THE HONG KONG INSTITUTION OF ENGINEERS
香港工程師學會

NEW ZEALAND

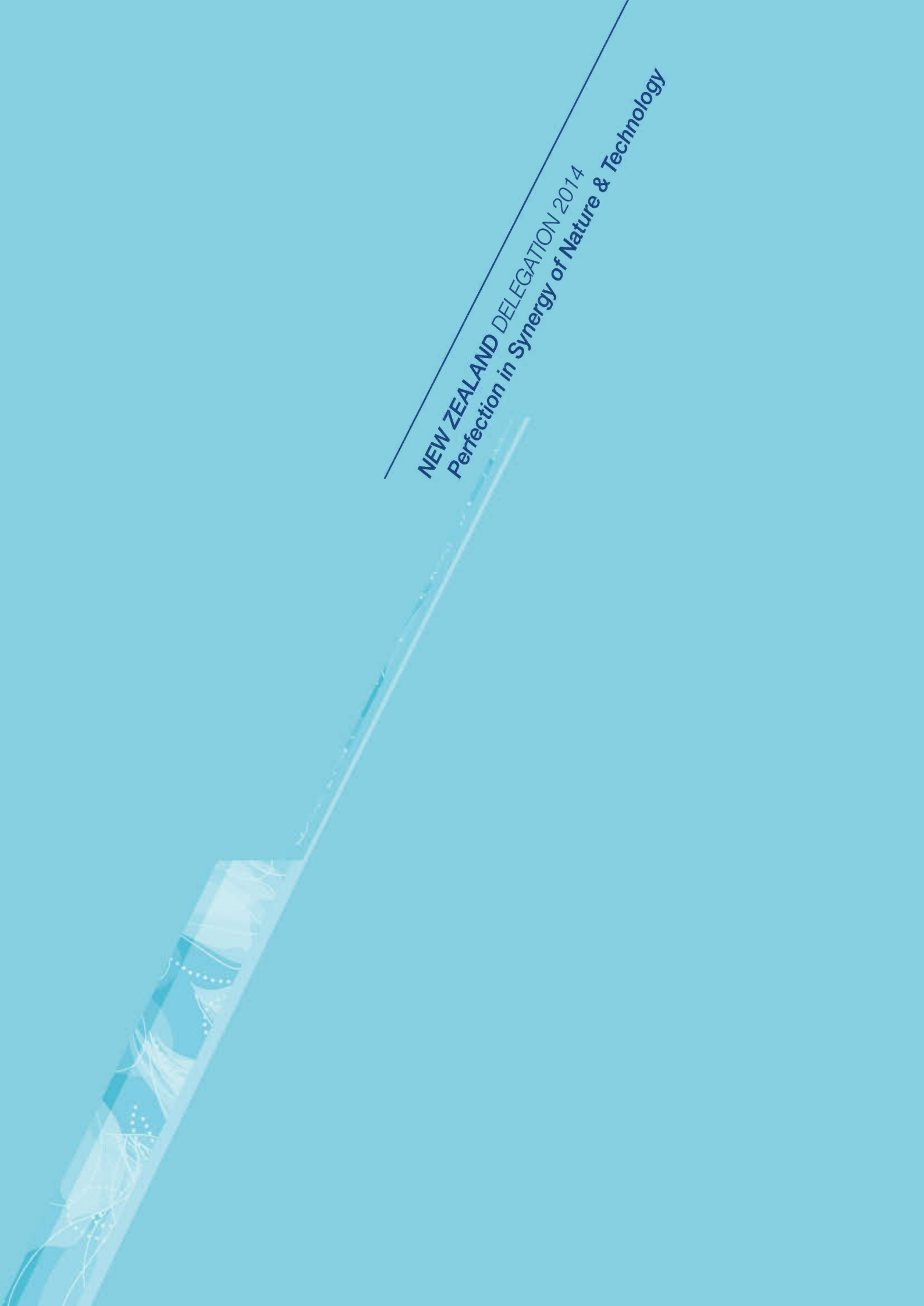
PERFECTION IN SYNERGY OF NATURE & TECHNOLOGY

DELEGATION

2014

NEW ZEALAND DELEGATION 2014 - Perfection in Synergy of Nature & Technology

HKIE - YMC & HKIE - Continuing Professional Development Committee


NEW ZEALAND DELEGATION 2014
Perfection in Synergy of Nature & Technology

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Ir Raymond K S CHAN, BBS

President, the HKIE

New Zealand's achievements in integration of nature and technology have been significant, and the country has been generally ranked highly on international livability measures, e.g. Auckland was ranked the world's 3rd most livable city in 2012.

