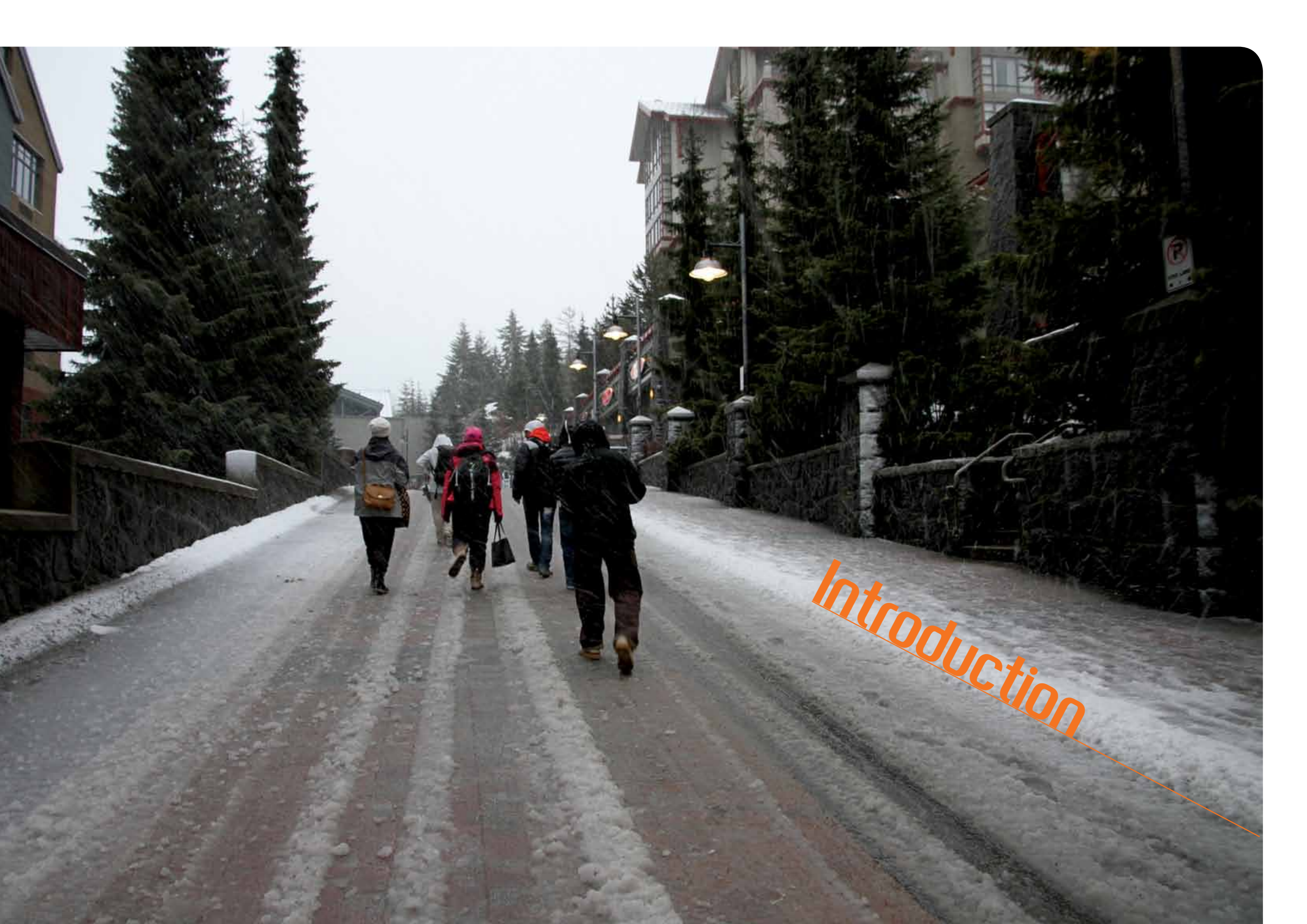
thanks are given to the Canadian Chapter and various professional institutions in Canada for sharing with us their green plan implementation.

It is our great honour to have received supports and advices by our advisors including Ir F C CHAN, Ir Prof Reuben P K CHU, Ir Prof K K CHOY, Ir Raymond K S CHAN, Ir Victor C K CHEUNG, Ir Peter Y WONG, Ir Dr. Otto L T POON, , Ir Edmund K H LEUNG, Ir S T CHAN and Ir Gary C W KO. They gave us valuable advice in planning of delegation and shared insights into key study areas.

I am proud to have a great team: intelligent, enthusiastic, devoted, energetic, thoughtful and innovative. We carried out local and overseas research; drafted technical papers and presentation materials; identified and liaised with our Canadian counterparts; coordinated on the itinerary, flight, accommodation, coach, insurance and catering; designed poster, name card, leaflet and souvenirs; arranged matching local seminars and visits in Hong Kong and the Mainland; raised thoughtful questions at the Delegation and discussed critically what we learnt in this delegation report. Every consideration counted and I loved working with this team.

Lastly, I must thank the Delegation Chairman, Dr. Ernest TSANG, the Deputy Delegation Managers, Mr Jerry CHAU and Ir Kenneth CHEUNG for their hard works and great efforts to make the Delegation a successful and memorable one. It is my honour to be part of the team. We as young engineers are looking forward to using our knowledge to build Hong Kong an even more livable city in the months and years ahead!





Introduction



✿ Background of YMC Delegation

Since 1991, YMC has been organising Delegations to various parts of the world. A specific theme is chosen for each Delegation with the following objectives:

- To widen the vision and horizon of young engineers
- To appreciate latest engineering practices around the globe and assess the applicability of these practices in Hong Kong
- To promote Hong Kong and its engineering practices
- To enhance the relationship between HKIE and Mainland/Overseas Institutions

These objectives can be achieved through the Delegation and a series of local seminars and visits held before and after the Delegation.

✿ Theme of the Canada Delegation 2012 – Engineering the Most Livable City in the 21st Century

Following the success of the Australia Delegation 2008, the Dubai Delegation 2009, the Denmark Delegation 2010 and the UK Delegation 2011, YMC has organised another Delegation in 2012, and the chosen destination was Vancouver, Canada.

With the theme of “Engineering the Most Livable City in the 21st Century”, the delegates visited Vancouver, targeting to be the greenest city in the world by 2020. The delegates had an opportunity to explore the latest developments in green building design and construction, clean air initiatives and clean water policies. The delegates studied how Canadian engineers explore innovative ideas, apply emerging technologies and make reference to proven practices in building greener communities, thus enhancing the quality of life of the citizens.



✿ Objective

The objective of this Delegation is to allow young engineers to learn how engineers in Canada apply their professional knowledge to improve the quality of life. Sixteen young engineers, as known as the delegates, visited Vancouver, Canada.

The delegates focused their study in three key areas, namely:

1. Innovation: water treatment and green transportation development
2. Technology: Vancouver 2020 plan and green building
3. Synergy: neighbourhood development and renewable energy

After carrying out comparable project researches in Hong Kong, visiting selected project sites, and exchanging ideas with relevant professionals in Vancouver, the delegates are able to compare and contrast the practices in Canada and Hong Kong.

The Overseas Delegation 2012 to Canada has the following specific objectives:

- To acquire new experience and global exposure in visiting sites and exchanging with engineering professionals in Vancouver
- To inspire young engineers to develop innovative ideas and appreciate the roles engineers play in bringing quality living to the community
- To encourage young engineers to extend their network and broaden the horizon
- To enrich HKIE members with technological development and applications for building green communities
- To promote the professional image of HKIE and Hong Kong engineers

This report shares the overseas findings observed by the delegates and an analogy is drawn to Hong Kong practices.





🌿 Composition of Delegates

Promotional materials were published in October 2011 to invite young engineers to join this Delegation. An overwhelming response was received. In November, sixteen delegates were chosen from a group of elite young engineers by advisors through interviews. These delegates came from a wide range of engineering disciplines, including Building Services, Civil, Structural, Electrical, Environmental, Geotechnical, Information Technology and Mechanical. They work in different sectors of engineering professions, ranging from government departments to public sectors, consultants and contractors. The delegates are in essence a representation of overall young engineer community in Hong Kong.

🌿 Why Vancouver

Vancouver, Canada enjoys an international reputation as one of the world's most livable cities. Vancouver also ranks among the greenest cities in the world. Currently Vancouver holds the record in being the city with the smallest carbon footprint in North America (City of Vancouver, 2012). From the beginning of 2009, Mayor Gregor ROBERTSON assembled the Greenest City Action Team and threw down a challenge: to develop a plan and make Vancouver the greenest city in the world by 2020. With this challenge, the Greenest City Action Team identified ten long-term goals to be achieved through working with residents, businesses, other organisations and governments.



Each goal was accompanied by measurable 2020 targets:

1. Green Economy Capital
2. Climate Leadership: Eliminate Vancouver's dependence on fossil fuels
3. Green Buildings: Lead the world in green building design and construction
4. Green Mobility: Make walking, cycling and public transit preferred transportation options
5. Zero Waste: Create zero waste
6. Easy Access to Nature: Provide incomparable access to green spaces, including the world's most spectacular urban forest
7. Lighter Footprint: Achieve a one-planet ecological footprint
8. Clean Water: Enjoy the best drinking water of any major city in the world
9. Clean Air: Breathe the cleanest air of any major city in the world
10. Local Food: Become a global leader in urban food systems



Clean water, clean air as well as waste reduction and energy efficiency are key challenges in Hong Kong. The long-term development of Hong Kong, Macau and Guangdong Province is closely connected in economical and environmental aspects, thus sustainable development of these three places requires cooperation in transforming this Greater Pearl River Delta Region into a model city cluster of green and quality living. Consultation of the initial corporation proposals for the Regional Cooperation Plan on Building a Quality Living Area was carried out.

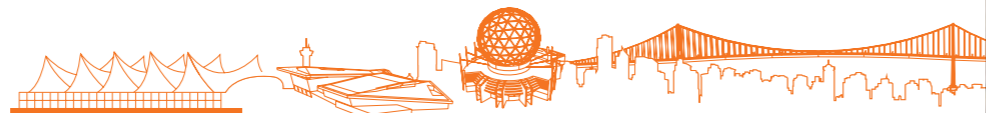
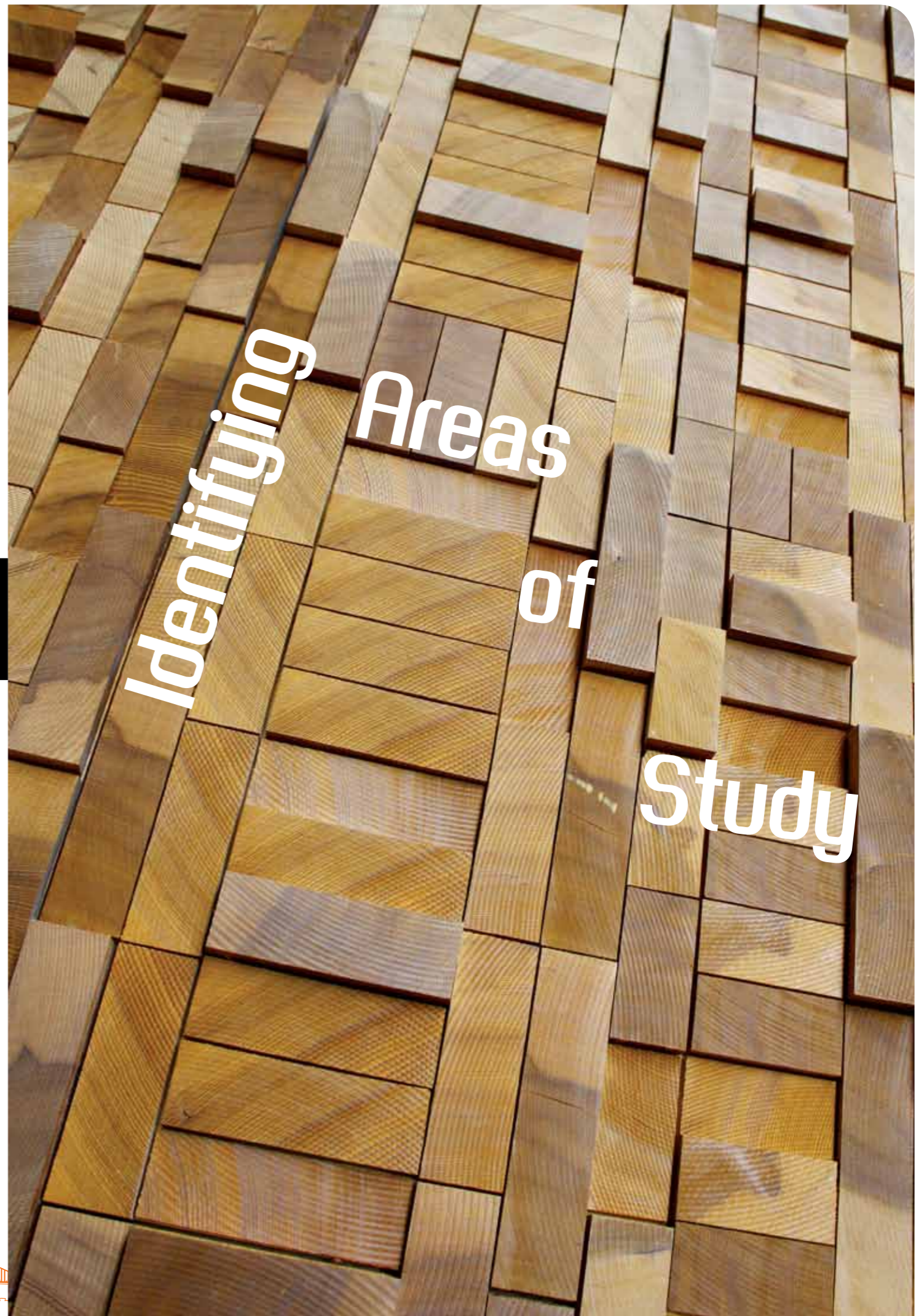
With various approaches taken by authorities in Vancouver and Hong Kong, the delegates believe that through this Delegation, we will be able to acquire deeper knowledge on various strategies to be applied in building a greener community. Vancouver takes the lead to show the world how to promote sustainable living well within its limits. It is a case example for

the team to study on technological development, as well as public engagement done to commit the entire society to achieve the greenest city plan.

How can we make the planet a better place for our next generation? How can we move towards an environmentally sustainable economy? How can we bring long-term benefits to the community, such as creating green jobs, improving public health and enhancing community well-being? What can engineers do in achieving sustainability? Delegates hope to inspire you to think and take action towards building a greener community after studying this report.

References:

- City of Vancouver, 2012. *Vancouver 2020: A Bright Green Future*. Retrieved from <http://vancouver.ca/greenestcity/PDF/Vancouver2020-ABrightGreenFuture.pdf>



Three study teams were formed among the delegates, with each team focusing on the following:

 **Innovation**

 **Technology**

 **Synergy**

Innovation

The innovation team studied drinking water, wastewater treatment and green transportation.

Quality of drinking water and sewage treatment affect health and the environment. The team aims to study enhancement of drinking water and wastewater treatment quality, waste-to-energy technology of water treatment and water conservation. Hong Kong's two main sources of water are rainfall from natural catchment and supply from Dongjiang at Guangdong Province. With proper treatment and quality monitoring, water quality in Hong Kong conforms chemically and bacteriologically to the Guidelines for Drinking-water Quality recommended by the World Health Organisation. Increases in economic activities have also resulted in sewage generation. Since the majority of Hong Kong population is concentrated along the Victoria Harbour, delegates researched on the HATS Project which aims at improving water quality of the Victoria Harbour and is currently at implementation stages.

Waste management is one of the most challenging environmental issue in Hong Kong and landfilling is the primary way to dispose daily waste. However, landfills are running out of space. Thus, delegates would like to explore ways of making use of sludge generated after water treatment process, in particular, in energy generation. To conserve water, different fresh water alternatives are studied, including desalination and water reclamation. Hong Kong is one of the cities that use seawater for flushing to reduce the demand on fresh water. The delegates studied the Total Water Management Strategy championed by WSD in ensuring sustainable use of water resources, which mainly includes public education on water conservation, promotion of water saving devices and active leakage control.



To facilitate the study, delegates visited the Seymour-Capilano Filtration Plant and the Annacis Island Wastewater Treatment Plant in Vancouver to gain knowledge on water and waste treatment technology and co-generation process. Visit to district neighbourhoods like Whistler allowed delegates to appreciate innovative ways of stormwater and wastewater management.

The air we breathe everyday is an important aspect for quality of life. Power plants and motor vehicles are major sources of air pollution in Hong Kong. Adoption of green mobility is one of the ways to improve air quality. Transport energy use accounts for 28% of total energy consumption (EMSD, 2011). As the backbone of public transport network in Hong Kong, railway network serves the domestic and land-based cross-boundary needs. Moreover, delegates appreciated the rapid development of the Skytrain system in Vancouver to promote green transport.

While conventional petrol or diesel vehicles are major sources of air pollution, smog and air pollutants including respirable suspended particulates, sulphur dioxide and nitrogen oxides, are not only harmful to human health, but also reduce visibility in urban areas. Since vehicles emit large amount of carbon dioxide which is one of the principle greenhouse gases that are accountable for global warming, delegates carried out researches on promotion and testing of electric vehicles, fuel cell application and discussed the major obstacles that have hindered their wider adoption in Hong Kong. By analysing the development of electric vehicles and fuel cell technology in Vancouver, for instance, visit to Ballard Power, the team aims to give recommendations on promoting wider adoption of electric vehicles and possibility of fuel cell application in Hong Kong, apart from the current testing of first electric bus by KMB, to enhance quality of life of Hong Kong citizens.

Technology

The technology team studied the strategy, overall planning, and direction for contributing to the Vancouver mission towards greenest city in the world by year 2020, with focus on water, air and green building.

The delegates aim to study environmental policy set by the Hong Kong Government. Understanding water, air, waste and energy issues are key concerns and some of these issues are cross boundary. Thus, delegates studied the Regional Cooperation Plan on Building a Quality Living Area amongst Hong Kong/Macau/Guangdong, a framework agreement on transforming the Greater Pearl River Delta Region into a model city cluster of green and quality living. It sets out the directions to tackle air pollution, enhance cleaner energy production, promote wider use of electric vehicles, cooperate in protecting marine water quality etc. with an emphasis on coordination, consensus and practicability. To facilitate studies on long-term plan of enhancing quality of life, delegates studied the Regional Cooperation Plan on Building a Quality Living Area and the Greenest City Action Plan, together with analysis on public engagement (GPRD - QLA, 2011).

In Hong Kong, most energy is consumed by buildings. Thus, the delegates would like to learn technological advancement on building as an effective way of emission control. Planning, design and construction of green buildings were studied. Green building design is a way to construct a greener city especially for building-intensive city like Hong Kong. In the Executive Summary of the Consultancy Study on Building Design that Supports Sustainable Urban Living Space in HK (BD, 2009), sustainable building design features like enhancing air ventilation,

environmental quality of pedestrian level and greenery for new buildings are recommended. Besides, the Urban Renewal Authority has been contributing to improve the existing urban environment. Currently various green building assessment methods for existing buildings and new buildings are adopted in Hong Kong to encourage organisations to involve in constructing a sustainable city. These methods include Leadership in Energy and Environmental Design (LEED), Building Environmental Assessment Method (BEAM) and China Green Building Evaluation Standard. Specifically, LEED is the one originated from U.S. and adopted by Canada extensively. As buildings in both Vancouver and Hong Kong account for huge amount of energy consumption, energy conservation in buildings is especially important and practices adopted are comparable in both places. Other than efforts by the Hong Kong Government, the Construction Industry Council is constructing the first Zero Carbon Building in Hong Kong as a pilot project for office and education use. Making use of renewable energy, natural ventilation, energy efficient system and green planting, the building is expected to be carbon neutral. The concept of net zero building is also widely employed in Vancouver.

By visiting the Urban Renewal Exhibition Centre, as well as attending zero carbon building, green initiative in public housing and green building assessment seminars in Hong Kong; and at the same time by visiting the net zero energy house and zero carbon building, as well as attending City of Vancouver presentation in Vancouver, the technology team aims to compare the adoption of green building technology in both cities.



The synergy team analysed the use of proven technologies, in a coordinated manner, for achieving the goal of energy conservation.

In Hong Kong, consumption of total electrical energy by air-conditioning systems is increasing. Delegates would like to study various types of cooling system for enhancement of energy efficiency. This can be achieved by understanding the first adoption of district cooling system in Kai Tak Development in Hong Kong.

In September 2010, Hong Kong Government proposed a target on 50-60% carbon intensity reduction as issued in a consultation document titled Hong Kong's Climate Change Strategy and Action Agenda Consultation Document (CLP, 2010). The future use of fuel shall go to cleaner energy choices and renewable energy which produces zero global warming gases and pollutants. Thus, wind energy, solar energy and nuclear energy are the areas of study for the review of Hong Kong's position on energy sources.

Electricity consumption in Hong Kong is increasing at a rate of about 5% per annum (EMSD, 2011). On one hand, small scale renewable energy source is fed into the Hong Kong power grid to reduce the electricity demand from the power station and energy production from fossil fuel. Large scale wind turbines and solar panels used by power utilities are other alternatives to replace the pollutant-emitting fuels. Smart metering and smart grid, on the other hand, manage customer consumption pattern using an interfacing unit which tells consumers the energy consumption breakdown and suggests actions to be taken for saving energy and tariff. Through visit to Hongkong Electric Condition Monitoring Centre, delegates hope to learn more on the process control on use of energy in the upstream side to provide suggestions on ways of reducing energy waste.

By visiting the Whistler, SEFC and BC Hydro in Vancouver, delegates aim to acquire relevant knowledge on district energy system and renewable energy, and explore possible applications to sustainable energy in Hong Kong.

Study Areas

- Water treatment plant
- Railway development
- Electric vehicles
- Fuel cell application
- Green building assessment method
- Urban renewal
- New green building
- District cooling system
- Smart grid
- Renewable energy
- Nuclear power

A series of local events was arranged. The following table shows the events organised for learning in the corresponding study areas.



Categories	Areas of study	Local events
Innovation	Water treatment plant	<ul style="list-style-type: none"> • Visit to Ngau Tam Mei Water Treatment Works • Visit to Tai Tam Waterworks Heritage Trail • Visit to Lai Chi Kok Drainage Tunnel
	Railway development	<ul style="list-style-type: none"> • Seminar on Development of Railway Network in Hong Kong and Pearl River Delta Region • Visit to MTR Kowloon Bay Depot
	Electric vehicles	<ul style="list-style-type: none"> • Seminar on Electric Vehicle Initiatives • Visit to KMB Depot
	Fuel cell application	<ul style="list-style-type: none"> • Seminar on Fuel Cell Application and its Challenge Ahead
Technology	Green building assessment method	<ul style="list-style-type: none"> • Seminar on Green Building Assessment
	Urban renewal	<ul style="list-style-type: none"> • Visit to Urban Renewal Exhibition Centre • Seminar on Green Building Initiatives in Public Housing
	New green building	<ul style="list-style-type: none"> • Seminar on First Zero Carbon Building in Hong Kong • Visit to CUHK Construction of New Laboratory Building • Visit to Development at Anderson Road
Synergy	District cooling system	<ul style="list-style-type: none"> • Seminar on Energizing Kowloon East
	Smart grid	<ul style="list-style-type: none"> • Seminar on Smart Grid Development • Visit to Hongkong Electric Condition Monitoring Centre
	Renewable energy	<ul style="list-style-type: none"> • Visit to Hongkong Electric Renewable Energy Projects in Power Station • Seminar on Development of Renewable Energy Projects in Hong Kong
	Nuclear power	<ul style="list-style-type: none"> • Visit to Guangdong Daya Bay Nuclear Power Station

Details of these events can be found in the "Local Events" chapter. The overseas events in this Delegation were also elaborated in the "Overseas Events" chapter. With learning gained from these events, delegates wish to convey the sound insights in the coming chapters.

References:

- BD, 2009. *Consultancy Study on Building Design that Supports Sustainable Urban Living Space in HK*. Hong Kong.
- CLP, 2010. *Response to Hong Kong's Climate Change and Action Agenda Public Consultation*. Hong Kong.
- EMSD, 2011. *Hong Kong Energy End-use Data 2011*. Retrieved from http://www.emsd.gov.hk/emsd/e_download/pee/HKEEUD2011.pdf
- GPRD-QLA, 2011. *Regional Cooperation Plan on Building a Quality Living Area*. Retrieved from http://www.gprd-qla.com/en/show_plan.asp?id=264&left04=hlink





Overseas Events

5 March

🌸 Visit to Resort Municipality of Whistler

The first official event of the Delegation was a visit to the RMOW in Whistler. Messrs. Dan WILSON, Ted BATTISTON, James HALLISEY and Michael DAY gave presentations on Whistler2020, RMOW carbon neutral plan and Cheakamus Crossing infrastructure such as DES.

The speakers explained to the delegates that Whistler2020 was a plan to enrich community life, enhance the resort experience, ensure economic viability, and protect the environment and partner for success. Besides RMOW carbon neutral plan encouraged citizens to make commitment to "carbon neutrality" by three means: track and understand emissions, aggressively reduce existing emissions and neutralize remaining emissions. The Plan also suggests integrating carbon costs into ongoing infrastructure management and financial decision-making. Carbon tax payments and re-allocations are used to put a price signal on those carbon emissions. In addition, the speakers pointed out that DES in Whistler utilises heat from treated wastewater effluent to provide water heating for the entire Cheakamus village and reduce GHG emissions by 90-95 % as compared to traditional methods.

After the seminars in Whistler, the delegates presented the green building practices in Hong Kong. Mr Roger WEETMAN then led us to the Lost Lake Passive House which uses architectural models to reduce the need of active heating and cooling system to maintain comfortable interior climate. This was achieved through a combination of informed design, airtight construction, super insulation and a heat recovery ventilation system.





Visit to Annacis Island Wastewater Treatment Plant

The delegates visited the Annacis Island Wastewater Treatment Plant. Ms Echo LIN, the Process Engineer of the plant, introduced that the treatment plant had been built in 1975 and expanded to full secondary treatment in 1997. Currently, the plant is capable of treating a peak flow of 1,382 million litres and 966 million litres per day for primary and secondary treatment respectively.

One of the innovative features of the plant is the recycling of sludge produced from the secondary treatment process. Sludge is turned into useful biosolids by heating in digesters, where 99.999% of harmful bacteria is removed. The daily production rate of biosolids is around 120 tons. These biosolids are used as fertilizers, topsoil mixes for landscaping and material to reclaim disturbed lands. In addition, during the process of heat treatment of sludge, 72,000m³ of usable digester gas with 64% methane content is produced everyday. Due to its high methane content, the gas is directed into the co-generation facilities, where convert gas into energy for daily use of plant, such as energy consumption of treatment process and the entire heat energy for plant buildings. The co-generation facilities are designed to generate 3,216kW of electrical power and 3,700kW of heat.



Visit to Annacis Wastewater Centre and Seminar on IAQGMP

In order to provide laboratory facilities for research, education and training in wastewater treatment, Metro Vancouver specially established Annacis Wastewater Centre to promote energy reduction, reuse of materials and mitigation on environmental impacts.

After the walking tour of the Annacis Wastewater Centre led by Ms Laurie FRETZ of Metro Vancouver, Mr Jason EMMERT, an Air Quality Planner of Metro Vancouver, introduced the IAQGMP covering the air quality and climate in Metro Vancouver, origins of IAQGMP, review on the goals, strategies and actions of IAQGMP and current projects.

There are 3 goals, 12 strategies and 81 actions in the IAQGMP, with vision of healthy, clear and clean air for current and future generations. The goals are to protect human health and the environment, improve visual air quality and minimise the region's contribution to global climate change. The strategies are mainly to reduce emission of diesel particulate matters, reduce air contaminants, reduce carbon footprint of transportation system and increase public understanding. In response to the strategies, Mr EMMERT further presented two on-going projects, namely Non-Road Diesel By-Law and Small and Medium Enterprise GHG Training. Near the end of the session, the delegates presented the current practice of clean water treatment in Hong Kong.



Visit to Seymour-Capilano Water Filtration Plant

The delegates visited the Seymour-Capilano Water Filtration Plant built on an eight-hectare site in the Lower Seymour Conservation Reserve near North Vancouver. Mr Willyam DRAGON, Water Treatment and System Controls Supervisor of the plant, gave an overview on the plant's design and operation. He introduced that the plant was managed by Metro Vancouver to deliver regional services to about 2.3 million people. The plant has an overall capacity of 1.8 billion litres per day treating water from two reservoirs located in the Seymour and Capilano watersheds. In particular, water arrived from Seymour, about 11km to the north, along an existing 2.3m diameter tunnel, while a new twin tunnel was being constructed to take Capilano water to and from the plant, with the return arm being gravity-fed. Furthermore, the plant itself was designed and built adopting many sustainable features, such as green roof, stormwater management and geothermal heating and cooling. Next, Mr DRAGON highlighted the water filtration process at the plant. After the presentation, the delegates were taken by Mr Tahir MALOKU to a guided tour of water treatment process, for instance, the filtration process and a backwash simulation.



Exchange gathering with IEEE Vancouver Section

An exchange gathering was conducted on the evening with IEEE Vancouver Section at the Simon Fraser University Harbour Centre at Downtown. IEEE is an international professional association which puts its effort on advancing technological innovation and excellence for the benefit of humanity.

The networking session was commenced by an introduction and overview of IEEE and its Vancouver Section presented by Mr Steven McClain, the Secretary of the Section, followed by introduction of GOLD presented by the GOLD Chairman Mr Ophir KENDLER. The IEEE Women in Engineering was also introduced, which was similar to HKIE Women in Engineering.

The session then went on to the introduction of HKIE and the Delegation by HKIE President Ir F C CHAN and Delegation Manager Ir Iman LAI respectively. Both parties shared views on the recognition of undergraduate programmes for students and graduates proceeding to professional engineers in either location. Different practices and engineering related topics were also shared. Lastly, HKIE and IEEE exchanged souvenirs as a vote of thanks to each other.



Visit to Vancouver Convention Centre

The delegates visited the West Building of the Vancouver Convention Centre under the guidance of Mr Mike GARCIA, the Building Service Chief Engineer of the VCCW.

Expansion work of the West Building was completed in 2009 covering over one million square feet for a combined total of 466,500 square feet of meeting space. The speaker mentioned that the West building had received LEED Platinum Certification, the first convention centre in the world to earn such rating. The delegates visited the world-known green feature, a six-acre "living roof" on the West Building with more than 400,000 indigenous plants. It is the largest green roof in Canada and the largest non-industrial living roof in North America. The roof's sloping form builds on the topography of the region creating a connection to the nearby environment. The West Building also features marine skirt and a seawater heating and cooling system that lead to an unique marine habitat of its coastal line, and provide heating in the winter to enhance comfort to the convention centre itself.



Visit to Centre for Interactive Research on Sustainability

The delegates visited the recently opened green building, CIRS in UBC. CIRS is not only North America's greenest building utilising the energy flow and resources available within the site and surroundings, but also a space for multi-disciplinary education and research in sustainability.

During the visit, the delegates were guided by Mr Alberto CAYUELA, the Associate Director of the UBC Sustainability Initiative. Mr CAYUELA led a tour around the building, from the individual function of each green feature to the design concept in integration of the natural system with the built environment. For instance, the dynamic façade on the western side of the building, also known as the "Living Wall", was designed to regulate the heat gain and day light throughout the year.

The delegates then visited the solar aquatics system, which treats all the raw sewage and wastewater from the CIRS with biological methods mimicking the purification process of naturally occurring water systems using plant and bacterial life. The treated water is reused within the building for irrigation and toilet flushing creating a closed loop water cycle. Mr CAYUELA then guided the delegates to the living roof using the rainwater and reclaimed water for irrigation, the mechanical ventilation system using clerestory windows and raised floor air distribution system, and the implementation of green cloud computing.

Exchange with UBC

An exchange gathering with the Department of Civil Engineering of UBC took place in the afternoon. UBC is a leading research university located in Vancouver and is home to some of the outstanding facilities including sustainability research centre and world-class botanical garden for plant research.

The delegates visited the Department of Civil Engineering in the Vancouver campus of UBC and various speakers namely Dr. Nemkumar BANTHIA, Dr. Thomas M. FROESE and Dr. Sheryl STAUB-FRENCH gave presentations on introduction of the University and the Faculty of Applied Science, offer of sustainability courses and assessment of new and existing building with use of Building Information System.



Visit to Clean Energy Research Centre of UBC

CERC is a multi-disciplinary centre housed in the Faculty of Applied Science at UBC. CERC provides state-of-the-art research facilities for investigation of clean energy problems and development of environmentally-friendly solutions and promotion of research. There are nine laboratories in CERC.

Guided by Dr. David P. WILKINSON, Director of CERC and accompanied by Ms Carolyn BAILEY of Canadian Hydrogen and Fuel Cell Association, the delegates had a tour of High Headroom Laboratory, Fuel Cell Laboratory, Clean Combustion Laboratory and Clean Burning Engines Laboratory of CERC. During the tour, the delegates had a chance to meet students and postgraduates who are responsible for different innovative clean energy projects in CERC. These projects are related to the use of wooden pellets as bio-energy, re-dox and hybrid systems in fuel cells, and natural gas engines. One of which is the study on off gassing properties of wood pellets which are used as feedstock for combustion to produce heat and power.

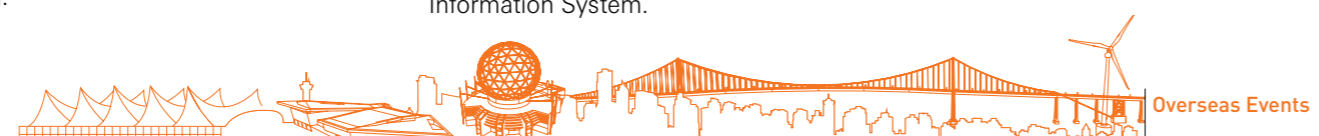
UBC Walking Tour

The delegates visited a clean energy research centre under construction guided by Mr Jeff GIFFIN of UBC. The CAD 27 million UBC Bio Energy Research and Demonstration Project is a partnership with Vancouver-based Nexterra Systems Corp. and General Electric Co. Biomass refers to renewable organic matter, such as wood or organic components of municipal and industrial wastes. This project includes the complete biomass gasification system, research laboratories and a building made of a demonstration lumber product. The system will produce sufficient amount of clean electricity and steam to replace up to 12% of natural gas that UBC campus consumed. The project will generate enough clean electricity to power 1,500 homes to reduce the natural gas consumption by up to 12% and eliminates up to 4,500 tons of GHG emissions per year from UBC campus.

Exchange with HKIE-Canadian Chapter

The delegates had a dinner gathering with the HKIE Canadian Chapter at night. The exchange commenced with a welcome speech by Ir Wilma LEUNG, Deputy Chairman of the HKIE Canadian Chapter. Afterwards, HKIE President Ir F C CHAN delivered his speech on the recent developments of HKIE. It was followed by YMC Chairman Dr. Ernest TSANG, who presented the growth of YMC. Lastly, Delegation Manager Ir Iman LAI, talked about the objectives of this Delegation.

After speeches, the delegates had the opportunity to meet Canadian Chapter members and practicing engineers in Vancouver. The members shared the latest development and challenges in implementation of greening plan in Vancouver. In return, the delegates shared the green building development in Hong Kong, in particular the first zero carbon building. Special thanks to Mr Arthur LO of the Canadian Chapter member for the ad hoc arrangement of a net zero energy single family home visit in the last afternoon in Vancouver.



🌿 Presentation by City of Vancouver and CSCE

The delegates visited the Vancouver City Hall at 453 West 12th Avenue for seminars with the City of Vancouver together with CSCE. City of Vancouver is the municipal government of the city providing innovative programs. The City is committed to bring the community-based GHG emissions down to 5% below 1990 levels. To achieve this goal, the City of Vancouver set out Greenest City 2020 Action Plan in 2009, here in around ten-year time, the City of Vancouver targeted to become the greenest city in the world. Ten Greenest City goals are set to be achieved, including green buildings, clean water and clean air which are also the main research topics of this Delegation.

Dr. Rishi GUPTA, Deputy Chair of International Affairs Committee of the CSCE delivered an introductory remark of the CSCE, followed by HKIE President Ir F C CHAN to deliver an introduction remark of HKIE. During the seminars, representatives from the City of Vancouver, Messrs. David RAMSLIE, David DESROCHERS and Lon LACLARIE gave the delegates presentations on different topics including waterworks design, green building program and strategic transportation planning. The delegates learnt about planning in these areas and current practices in Vancouver to achieve their 2020 targets.

One of the targets in 2020 action plan is to reduce per capita water consumption by 33% from 2006 levels. The Rain Barrel Program aims to capture rain from the roof top of each house to provide the lawn and garden chlorine-free water, becoming part of development of Integrated Rainwater Management Plan. Another attractive target is that all buildings constructed from 2020 shall be carbon neutral in operations.

City of Vancouver provided Passive Design Toolkit for the new construction building and renewal strategy for existing buildings for passive design elements such as layout, orientation, insulation, landscaping and ventilation. The existing and future development of Skytrain in Vancouver and strategies of encouraging more people to take Skytrain were covered.

Later, the delegates presented the current situation in Hong Kong regarding water supply, green building practices, railway development, waste-to-energy practices and energy production practices, followed by question and answer session. The presentation ended with a closing remark by the City of Vancouver Deputy Mayor, Ms Andrea Reimer.



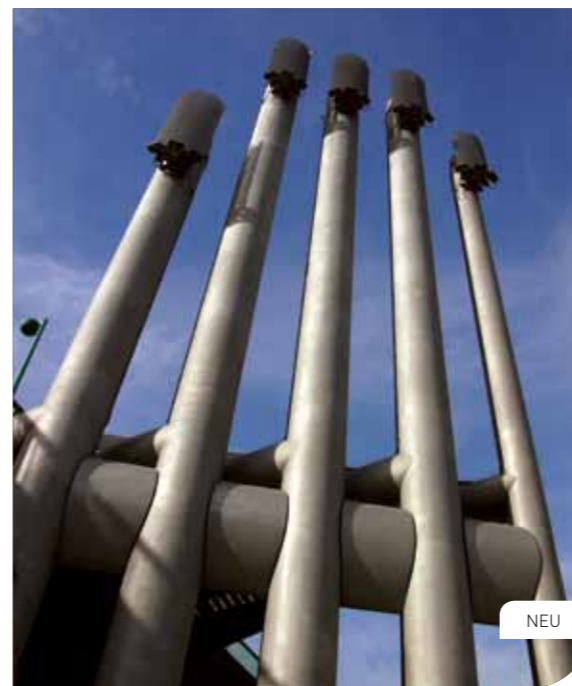
Vancouver City Hall

🌿 Visit to Southeast False Creek

The delegates visited NEU and SEFC Redevelopment under the guidance of Mr Kieran McCONNELL and Ms Rachel MOSCOVICH. SEFC was originally an industrial area and planned to be redeveloped as a mixed-use community. A green building strategy is adopted for SEFC, which requires that all buildings on citylands be constructed to a minimum LEED Silver Standard, with an objective of LEED Gold Standard. NEU is an environmental friendly community energy system that would provide space heating and domestic hot water to all buildings in the SEFC.

Mr McCONNELL first introduced the delegates to the project background of NEU with description of the current status of the project. The presentation was followed by a visit to the False Creek Energy Centre. The centre is integrated with a sewage pumping station, recovering heat from untreated urban wastewater, a renewable energy source. The wastewater not only provides heat exchange to a hot water distribution system, but also generates natural gas which forms an energy source with high efficiency boilers. The system of insulated underground pipes then transports hot water to the neighbourhood.

Followed by the visit to NEU, Ms MOSCOVICH guided the delegates to SEFC community. She gave introduction to key sustainability features adopted in the green buildings which include series of passive design and energy efficiency measures. The delegates visited the Habitat Island which was formed to compensate a portion of the natural waterfront that had been lost due to the development of the SEFC. At the end of the visit, the delegates visited the Net Zero building, which is labeled as Canada's first net zero multi-unit residential building. The goal of the Net Zero building is to produce as much energy as they consumed on an annual basis.



NEU



Net Zero Building

🌿 Exchange gathering with APEGBC

A social gathering with APEGBC took place at night at Sutton Place Hotel. APEGBC is a regulatory agency that licenses professional engineers, provides guidelines and standards for practice, receives complaints, investigates and disciplines the member when appropriate. The evening started with a stand up reception with food and beverages maximizing mingling and interaction amongst engineers. Mr Jeff HOLM, President of APEGBC, gave a welcome speech. Then HKIE President Ir F C CHAN delivered his speech on the recent developments of HKIE. Afterwards, the delegates met Vancouver engineers including young engineers from APEGBC Vancouver Branch and the Consulting Engineers of British Columbia – Young Professionals Group for cultural exchange and sharing of working experience in different industries. Lastly, Mr Jeff HOLM gave a closing speech, followed by Delegation Manager Ir Iman LAI, to present objective of this Delegation and thank APEGBC for the hosting.





🌸 Seminar at BC Hydro

The seminar commenced with a brief overview of BC Hydro given by Mr H T SUEN, followed by three presentations on IRP, Power Optimizer (a tool to minimise the transmission losses) and the development of Smart Grid by Ms Nan DAI, Dr. Veera Raju VINNAKOTA, and Mr Johnson LEE, respectively.

BC Hydro is a commercial Crown electric utility corporation owned by the Province of British Columbia, which served majority of the population in the Province. Hydroelectric is the major source of power generation and its total generating capacity was approximately 12,000MW serving 1.85 million customers. The BC Hydro's transmission system consists of approximate 18,000km of transmission lines to connect the remote locations of the power generation facilities and the load centres with interconnection to Alberta and the United States.

IRP is a tool adopted by BC Hydro to outline a twenty-year plan to meet the growth in electricity demand by energy conservation and clean energy generation, and a thirty-year plan to identify transmission needs. The ultimate goal of the IRP is to achieve self-sufficiency to ensure the commodity provided by BC Hydro comes from clean or renewable resources.

Overviews on Electric Grid Control, EMS, optimization tools for electric power control, studies on power losses and control, and real time optimization tool for voltage control and minimal transmission losses were presented by Dr. VINNAKOTA. These operation tools are to ensure the reliability of the system and to minimise the transmission losses.

Smart metering is the first approach by BC Hydro to modernize its grid. The smart meter integrates bi-directional communication, which enables identification of electricity outage, minimises electricity theft and allows real time monitoring of electricity usage to achieve conservation of energy. According to the speaker, currently 875,000 smart metres were installed. Full project installation of 1.85 million smart metres is underway and is targeted to be completed by the end of 2012.

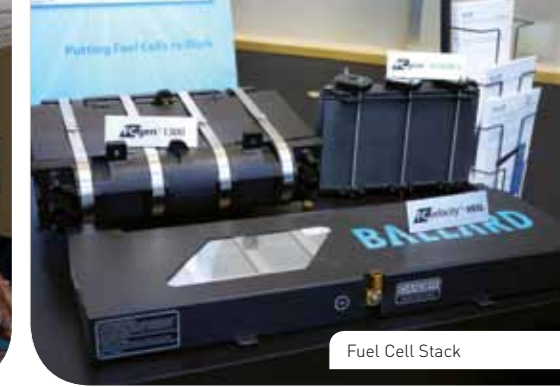


🌸 Visit to Ballard Power

The delegates visited Ballard Power Systems Inc., which designed and manufactured clean energy hydrogen fuel cells. The visit started with a brief presentation called "Smarter Solutions for a Clean Energy Future", which was presented by Ms Lori ROSALI. She first introduced PEM fuel cell technology and various products for a range of applications. She explained that PEM fuel cells combine hydrogen fuel and oxygen from the air to produce electrical energy efficiently, quietly and without combustion with by-products of water and heat.

She later presented the wide commercial application of the PEM fuel cell technology worldwide, including material handling, backup power, transit buses and electricity generation. She mentioned that fuel cells can be used in both stand-alone configurations and hybrid designs to complement other technologies, such as batteries.

Afterwards, the delegates visited their in-house testing laboratory, where a number of hydrogen fuel cells are under testing by development and research teams for product functionality, durability, reliability, safety and robustness. The fruitful visit ended with a souvenir presentation to the speaker by advisor Ir Peter WONG.



🌸 Visit to Net Zero Energy House

A visit was made to the Net Zero Energy House, which is also known as Harmony House, built under the EQuilibrium Sustainable Housing Demonstration Initiative. The tour and presentation of the captioned were given by a member of the HKIE Canadian Chapter, Mr Arthur LO of Insightful healthy Homes Inc, one of the leaders of the Harmony House project and the builder of the house.

A net zero energy house, by its definition, produces sufficient energy for its usage on annual basis through energy conservation and implementation of renewable energy. The showcase of the above is to cope with the ambitious target by the City of Vancouver to have all new construction in Vancouver be GHG neutral by 2030.

Sixty six photovoltaic panels installed on the roof of the house produce approximately 14.8kW at peak. Mr LO stressed that in order to achieve net zero energy, the emphasis should be placed on energy conservation ahead of on-site production of renewable energy since conservative measures are more cost effective and can also upgrade the quality and durability of the buildings. For the cold climate of Canada, space heating is the biggest energy consumption in residential building hence enhancement of the insulation and improvement of the airtightness of the building envelope is the first priority in conservative measures. Harmony House has used innovative and advance insulation and air-tight technologies, for instance triple glazed fibreglass frame windows (R-Value of 6), vacuum insulated panel (R-Value of 38.5) and environmental friendly space foam.