To align with the theme of the Hong Kong Institution of Engineers (HKIE) this year "High Gear for New Technology, a Mindset for Change" and the theme of Young Members Committee (YMC) Overseas Delegation "Perfection in Synergy of Nature and Technology", it is most opportune and inspiring for the YMC to have chosen New Zealand as the destination for this year's overseas delegation. I am extremely impressed by the YMC's efforts in putting together the March delegation to Auckland and Christchurch, including the thorough year-long preparatory and research work.

I have had the privilege to join the full trip this year and experienced a great deal from the trip, for instance, the most advanced technology of renewable energy including hydro power, geothermal power and wind power, the new idea of shared space of pedestrian and vehicle in the city of Auckland, the innovative revitalisation of the inner city waterfront led by the Waterfront Auckland, as well as the effective leadership and coordination works for the ongoing recovery works in Christchurch of the Canterbury Earthquake Recovery Authority (CERA).

In the exchanges with Institution of Professional Engineers New Zealand (IPENZ), the University of Auckland and University of Canterbury, we shared their experiences of the engineering practice in New Zealand. I am sure the young delegates also enjoyed every minute of the trip and will be benefited from it in the years to come.

My special tribute to Ir Vincent Leung and Ir Annie Chan for their leadership and congratulations to everyone in the team for their dedicated teamwork, enthusiasm and effort.

The Overseas Delegation organized by our YMC every year is always meaningful. I have joined these delegations in recent years and visited a number of cities, such as London, Vancouver, Frankfort and Munich. These visits have given me lots of valuable and unforgettable experiences. It was regrettable however that I could not be able to participate in this year's trip to New Zealand, due to other commitments. In any case, I would expect to share some experience from our young delegates in the coming debriefing session.

With the theme of "Perfection in Synergy of Nature and Technology", and based on the well planned itinerary together with much detailed background information prepared by the delegates, I have full confidence that our young members have demonstrated their good team spirit and excellent organizing ability for a successful overseas study trip.

I have to express my appreciation to Ir Annie Chan, Ir Vincent Leung and other young delegates for their success in organizing this overseas delegation, which has achieved fruitful and valuable results.

Immediate Past President, the HKIE

Ir Prof. CHOY Kin Kuen

Senior Vice President, the HKIE

Ir Victor C K CHEUNG

I would like to commend the YMC for successfully organized the overseas delegation to New Zealand this year. As usual, the trip was well planned and all participants took part in the preparation and execution of the trip. The concerted effort of the delegation team members made the event much more fruitful and meaningful.

I find the theme of this year's overseas delegation – Perfection in Synergy of Nature and Technology very appropriate. New Zealand is not only best known of its beautiful sceneries with spectacular mountains, lakes and rivers – an ideal holiday destination, it is also a leading nation in environmental sustainability, with over 30% of its energy supply generated from renewable energy, primarily hydroelectric power and geothermal power. New Zealand is also one of the world's most active places for seismic activity and it is reported that its building code is one of the most stringent in the world.

Through this trip, our young engineers had the opportunity to gain valuable insight on how technological development could blend in with nature harmoniously and how the New Zealand government effectively tackles the challenges of re-development after the recent earthquakes. I am sure that the experience gained through the learning and sharing process of the delegation will be most beneficial to their professional career advancement.

I would like to congratulate Ir Vincent Leung, Ir Annie Chan and the delegation team members for accomplishing this successful mission.

The YMC chose New Zealand as their destination for their Overseas Delegation 2014. This a very good choice, since New Zealand is a country of great natural beauty yet much less populated than what we are accustomed to. And this is where they can find some prime examples as to how engineering can harness the power of nature to serve mankind on the one hand, and on the other how mankind learn to live in harmony with nature.