Other energy conservation approaches including LED lighting and natural lighting design, high efficiency heat recovery ventilation, and passive solar gain through the south façade were adopted.



Local Events





Local Visit Series

- 12 Nov 2011**
Visit to Hongkong Electric Condition Monitoring Centre
- 26 Nov 2011**
Visit to Lai Chi Kok Drainage Tunnel
- 3 Dec 2011**
Visit to MTR Kowloon Bay Depot
- 3 Dec 2011**
Visit to Ngau Tam Mei Water Treatment Works
- 10 Dec 2011**
Visit to Development at Anderson Road
- 7 Jan 2012**
Visit to KMB Depot
- 14 Jan 2012**
Visit to CUHK Construction of New Laboratory Building
- 19 Jan 2012**
Visit to Urban Renewal Exhibition Centre
- 4 Feb 2012**
Visit to Tai Tam Waterworks Heritage Trail
- 25 Feb 2012**
Visit to Hongkong Electric Renewable Energy Projects in Power Station
- 5 May 2012**
Visit to Guangdong Daya Bay Nuclear Power Station

Local Seminar Series

- 21 Nov 2011**
Seminar on Development of Renewable Energy Projects in Hong Kong
- 8 Dec 2011**
Seminar on Green Initiatives in Public Housing
- 27 Jan 2012**
Seminar on Electric Vehicle Initiatives
- 1 Feb 2012**
Seminar on Smart Grid Development
- 15 Feb 2012**
Seminar on Development of Railway Network in Hong Kong and the Pearl River Delta Region
- 29 Feb 2012**
Seminar on First Zero Carbon Building in Hong Kong
- 12 Apr 2012**
Seminar on Green Building Assessment
- 28 May 2012**
Seminar on Energizing Kowloon East
- 11 Jun 2012**
Seminar on Fuel Cell Application and its Challenge Ahead

Starting from November 2011, a total of nine seminars and eleven visits in the areas of innovation, technology and synergy were held. They covered different aspects including green building design and construction, water treatment, green mobility including public transport and fuel cell application.

Since buildings, for instance, material used, construction method applied and building services system installed, contribute to a major source of air pollution and GHG emissions in Hong Kong, great efforts on strategic building incentives, new building codes, and encouragement on employing efficient plants and machinery in the buildings are implemented. The total method is employed in Hong Kong, including sets of green building code, pilot implementation of new green building, and urban renewal practices.

Seminar on Green Building Assessment provided information of three types of building codes employed in Hong Kong, including LEED, BEAM and China Green Building Evaluation Standard.

The organisations in Hong Kong commonly adopt BEAM (or BEAM Plus to the latest). The seminar gave background information on differences between BEAM (commonly adopted by Hong Kong), and LEED (adopted by Canada) as the baseline of “green building”.

After gaining knowledge on green buildings, several applications for constructing a greener city could be referenced for further comparison and contrast of buildings in both places. Visit to Urban Renewal Exhibition Centre and Seminar on Green Building Initiatives in Public Housing were organised for the delegates to understand the applications of the standard, for instance, Vision City in Tsuen Wan, Queens Cube in Wan Chai, Island Crest Developments in Sai Ying Pun, and Redevelopment of Lam Tin Estate Phase 7. Other than the standard requirements, applications for energy efficiency including natural ventilation and day lighting, sun shading provision, water chiller system with energy efficient

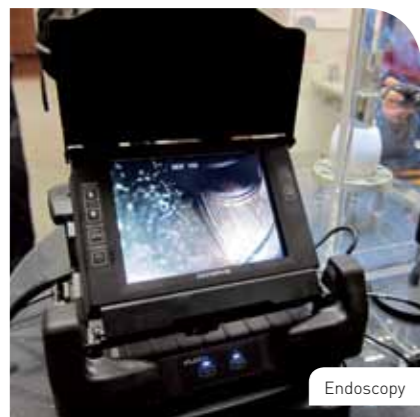
label, LED lighting, high thermal performance structural fabric, and solar hot water systems in buildings were introduced. Last but not least, active participation of citizens and systematic approach for processing of waste are the long-term solution for resolving the global warming issue.

The two new green buildings, namely ZCB and CUHK New Laboratory Building, were comprehended in the seminar and visit series to enhance green building knowledge. Based on each energy consumption requirement, different designs were formulated. For example, the first ZCB in Hong Kong has the green features of carbon neutral, energy plus, climate positive, educating, waste heat to energy, and native urban woodland. The building itself consumes less than 100 kWh/m²/year of electrical energy which is approximately 40% less than the baseline of Hong Kong’s Building Energy Code. For the CUHK New Laboratory Building, on top of the requirements of BEAM Plus,





Power Generator



Endoscopy



Tai Tam Waterworks Heritage Trail

there are a number of large fume extraction fans. Each could cater for around 15 m³/s air flow rate at the roof level of the building. The design of fume cupboards, VAV system and supply air grilles in laboratory room all are specially considered that they avoid the air flow inside the room affecting the experiments. The design planning ahead for future expansion is preferable in the sense of less emission from retrofit, lower cost, and higher flexibility of the use of the building.

On top of individual buildings, a district cooling system, as introduced in Seminar on Energizing Kowloon East, would be adopted for further improving energy efficiency of air conditioning system. The first phase of cooling system would be supplying to shopping malls while the second phase would be supplying to hotels. This type of

district system is mostly applicable to new buildings, and economically attractive to the targeted customers.

Carbon dioxide could be converted to oxygen under plants' photosynthesis and this increases our living standard under decreased atmospheric temperature. Therefore, with integration of roof greening, use of solar energy, etc., the redevelopment/ new development of Hong Kong areas provide healthy and harmonious living to the residents. The factors of environment, economy and society shall be taken into account for the design of new buildings and re-developments.

Clean air is another important aspect of enhancing quality living of citizens. There is no boundary of pollution. No doubt that Hong Kong is closely economically and environmentally integrated with the Pearl River Delta Region. Studies on plan of working with Guangdong Province and Macau to transform the PRD Region into a green and quality living area were conducted.

Seminar on Energizing Kowloon East was arranged to brainstorm and collect views on development of Kai Tak as the second central business district. Encouragement of walking, usage of monorail as public transit and adoption of district energy system were discussed in the seminar. To enhance understanding on Development of Railway Networks in Hong Kong and PRD Region, a seminar was organised. MTR Corporation is currently constructing various new lines and extension of the existing lines in Hong Kong and PRD Region to connect Hong Kong and the Mainland as a whole, for example, the Guangzhou-Shenzhen-Hong Kong Express

Railway Line. The construction of the new/ extension lines within Hong Kong would substantially increase the total rail length in Hong Kong, enhancing reliance on the railway for in-bound and cross-boundary travel and thus reduce the use of road transport which enhances the social, economic as well as the environmental sustainability with zero road side emission in the use of railway. Usage of cross-boundary transport is covered in the 12-5 plan.

A further way to decrease the town emission content is to use EVs, which was addressed in the seminar series - Seminar on Electric Vehicle Initiatives. The benefits of using EVs as compared to using normal petroleum vehicles are higher energy efficiency, quieter ride, more economical fuel cost and zero road-side emission. However, challenges have also been identified which are lack of charging infrastructure, higher price as well as requirement of more effort on education and promotion. Hong Kong Government is keen on identifying more places to accommodate the charging stations, providing exemption of the First

Registration Tax for EVs, and reserving fund for launching exhibition, EV leasing and test driver program. The EV program is also applicable to electric bus, which was discussed during the visit to KMB Kowloon Bay Depot. Short distance route was targeted for the first trial of use of the subsidized electric buses.

In this century, the technology is advancing at an astonishing speed. The ways to reduce emission using emerging technologies include use of renewable energy, and alternative fuel which has lower impact to global warming.



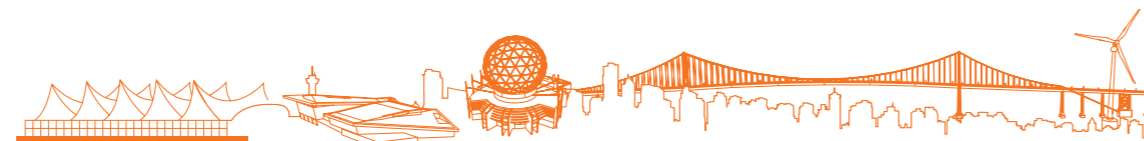
Seminar on Development of Renewable Energy Projects in Hong Kong, and Visit to Hongkong Electric Renewable Energy Projects provided updated information on the situation of use of commercial scaled renewable energy. The main renewable energy applicable in Hong Kong is considered to be solar energy and wind energy. The largest solar power system in Hong Kong is comprised of 5,500 amorphous silicon TFPV modules, which is capable of generating an electricity of 550 kW. It was estimated that the 620,000kWh electricity generated would help reducing 520 tons of carbon dioxide emission annually. For Wind Power Station, a pilot wind power plant located on the Lamma Island has been generating more than 4 million kWh of green electricity, reducing over 1,400 tons of coal consumption and avoiding emission of more than 3,200 tons of carbon dioxide since commissioning.



Lamma wind turbine

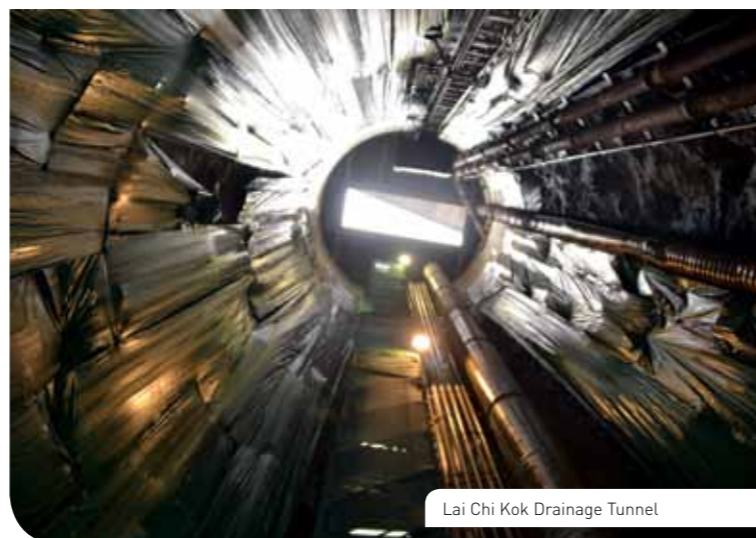


Hong Kong MTR





Ngau Tam Mei Water Treatment Works



Lai Chi Kok Drainage Tunnel



Tai Tam Waterworks Heritage Trail

Fuel cell is an alternative energy which makes use of the hydrogen cycle and produces water as by-product rather than the GHG carbon dioxide. Seminar on Fuel Cell Application and its Challenge Ahead provided the technical background, applications in Hong Kong and the challenges faced in the projects, enabling the exploration and suggestion on future use of this emerging technology as a solution to global warming.

By better mix of existing technologies, the greening strategy could also be applicable to elsewhere in a city. From power generation point of view, cleaner source of power was well developed long time ago. Therefore, expanding the use or adoption of cleaner power source for replacing existing coal fired power plants could reduce the emissions. Digitization, sensing and actuating are the existing IT technologies applied in buildings. By applying these existing technologies under international standard in power network, the customers could be much aware of their electricity consumption under newly developed interactive communication between equipment, utilities and users (e.g. home interfacing unit and smart metre). In another way, the mass transit has been evolving, from coal burning to now electric driven by power electronics. By expanding of railway transit service areas in Hong Kong, the

roadside pollution could be reduced as compared to transportation by existing gasoline powered vehicles.

For power generation, it was learnt from Visit to Daya Bay Nuclear Power Plant in Shenzhen that nuclear power could efficiently provide the energy without the pollutant emissions. It involves two pressurized water reactors as the generating units. Each reactor has an installed capacity of 984MW. Lingao first phase, equipped with two 990MW pressurized water reactors, is the second commercial nuclear power plant in Guangdong Province and started operation in 2006. Under nearly full time rated output of the plant, the southern China could effectively reduce carbon dioxide emissions.

For the power network, visit to Hongkong Electric Condition Monitoring Centre was arranged to understand the technology applied to gather the conditions of the power network for better management of energy flow. On top of that, smart grid, as discussed in Seminar on Smart Grid Development, manages the use of energy and put focus on interaction with customers. Through the use of smart metre, a communication channel between the grid operator and customers, real time monitoring of customers' own loading is possible, especially



Power Cable

when they install interfacing units in every power socket in homes, offices or industrial buildings. This demand side management aims at Reduce in 3Rs (Reduce, Reuse, Recycle) strategy.

Similarly, clean water is also an important aspect for better quality of living. Clean water, including both drinking water and wastewater, is especially important in aspects of hygiene and health of citizens. Visit to Ngau Tam Mei Water Treatment Works, Tai Tam Waterworks Heritage Trail and Lai Chi Kok Drainage Tunnel were arranged to study adoption of frontier technology in water treatment in Hong Kong. The treatment process of drinking water includes different treatment units such as pre-ozonation and mixing tank, flocculation and sedimentation tanks, biological filtration tanks, and finally disinfection and pumping facilities. The sludge produced in the water treatment works is then thickened and pressed into cakes for disposal at landfill sites.

The treatment works incorporate the most advanced treatment technologies, including the first use in Hong Kong – GAC biological filters, which are enhanced by ozonation in the treatment process.

Insights



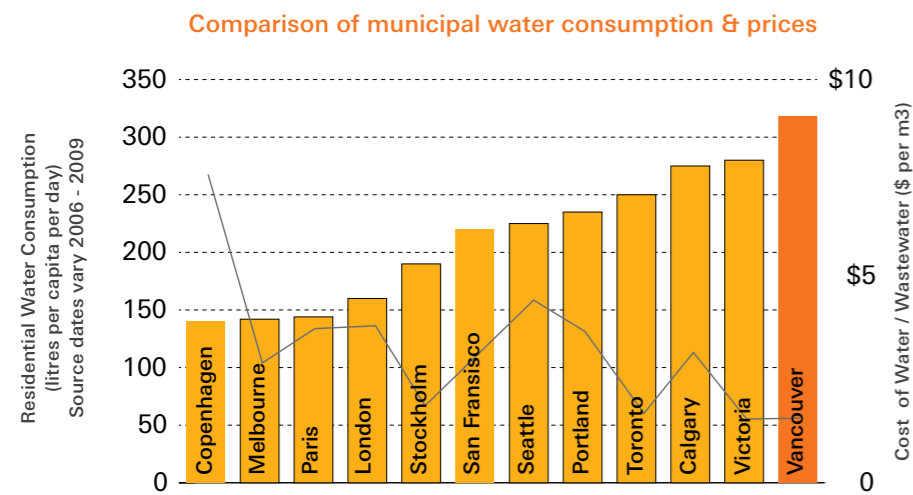
After describing what the delegates have learnt from local and overseas events in previous chapters, this chapter is to present various insights the delegates have gained throughout this Delegation.

Innovation

DRINKING WATER - Vancouver

Vancouver is very rich in water resources with geographical advantage. In terms of drinking water quality, Vancouver has been consistently meeting all British Columbia and Canadian health-based standards in recent years. However, due to health concern related to the taste, odour, or quality of tap water, 20% of Vancouver residents drink primarily bottled water, resulting in energy waste for bottled water production and solid waste increase.

Since Vancouver has extremely reliable water resources, the cost of municipal water price is CAD 0.67/ 1000 litres. This is, by far, the lowest in industrialized world. About 86% of water customers in Vancouver, who are predominantly singles and two-person units, are not metred. They pay at a fixed flat rate, no matter how much water they use. The combination of the low price and a flat rate contributes to over-consumption and provides no incentives for conservation or efficiency. The average per capita water use in Vancouver is more than 320 litres per day, as comparison, an average of 170 litres per day per capita is used in the rest of the world.



Source: Greenest City Action Plan 2020

“Vancouver 2020 – A Bring Green Future”, an action plan for becoming the world’s greenest city by 2020, proposed two targets to be met by Vancouver by 2020 in the water aspect:

- Always meet the stringent of British Columbia, Canadian, and WHO drinking water standards
- Reduce per capita water consumption by 33%

After acquiring background of water conservation in Vancouver, innovative ideas learnt throughout the Delegation are shared below.

One of the ways to enhance water conservation is to increase security and quality of Vancouver’s drinking water. Apart from deactivating old roads in watersheds that are no longer required to minimise the risk of pollution, the Seymour-Capilano Water Filtration Plant at the capacity of 1.8 billion litres per

day was constructed and commissioned in May 2010 for treating the water collected from the Seymour and Capilano watersheds, which supply about 70% of the region’s drinking water. The plant adopts ultraviolet light and ozone for disinfection, which can reduce the use of chlorine, and hence reduces health concerns associated with disinfection by-products in drinking water. These actions bring improvements to the drinking water quality for the residents of Vancouver and increase their confidence in drinking water at their taps and hence can reduce the consumption of bottled water.

Apart from enhancing drinking water quality, a comprehensive Water Conservation and Stewardship Strategy has been developed for water conservation. In particular, some highest priority actions are proposed to be carried out as follows:



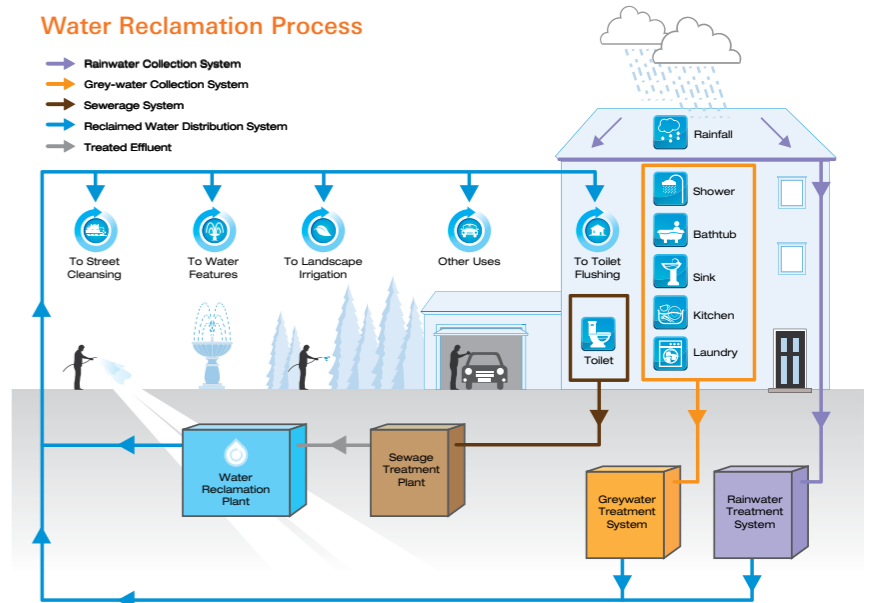
1. Universal water metering and volume-based pricing:
Currently in Vancouver, only 14% of water customers are fitted with universal water meter. 74% more water is being used for the customers who paid at fixed flat rate. Now installation of universal water meter is mandatory for all new single-family homes and duplex connections.
2. Develop and implement enhanced water education, incentive, and conservation programmes.

This includes encouraging citizens to purchase water-efficient fixtures (e.g. low-flow toilets and rain barrels), and to set up rebate programme for every purchase. Continual education is required to enhance people awareness of importance of water conservation. In particular, since 40% of water usage is used for lawn sprinkling in Vancouver, “Lawn Sprinkling Regulation” is introduced to limit that the watering of lawn can only be operated in a certain period.

DRINKING WATER - Hong Kong

On the other hand, unlike Vancouver, the natural water resources in Hong Kong can only meet about 20% of local demand, whereas the remaining 80% is achieved by the water supply from Dongjiang River in Mainland China. Back in the history, Hong Kong suffered a lot in water supply shortage, and in order to enhance local water supply, the Hong Kong Government initiated construction of new reservoirs, use of seawater for flushing and negotiation with China for increasing the Dongjiang River supply.

Nowadays, there are still huge challenges in clean water management. To ensure high quality of drinking water, similar control at source action to Vancouver has been undertaken in Hong Kong to protect natural water resources. There are limited accesses to the country parks where the catchwater and impounding reservoirs are located at. As for the water supply from Mainland China, a closed aqueduct system has been adopted to protect the raw water in its delivery. In addition, water treatment processes adopting ultraviolet light, ozone and etc. to provide drinking water up to the WHO standards. However, there is still a concern on the water quality at the consumer’s point mainly due to aging of the building plumbing systems. Boiling is usually considered to be required by the general public for safe consumption of water.

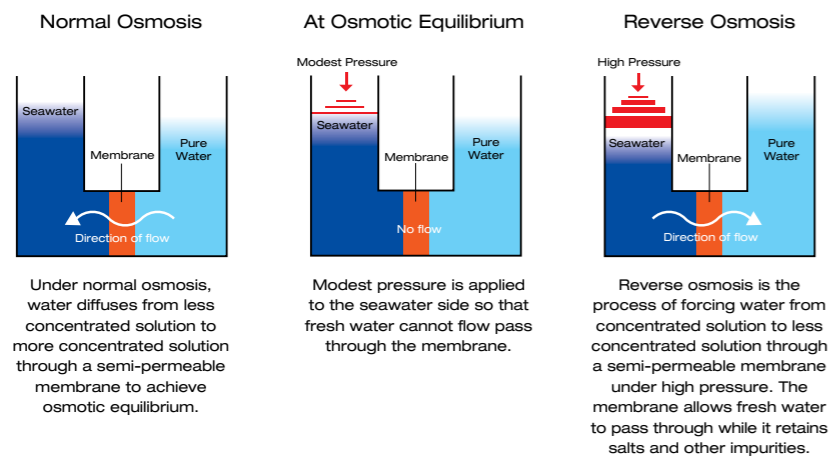


In Hong Kong, WSD introduced TWM Scheme in order to promote sustainable use of water. TWM Scheme complies with two main ideas – Water Demand Management to reduce amount of water consumption and Water Supply Management to strengthen water supply.

Water Demand Management is a combination between public education and government actions. Public education such as media announcements, websites and seminars are introduced to general public to convey water conservation tips. The Hong Kong Government also promotes the usage of water saving device and introduces Water Efficiency Labelling Scheme. To conserve water, rehabilitation and replacement of water mains are being carried out in phases and possible further introduction of seawater for flushing to remaining areas is underway. To increase non-potable water usage, the Hong Kong Government is conducting water reclamation scheme to provide treated lower quality water (e.g. rainwater, sewage) to replace high quality water for non-potable usage, i.e. irrigation and street cleaning.



Mechanism of Reverse Osmosis



Source: Water Supplies Department, Total Water Management

In TWM, the option for desalination has been explored in Hong Kong. In 2003, desalination through reverse osmosis pilot tests were set up in Tuen Mun and Ap Lei Chau and the results were positive.

Recommendation

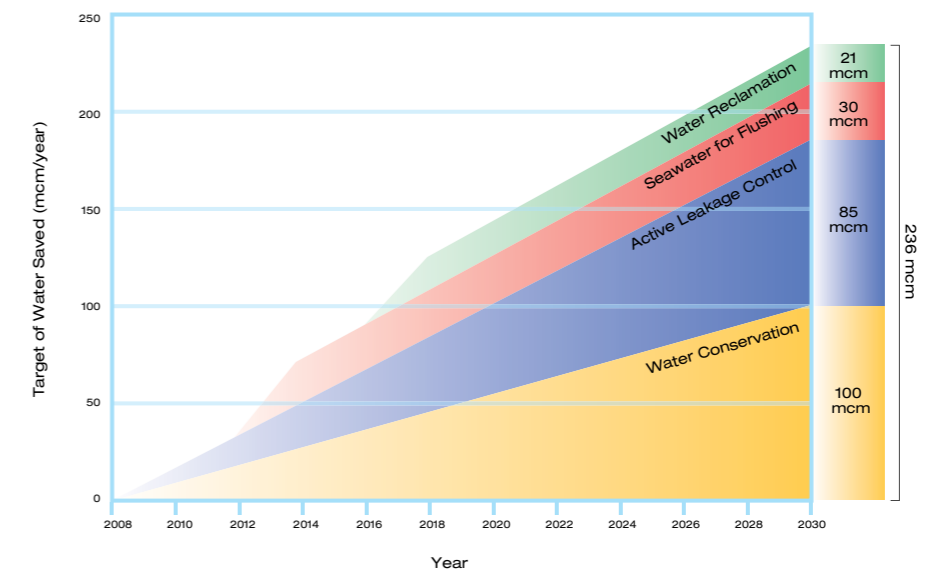
To encourage direct consumption of drinking water at tap, enhancing the confidence of consumers by increasing water monitoring at consumer taps and making water quality data known to consumers are recommended. Currently, water samples are taken at water treatment works, service reservoirs, connection points and consumer taps, and analysed at site and in laboratories by qualified staff of WSD. It is believed that the consumer tap water quality sampling and monitoring can be extended and adopted as part of the building management items. Indeed, WSD is now implementing the Quality Water Recognition Scheme for Buildings, which is a voluntary scheme encouraging owners, operators and management agents of buildings to maintain their plumbing systems properly. Certificates will be awarded to them should there be consistent maintenance of good plumbing conditions for supplying drinking water to residents. The opportunity and potential of this scheme are key factors to increase the confidence of local residents and overseas visitors to use water at the tap. The Hong Kong Government should enhance promotion of this scheme to the public and building owners in providing and maintaining good quality of drinking

water to consumers and may consider setting this scheme mandatory for buildings in Hong Kong.

In order to increase the public awareness of water conservation in Hong Kong, it is necessary for the Hong Kong Government to develop new strategies of education and promotion. WSD launched many events successfully in the past, including seminars and poster promotions. It should encourage more public participation and actively bring the idea of water conservation into daily living. For example, water conservation campaigns between buildings in neighbourhood and water conservation day such as 10-minute shower. These events encourage the public to incorporate innovative ideas of water conservation into their daily lives. On the other hand, as mentioned in the TWM, the Hong Kong Government introduced the water efficiency labelling scheme and promotion of the use of water saving devices. In order to promote the public to use these devices, similar to Vancouver, rebate programmes are suggested to be set up to encourage citizens to buy and install these devices.

In conclusion, in order to achieve sustainability in water usage, it requires supports from both the public and the Hong Kong Government. Through education and promotion materials to increase public awareness and taking initiatives to explore new ways to provide sustainable water by the Hong Kong Government, better environment can be attained.

Cumulative Savings of TWM Measures



Source: Water Supplies Department, Total Water Management

WASTEWATER - Vancouver

Quality of wastewater treatment is another concern of quality living. A mix of primary and secondary sewage treatment facilities is served in Metro Vancouver. To convert waste to energy, Annacis Island Wastewater Treatment Plant adopts the co-generation to make use of treated sludge to produce electricity and heat to reduce energy consumption. Similarly, the adoption of solar aquatic system in CIRS provides no sludge and no smell. The provisions of purple pipes, and a second set of plumbing that uses rainwater and recycles water from washing dishes and showers in all new buildings, are under investigation by City of Vancouver.

WASTEWATER - Hong Kong

Similar to Vancouver, Hong Kong is also tackling water pollution associated with sewage treatment and disposal. Hong Kong generates 2.9 million cu. m of sewage everyday. The water pollution in the Victoria Harbour does not only limit its beneficial use but also impairs Hong Kong's image as an international city.

To improve the water quality of the Victoria Harbour, DSD of the Hong Kong Government implemented a large-scale sewerage project, the HATS project in stages. Under HATS Stage 1, sewage generated from Kowloon and northeastern part of Hong Kong Island is intercepted and transferred by a deep tunnel system to a centralised treatment works at Stonecutters Island for chemical treatment before discharged into the western approaches of the Victoria Harbour. HATS Stage 1 system is now collecting and treating 1.4 million cu. m of sewage everyday, which is about 75% of the sewage



generated from the Harbour area. Following the success of HATS Stage 1, HATS Stage 2 comprising Stage 2A and Stage 2B, are also underway. Further improvement to the water quality in the Victoria Harbour can be achieved by collecting and treating the remaining 25% of sewage generated from the northern and southwestern sides of Hong Kong Island and by providing biological treatment and disinfection. After the completion of HATS Stage 2, the whole system can ultimately serve a total population of 5.7 million. It is expected that the beneficial use of the Victoria Harbour could be extended and more area of the Harbour would become suitable for organising water activities for the enjoyment of the public (DSD, 2012).



Lots of energy is consumed during the process of collection and treatment of sewage. Similar to Vancouver, energy management at STW is one of our concerns and DSD is increasing the use of renewable energy technologies including the application of solar and regeneration of energy from biogas in the sewerage facilities. For example, large-scale grid-connected PV system is installed for supplying electricity to part of the equipment at Yuen Long STW. Biogas containing 65% methane gas as a by-product of the anaerobic digestion process in sludge treatment is used as a renewable fuel in STW in Sha Tin, Tai Po, Shek Wu Hui and Yuen Long. Biogas is used as fuel for gas boiler for generation of hot water to sustain the digestion process at a specific temperature in these treatment works. Dual fuel engine generators are installed at the Sha Tin STW for supplying equipment with electricity. Combined heat and power generation systems using biogas as fuel are installed at Shek Wu Hui STW and Tai Po STW. The electricity generated is supplied to the plant facilities while the recovered thermal energy is for pre-heating the recirculating water which provides heat to support the sludge digestion process as required.

To reduce water pollution associated with discharge from STW, apart from providing sewage collection, treatment and upgrading of existing systems, another idea is to make suitable use of the treated effluent of sewage for various purposes instead of disposal. Production and supply of reclaimed water from large sewage treatment plants for public use is not common in Vancouver, probably due to their abundance of natural water resources that makes the low necessity of alternative water resources from reclaimed water. Nevertheless, the use of reclaimed water has been studied and demonstrated to be successful in Hong Kong. The Ngong Ping STW, the first tertiary sewage treatment plant in Hong Kong, is now producing reclaimed water which is purified, odourless and safe for a wide range of non-potable uses including irrigation, rearing aquarium fishes and flushing in nearby public toilets. Use of reclaimed water not only relieves the demand on freshwater resource but also minimises pollution to the environment and burden to the ecosystem.

Last but not least, water conservation is of high importance. The water pollution problem as well as the resources used in treating sewage will be much reduced if the amount of water use can be reduced. The water pollution problem actually goes hand in hand with the water resources management, the same situation for Vancouver and Hong Kong. To achieve water conservation, education and promotion of efficient use of water are two key tasks to work on by the Hong Kong Government.

Recommendation

The possible applications could be adopted in Hong Kong are highlighted below. To learn from Vancouver, we could possibly look into the examples of the Annacis Wastewater Centre and the use of co-digestion technology in the Annacis Wastewater Treatment Plant.

The nature of research, education and sharing is targeted in the Annacis Wastewater Centre. The delegates suggest that such an academy could be

a showcase in Hong Kong if a similar sustainable academy for purpose of research, education and sharing could be set up in Hong Kong, for example, the Stonecutters Island Sewage Treatment Plant (SISTP).

Both Hong Kong and Vancouver are adopting waste-to-energy practices to generate energy for use from the sludge treatment processes. In this aspect, Vancouver is one step forward than Hong Kong with the use of co-digestion technology in sludge treatment and use of treated sludge as soil amendments and fertilizers. The co-digestion process with addition of digestible substrates into the anaerobic digesters in addition to the normal feed of sewage sludge provides a notable benefit of boosting gas production and hence increases the renewable energy production. The application of this new technology in Hong Kong should be further studied and considered. It is recommended that a pilot plant for co-digestion set up at the SISTP which is the largest sewage plant in Hong Kong currently handling about 600 tons of sludge everyday. Facing the coming expansion and upgrading, this will be a good opportunity to drive advance in sludge treatment technology for producing more renewable energy with stable sludge generation everyday and enhancing the energy management practices in sewage treatment facilities in Hong Kong. Apart from this, a large amount of waste is produced from food service industry daily in Hong Kong and normally it is disposed at landfill site. Studies are suggested to be carried out on co-digesting nutrient-rich food waste with sewage sludge in the development of the technology and as a means to relieve the solid waste burden in Hong Kong. Together with the above-mentioned studies, preparation work and methods should also be explored for turning post-treatment sludge into fertilizers for safe use. The Hong Kong Government might consider taking initiative of adopting new plumbing that uses rainwater and recycles water from washing dishes and showers in public buildings in new development neighbourhood, for example, Kai Tak development.



CLEAN AIR - Vancouver

Apart from sustainable features of clean water, clean air is another important aspect of quality living. Building a green transportation system is a crucial element in a sustainable city. From this Delegation, the delegates learnt that both Vancouver and Hong Kong are putting great efforts in turning their existing transportation system green. Nevertheless, given their unique local circumstances, both cities are adopting different strategies in realising this goal.

According to the Greenest City 2020 Action Plan (City of Vancouver, 2012), a key green transportation strategy for Vancouver is the promotion of active transportation, such as cycling and walking. It is believed barriers to the wider adoption of active transportation include the feeling of safety, comfort and convenience since in many Vancouver neighbourhoods, residents often need to drive five to ten-minute to get to the nearest shopping centre for daily groceries. To minimise such routine transport trips, one item in the Action Plan calls for the planning of more mixed-use areas with pedestrian-oriented public spaces, so that goods and services are within a safe and enjoyable ten-minute walk from living areas. Furthermore, realising that cars are going to be parts of Vancouver's main city transportation, reducing their environmental impact is another focus of the Action Plan. One such new initiative is for the Government to provide greater support for car sharing, in terms of allocating car-shared vehicles, on-street parking spaces and granting them permits to park in residential areas. The idea of car sharing is to reduce private car ownerships; hence there will be fewer cars on the road, less pollutant emission and better air quality.

CLEAN AIR - Hong Kong

Compared to Vancouver, Hong Kong is more densely populated. Thus, Vancouver's plan to have goods and services made available within a ten-minute walk from living areas is already a norm for many parts of Hong Kong. Nevertheless, Hong Kong has a need to promote walking as a transport mode, especially in popular shopping areas. To this end, since 2000, the Hong Kong Government introduced Pedestrian Schemes in selected areas, including Causeway Bay, Mong Kok, Tsim Sha Tsui, Central and Wan Chai.

Under this Scheme, vehicular access to selected roads is restricted either full-time or part-time, depending on local needs. The aim is to minimise transport trips by enhancing safety, comfort and convenience of walking. In addition, like Vancouver, reducing the environmental impact of cars is a focus of Hong Kong's green transportation policy. In 2011, the Hong Kong Government launched a three hundred million Hong Kong Dollars Pilot Green Transport Fund (EPD, 2011). A transport operator may apply for the Fund to test green and innovative transport technologies. The goal of this Fund is to provide financial incentives to applicants to adopt greener transportation technologies in their operation, thereby improving air quality for the whole community.

Besides encouraging active transportation and reducing environmental impact of cars, promotion of public transport is also an important part of green transportation. Both Hong Kong and Vancouver are putting much emphasis in this regard. For many years in Hong Kong, it is the policy objective of the Government to set railways as the priority of mass transit. Currently, railways account for about 37% of domestic public transport, and some 61% cross-boundary passenger trips (ISD, 2011). Several new railway lines are now under construction in the city, including the West Island Line, the South Island Line, the Kwun Tong Line Extension and the cross-boundary Guangzhou - Shenzhen - Hong Kong Express Rail Link. Similarly in Vancouver, new mass transit infrastructures are planned, including the Canada Line extension, the Millennium Line extension and the Downtown Streetcar project. Increasing public transport's frequency, capacity and accessibility are also high on the agenda in Vancouver Government's agenda. According to the Greenest City Action Plan, by 2020 (City of Vancouver, 2012), Vancouver targets to have over 50% of local trips done by foot, bicycle and public transit, up from about 40% in 2008.



Vancouver Electric Vehicle



Hongkong Electric Vehicle

Recommendation

Looking ahead, the delegates suggest that adoption of sustainable transport such as walking and cycling in new development area such as Kai Tak Development. Innovative technologies, including electric vehicles and fuel cell vehicles, can well be the means of green transportation of the future. Electric vehicles are powered by batteries only, thus emitting zero roadside emission. Both Vancouver and Hong Kong Governments are actively promoting the wider adaption of electric vehicles. Policies common to both cities include subsidising the building of charging networks, purchasing of electric vehicles as part of the Government fleet, as well as partnering up with manufacturers to introduce a greater variety of electric vehicles to be sold in the two cities. As for fuel cell vehicles, it is an emerging technology that produces electricity through a chemical reaction of hydrogen and oxygen. Since the by-product of this chemical reaction is water, fuel cell is seen as a green way of producing power for transportation needs. One of the largest fuel cell fleet currently in operation

is the bus fleet in Whistler. Supported by the local Government and the local fuel cell manufacturer Ballard Power Systems, services of these buses began in early 2010 as a showcase project of the Vancouver/Whistler Winter Olympic Games held in the same year. By mid 2011, the fleet successfully surpassed one million kilometres of service, saving two thousand two hundred tons of greenhouse gas emission (Fuel Cell Today, 2011). In contrast, the use of fuel cell vehicles is rather limited in Hong Kong. The Hong Kong Government is not very supportive of fuel cell, claiming safety as a major concern due to the unproven state of the technology (Hsing, 2005). Yet, a few years have now gone by. With the successful showcase of fuel cell buses in Whistler, the delegates recommend the Hong Kong Government revisiting the possibility of adopting fuel cell buses as another option of green transportation in the city in the future.

After all, making the transportation system green is an integral part of the building a sustainable city, a common vision for both Vancouver and Hong Kong citizens.

References:

- City of Vancouver, 2012. *Greenest City 2020 Action Plan*. Retrieved from <http://vancouver.ca/greenestcity/PDF/GC2020ActionPlan.pdf>
- DSD, 2012. *Harbour Area Treatment Scheme*. Retrieved 26 May 2012, from <http://www.dsd.gov.hk/others/HATS2A/en/FAQ/index.html>
- EPD, 2011. *Green Hong Kong April 2011*. Retrieved from http://www.epd.gov.hk/epd/english/news_events/newsletter/files/Green_HK_Apr_2011_eng.pdf
- Fuel Cell Today, 2011. *Fuel Cell Bus Fleet Exceeds 1 Million Miles in Service*. Retrieved 26 May 2012, from <http://www.fuelcelltoday.com/news-events/news-archive/2011/december/fuel-cell-bus-fleet-exceeds-1-million-miles-in-service>
- Hsing, I.M., 2005. *Feasibility Study of Utilizing Fuel Cell in Hong Kong*. The Hong Kong University of Science and Technology
- ISD, 2011. *Hong Kong: The Facts - Railway Network*. Retrieved from <http://www.gov.hk/en/about/about/hk/factsheets/docs/railway.pdf>

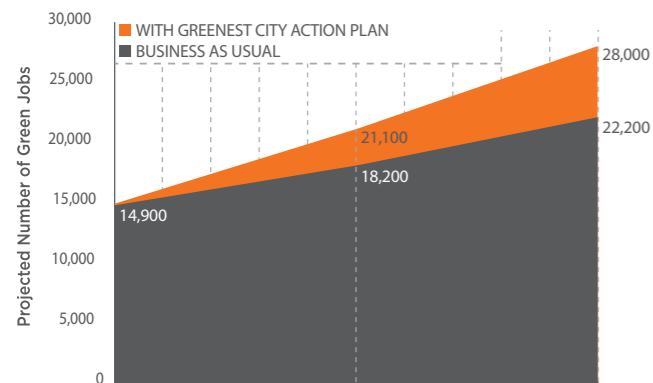
GREEN POLICY - Vancouver

City of Vancouver, the municipal body of the City, aims to become a global leader in addressing climate change. Hence, the Greenest City 2020 Action Plan was set up in 2009, with a vision for a healthy, sustainable future by setting economic, GHG, waste, building, transportation, air, water and food targets (Federation of Canadian Municipalities, 2012). The ten long-term goals were set up by GCAT, including green economy, climate leadership, green buildings, green transportation, zero waste, access to nature, lighter footprint, clean water, clean air and local food (City of Vancouver, 2012).

In addition, an EAC was convened for each working group, so that the groups were able to meet those targets by providing guidance and its best course of action. The EAC consists of business leaders, academics, advocacy organisations, senior levels of government and professionals.

Among the ten goals set from the action plan, a few are worth to discuss here. First, green jobs have been created substantially due to the effect of the action plan. Based on 2010 – 2011 figures, there were approximately 14,900 green jobs in eight sectors, which made up more than 3% of total jobs in the city. The increase of green jobs was partly due to the transformation of existing jobs through skills upgrading and through the green move of business processes. With easy accessibility of green jobs and the potential prosperity of green economy, green jobs are expected to grow at a larger pace than of usual business by 2020.

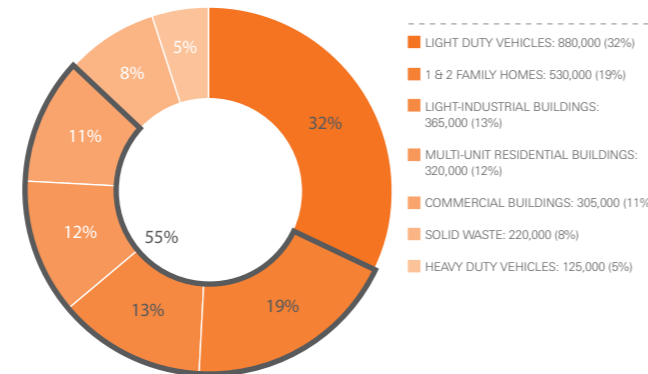
Forecasted green jobs growth



Source: Greenest City Action Plan 2020

Green building was also one of the ten goals set by the action plan. With the aim of achieving the building industry's LEED environmental performance, the City required all new buildings to conform to the new codes, while guidelines have been suggested on renovating existing buildings. The housing development of SEFC, with built-in features in reducing energy consumption, set an example for future green building development. The figure below shows that GHG emissions were mostly from the building (55%) (City of Vancouver, 2009). It is targeted that the amount of GHG emission could be reduced with the wide adoption of green building.

Vancouver's 2008 GHG emissions (tCO₂e)



Source: Greenest City Action Plan 2020

Besides, Vancouver developed a comprehensive water conservation and stewardship strategy. Key elements of the strategy include the adoption of high performance water-saving technologies and purple pipes that uses rainwater and recycles water from washing dishes, and showers in all new buildings. There are also rebates for the purchase of water-efficient fixtures. All these help to reduce water consumption by 33%.

As of 2012 statistics, among the 650,000 people living in the City of Vancouver, 35,000 of them have already been engaged in the action plan, of whom 9,500 were deeply engaged. This accounted for a good percentage of people who were involved in meeting the City's goals. It is therefore not surprising for the City of Vancouver to win the Federation of Canadian Municipalities Sustainable Communities Awards (Planning).

GREEN POLICY - Hong Kong

For Hong Kong, there is a long-term objective for the Government to encourage the public to switch to a greener lifestyle. ENB prepares the Environmental Performance Report each year to describe the efforts in improving Hong Kong's environment and report progress of sustainable development in Hong Kong (EPD, 2012a).

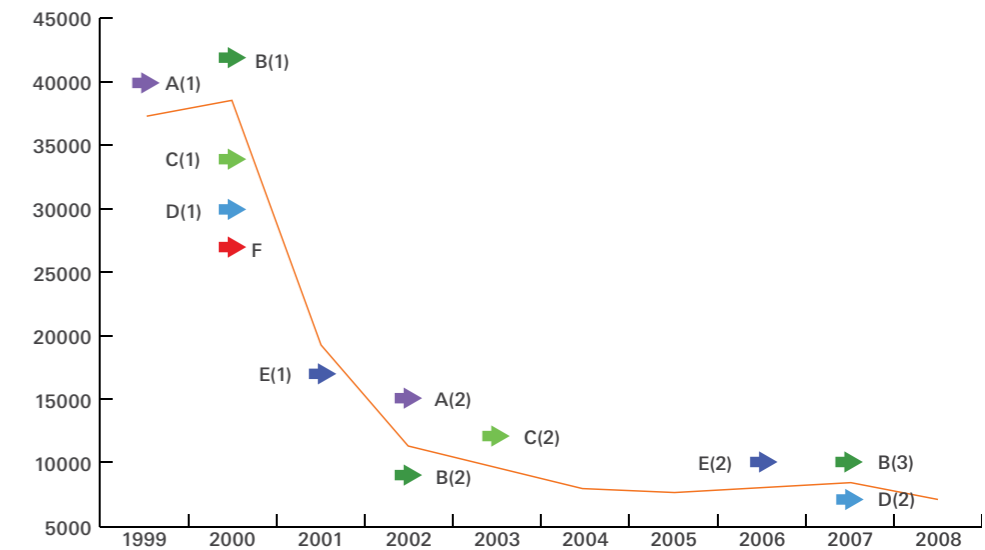
The Government sets high priority in controlling both street-level air pollution and smog. A wide range of measures has been implemented to control emissions from motor vehicles, power plants, and industrial and commercial processes locally. The Action Blue Sky Campaign, with the slogan "Clean Air for a Cool Hong Kong!" was organised by EPD and launched in 2006 (EPD, 2012b). Programs and events such as Smoky Vehicle Control Program, Setting Air-conditioned Room Temperature to 25.5°C and Energy Efficiency Labeling Scheme were set up. The Government also enacted the Motor Vehicle Idling (Fixed Penalty) Ordinance (Cap.611) to prohibit air pollution caused by running engines of idling vehicles in 2011.