The Delegation had a very packed programme, visiting a lot of places and among them a few power plants of renewable energy: hydropower, wind energy and geothermal generation. Such visits will certainly enhance the participants' appreciation of the effort put in by the New Zealanders in dealing with issues associated with climate change. The knowledge and experience so gained will be useful when they have to handle similar issues back in Hong Kong.

New Zealand also has some particular geological environments – volcanoes and earthquakes, something that is not commonly encountered in Hong Kong. While there is no way to prevent natural phenomenon from occurring, how the New Zealanders adapt their lives to it and how they recover after an occurrence will surely enlighten the Delegation. Indeed, Hong Kong has our own share of natural phenomenon to cope with, be it typhoons or flooding or landslides, but the delegates will be better equipped after this tour.

I wish to congratulate the Delegation under the leadership of Vincent and Annie. Their effort in the past few months paid off very well with the successful completion of their visit. I am sure they will all cherish their time together and the wonderful experience gained from this project, something that will enrich their professional development and career.

Vice President, the HKIE

Ir CHAN Chi Chiu , SBS, JP

Vice President, the HKIE

Ir Joseph K H CHOI

I would like to express my heartfelt congratulations to the YMC for having successfully organized their overseas delegation to New Zealand.

New Zealand is a smart choice for the delegation. New Zealand is a country with a very close relationship between nature and technology. With clear objective in striking for taking the balance between development and nature, New Zealand cities generally rank highly on international livability measures. I trust that all delegates have gained a lot after the visit, not only through technical visit and seminar but also the valuable sharing sessions with young engineers in New Zeland.

The delegation has been prepared for months while the teamwork of the YMC Delegation under the leadership of Ir Vincent Leung, the Delegation Manager and Ir Annie Chan, the Delegation Chairman, has been well demonstrated and is particularly impressive.

I would also like to take this chance to appraise YMC to publish this report and to prepare the debriefing presentation to share their learning experiences. I am looking forward to joining the debriefing presentation conducted by the delegates.

The Overseas Delegation organized by the YMC is always an event that HKIE can be proud of and this Delegation makes no exception. It is executed with dedication and professionalism, with almost military precision. From recruitment of delegation members, assignment of preparation works, meeting peers and visiting local projects prior to the trip, establishing contacts overseas, organizing the programme, ably representing the Institution to host organizations and Institutions overseas, and publishing of the Report fully illustrate the competency and team spirit of the Delegation. I often wish design and execution of engineering projects could be as efficient and effective.

This theme of the Delegation is "Perfection in Synergy of Nature and Technology" which covered topics related to transportation, natural resources, and natural challenge. As someone who takes a keen interest on energy, environment, climate change and sustainability, the theme sounded a resonant chord in me. If one refers to the "Summary for Policymakers" published recently by IPCC (Intergovernmental Panel on Climate Change). It is now beyond reasonable doubts that human activities, particularly the discharge of green house gases, is making significant impacts on the natural environment. I believe delegation members had the opportunities during this trip to witness how engineering projects in New Zealand could damage or be in harmony with nature. It is the choice we engineering professionals should learn to make. Such decisions would change the course of our mother earth in the decades to come.

I must therefore congratulate the Delegation under the able leadership of Ir Vincent Leung and Ir Annie Chan for organizing this trip on a subject which is most relevant to the way how engineers should practice taking nature into consideration. My only regret is that I could not take part on this trip but I look forward to learning more at the presentation session.

Past President, the HKIE

Ir Dr. Otto L T POON, BBS, OBE

Ir Edmund K H LEUNG, SBS, OBE, JP

Past President, the HKIE

I have had the privilege and honour to have been invited to be one of your delegation advisors for many years, and this year has been no exception.

I always support the organizing of overseas delegations for young engineers as I believe in "seeing is believing", there is so much we can learn from seeing projects overseas. The opportunity to experience foreign culture is also most valuable. Such valuable experience, both technical and cultural, will definitely become useful in one's career.

New Zealand is a remote country from Hong Kong, and has very different characteristics. They have vast expenses of land, plentiful resources, and a relatively small population, which makes it much easier for them to pursue the ideals of preserving nature and causing minimal harm to the environment. However, that does not mean that they do it at the expense of technical development. As the delegates have found out themselves, there had been a lot of successful technical development, a lot of which can be applied to Hong Kong, even though we have vastly different characteristics and constraints.