Hong Kong shares a air shed with the Pearl River Delta Region so trans-boundary issues affect Hong Kong residents particularly. In 2002, the Hong Kong Government and the Guangdong Provincial Government jointly agreed an regional air emission reduction targets to be achieved by 2010.



Source: EPD, 2012b

Measures and effectiveness in reducing number of smoky vehicles spotted



MEASURES TO REDUCE VEHICLE EMISSIONS

- ADVANCEMENT OF SMOKE TESTING METHOD:**
 - A(1) - DYNAMOMETER SMOKE TEST FOR LIGHT DUTY VEHICLES (SEP 1999)
 - A(2) - DYNAMOMETER SMOKE TEST FOR HEAVY DUTY VEHICLES (JAN 2002)
- ONE-OFF GRANT FOR VEHICLE REPLACEMENT:**
 - B(1) - DIESEL TO LPG TAXI (AUG 2000)
 - B(2) - DIESEL TO LPG LIGHT BUS (AUG 2002)
 - B(3) - REPLACEMENT OF PRE-EURO & EURO I COMMERCIAL VEHICLES (APR 2007)
- RETROFITTING EMISSION REDUCTION DEVICE:**
 - C(1) - TRAP/DOC RETROFITTING FOR PRE-EURO LDV (SEP 2000)
 - C(2) - DOC RETROFITTING FOR PRE-EURO HDV (JAN 2003)
- CLEANER DIESEL:**
 - D(1) - ULSD (JUL 2000)
 - D(2) - EURO V DIESEL (DEC 2007)
- STRINGENT VEHICLE IMPORT STANDARD:**
 - E(1) - EURO III STANDARD (OCT 2001)
 - E(2) - EURO IV STANDARD (OCT 2006)
- PUNISHMENT FOR SMOKY VEHICLE:**
 - F - THE FINE OF FIXED PENALTY TICKET RAISED TO \$1,000 (DEC 2000)

Source: EPD, 2012c



Besides, the Air Pollution Control Ordinance sets emission caps to the power sector through a technical memorandum promulgated in 2008 and reviewed in 2010 to ensure that the power sector is in line with their emission reduction targets. The new set of emission caps for power sector starting 2015 are 12,482 tons for SO₂, 27 552 tons for NO_x and 831 tons for RSP, reduced by 50%, 35% and 34% respectively compared to the targets set by the first technical memorandum in 2008.

Progress in achieving the 2010 emissions reduction targets

Pollutant	Emission Level 1997 (tons)	Emission Level 2009 (tons)	Change in Emission Level 1997-2009	Emission Reduction Target for 2010
SO ₂	66 200	50 500	-24%	-40%
NO _x	124 000	84 100	-32%	-20%
RSP	11 500	4 890	-57%	-55%
VOC	68 800	29 000	-58%	-55%



Source: EPD, 2012a

To promote green building development, several guidelines and codes have been issued. Code of Practice for OTTV was issued by BD in 1995 aimed at reducing energy consumption of air-conditioning by controlling the heat transfer through building envelope (Buildings Authority, 1995). Code of Practice for Energy Efficiency of Building Services Installation (Building Energy Code (BEC)) was issued under Buildings Energy Efficiency Ordinance (Cap. 610) and mandatory submissions are required starting from 21 September 2012. This BEC provides technical guidance and details in respect of the minimum energy efficacy requirements governing building services installations

including lighting, electrical, lift & escalator and air-conditioning installation. Up to March 2012, 3060 registration certificates were issued to 1,358 building venues involving 3,215 installations (EMSD, 2012).

BEAM Plus green building rating system to measure, improve and label the environmental performance of buildings has been endorsed by HKGBC since April 2010 (HKGBC, 2012).

Recommendation

It is explained above that Hong Kong has been implementing policies for better environmental conservation. Numerous on-going programs such as roving

exhibitions, video broadcasting sessions, competitions, award schemes and guided tours have been carried out. Although Hong Kong Government has done well in setting clear goals and objectives to be achieved, Hong Kong can make reference to City of Vancouver's successful experience and further promote its green living.

The delegates observe two reasons contributing to success of Greenest City Action Plan in Vancouver: the effective use of media and the call for campaign.

For example, City of Vancouver has successfully raised the citizen awareness of the plan of being

the most livable city, with the technological aid of various social media (e.g. facebook, twitter, webpages, e-mail). It was found that there are more than 8,000 followers (by April 2012) in twitter and more than 3,000 people liked the facebook page. The City shared information openly on how the general public can get involved in this campaign, as well as promoting green energy in Canada. With close communication between the municipal body and the public, City of Vancouver is able to deliver messages and implement policies easily. The use of new media, such as facebook and twitter, also captures youth's attention on this campaign. Hong Kong has also adopted some new media as a mean of publicity, and it is hoped that the Government could continue and further develop these communication channels.

Moreover, the success of the Greenest City Action Plan is due to its clear objective as set by City of Vancouver, "Greenest City 2020". In the Action Plan, comprehensive sets of goals and targets are clearly mentioned. Specific strategies and plans will be implemented in order to achieve the goals. Many tools, programs and incentives have been provided to make it easier for their residents and businesses to get involved in it. The Hong Kong

Government has indeed put great efforts in the promotion of green energy and green development in Hong Kong. However, the message is not conveyed as strongly as in the Action Plan from the City of Vancouver, where all resources are pulled together for one campaign. The advantage of having only one campaign is to develop clear, discrete and sustainable goals for coming 10 years. The campaign is easily recognised as the Action Plan applies to all parties from different sectors. Hence, it is suggested that the Hong Kong Government could explore the implementation of a long-term action plan, which is also applicable to all industries and sectors.

Green economy, one of the highly appreciated goals in the Action Plan, aims to create green jobs for all sectors. For example, organisations and businesses make environmentally responsible improvements in their operations, such as sourcing recycled, reclaimed or locally manufactured materials, taking steps to improve energy efficiency, or reducing the amount of solid waste that businesses produce. Many of the resource-based companies headquartered in Vancouver have sustainability departments, which



Source: Hong Kong Green Building Council

have created green jobs. These job opportunities are not created in a particular industry, but for the existing operations of companies. Registered Energy Assessor in Hong Kong is of one kind of green jobs that could be promoted.

With Hong Kong community having higher expectation on companies about corporate social responsibility, sustainable development is necessary. To achieve this, it is suggested that sustainability departments could be set up in companies in order to develop long term sustainable goals for the future. Measurable improvements should be made by companies to evaluate their environmental performance, and hence improve their productivity as well as competitiveness.

References:

- Building Authority, 1995. *Code of Practice for Overall Thermal Transfer Values*. Hong Kong.
- City of Vancouver, 2009. *2008 Greenhouse Gas Emissions Inventory Summary and Methodologies*. Retrieved from <http://vancouver.ca/sustainability/documents/2008GHGInventoryMethodologiesDocument20091210.pdf>
- City of Vancouver, 2012. *Greenest City 2020 Action Plan*. Retrieved from <http://vancouver.ca/greenestcity/PDF/GC2020ActionPlan.pdf>
- EMSD, 2012. *HK Energy Efficiency Registration Scheme for Buildings*. Retrieved 26 May 2012, from <http://www.emsd.gov.hk/emsd/eng/pee/eersb.shtml>
- EPD, 2012a. *2011 Environmental Performance Report*. Retrieved from <http://www.epd.gov.hk/epd/misc/er/er2011/>
- EPD, 2012b. *Action Blue Sky*. Retrieved 26 May 2012, from http://www.epd.gov.hk/epd/english/action_blue_sky/action_blue_sky.html
- EPD, 2012c. *An Overview on Air Quality and Air Pollution Control in Hong Kong*. Retrieved 26 May 2012, from http://www.epd.gov.hk/epd/english/environmentinhk/air/air_maincontent.html
- Federation of Canadian Municipalities, 2012. *FCM Planning - Co-winner 1*. Retrieved 26 May 2012, from <http://fcm.ca/home/awards/fcm-sustainable-communities-awards/2012-winners/planning-%E2%80%93-co-winner-1.htm>
- HKGBC, 2012. *BEAM Plus Project Assessment*. Retrieved 26 May 2012, from <http://www.hkgbc.org.hk/eng/beamplus-main.aspx>



In this section, different green building design examples in Vancouver and Hong Kong are reviewed and recommendations are drawn from benchmarking the practices in Vancouver and Hong Kong.

Green building refers to sustainable building, which increases efficiency in the use of energy, water, material, etc to enhance environmental protection. It is a global trend and there are a number of green building programs to assess green building designs. In Hong Kong, BEAM Plus is the latest green building standard adopted. Whereas in Vancouver, LEED, an international rating system established in US, is followed.



**Vancouver Example 1:
Vancouver Convention Centre West**

VCCW was opened in April 2009 as an expansion to the existing Vancouver Convention Centre and a showcase for sustainable building. With countless numbers of cutting edge green features and technologies born with VCCW, the building was LEED Platinum certified for new construction by the Canada Green Building Council and was the first convention centre in the world to receive this highest level of LEED certification.

As part of a model of sustainability, the green roof of the building comprises a nurturing ground of indigenous plants and grasses which also provide natural habitat for birds, insects and small mammals. Moving to the foundations of the building, a unique marine habitat merges with the building to revitalize the marine skirt around the building. The artificial reef grown at the marine habitat improves the water quality

in the area and offers sustainable environment to various marine species.

With the prime goal in energy and water conservation, a number of advanced green features are exhibited in VCCW. The multi-purpose green roof helps to manage stormwater, by utilising rainwater for irrigation; and mitigate heat-island effect, by reducing summer heat gains and winter heat losses. In order to take full advantage of the locale of VCCW, seawater heat pump system and geothermal heat pump are used for radiant floor cooling and heating to provide the interior space with comfort and even temperature while reducing energy consumption for heating and cooling purposes. To minimise water consumption, VCCW is implemented with on-site black water treatment to process the building's sewage for non-potable water usage such as toilet flushing and supplemental water for irrigation of the green roof.

**Vancouver Example 2:
Centre for Interactive Research on Sustainability in UBC**

CIRS is a research and education laboratory building integrated with green building elements, including good use of resources and energy flow available within the site and surroundings. CIRS was certified with LEED Platinum and Living Building Challenge, established by the International Living Building Institute.

CIRS is composited with natural lighting, living roof and living wall, natural ventilation, energy efficient system, rainwater recycling system, green IT, etc. For natural lighting, it is one of the original goals of the CIRS project to attain 100% daylight building feature. To achieve this, the U-shape design of the building maximises utilization of natural daylight and fresh air for inhabitants.

In respect of application of living roof and living wall, the building is cultivated with native plants designed to provide habitats for local animals and insects and this feature plays an important role in water management. The living wall provides solar shading to the western façade so as to minimise the air conditioning loading capacity requirement. For ventilation system, the building adopts passive natural ventilation design in most of the regularly inhabited spaces. Operable windows allow adjustment of air flow and temperature in workspaces.

On the other hand, a heat recovery system captures waste heat in the exhaust ventilation from the fume hoods on the adjacent building and transfers thermal energy to the heat pumps in CIRS. The heat pumps provide heating and cooling to the building through radiant slabs and a displacement ventilation system. In addition, rainwater is harvested from the roofs of the building and stored in a cistern below the building. The rainwater is then filtered and disinfected on site and distributed through the building potable water applications.

One of the special green elements in CIRS is "no desktop computers or servers", which reduces the consumption of energy. Occupants use remote access to desktops, drives and servers, which are stored "in the cloud" instead (CIRS, 2012).

In short, CIRS detailed design is implemented satisfactorily including the building material used for the building envelope, and occupants' equipment in the building. The building aims to develop a completely sustainable environment to occupants and also to establish a role model of sustainable building design.

**Vancouver Example 3:
Net Zero Energy House & Southeast False Creek Development**

After looking into the green technological features applied to laboratory building, the final examples are about special green technologies brought to residential house and regional development in Vancouver.

Net Zero Energy House is a self-energy sufficient house through energy conservation and the use of RE. The house is well insulated by space foam vacuum panel with sixteen inch thickness as well as triple glazing



Façade of CIRS



Net Zero Energy House



windows with fiberglass window frames. This largely reduces energy for heating or cooling inside the house.

Moreover, natural lightings and LED lightings are adopted. Wireless lighting button, which can control lighting anywhere in the house and heat photo sensors which measure outdoor and indoor conditions for lighting control are used.

For solar energy, 66 solar photovoltaic panels are installed on roof, which can produce 14.8kW DC power and convert to AC power.

Besides, other energy conservation ways include application of heat recovery ventilators and passive solar gain through the south façade.

Other than putting efforts on reducing of energy consumption from buildings, a good planning on the living district is also important to improve the quality of living and sustainable community. SEFC development is a good example to show the establishment of a better living place to the local residents. NEU is a successful large scale sewage heat recovery system to the whole region for providing heating to all buildings there.

In addition, the artificial island – Habitat Island is built for reconstruction of waterfront during the development of SEFC and compensation on damage to the natural habitat. Habitat Island attracts bald eagles and herons perching on the branches of trees. (Habitat Island, 2010) This shows the importance of natural environment to our living place.

Therefore, besides green building, urban planning also plays an important role in developing a sustainable environment for our living.



Habitat Island in SEFC

GREEN BUILDING - Hong Kong

Hong Kong Example 1: CUHK New Laboratory Building

In comparison to UBC, CUHK built a laboratory building with green features and is applying for BEAM Plus Platinum Award. There are several applications of green features in the building, such as district cooling plant, special featured façades installed at north and south oriented walls, green wall, etc.



Similar to CIRS, green walls are applied to the laboratory building. There are a number of steel strings at the exterior walls to allow the plants to grow along the strings. This can minimise heat gain from the sun. In addition, the façades are slightly sloped or oriented horizontally according to the wall orientation so as to achieve the same purpose as green walls.

District cooling plant is a centralised cooling system which provides chilled water to the air-conditioning system of buildings via underground chilled water pipe network. The system is more energy efficient and is able to save energy up to 35% comparing with conventional air-cooled air conditioning system (EMSD, 2012).

Owing to the practical use of the laboratory building, some special designs are used in the laboratory rooms. For instance, venturi valves are installed to ensure the change of air flow control within one second for air conditioning system. The reaction time is much faster than using VAV boxes.

It is observed that some green features of CIRS may be applicable to the CUHK laboratory building, especially water conservation systems, such as rainwater recycling system, solar aquatic system, etc. Besides, green IT is an environmental and economical approach to reduce the heat load in the occupants' space and server room is not necessary anymore.

Hong Kong Example 2: ZCB & Redevelopment of Lam Tin Estate Phase 7

In order to promote green and sustainable living to the public, HKCIC is developing the first ZCB in Hong Kong. It comprises of several green technologies with some of them in experimental stage. It acts as a showcase to demonstrate the state-of-art of eco-building design and ZCB is targeted to be certified with BEAM Plus Platinum Award as the pioneer in Hong Kong.

There are a number of passive designs which are for experimental use. For example, ventilated façade is applied together with the direction of prevailing wind so as to maximise its effectiveness. Wind catcher installed on roof is used to draw in the natural wind from outdoor and release the hot air inside the building to the atmosphere. High performance shading/ glass and light shelf help to minimise heat gain to the building.

For active designs, chilled beam, underfloor cooling which also applied in CIRS, high-volume low-speed fan and active skylight are used to increase the energy efficiency of the ventilation system and take the advantage of natural resources. In addition, a large-scale biodiesel generator is used which produces heat and electricity from waste cooking oil. A solar thermal system is also installed for hot water use at the eco-café (HKCIC, 2012).



ZCB (HKCIC, 2012)

Prior to the development of ZCB, Hong Kong Housing Authority had already acted as a pioneer to implant green initiatives in public housing. One successful example is the redevelopment of Lam Tin Estate Phase 7, which integrated environmental, economic and social elements in the design. From the orientation of the residential buildings, application of solar energy, community engagement, etc, show that education and practical usage matching with the needs of occupants are also important to the continual development of green building in Hong Kong.

Comparing to net zero multi-unit residential building in SEFC, the geographical difference in Hong Kong leads to the limitation of green features that are applying in Vancouver. For instance, building height is one of the key factors that energy self-sufficiency is hardly applicable in Hong Kong. The possibility of building net zero energy houses in urbanized districts is relatively lower in Hong Kong due to its high population density.

Recommendation

With the different showcases of green buildings in Hong Kong and Vancouver, the importance of sustainability in building design is gradually being recognised by the public. By increasing the public awareness of the relationship between green building and sustainable living, the demands for green features in new developments and redevelopments to conserve energy and water grow equally or more importantly than aesthetic features. In the example of VCCW, these two features merge cooperatively together with the spectacular green and living roof. The green roof provides a natural habitat for various species of mammals, insects, birds and plantations; at the same time, the increased thermal insulation for the building reduces energy usage for heating and cooling.

Innovative ideas and technologies are also significant elements for green building as showcase in the CIRS building in UBC. CIRS implements a solar aquatic system, design to mimic the purification processes of naturally occurring water system such as wetland, to treat sewage from the building on site and reuse within the building for irrigation and toilet flushing. The building also puts green technology into practice by replacing traditional desktop computers with cloud computing to reduce energy consumption and heat gain from traditional computing systems.

Green technologies are limitless yet sustainability also extends beyond just the building itself. In SEFC, sustainability expands to a higher level where urban planning and conservation of nearby natural environment are well planned with community engagement. This is also not the final stop for sustainability as the goal to maintain sustainable living for future generation and must be passed on through on-going education.



NEIGHBOURHOOD DEVELOPMENT - Vancouver

The technology to create a greener, more livable city is now readily available in the global market; however, these technologies need to be integrated into a cohesive living environment in order to maximise benefits and noticeably increase the community's quality of living. That way, citizens can truly see that small changes in their lifestyle can greatly benefit themselves and the environment. In this section, we highlight examples from Vancouver which have successfully synergised a more livable human habitat using DES and runoff water management, with cited examples of SEFC development, Cheakamus Crossing, UBC, and VCCW, while lowering human impact on the surrounding environment through strategic planning. An example is also discussed from Guangzhou University City in China. Recommendations are drawn after comparing Kowloon East and Kai Tak Development with the above Vancouver developments.

Southeast False Creek Development

SEFC was a former heavy industrial area. In 1999, the City of Vancouver issued the "South False Creek Policy Statement: Towards a Sustainable Urban Neighbourhood and a Major Park in South False Creek" to pursue a sustainable redevelopment of the area (City of Vancouver, 1999).

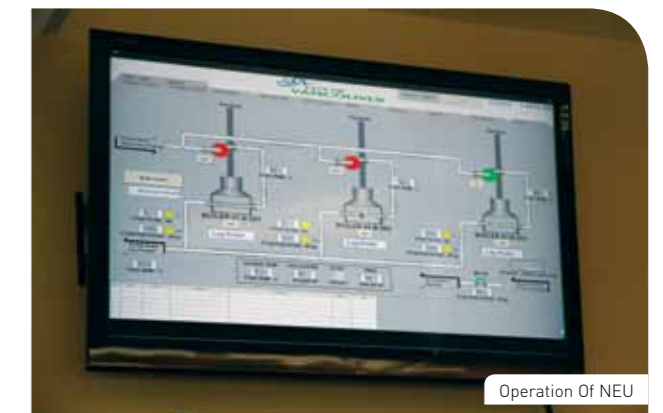
SEFC adopted Neighbourhood Energy Utility, which recovers heat from the sewer to provide heat and hot water for the residents in the community. Combined with the energy efficient LEED certified buildings in SEFC, NEU reduces GHG emissions by over 60% compared with conventional technology. The waste heat provides approximately 70% of the energy demand (City of Vancouver, 2008).



NEU is a renewable energy source, which turns the residual heat of the sewer into useable energy for space heating and domestic hot water by heat exchange process. The sewage heat recovery process is centralised with a sewage pumping station at the False Creek Energy Centre. During the high demand period in the winter, the system is supplemented by high efficiency natural gas boilers to ensure reliability. Heated water is delivered to SEFC buildings via

The SEFC GBS was set out by the City Council initially in 2004 to further outline the requirements and guidelines for the review of rezoning and development application within SEFC. As stipulated in the SEFC GBS, all buildings within the SEFC must achieve a minimum LEED Silver certification and aim to achieve LEED Gold standard (City of Vancouver, 2008).

The first phase of the SEFC development was the construction of the Olympic Village for the 2010 Winter Games for 2,800 athletes and officials, and subsequently for residential housing. The planned accommodation of residence is 12,000 to 16,000 by 2020 (City of Vancouver, 2007).



insulated pipes to reduce heat loss in the distribution process. Each SEFC building consists of an energy transfer station, which delivers space heat and domestic hot water to occupants by the building's

References:

- CIRS, 2012. *Centre for Interactive Research on Sustainability, The University of British Columbia*. Retrieved 26 May 2012, from <http://cirs.ubc.ca/>
- EMSD, 2012. *Electrical and Mechanical Services Department*. Retrieved 26 May 2012, from <http://www.emsd.gov.hk>
- Habitat Island, 2010. *Southeast False Creek & Olympic Village*. Retrieved 26 May 2012, from <http://vancouver.ca/olympicvillage/habitatisland.htm>
- HKCIC, 2012. *Construction Industry Council*. Retrieved 26 May 2012, from <http://www.hkcic.org>

mechanical system. Energy meters are installed in the stations for billing. Solar panels are installed on the stations to generate further energy to the community. No storage tank is installed with NEU to reduce unnecessary energy loss.

NEU is a self-funded utility that provides a return on investment to taxpayers. For developers, its scale of economies makes it a more cost-effective way to meet renewable energy targets than stand-alone systems in separate buildings.

One of the strategies identified during the planning stage for the SEFC neighbourhood for enhancing energy performance is to reduce the energy use in managing parks and open space areas. The provision of open space, which includes streets, parks, greenways, promenades, gardens, and water bodies, is of key importance in creating connectivity between the community and its surrounding environment. By closely integrating open spaces with surrounding buildings, energy performance of the buildings can be enhanced through the effects of sun, shade, air flow, and water runoff management.

The SEFC neighbourhood utilises rainwater as another resource, as it has designed water systems to utilise gravity and runoff water wherever possible instead of pumps and potable water. Runoff water is captured more effectively by using granular surfaces and other permeable paving systems instead of concrete paved surfaces. The development recycles rainwater for use in toilet flushing and irrigation; absorption into green roofs; and on-site treatment

through wetlands and swale parks before releasing it into the ocean. Furthermore, by reducing paved street widths and using modular paving materials, the development reduces its water consumption and energy use. Microclimate control and carbon sinks are provided through the extensive use of street trees and community gardens (Compass Resource Management Ltd., 2002).

Habitat Island is designed to replicate the coastlines of the area and has now become an oasis for many birds and wildlife. The Island is developed after extensive study of the specimens of trees, plants and driftwood logs that would bring biodiversity back to the urban area and is open for public enjoyment. The Island used 60,000 cu. m of dirt, rocks, and sand, much of which was from the development's leftover materials. The development has also enhanced the shoreline by providing fish habitat, public access to the water, as well as an unobstructed waterfront view of the city's landscape from the promenade (City of Vancouver, 2010).

Cheakamus Crossing

Cheakamus Crossing, once the home of Whistler's Olympic Athletes' Village, is now a residential neighbourhood with housing for employees, residents and athletes. Situated next to the Cheakamus River wetland areas, exceptional planning was done to minimise any environmental issues that may arise due to the construction of the neighbourhood. In 2004, the guiding document Whistler 2020 – Moving toward a Sustainable Future was formulated by the RMOW as the neighbourhood's master plan. Whistler 2020 is developed by the community with its focus on enriching community life and protecting the environment. It is developed in four phases, as outlined below:

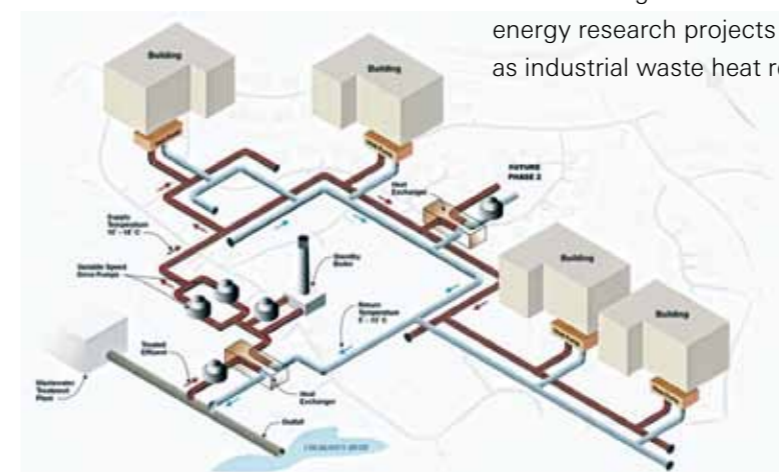
As part of its Carbon Neutral Operations Plan within Whistler 2020, the RMOW set up a mechanism to allocate the carbon tax within their local community in resorting to better energy/GHG management. The carbon emissions are measured and reported in the allocation mechanism. A price signal is set on those carbon emissions, which are measured and reported in the mechanism and reallocated the carbon tax to the households and organisations. This aims for commitment to "carbon neutrality", conforming to the carbon operation plan. The RMOW tracks and understands users' emissions and provides recommendations on



Source: <http://www.whistler2020.ca/whistler/site/genericPage.acds?instanceid=1967751&context=1930511>

how to aggressively reduce existing emissions to meet the target emission rate. Finally, the carbon costs are going to be integrated into ongoing infrastructure management and financial decision-making. Upon implementation of this mechanism in 2008, the total estimated RMOW GHG emissions in 2011 recorded a 13% drop from 2009 peak levels.

The DES extracts low-temperature ambient heat from treated sewage effluent from the nearby WWTP, and is able to provide both heating and cooling. The system captures waste heat from the WWTP to provide space heating, domestic hot water heating, and cooling for 2,200 users occupying 85,000 sq. m of space which includes domestic housing and commercial buildings. The system is one of the first closed-looped, heating and cooling district energy systems in the world and reduces GHG emissions by 95% and 1,600 tons of carbon dioxide emissions per year over conventional heating technologies. The system produces up to 11,000 MWh of building heating energy per year, using energy that is otherwise be wasted.



Source: <http://www.whistler.ca/residents/municipal-services/district-energy-system>

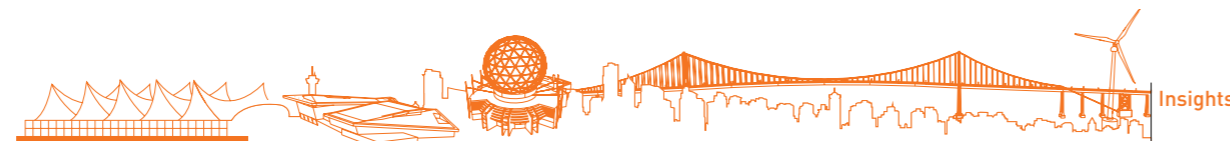
With measures taken to preserve the original vegetation and natural wetlands, the wetland complex serves three purposes: on-site stormwater retention and treatment as well as habitat enhancement. An innovative stormwater management system, using a network of roadside rain gardens, swales and sediment ponds, is used to minimise impact on the water flow or quality in the nearby Cheakamus River. Furthermore, sediment and contaminant levels in stormwater are reduced with the help of rain gardens situated throughout the site, while "ecolawns", open grass areas using highly drought-tolerant and low-maintenance plants, replace conventional, high-maintenance lawns (Resort Municipality of Whistler, 2011).

The University of British Columbia

Since the 1920s, UBC has largely relied on its central steam plant to supply the entire campus with heating. The plant, which generates heat by natural gas, is inefficient due to over 20% heat loss during distribution with poorly insulated pipes. The heating system replacement project is one of the projects in place to meet with the UBC GHG reduction aggressive targets: to be below 2007 levels by 33% in 2015, 67% in 2020, and 100% in 2050.

The five-year project, funded with CAD 85 million, is forecasted to reduce campus energy use by 24%, GHG emissions by 22% (11,000 tons of GHGs), and save up to CAD 4 million annually in operational and energy costs. The major savings is due to the system's ability in operating at a much lower average temperature than the outgoing system, 80°C versus 190°C, which also allows for compatibility with current and future UBC clean energy projects. A payback period of 25 years is expected before the investment is going to be recovered, with the design life of the system at 60 to 80 years (UBC, 2011).

The works include replacing 14km of aged pipes with insulated pipes, construction of 131 energy transfer stations across campus, and a 52 MW, natural gas powered hot water plant (UBC, 2011). The pre-insulated pipes do not need to be buried as deeply, saving on installation and maintenance costs. Since hot water can be heated in numerous ways, this system is extremely flexible – the effects of future global energy market changes are minimised, and UBC can continue to conduct clean energy research projects as a part of its ongoing Living Lab initiative, such as industrial waste heat recovery and biomass gasification.



Vancouver Convention Centre

The new West Building closes the gap between the natural ecosystem surrounding Vancouver and the human ecosystem by integrating the landscape, human and marine habitats.

The 6-acre living green roof connects biologically to Stanley Park via a mile-long habitat corridor of waterfront parks, supporting a diversity of birds in the urban core. Irrigation to the roof is provided by the building's wastewater treatment plant. If irrigation demand exceeds the capacity of the wastewater treatment plant, additional water can be provided by an on-site reverse osmosis desalination plant drawing and treating seawater pump from the harbour.

The marine restoration effort returns the site to pre-industrial conditions, re-routing the shoreline around the building's foundation piles. This is achieved by means of a custom-designed habitat skirt consisting of 5 concrete tiers on a sloping vertical frame surrounding the entire 1,500 ft perimeter, which emulate rocky surfaces for marine life to attach to. The founding concrete tiers are covered in barnacles and mussels, with an increasing number of sea urchins, sea stars and crabs competing for space. Large schools of salmon feed on plankton and find shelter in the skirt's plant life.

NEIGHBOURHOOD DEVELOPMENT - Guangzhou

The China's largest, and world's second largest District Cooling System is located not far from us at Guangzhou University City, an island of universities campuses with capacity of more than 180,000 students and 350,000 residents. It is equipped with secondary pumping system (constant flow rate / variable temperature difference) which varies the supply and return temperatures of buildings by changing the quantity of chilled water in primary loop through the plate heat exchanger unit.

It also contains one of China's largest ice storage plants. By making ice at night time and melting ice during peak hour or when needed, it provides a load shifting opportunity which can relieve power burden. It has capacity of up to 100,000 tons of refrigeration.



Green Roof of Vancouver Convention Centre

NEIGHBOURHOOD DEVELOPMENT - Hong Kong

Kowloon East

The Kowloon East Development, which is adjacent to the Victoria Harbour and comprising of Kwun Tong, Kowloon Bay, and former Kai Tak Airport areas, is set to become a demonstration of a sustainable, environmental-friendly development with multiple uses, from residential and community use to business and tourism centres. It features an Environmentally Friendly Linkage System with pedestrian bridges and a monorail, improved streetscape with greening and public open spaces, and a waterfront promenade for the public to enjoy the spectacular views of Hong Kong. To further promote energy efficiency and conservation, the Hong Kong Government plans to implement the first DCS at the KTD to supply chilled water to buildings in the development area.

DCS is a centralised cooling system that supplies chilled water to the air-conditioning systems of buildings via a network of underground insulated pipes. This eliminates the need of individual chiller plants for each building, saving space and lowering operational and start-up costs for individual buildings. Not only does it provide a more reliable and higher-quality air-conditioning to users, the system uses 19% less energy than standalone air conditioning systems operating on cooling towers and 35% less than air-cooled chillers. At Kai Tak, two chiller plants produce and supply chilled water to non-domestic buildings by utilising seawater to chill and dissipate exhausted heat from the plant and to run the pumphouse for the pipe network. Implementation of DCS in the KTD area brings significant environmental benefits, with an expected maximum annual electricity savings of 85 million kWh, or 59,500 tons of CO₂ emissions, for the planned total air-conditioned floor area of about 1.7 million sq. m. The provision of DCS service to users is subjected to a tariff which is expected to be implemented by the Hong Kong Government. In order to attract

private users to connect to the DCS, the tariff would be set at a competitive level comparable to the charge of traditional, cost-effective air-conditioning systems (EMSD, 2003).

During the planning stage, EMSD conducted an implementation study and found that DCS, with a normal design life of 30 years, requires a pay-back period of 25 years in Kowloon East, with significant up-front capital costs with low revenues in the initial years.

Recommendation

Regarding planning, by implementing a fee to those technologies that emit high levels of GHG and carbon dioxide, green technologies which would otherwise be more expensive become highly competitive in terms of cost. This initiative can be further studied by the Hong Kong Government.

In view of Hong Kong's urban density, it is both cost-effective and environmental-friendly to implement district energy systems, passive design to utilise natural light and ventilation, and usage of sustainable materials from nearby origins. With Hong Kong seeing the pilot use of DCS and a sustainable, green development in KTD, it is a great opportunity to implement green technologies in neighbourhood development. Continuous monitoring and optimisation of DCS would be helpful to understand whether this and other district systems are applicable and how best to market them so the public is able to recognise its benefits to begin implementation for domestic use. Further study into other areas of waste-to-energy opportunities, such as heat from wastewater or inefficient systems, can help implement a broader use of DES.

Apart from district energy system, integration with the environment is another element of neighbourhood development. Green roofs and vertical walls are becoming more prominent in Hong Kong, as seen in the current urban greening of the Tuen Mun Road and town centre. Urban greening can be applied to KTD and other new developments to greatly improve the visual environment, such as on covered walkways and carriageways. Street greening, such as planting of road side trees and other low-maintenance greenery, also create local carbon sinks to improve air quality. Green open spaces can become more "green" by using on-site recycled material for park benches, walkways, play areas, and delineating elements.

Management of runoff water can further integrate the human habitat into the natural environment. By applying permeable surfaces and installing local rainwater catchments, the load on the stormwater system can be reduced while rainwater can also be utilised for irrigation and toilet flushing purposes. This can be especially useful for remote areas to reduce the energy needed for water pumping.

Due to the high demand for land, Hong Kong has greatly reduced its natural shorelines through reclamation, significantly affecting marine habitats. Man-made reproduction of natural habitats and shoreline are able to minimise impacts to the natural environment due to construction at coastal areas. For future reclamation projects such as the Hong Kong Link Road adjacent to the Chek Lap Kok Airport island and developments near the water, this humanistic approach is an important area of research which should look into in order to integrate human habitat within natural environment in a peaceful manner.

EXPLORING OPPORTUNITIES ON USE OF RE

As a result of increasing population and energy demand, renewable energy is identified as a sustainable energy for future global development.

Distributed Generation

Electricity generation close to the demand location can effectively reduce transmission and distribution loss. However, the cost of small scale generation and RE is higher when compared with large scale electricity production from fossil fuels.

Both Vancouver and Hong Kong adopt distributed generation.

Seventy BC independent power providers (IPPs) are currently operating and supplying BC Hydro with 12,599 GWh of annual supply and 3,209 MW of capacity, from a wide variety of power facilities including hydro, solid waste, wind and biomass. About 16% of total domestic electricity is provided by IPPs.

In view of typical renewable energy identified by Hong Kong like energy from waste, wind and solar, the power output fluctuation can influence the system stability. The RE is promoted in the way of smaller scale for connection to power grid. Currently, single source of renewable energy feeding into the power grid



is limited. Typical on-grid small scale RE projects are conducted by schools for education purpose.

There are other forms of energy available in Hong Kong like wind energy and waste generation. The two power utilities plan to construct two offshore wind farms outside Sai Kung and Lamma Island respectively.

Waste generation is increasing at a rate of 3% per year. Besides, the strategic landfills will be exhausted in 5 to 8 years. Landfill gas is extracted from 3 landfill sites as shown in the table below for electricity generation:

Strategic Landfills	Modes of Landfill Gas Utilization	Quantity of Gas Utilised (cubic metre per hour)
WENT	Electricity generation for on-site use and leachate treatment	4,150
SENT	Electricity generation for on-site use and leachate treatment	1,778
NENT	Electricity generation for on-site use and leachate treatment, off-site town gas production	7,015

Note: The above figures are average figures in 2010

Another form of energy from waste is biogas, resulted from anaerobic digestion in sludge treatment process. The gas is used for heating up water and generating electricity by means of Dual Fuel Engine Generator and CHP Generation System. This reveals potential of further development of waste energy.

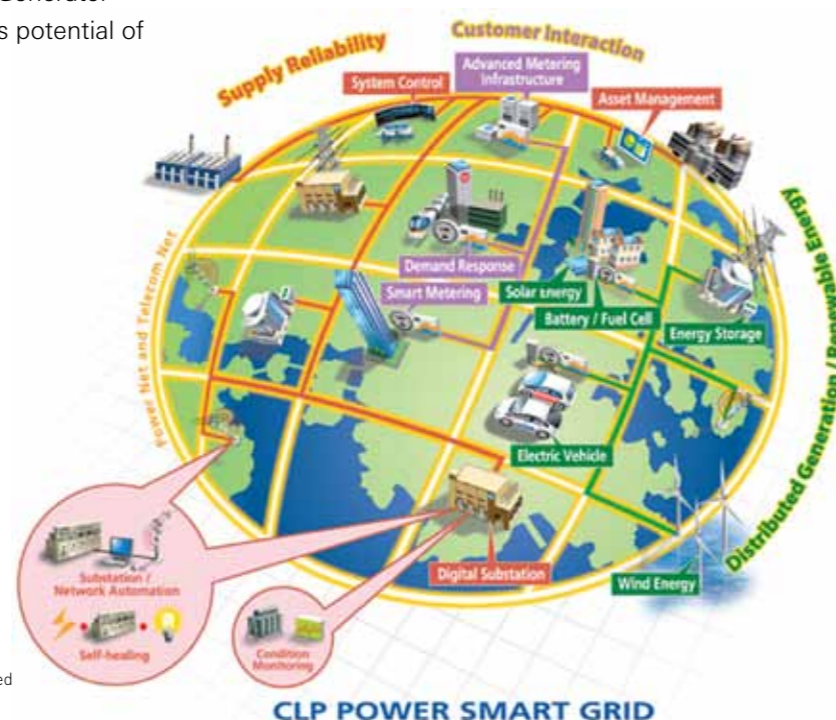
Demand Side Management

DSM is influencing the amount and timing of energy demand from customers through the activities in management circle.

In Vancouver the BC Hydro's DSM activities include Power Smart, which is an educational programme on promoting the use of power wisely, and Smart Meters, which are hardware and the associated communication network allowing consumers to access their real-time demand consumption. The smart meters installation of 1.85 million homes / buildings in BC is targeted by year end of 2012. A few more are named – Live Smart BC, Lighting Rebates, Fridge Buy-backs, Appliance Rebates, BC Building Code amendments and some other programs on increasing public awareness on energy use.

For Hong Kong, 400 customers were selected for the trial run of smart meters and home display unit at LOHAS Park in Tseung Kwan O District. In this project, smart meter was installed in each of the household and a home display unit for providing information of individual consumption of each socket or individual appliance.

There are also some campaigns on promoting wise usage of energy in Hong Kong like Mandatory Energy Efficiency Labelling Scheme, Energy Efficiency Registration Scheme for Buildings, and E&M Safety Carnival etc.



Source: CLP Power HK Limited

Recommendation

Hong Kong may consider adopting more RE technologies in both utility generation level (increase the use of solar photovoltaic and wind turbine for electricity generation), and distributed generation level (generation from customer side). Besides, clean energy from nuclear can reduce demand of fossil fuels and GHG emission. However, this requires detailed study on safety measures and further increase of power network interconnection capacity to cater for energy deficits during trough season. Furthermore, to enhance the system stability, more energy storage devices like pump-storage power station which Hong Kong utility is using, fuel cell which adopts hydrogen cycle with reduced GHG emissions, and battery system including batteries in every electric vehicle, can be utilised. To promote use of RE, it is suggested to measure the reverse power flow, so that surplus power generated could be sold back to the power utilities, subject to agreement between the Hong Kong Government and power utilities.

Possible sources of electricity supply include extensive use of anaerobic digestion for sewage treatment, extraction of landfill gas, and Food Waste Recycling Partnership Scheme which comprises of organic waste treatment facilities for processing of food waste under anaerobic digestion. For example, the treatment facility under construction in Siu Ho Wan of Hong Kong has a daily treatment capacity of 200 tons of source separated organic waste, and it is capable of producing 20 tons of gas per day and for further conversion to 2.8 GWh per year. This kind of scheme could be expanded for recovering more energy from waste (currently totally 3200 tons of food waste per day) and reduce reliance on the landfill sites. Further division of types of food waste is suggested for recovering energy. Moreover, more effective promotional campaigns are suggested for the success of extending waste recycling and demand side management.

References:

- City of Vancouver, 1999. *Southeast False Creek Policy Statement*. Retrieved 26 May 2012, from <http://vancouver.ca/commsvcs/southeast/policystatement/index.htm>
- City of Vancouver, 2007. *Southeast False Creek Official Development Plan*. Retrieved from <http://vancouver.ca/commsvcs/bylaws/odp/SEFC.pdf>
- City of Vancouver, 2008. *Southeast False Creek Green Building Strategy*. Retrieved from <http://vancouver.ca/commsvcs/guidelines/S012.pdf>
- City of Vancouver, 2010. *Southeast False Creek & Olympic Village, Habitat Island*. Retrieved 26 May 2012, from <http://vancouver.ca/olympicvillage/habitatisland.htm>
- Compass Resource Management Ltd., 2002. *Southeast False Creek Phase 1 Energy Options*. Retrieved from <http://vancouver.ca/commsvcs/southeast/documents/pdf/eossynopsis.pdf>
- EMSD, 2003. *Implementation Study for a District Cooling Scheme at South East Kowloon Development*. Retrieved from http://www.emsd.gov.hk/emsd/e_download/pee/dcs_sekds_es_eng.pdf
- Resort Municipality of Whistler, 2011. *Whistler*. Retrieved 26 May 2012, from <http://www.whistler.ca/>
- UBC, 2011. *Getting Into Hot Water*. Retrieved 26 May 2012, from http://www.planning.ubc.ca/vancouver_home/news_and_events/enewsletter/december_2011/articles558.php
- VCC, 2012. *Vancouver Convention Centre*. Retrieved 26 May 2012, from <http://www.vancouverconventioncentre.com/>





Conclusion

With growing population, climate change and economic opportunity, many cities in the world are facing the challenge of building a sustainable city. Hong Kong is no exception.

Vancouver has set out the Greenest City 2020 Action Plan in collaboration with universities, businesses and citizens. Continuous public consultations are being carried out. Measurable targets of the ten long-term goals are set engaging involvement of the entire community in achieving the goals. During the Delegation, delegates talked to many Vancouver engineers as well as professors and students in university, and observed that everyone was committed to a role in the plan, from an individual home to the whole neighbourhood, from a single building to the entire community. Starting from the pioneering work of the Mayor, the City of Vancouver devoted greatest resources to compile the detailed and comprehensive plan. Such plan gives citizens clear directions and leadership where the Vancouver community is heading to.

Comparing to Hong Kong, the Hong Kong Government's commitment to sustainability less stands out. The Council for Sustainable Development is only an advisory body. Sustainable policies require new initiatives, from infrastructure development to environmental protection; from transportation to energy usage. Yet, at the time of writing this report, the introduction of new measures in these policy areas touch on the jurisdiction of the Transport and Housing Bureau, the

Development Bureau or the Environment Bureau. With different policy focuses, co-ordination amongst these bureaus could become complicated. A clear demarcation of policy content under one bureau might help. Moreover, the "Regional Cooperation Plan on Building a Quality Living Area" proposal is a good start for Hong Kong to work hand in hand with Macau and the Guangdong Province. The Hong Kong Government is suggested to consider setting up measurable targets, carrying out progress monitoring, making recommendations when necessary, and releasing regular progress reports to citizens for implementation of the plan. Most importantly, public engagement of the entire community is essential, starting from the day-to-day changing habit of conserving the environment. It is suggested that the Hong Kong Government might make reference to its Vancouver counterpart in how to empower citizens and to demonstrate stronger leadership in terms of clean water, clean air and green building policies.

The Delegation was held successfully with the support of advisors, local and overseas hosting organisations and sponsors, not to mention the dedication and enthusiasm of the delegates from various disciplines. This is not the end. After learning the beauty of engineering and policy practices in Vancouver and Hong Kong and drawing contrast and comparison, young engineers would like to apply overseas practices learnt in Vancouver to make Hong Kong a better living place. We sincerely invite you to join our efforts in sustaining Hong Kong and our engineering profession.



Annex

Profile of advisors



Ir F C CHAN
President, HKIE

Ir F C CHAN received his education in Hong Kong and UK. He was a graduate with first class Honours from the University of Hong Kong in Electrical Engineering. He carried out research in power system protection and obtained his Doctor of Philosophy from Imperial College, University of London.

Ir CHAN has extensive experiences in power systems specializing in power systems protection, distribution automation, substation design and construction, lighting applications and energy services. He gave lectures and published over 50 papers to share his experience. He is active in various learnt society activities in Hong Kong. He is currently the HKIE President. His current focus includes Smart Grid, End-user Behaviour and Fault Tolerance System. He is also keen on the promotion of engineer profession and the development of young engineers as well as the engineering and technology education in secondary schools in Hong Kong.