I therefore envy those who have joined the delegation and saw these projects with their own eyes. I only hope that they will share the knowledge with other members of the Institution so that we can all learn from it.

I take this opportunity to congratulate Delegation Manager Ir Vincent Leung for his able leadership, and all other delegates for excellent teamwork, and I look forward to seeing future delegations equally being successful.

I am honoured and privileged to be invited to be one of the Delegation Advisors for the third year. I always consider organizing an Overseas Delegation is the best Continuing Professional Development (CPD) event on team building and project management. It also arouses our young engineers' potential in leadership and motivates the young ones' vision to learn from overseas good practices. That is why CPD Committee has no hesitation in providing financial support to this meaningful event every year.

The theme this year is "Perfection in Synergy of Nature and Technology" with New Zealand as the chosen country which enjoys the good reputation on maintaining harmony between nature and technology. With heated debate on how to achieve the balance between development and environmental protection in Hong Kong, it is high time for our young engineers to see how New Zealand, a country whose cities generally rank highly on international liveability measures, is doing and get an insight on how we should move ahead.

During the selection interview of the delegation team, I am deeply impressed by the eagerness of our young engineers to get first hand information on the study areas – transportation, natural resources and natural challenge, through this delegation. All the candidates were willing to devote their time to make the delegation a success.

The delegation must be eager to share their findings not just from the visit but also the several months hard work in organizing the New Zealand visit and other local seminars / visits with our members. I am looking forward to reading the Delegation Report which would certainly inspire other young engineers to participate in the next overseas delegation to experience for themselves another insightful journey.

Lastly, I must congra tulate the YMC in particular Ir Vincent Leung and Ir Annie Chan for their success in organizing this delegation.

Ir CHAN Siu Tack

Chairman, the Continuing Professional Development Committee, the HKIE

Ir Gary C W KO

Chairman, the Professional Assessment Committee, the HKIE

One phenomenon of urbanization in this part of the world is foggy weather and unclear sky. Dense building, congested traffic, heavy industrial production may be amongst the contributing factors. They are, nevertheless, signs of development and are closely linked to economic prosperity that mankind has been pursuing since the beginning of civilization. Is the road to improving living standard always paved with undesirable environmental impact? What roles can engineers play to preserve our globe? Will the younger generation innovate more ingenious ways to benefit the future? There are many answers and yet none of them may be comprehensive! Neither will there be any easily implemented ways! However, a visit to New Zealand will, I am sure, drive most people to exert effort more proactively to pursue the preservation of the environment when we are immersed in development. Blue sky, clean air and natural beauty coexist with an urbanized civilization. I am glad that the YMC has a delegation to visit the southern hemisphere to experience it.

I understand that most of the delegation members are first time visitors to New Zealand, a country which is foreign but, because of her British heritage, may look familiar to members in some perspectives. I have learned that members of the delegation have paid visits to various places of disparity including non-technical ones. This exotic experience has broadened their horizon and will bring profound effects in their future career advancement. I am proud to be associated with this annual eye-opening event for our young members. Like the widely quoted Chinese saying tells, knowledge enhancement is not just by reading piles of books, it would better be attained by travelling hundreds of places. I look forward to seeing the YMC to continue this annual pains taking tradition.

Lastly, I would congratulate the YMC in particular Ir Vincent Leung and his team to have organised this successful New Zealand Visit.

I write to congratulate the success of YMC Overseas Delegation 2014 to New Zealand.

Organizing overseas delegation to widen the exposure of young engineers in engineering topics is YMC's tradition. Carrying on the footsteps of our predecessors, we organized a delegation to New Zealand this session with the theme "Perfection in Synergy of Nature and Technology". Throughout this delegation, I appreciate that our delegation team could learn natural resources utilization, transport network and construction and the advanced technologies for tackling the natural challenges in New Zealand. It is hoped that their observations and knowledge could be applied and shared with other engineers in Hong Kong.

I would like to express our sincere gratitude to our advisors, including Ir Raymond K S CHAN, Ir Prof. K K CHOY, Ir Victor C K CHEUNG, Ir C C CHAN, Ir Joseph K H CHOI, Ir Dr. Otto POON, Ir Edmund K H LEUNG, Ir S T CHAN and Ir Gary KO, for giving supports and advices to the delegation. I must express my particular thanks to President Ir Raymond K S CHAN to take time out from his busy schedules in joining our trip and giving us valuable advices.