Ir Prof Reuben P K CHU, JP
Immediate Past President, HKIE

Ir Prof CHU has served in the Council and a number of leading positions in various boards and committees, Division committee and Discipline Advisory Panel and has made significant contributions to the development of HKIE.

He is a Registered Professional Engineer in Civil, Fire, Geotechnical and Structural Disciplines, a Registered Structural Engineer and a Registered Geotechnical Engineer. Currently, he is the Managing Director - Structural, Infrastructure and Environmental of Meinhardt Consulting Engineers. He has over 30 years experience in consulting engineering and has delivered services to private sectors, government departments, MTRC and London Underground in Hong Kong, Macau, Mainland and UK. Over the years, he has established strong connections in the community. He has also served numerous government bodies in Hong Kong. He is currently an Adjunct Professor of the Hong Kong Polytechnic University and has served a number of Advisory Committees/Boards of local universities. With his remarkable engineering achievements and community service, he was appointed as a Justice of the Peace by the Hong Kong Government in 2008.



Ir Prof K K CHOY
Senior Vice President, HKIE

Ir Prof CHOY graduated in 1975 at the Hong Kong Polytechnic with an Associateship in Structural Engineering. After graduation, Ir Prof CHOY worked for two years as a Site Engineer for Hip Hing Construction Co. Limited at the construction site of the New World Centre in Tsim Sha Tsui, Kowloon, Hong Kong. He then joined the Hong Kong Government in 1977, initially in the Architectural Office of the then Public Works Department and was later transferred to the then Buildings Ordinance Office in 1981. He has extensive experience in designing, planning, construction and control of building in civil engineering projects.

Ir Prof CHOY is a Chartered Civil and Structural Engineer, a Fellow of the Institution of Structural Engineers and HKIE, and a Class 1 Registered Structural Engineer of the People's Republic of China. He has been appointed as an Adjunct Professor of the University of Hong Kong and the Hong Kong Polytechnic University since 2004. He retired from the Hong Kong Government in 2011. Before then he was an Assistant Director of BD. He also serves the HKIE as the Senior Vice President and the Professional Green Building Council as a Vice Chairman.



Ir Raymond K S CHAN, JP
Vice President, HKIE

Ir Raymond CHAN was the Head of the Geotechnical Engineering Office of the Hong Kong Government between 1998-2011 before his retirement, responsible for a wide spectrum of geotechnical functions including the management of the Hong Kong slope safety system to mitigate the risks of landslides and geohazards in Hong Kong. Ir CHAN has over 35-year experience in civil and geotechnical engineering. He has published over 25 key-note lectures and the state-of-the-art papers on landslide risk management and geotechnical engineering practice in Hong Kong.

Ir CHAN served on the Accreditation Advisory Board of the Industry Department and various advisory boards of the Engineering Departments of the University of Hong Kong, the Hong Kong University of Science and Technology and the Hong Kong Polytechnic University. In 1999-2002, Ir CHAN was appointed as Adjunct Professor and the Chairman of the Steering Committee of the Jockey Club Research and Information Centre for Landslip Prevention and Land Development of the University of Hong Kong.

He has been a member of the Scientific Committee of the Integrated Research on Disaster Risk (IRDR) since March 2009. He is also an advisor to IRDR(China).

Ir CHAN has been a Justice of Peace since 1997. Currently he is the Guest Professor at the Hong Kong University of Science and Technology and the Vice President of HKIE.



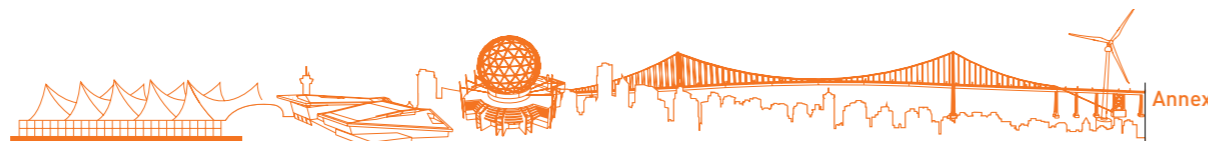
Ir Victor C K CHEUNG
Vice President, HKIE

Ir CHEUNG is a Director of J. Roger Preston Limited, a leading Building Services Consultancy in the South East Asia region. He is a Registered Professional Engineer in Building Services and Fire disciplines.

Ir CHEUNG graduated with first class Honours in Environmental Engineering from the South Bank Polytechnic, UK and obtained an MSc in Energy Engineering from the Surrey University, UK.

He has over 35 years of experience in the field of electrical & mechanical and building services engineering and responsible for a wide range of building and infrastructure projects in the region.

Ir CHEUNG is active in community services and has served on various task forces, boards and committees for the Hong Kong Government, NGO's and professional bodies. He is currently the Vice President of HKIE.



Profile of advisors



Ir Peter Y WONG
Past President, HKIE

Ir WONG has worked in consultant, contracting and manufacturing firms before taking up his post as Director in Yook Tong Electric Co. Limited. He has over 25-year experience in electrical equipment technology design, specification, sales and marketing in both Hong Kong and European Communities.

Benefited by cross-industry exposure, Ir WONG is in a good position to help shape the local construction practice: pioneering in upgrading standards of locally manufactured products; instrumental with the first RCD protected 13A ring circuit installation five years before adoption by IEEE Regulation; first to equip luminaries with energy saving lamps in projects seven years before the Government adopted such as standard specification. He pens the submission to the Administration for the electrical contractors proposing the first material fluctuation clause and tender format. Ir WONG was elected as the HKIE President for session 2008/2009. Currently, Ir WONG is the Chairman of ERB, Hong Kong and Vice President of CIBSE, UK.



Ir Dr. Otto L T POON, BBS, OBE
Past President, HKIE

Ir POON is a Chartered Engineer with 50 years' E&M engineering experience and the founder of Analogue Group of Companies.

He had participated in public services both to the community and the engineering profession which included Advisory Council on the Environment, Energy Advisory Committee, Solicitors Disciplinary Tribunal Panel, Council for Sustainable Development, Trustee Board of Institution of Mechanical Engineers, UK, as well as being the HKIE President (1998-1999), President of Hong Kong Association of Energy Engineers (2004-2008) and President of Association of Energy Engineers, Hong Kong Chapter (2006-2009).

He now serves as the Advisor to Bauhinia Foundation Research Centre, Honourary Treasurer of Hong Kong Climate Change Forum, Honourary Member of Chinese Mechanical Engineering Society, and President of the Hong Kong Federation of Electrical and Mechanical Contractors.

He was awarded OBE in 1996, BBS in 2003 and the University Fellowship by the Hong Kong Polytechnic University in 2007. He was elected as an Outstanding the Hong Kong Polytechnic University Alumni and an Outstanding IMechE Branch Member of the Year. He was inducted into the Hall of Fame of HKIE in 2010 and conferred an Honourary Degree of Doctor of Technology by Coventry University, UK in 2011.



Ir Edmund K H LEUNG, SBS, OBE, JP
Past President, HKIE

Ir LEUNG is a professional engineer with broad-based experience covering power, manufacturing and construction industry.

Graduated from the University of Hong Kong in Mechanical Engineering, he worked for the power utilities, a manufacturer, contracting and consulting organisations and helped to plan, design and construct many infrastructure projects including railways and tunnels and many complex building projects.

He retired from Hyder Consulting Limited in 2003 and served as part-time advisors and independent non-executive directors for various organisations. In 2009, he re-embarked on full time work when he was appointed as the Managing Director of Hsin Chong Construction Group Limited.

He had served as the HKIE President, Chairman of the Hong Kong Branch and Council Member, of IMechE.

He is presently the Chairman of the Energy Advisory Committee, Chairman of the Process Review Committee of the Financial Reporting Council and a Justice of Peace.

He was awarded a Silver Bauhinia Star in 2009 and inducted into the Hall of Fame of HKIE in 2010.



Ir S T CHAN
Chairman, the Continuing Professional Development Committee, HKIE

Ir CHAN is an Assistant Director (Estate Management) of the Hong Kong Housing Department, the Hong Kong Government. He graduated from the University of Hong Kong in 1977 with a degree in civil engineering, and obtained a MBA in 1986 from the Chinese University of Hong Kong.

He worked in civil engineering consultancy for seven years before joining the Hong Kong Housing Department in 1984. He has extensive experience in the planning, design, project management and contract administration for the construction of public housing developments, and estate management and maintenance of public housing estates.

He is a Fellow of the Hong Kong Institution of Engineers and the Institution of Structural Engineers. He participates actively in various professional institution's activities. He has been the Council Member of the HKIE and the Chairman of the HKIE Structural Division. He is currently the Chairman of the HKIE-Continuing Professional Development Committee, Council Member of the Institution of Structural Engineers, and Deputy Chairman of the HKIE Structural Discipline Advisory Panel and the HKIE Building Discipline Advisory Panel.

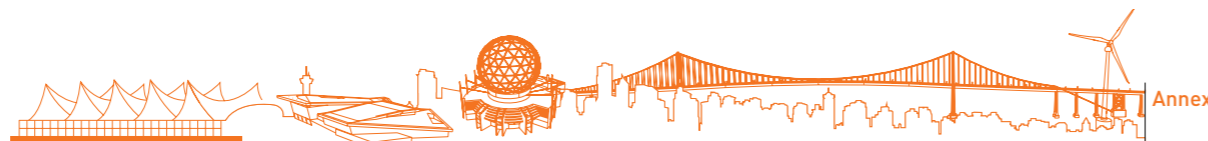


Ir Gary C W KO
Chairman, the Professional Assessment Committee, HKIE

Ir KO joined CLP Power (Hong Kong) Limited as a Graduate Trainee after graduating with first class Honours in electrical engineering from the University of Southampton, United Kingdom in 1980.

He moved to the contracting business by joining Kum Shing Group as a Contracts Manager in 1991. Initially responsible for electric cable trenching business, he advanced with the growth of the Group and is currently the Executive Director and Chief Operating Officer to oversee multi-disciplined contracts.

He is an active member of the Institution. His past service includes Council Member, Chairman of the Electrical Division and Chairman of the HKIE-Continuing Professional Development Committee. Currently, he is the Chairman of the Professional Assessment Committee. In addition to the service to the HKIE, he is an Honourary Advisor of the Hong Kong & Kowloon Electrical Engineering & Appliances Trade Workers Union, Member of the Engineers Registration Board and Member of the Election Committee of the Chief Executive.





Dr. Ernest K W TSANG
Building Services Engineering
Delegation Chairman & Public Relations Officer

Ernest obtained his Doctor of Philosophy from the City University of Hong Kong. Ernest is a specialist in building energy and day-lighting modeling with more than ten research publications. Upon his graduation, he has joined Parsons Brinckerhoff (Asia) Ltd. as a Sustainability Consultant. He was involved in green building assessment and micro-climate analysis. Ernest joined YMC as helper in 2005 and was elected as a Committee Member in 2008. He is currently YMC's Chairman.



Ir Iman W M LAI
Civil Engineering
Delegation Manager

Iman obtained her Bachelor Degree of Applied Science in Civil Engineering and LLB degree from the University of British Columbia, Canada and the University of London, United Kingdom respectively, and is now a MBA candidate at the Hong Kong University of Science and Technology. She acquired charterhip recognised by professional institutes of Australia and Hong Kong. She is currently working as an engineer in Development Bureau of the Hong Kong Government and is responsible for Sichuan Reconstruction support work. After joining YMC as a helper in 2006, she is now the Deputy Chairman in 2011/2012. In the past years, she had opportunities to organise and join various valuable events, such as Young Engineers of the ASEAN Federation of Engineering Organisations' Conference, Dubai, Beijing/Tianjian and Sichuan Delegations.



Mr Jerry C W CHAU
Electrical Engineering

Delegation Deputy Manager

Jerry graduated from the Hong Kong Polytechnic University with a Double Degree in Electrical Engineering and Accountancy, and Master of Science in Electrical Engineering. He is now working in CLP Power Hong Kong Ltd., with main duties of cable diversion, and system operation for maintaining and improving power system reliability. He joined YMC as a Co-opted Member in 2010/2011 and is Committee Member in 2011/2012.



Ir Kenneth K W CHEUNG
Civil Engineering

Delegation Deputy Manager

Kenneth obtained his Bachelor of Applied Science in Civil Engineering from the University of British Columbia, Canada and his Master in Infrastructure Project Management from the University of Hong Kong. Kenneth is a professional engineer in Civil Engineering discipline in Hong Kong and is now working as an Engineer in the Maritime Section of URS Scott Wilson Ltd., responsible for design and project management of container terminal development in various parts of the world. He has been actively participating and contributing himself to YMC and is now a Committee Member of YMC.



Ir Ken K K CHAN
Civil Engineering

Overseas Liaison Officer

Ken obtained his Bachelor Degree in Civil and Environmental Engineering from the Hong Kong University of Science and Technology. He acquired charterhip recognised by professional institutes of Australia, United Kingdom and Hong Kong. Currently, he is working as an engineer in Development Bureau of the Hong Kong Government and is responsible for Sichuan Reconstruction support work.



Ms Emily H T YU
Geotechnical Engineering

Overseas Liaison Officer

Emily obtained her Bachelor of Applied Science in Geological Engineering from the University of British Columbia, Canada. Before she moved to Hong Kong, she worked in the environmental oil and gas sectors in Canada. As part of her training towards a professional Geotechnical and Civil Engineer, Emily has had experiences in designing for major projects such as reclamation works for the Hong Kong Link Road and site formation works for the Guangzhou-Shenzhen-Hong Kong Express Rail Link. Since Emily joined the geotechnical team of Atkins China Ltd., she has been actively developing her skills in all engineering-related aspects.



Ir Leo H Y CHAN
Information Engineering

Logistics Officer

Leo obtained his Bachelor of Applied Science in Computer Engineering from the University of British Columbia, Canada and his Master in Business Administration from the University of Bradford, United Kingdom. He is now pursuing his second Master Degree in Public Administration from the University of Hong Kong. A professional engineer in the Information Engineering discipline, Leo is working as an Engineer in Electrical and Mechanical Services Department (EMSD) of the Hong Kong Government. Furthermore, he is the Past Chairman of YMC, Honourary Treasurer of the HKIE Information Technology Division, Honourary Secretary of the Hong Kong Association of Professional Energy Engineers and Council Member of the Association of Professional Engineers of EMSD.



Ms Serene Y M CHEUNG
Electrical Engineering

Logistics Officer

Serene obtained her Bachelor Degree in Electrical Engineering from the Hong Kong Polytechnic University and is subsequently pursuing a Master Degree in Electrical Engineering. She is working as a Graduate Trainee in CLP Power Hong Kong Ltd. and is currently a helper in HKIE.





Mr Timothy L CHAN
Civil Engineering

Editor

Timothy obtained his Bachelor Degree of Applied Science in Civil Engineering from the University of British Columbia, Canada. He is currently working as an Assistant Resident Engineer in Mott MacDonald Hong Kong Ltd., responsible for contract administration and construction supervision for the design and build project of drainage tunnel.



Ir Kelvin Y M CHOI
Civil, Structural and Geotechnical Engineering

Editor

Kelvin spent years specializing in tunnelling, blasting and geotechnical - design and construction works. He worked both on site and in design office to supervise various engineering works and participated in local and overseas infrastructure projects. He was awarded the memberships in the HKIE (CVL, STL, GEL), IMMM, IStructE, and ICE, together with registration as Chartered Engineer. Furthermore, he is Council Member of the Institute of Materials, Minerals and Mining Hong Kong Branch. He is currently working as Deputy Design Manager of Dragages Hong Kong Ltd for Guangzhou-Shenzhen-Hong Kong Express Rail Link tunnels project.



Ms Vicky Y CHEN
Environmental Engineering

Local Liaison Officer

Vicky obtained her MPhil Degree in Civil Engineering from the Hong Kong University of Science and Technology. After graduation, she joined Water and Urban Development Department in AECOM Asia Company Ltd. She is currently working as an Assistant Resident Engineer for trunk sewer upgrading construction in North District under Drainage Services Department's project.



Mr Dominic C Y MOW
Civil Engineering

Local Liaison Officer

Dominic obtained his Bachelor Degree in Civil Engineering from the Hong Kong Polytechnic University. He is currently working as a Graduate Engineer in AECOM Asia Company Ltd., participating in different projects of traffic design including Traffic Incident Management System, Shatin to Central Link as well as Lam Tin Tseung Kwan O Tunnel.



Ms Venice C L HUNG
Building Services Engineering

Treasurer

Venice obtained her Bachelor Degree in Building Services Engineering from the University of Hong Kong. Upon her graduation, she joined Parsons Brinckerhoff (Asia) Ltd. as an Assistant Engineer and has been trained to become a professional Building Services Engineer. She joined YMC as a helper in 2009 and is now a Committee Member.



Mr Terris T C LO
Mechanical Engineering

Secretary

Terris obtained his Bachelor Degree in Mechanical Engineering from the University of Hong Kong in 2011. He is now working as a Graduate Trainee in Hongkong Electric Company Ltd. As a fresh graduate from the University, he has just started off his engineering career path by participating in a number of company and HKIE events.



Ms Kathy S Y WONG
Civil Engineering

Publication Officer

Kathy was graduated from the University of Hong Kong with a Bachelor Degree in Civil Engineering in 2010. Upon her graduation, she joined China State Construction Engineering Corp. Ltd. as a Graduate Engineer. She is currently pursuing a Master Degree in Geotechnical Engineering. At present, she is responsible for various site operation works and achievement of construction programme.



Mr Ken O K WONG
Civil Engineering

Publication Officer

Ken obtained a Master Degree in Civil Engineering from the University of Bristol, United Kingdom. He is now working as a Graduate Engineer in the transportation business line in AECOM Asia Company Ltd. During his training, he had experiences in designing highways structures for some major infrastructures projects including Shatin to Central Link and the Guangzhou-Shenzhen-Hong Kong Express Rail Link.



Ir Leo H Y CHAN

Vancouver is widely recognised as one of the most livable cities in the world. Therefore, the focus of this Delegation is to study how Vancouver engineers contribute to quality living of Vancouver citizens. This Delegation not only widen my exposure in latest technologies in clean air, clean water and green building, I also gained first-hand insights in learning how Canadian engineers bring sustainability into every work they do, from policies formulation to building construction; from research to public education. Furthermore, through organising this Delegation, not only could I sharpen my management skills, I also met some life-long friends. I highly recommend YMC Overseas Delegation to all young engineers alike.

Mr Timothy L CHAN

It is good to be home to explore and learn how Vancouver is engineered as the "Most Livable City". Through preparation and participation of Delegation, not only could I learn about technical aspects in vast range of engineering specialties, but also develop my communication and presentation skills. I would like to give thanks to each of my awesome teammates with collaborative efforts for delivering such a memorable and fruitful trip. I am amazed by the delegates' passion, eagerness and enthusiasm for engineering throughout the Delegation. Let's engineer Hong Kong into another "Most Livable City".

Ms Emily H T YU

I have called Vancouver home for most of my life, and she is truly an exceptionally livable city. This Delegation trip helped me to understand why: not only could the citizens embrace a green lifestyle, but the city has gone to great lengths to stay in harmony with beautiful natural environment in which Vancouver takes pride in. We, too, can make Hong Kong more livable with the leadership of engineers and support from the government.

To the delegation team – thank you for your commitment, enthusiasm, and most of all, your friendship throughout this unforgettable experience. I have learnt a great deal being in this amazing team. I am also grateful to HKIE, YMC, and our sponsors for continuous support to Overseas Delegation. The insights we gained from our exchanges are invaluable to our careers. Let's engineer a more livable Hong Kong together.

Ms Venice C L HUNG

The eight-day wonderful Delegation in Vancouver with 15 working hard, playing hard delegates is a memorable experience to me. Before understanding the policies and technologies adopted in Vancouver, taking a deep breath could immediately experience how she becomes the most livable city in the 21st Century. Through seminars and visits there, it was easy to feel how the quality of life is important to Vancouver citizens, especially on air quality policies and urban planning. Other than knowledge, friendship and management skills were also gained when organising Delegation. Thanks to advisors for their experience sharings during the trip. Certainly, many thanks to all delegates who made Delegation an unforgettable and successful one.

Ms Serene Y M CHEUNG

Worked, explored, played and shared with other 15 delegates during this eight-day fruitful trip gives me a memorable experience. This Delegation not only delivers us knowledge and experience, but also friendship. It widen my engineering exposure concerning on technologies on clean air, water treatment, green building and sustainability development. This journey does not mark an end with the success of the trip. Instead, it provides opportunities for us to review the current situation in Hong Kong and how young engineers contribute for a better Hong Kong. It is truly an invaluable experience and definitely an unforgettable part of my life.

Ms Kathy S Y WONG

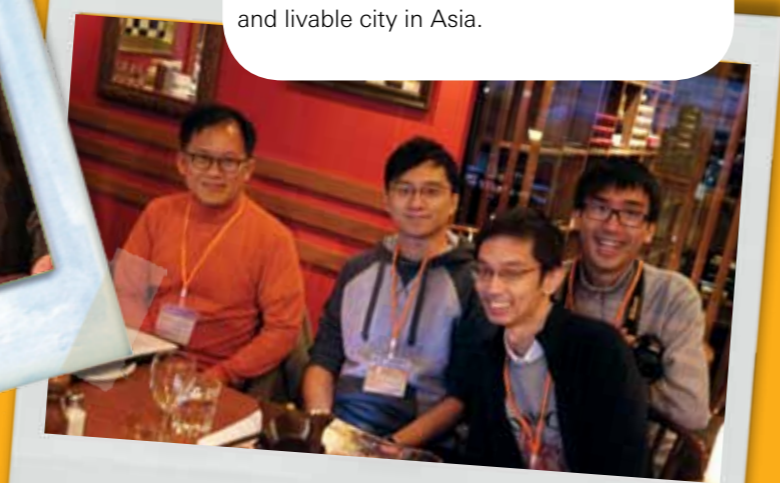
Through joining Overseas Delegation 2012 to Canada, my horizons were widened. This trip is very inspiring and I gained many memorable and once-in-a-life time experiences with my teammates and overseas counterparts. The main themes of the delegation are Innovation, Technology and Synergy. During the site visits and seminars with different engineering parties, I realised how the Canadian engineers devoted in clean air, clean water and green building works. I appreciate they can bring sustainability into every aspects of life. Canada is a really worth-visiting country with lots of new technologies implemented. The Overseas Delegation brings me not only insights of quality living, but also a team of cooperative delegates.