This delegation is made possible by the generous financial support from the HKIE – Continuing Professional Development Committee and sponsored companies, which are gratefully acknowledge.

Lastly, my sincere gratitude goes to all delegates taking part in this delegation particularly the great effort made by the Delegation Manager, Ir Vincent LEUNG, and the two Deputy Delegation Managers, Ir Kenneth CHEUNG and Ms Emily YU, that make this Delegation a successful one.

From preparation work to overseas logistics, from organizing seminars and visits to writing this delegation report, all are done by our delegates. Therefore, I invite you to read this report in detail. I hope that you could share our view as if you were to participate in this Delegation.

Ir Annie O Y CHAN

Chairman, the Young Members Committee, the HKIE

Ir Vincent C T LEUNG

Delegation Manager,
Honorary Secretary,
the Young Members Committee,
the HKIE

Human is living with the support from the nature and it is the responsibility for engineers to efficiently utilize the natural resources to continuously improve living standards of mankind. However, while we enjoy very much the new technologies to utilise the natural resources which invented and developed by the engineers, it is no doubt that we are also suffering from the challenges brought by the adverse effect of over-developing and the natural hazards. How can we efficiently utilize the natural resources by strike a balance between development and environment impact? How can we deal with the natural challenges?

Under the theme of "Perfection in Synergy of Nature and Technology", the YMC Overseas Delegation 2014 to New Zealand was organized to serve as an inspiration for young engineers to think proactively our role in dealing with natural resources and challenges and in the meantime, to equip our future leaders with new experience and global exposure to different engineering practices in New Zealand.

This Delegation could not be made possible without the generous financial assistance provided by the Continuing Professional Development Committee and sponsoring companies. On behalf of the Delegation Team, I would like to express our sincere thanks to all of them.

I would also like to express our greatest gratitude towards all receiving organizations for giving us an insight into the development planning, technologies and practices being or will be implemented in New Zealand. Particular thanks are given to Canterbury Earthquake Recovery Authority (CERA) and Institution of Professional Engineers New Zealand (IPENZ) which organized unforgettable tour of the recovery works in Christchurch and valuable sharing session with young engineers in New Zealand respectively.

It is our great honour to have received supports and advices from the Delegation Advisors. I would also like to express our sincere gratitude to our advisers, including Ir Raymond KS CHAN, Ir Prof K K CHOY, Ir Victor C K CHEUNG, Ir C C CHAN, Ir Joseph K H CHOI, Ir Dr. Otto L T POON, Ir Edmund K H LEUNG, Ir S T CHAN and Ir Gary C W KO. The advisers had given considerable supports in conducting interview, attending meeting in planning stage and joining our trip to New Zealand. Their guidance during this process was valuable to this trip as well as our delegates.

Last but not least, I must express my million thanks to delegates, especially the Delegation Chairman Ir Annie CHAN, the two deputy managers Ir Kenneth CHEUNG and Ms Emily YU, for their hard works and great efforts to make the New Zealand Delegation a memorable and successful one. It is my honour to be in the team.

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.

Composition of Delegates

Similar to previous YMC overseas delegations, overwhelming response had been received during the recruitment of delegates in October 2013. In November, sixteen delegates were chosen from a group of elite young engineers by advisors through interviews. These delegates came from various engineering disciplines, including Building Services, Civil, Electrical, Environmental, Geotechnical, Information, Mechanical, and Structural engineering. They work in different sectors of engineering professions, ranging from government departments to public sectors, developer, consultants, and contractors.

Why New Zealand?

Following the success of Overseas Delegation to Germany in 2013, from which young members appreciated how the engineers in Germany strive for excellence in different industries, the YMC has organized another Overseas Delegation in 2014 to New Zealand. New Zealand is a country demonstrating a very close relationship between nature and technology. It uses engineering technology to utilize renewable energy for up to 75% of its total power consumption and, at the same time, it adopts technology to overcome the challenges caused by earthquakes. With the success in keeping the balance between development and environment protection, New Zealand cities generally rank highly on international livability measures. The chosen cities were Auckland and Christchurch, the largest and second largest cities of New Zealand, respectively, which have undergone great change in just a few years.

Auckland

Driven by Auckland's governance reforms in 2010, the newly formed Auckland Council released the Auckland Plan in 2012, which aims to guide the development and growth of Auckland for the next thirty years and become the world's most liveable city. The Plan outlines the development strategies for a wide range of areas, such as waterfront development, pedestrian, motorway, and railway networks, energy resilience, and response to climate change. The core principle of synergising nature and technology will continue to drive projects that create a quality living environment for Aucklanders.

Theme and Objectives

Christchurch

In the wake of the devastating earthquakes starting 4 September 2010, Christchurch is looking forward to change. The strong earthquakes and aftershocks have left much of the Central Business District (CBD) with irreparable damage, but the city has taken this as an opportunity to put into action their bold vision of revitalising the oldest established city of New Zealand into a green and global 21st century city. Even in the midst of ongoing aftershocks, engineers from around the world flock to the city to take on the once-in-a-lifetime challenge: the Christchurch Rebuild. Seismic activity, difficult geology, public consultations, and long-term planning are just a few of the challenges that require engineers to be innovators in order to build a more resilient Christchurch for future generations.

The HKIE-YMC Overseas Delegation is a sustainable program that arouses young engineers' potential in leadership and motivates their vision to learn from overseas good practices, from which the delegates can gain knowledge on technological development and applications. This Delegation, with the theme of "Perfection in Synergy of Nature and Technology," aimed to explore the latest technologies New Zealand uses to enhance its close relationship with its natural surroundings.

While in New Zealand, the delegates visited private companies, government organizations, professional bodies, and universities to experience first-hand the importance of sustainable development. Furthermore, a series of ten local seminars and visits related to the theme had been organized. These experiences broadened and enriched the young engineers' technological knowledge in different application areas.

Under the theme of this Delegation, delegates focused in three major study areas which are "Natural Resources Utilisation," "Connected with Efficient Network," and "Facing the Natural Challenges." This report encapsulates the results of the study conducted by the delegates. broadened and enriched the young engineers' technological knowledge in different application areas.

Identifying Areas of Study

Natural Resources Utilisation

Connected with Efficient Network

Facing the Natural Challenges

Natural Resources Utilization

The delegates studied the energy resources utilised in both Hong Kong and New Zealand, and looked to understand the technology, feasibility, and policies of energy resources.

With the increasing public awareness of the impact on the environment due to the use of conventional types of energy sources such as coal and fossil fuel, renewable energy is becoming increasingly important in Hong Kong. Despite the lack of natural resources in the region, the uses of renewable energy can be found in many projects in Hong Kong. For instance, The Hongkong Electric Company Limited (HEC) built the first commercial scale wind turbine in Lamma Island. The Hong Kong Wetland Park also adopted geothermal heat exchange air-conditioning (A/C) system for its visitor centre, demonstrating the ability to be "green" without taking up precious land area.

Besides, the first gas-fired combined cycle power station in Hong Kong, namely the Black Point Power Station, was built by CLP Power Hong Kong Limited (CLP) and start operating since 1996. Natural gas is considered a greener source of fuel in generating electricity as it produces less greenhouse gas (GHG) than coal during combustion.

Furthermore, the new Electrical and Mechanical Services Department (EMSD) headquarters building was designed to make use of the concrete structure of the former Hong Kong Air Cargo Terminals Limited (HACTL) building as far as possible without demolition of the old building. This approach would help to reduce energy consumption due to a reduction of the use of construction materials as well as reduction of construction waste. Not to mention there are plenty of green elements implemented in the building not limited to solar panels, grey water recycling system, sun pipes, motion and daylight sensors, etc.

Comparing to Hong Kong, New Zealand has an abundance of energy resources, both renewable and non-renewable; however, they still face their own challenges. In order to compare and contrast how different cities tackle impacts incurred by climate change, this delegation trip included a seminar by Ir Iain Seymour-Hart introducing the effects of climate change, and visits to Ngatamariki Geothermal Power Station, Aratiatia Hydropower Station, and the prototype wind turbine of Windflow Technology Limited to understand local renewable energy technology.