Ms Vicky Y CHEN

It was really a valuable and wonderful experience with other 15 young delegates and advisors to explore Vancouver. I really learnt a lot from this fruitful engineering visit. Not only could it enhance my engineering knowledge on various areas such as water, power, building, but also strengthen my social skills such like communication skills with different persons from different backgrounds, presentation skills and team work skills. Now I hope we can contribute more to Hong Kong with the things learnt from the most livable city – Vancouver and make Hong Kong to be the most energetic and livable city in Asia.

Ir Iman W M LAI

Vancouver is one of the most livable cities in the world. How engineers in Vancouver can contribute to make the city a better place for living? Through this Delegation, not only could we learn the latest technological developments and applications in green building, clean water and clean air, but also appreciated commitment of Vancouver engineers in bringing an environmentally sustainable future together with citizens, businesses and governments. It is an honour to be part of the dedicated and intelligent Delegation team. We promoted the professional image of HKIE, YMC and Hong Kong engineers and gained friendship. Hong Kong, where are we moving next? We, young engineers, are looking forward to contributing to building of greener communities and enhancing quality of life for Hong Kong citizens.



Ir Ken K K CHAN

Vancouver, Canada has been ranked among the top world's most livable cities. In this Delegation, I could really see the planning and continuous efforts of their government bodies, academic and professional institutions and engineering industries to reach the goal of becoming the world's most livable city. Apart from learning the latest engineering practice in Vancouver with respect to their physical, environmental and economical setting, I have also made friends with a group of brilliant and young engineers of various disciplines. All-in-all, I have had a very fruitful journey to Vancouver.

Mr Dominic C Y MOW

From planning the Delegation to visiting the most livable city, Vancouver, it is my honour to work with 15 outstanding and passionate young engineers who are from various engineering disciplines through out these several months. Through a series of meetings in Hong Kong and day-to-day visits in Vancouver, I acquired not only the engineering knowledge in sustainability and green features that are adopted in Vancouver, but also the organisation skills, communication skills as well as the presentation skills from each delegate. I strongly believe that some green concepts in Vancouver can be useful and applied to Hong Kong which can lead our city to become another most livable city in the world.

Mr Ken O K WONG

Sustainability is one of the major issues concerning everyone in this planet, especially in Vancouver, which aims to become the greenest city in the world in the 21st Century. I am glad to have this special experience, to personally expose to their actions and plans and to exchange ideas and thoughts with different engineering background experts in the city.

Being in the delegation team, not only does it enhance my engineering knowledge, but also gain valuable soft skills, especially event organising, team working and social skills. I was deeply touched by all delegates' enthusiasms. Without their supports, the trip would not be so rewarding and successful. I hope the experiences and findings overseas would be a meaningful feedback to our society.

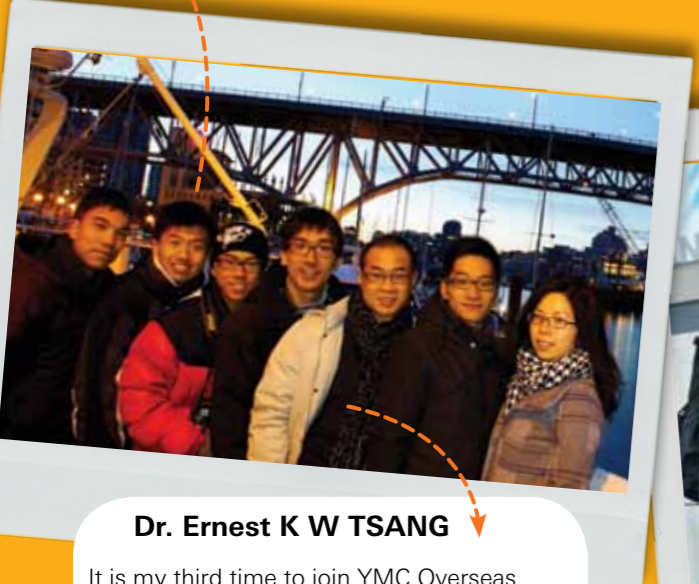
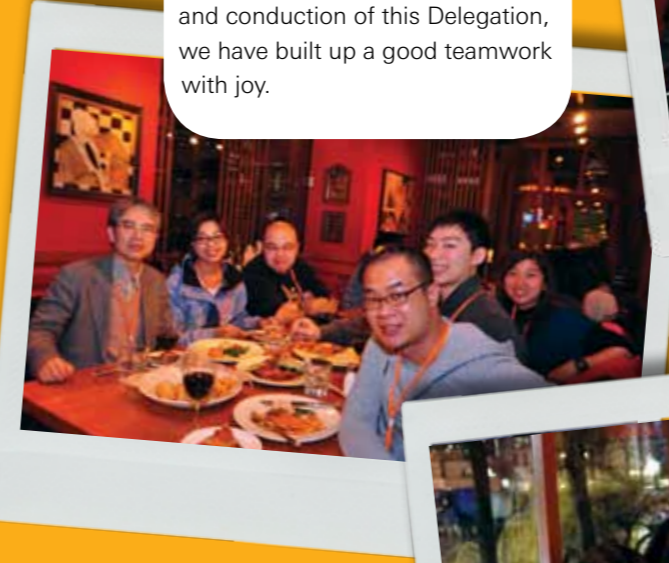
Ir Kenneth K W CHEUNG

Being part of this Delegation is an exciting and unforgettable experience! Through visiting Vancouver, which was recognised as one of the most livable cities in the 21st Century, it has certainly broadened our knowledge in different aspects of sustainability, from government green policies to sustainable buildings, from development in renewable energy to clean water, for us to learn, value and bring back to our engineering profession. Rewarding experience extends to the friendship gained among the Delegation through hours of hard work and fun we had together before, during and after this Delegation. This Delegation undoubtedly widened our horizons and boosted our passions to create a better and "sustainable" tomorrow.

Mr Jerry C W CHAU

I am glad to have this fruitful experience to broaden my horizons in the engineering field, especially the sustainability and advanced technology aspects. The content included town planning and strategy formation, which are the interesting topics for me to learn the upstream of engineering projects.

I was much impressed by enthusiasm, passion, diligence and smart shown by the delegates. Through challenging preparation and conduction of this Delegation, we have built up a good teamwork with joy.



Dr. Ernest K W TSANG

It is my third time to join YMC Overseas Delegation. In each trip, I acquire different skills and knowledge. Similarly in this year, the practices in Vancouver inspire me on how a pleasant environment can be created for our citizens. It is heartening to meet with Hong Kong engineers staying there and Past President (1976/1977), Ir Prof S Y KING. I am proud of their contributions to Vancouver. We have also learnt that they are caring about the developments of Hong Kong and institution. I promise that I will bring their experience back and apply them in Hong Kong. I would also like to express my thanks to all Advisors and Delegates. I believe our friendship will last forever.

Ir Kelvin Y M CHOI

What an unforgettable trip!

Breathing clean air, drinking clean water, and stepping onto green buildings... we, sixteen delegates had fruitful journey to the most livable city in the world. Greenings were found everywhere within Vancouver, from flowers along roadside to green roof on the landmark - Vancouver Convention Centre. It illustrates how citizens engineer their sustainable living with their vision, spirit, and goals. We were impressed by how they shape their living place to such a wonderland. We, young engineers, learnt from them. It is time for us to feedback and contribute to the sustainable development in Hong Kong.

Mr Terris T C LO

"Engineering the Most Livable City in the 21st Century" is never an easy task, especially with an uplifting expectations from the general public. 16 delegates from various engineering discipline were then paid a visit to Vancouver, Canada and had exchange about the visions of the most livable city, in terms of green building, clean air and clean water.

It is my honour to work with the fellow young engineers from different disciplines. The working experience with the fellow delegates was awesome, and I have learnt a lot from them through their engineering expertise. I surely believe that our friendship would be everlasting.

"Engineering the most livable city, engineering Hong Kong." Let's shape our beautiful City with awesome young engineers.

Acknowledgement

We would like to express our deepest gratitude to the following organisations for their helpful guidance and enduring support leading to the success of this Delegation:

Association of Professional Engineers and Geoscientists of British Columbia
 Canadian Council of Professional Engineers
 Canadian Society for Civil Engineering
 Canadian Hydrogen and Fuel Cell Association
 The Hong Kong Institution of Engineers – Canadian Chapter
 The University of British Columbia
 Institute of Electrical and Electronics Engineers - Vancouver Section

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Mr Jeff ERTEL	Ms Nikki Qianni JIANG	Mr Walton WANG
Ms Sarah FAUCHER	Mr C M KWAN	Ir Michael WRIGHT
Mr Cecil FONG	Ir Y L KWAN	Mr Stephen YIM
Ms Carmen GERMAIN	Mr Edwin LEE	Ir Albert YUEN

Acronyms

AAEE	American Academy of Environmental Engineers	IEEE	Institute of Electrical and Electronics Engineers
AC	Alternating Current	IMEchE	Institution of Mechanical Engineers
APEGBC	Association of Professional Engineers and Geoscientists of British Columbia	IPP	Independent Power Provider
BC	British Columbia	IRP	Integrated Resource Planning
BC Hydro	The British Columbia Hydro and Power Authority	IT	Information Technology
BD	Buildings Department	KMB	The Kowloon Motor Bus Co. Ltd.
BEAM	Building Environmental Assessment Method	KTD	Kai Tak Development
BIM	Building Information Model	LED	Light Emitting Diode
BRDP	Bioenergy Research and Demonstration Project	LEED	Leadership in Energy and Environmental Design
CERC	Clean Energy Research Centre	MTRC	Mass Transit Railway Corporation
CHP	Combined Heat and Power	NENT	North East New Territories
CIBSE	Chartered Institution of Building Services Engineers	NEU	Neighbourhood Energy Utility
CIRS	Centre for Interactive Research on Sustainability	NGO	Non-governmental Organisation
CLP	The CLP Power Hong Kong Limited	NO_x	Nitrogen Oxides
CO₂	Carbon Dioxide	OTTV	Overall Thermal Transfer Value
CSCE	Canadian Society for Civil Engineering	PEM	Proton Exchange Membrane
CUHK	The Chinese University of Hong Kong	PRD	Pearl River Delta
DC	Direct Current	PV	Photovoltaic
DCS	District Cooling System	RCD	Residual Current Device
DES	District Energy System	RE	Renewable Energy
DSD	Drainage Services Department	RMOW	Resort Municipality of Whistler
DSM	Demand Side Management	RSP	Respirable Suspended Particulates
EAC	External Advisory Committee	SEFC	Southeast False Creek
EMS	Energy Management System	SENT	South East New Territories
EMSD	Electrical and Mechanical Services Department	SISTP	Stonecutters Island Sewage Treatment Plant
ENB	Environment Bureau	SO₂	Sulphur Dioxide
EPD	Environmental Protection Department	STW	Sewage Treatment Works
ERB	Engineers Registration Board	TFPV	Thin Film Photovoltaic
EV	Electric Vehicle	TWM	Total Water Management
GAC	Granular Activated Carbon	UBC	The University of British Columbia
GBS	Green Building Strategy	UK	United Kingdom
GCAT	Greenest City Action Team	US	United States of America
GHG	Greenhouse Gas	VAV	Variable Air Volume
GOLD	Graduates of the Last Decade	VOC	Volatile Organic Compounds
HATS	Harbour Area Treatment Scheme	VCCW	Vancouver Convention Centre West
Hongkong Electric	The Hongkong Electric Company Limited	WENT	West New Territories
HKCIC	Hong Kong Construction Industry Council	WHO	World Health Organisation
HKIE	The Hong Kong Institution of Engineers	WSD	Water Supplies Department
IAQGMP	Integrated Air Quality and Greenhouse Gas Management Plan	WWTP	Whistler Wastewater Treatment Plant
		YMC	Young Members Committee
		ZCB	Zero Carbon Building



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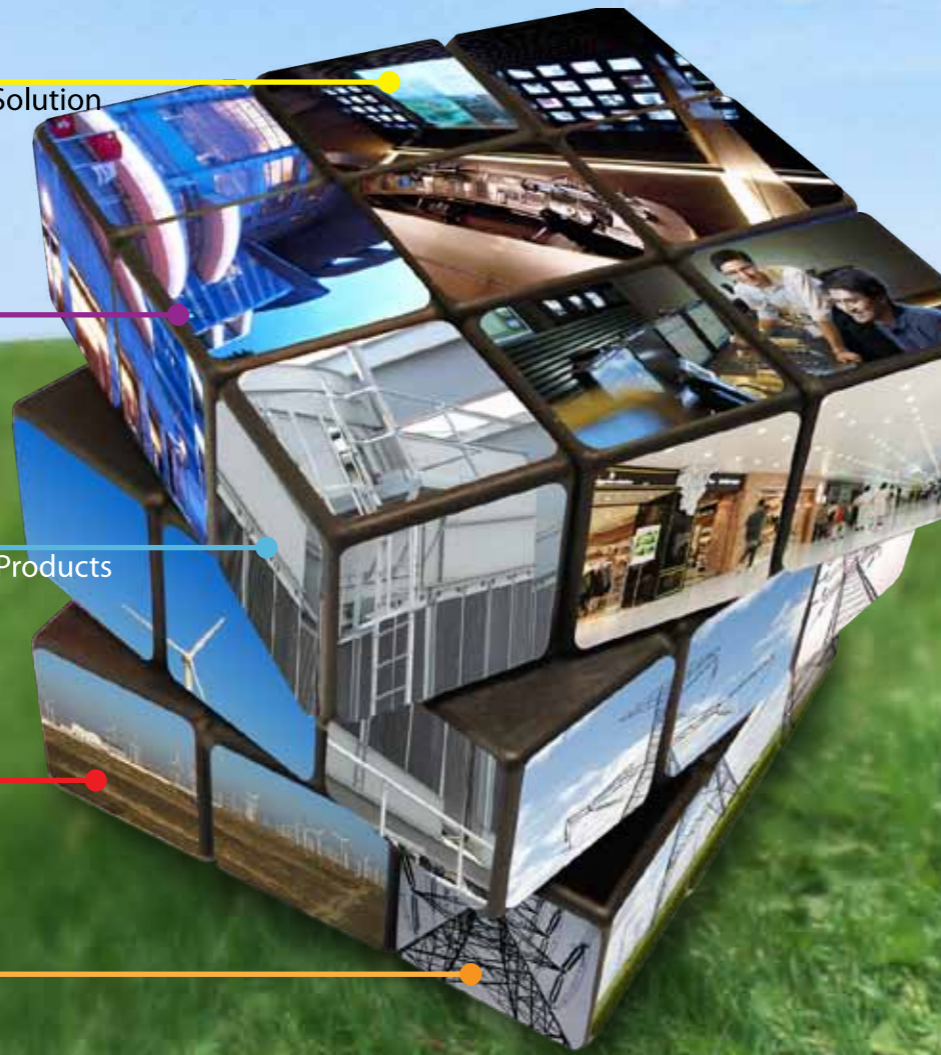
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我們的願景

我們致力在城市基礎設施的管理、營運、建造和保養領域擔當領先角色，為香港的持續發展作出貢獻。

Our Vision

We aspire to play a leading role in the management, operation, construction and maintenance of the city's critical infrastructure to enable sustainable development of Hong Kong.

我們的使命

我們不斷開拓進取，通過優質的供電系統、電力、建築、土木、機械、照明等工程服務，為客戶提供最適切及時、最具效益的解決方案，同時關顧所有持份者。

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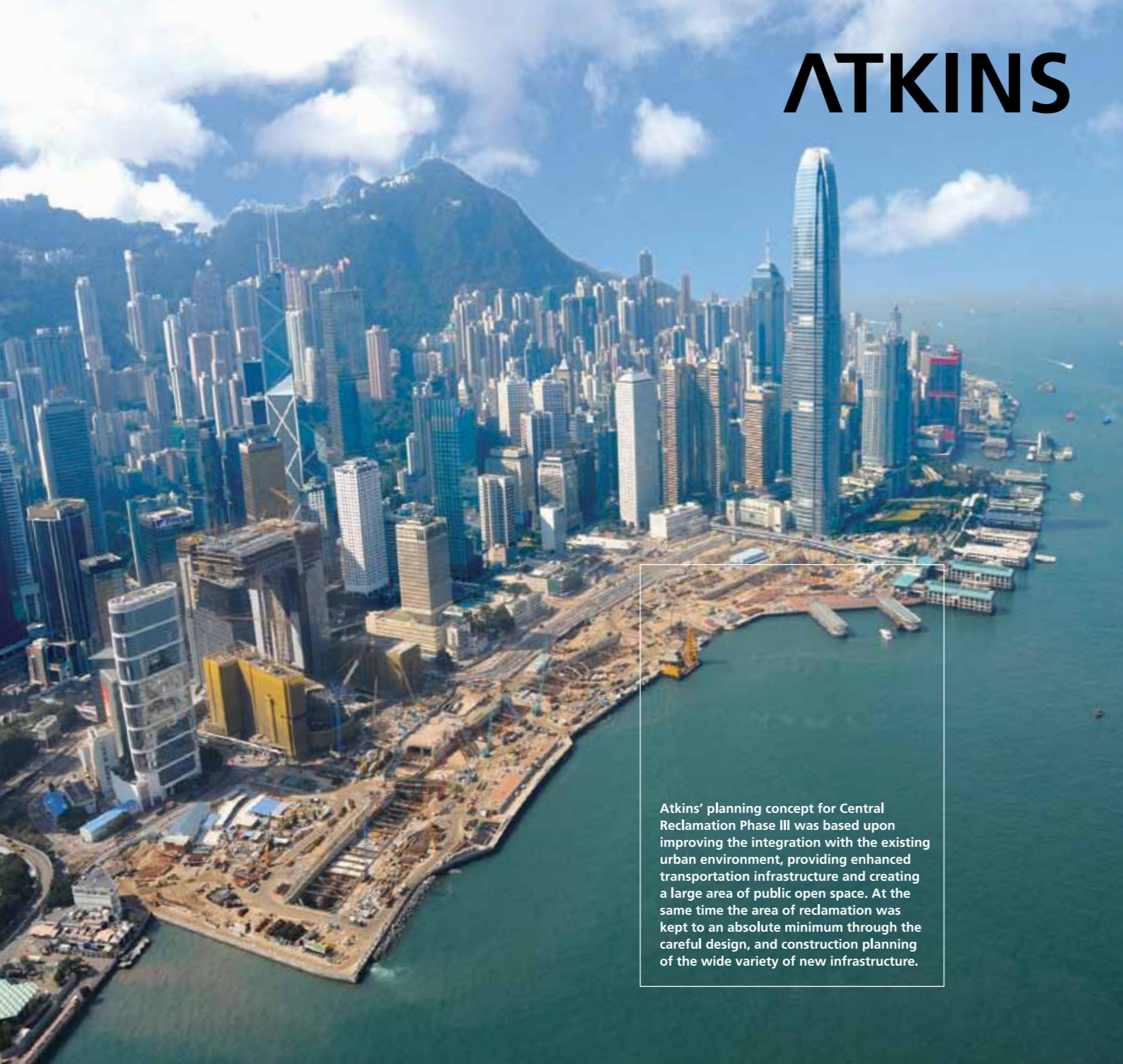
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*主要氣體包括二氧化碳、粒狀物及氧化氮

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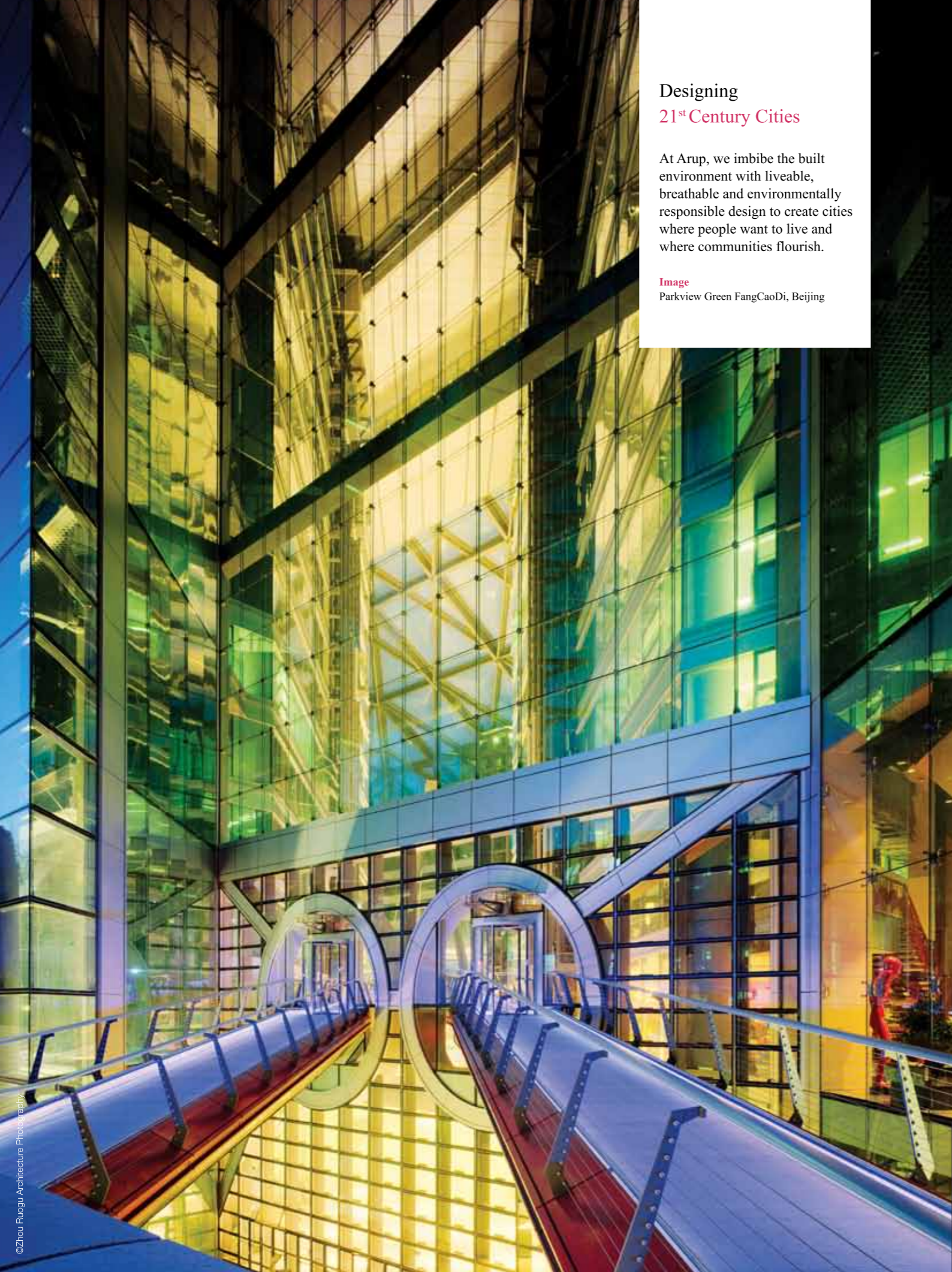
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