Connected with Efficient Network

The delegates studied the mode of transportation in both New Zealand and Hong Kong and compared the different improvement and advancement in the public transportation and road network.

Hong Kong has been known as one of the busiest cities in the world, the high demand on transport grows with the continuous growth of the high population density. Railway has been serving as the backbone of the city since the 1970s. The railway system has grown with the city to connect between the new towns including Shatin, Tseung Kwan O, and Tuen Mun. To cope with the continuous growth in the passenger demand and the city itself, different strategic extensions are currently under construction, including the Shatin to Central Link, Kwun Tong Line Extension, and South Island Line to expand the railway network and the Hong Kong Express Rail Link to connect with the high speed railway to Mainland China.

Road transport also remains an important issue for the cities for both private cars and public transportation such as buses. To relieve the traffic congestion nuisance for road users, the HKSAR Government initiated different roadwork modification and improvement works for the existing road networks, one of which is the Central Wanchai Bypass (CWB). The CWB project targets to bridge the eastern and western districts of Hong Kong Island to ease the traffic on the existing roads along the northern shore of Hong Kong Island.

On a vast scale, New Zealand with a total land area of over two hundred and sixty thousand square kilometres and a population of just four million, the citizens have a high reliance on railway service as the major transport for freight and cross-country travel. Within the highly populated cities, such as Auckland, road transport by private vehicle also takes an important role. To compare and contrast the strategies in tackling the increasing demands on transportation, the delegates visited City Rail Link (CRL) with Auckland Transport and a road network upgrade project, the Waterview Connection Project. The delegates also had a glimpse at the history of New Zealand transportation during their visit to the Museum of Transportand and Technology (MOTAT).

Facing the Natural Challenges

The delegates studied the natural challenges faced in Hong Kong and the cities in New Zealand and compared the mitigation measures adopted in these places to tackle their own natural challenges.

Throughout the study, the delegates identified that the natural challenges encountered in Hong Kong are mainly hazards due to flood, typhoon, and landslides while the natural challenges faced in Auckland and Christchurch are hazards due to earthquakes, volcano eruptions, and landslides.

Hong Kong is considered as a region with low to moderate risk of seismic activity and seismic resistant design is not yet a compulsory requirement for buildings in Hong Kong. As such, engineers in Hong Kong would have less opportunity to get involved with this subject. In view of this, the delegates arranged a series of local visits and seminars in Hong Kong before the delegation. From a sharing session on the "Recovery of Sichuan after the Earthquake in 2008" hosted by Dr. Guo Da Jiang, a seminar given by Ir Raymond Koo on "Geotechnical Earthquake Engineering and Its Recent Development in Hong Kong," and a visit to the "Po Shan Landslide Preventive Works - Ground Water Drainage System" guided by Ir Philip Chung, the delegates gained a better understanding on the types of natural hazard risks which Hong Kong faces (i.e. landslides and earthquake) and the latest approaches to mitigate these risks.

The delegates also gained a better understanding on the latest technology and mitigation measures adopted in buildings against seismic activity in New Zealand through the overseas seminars and visits arranged by the Canterbury Earthquake Recovery Authority (CERA), the University of Auckland (UoA), and the University of Canterbury (UC). The delegates were led by the professors and students of UoA and UC to various engineering test halls, where they demonstrated their latest seismic research and findings. In Christchurch, the delegates were guided by CERA to witness the devastating damage caused by the earthquake to the city, such as large scale differential settlement and landslides.

Natural Resources Utilisation

- Visit to Lamma Wind Turbine
- Visit to Hong Kong Wetland Park
- Visit to CLP Black Point Power Station
- Visit to EMSD Headquarters

Connected with Efficient Network

- Visit to New Civil Aviation Department Headquarters
- Visit to CWB Site
- Seminar on Future Development of MTR Corporation Limited (MTRC)
- Visit to Tuen Mun Highways Noise Barrier

Facing the Natural Challenges

- Seminar on Geotechnical Earthquake Engineering and its Recent Development in Hong Kong
- Visit to Po Shan Landslip Preventive Works – Groundwater Drainage System
- Sharing on Sichuan Earthquake

Corresponding Local Events to Area of Study

With the different areas of study, a series of local events were arranged. Details of these events can be found in the "Local Events" chapter. The overseas events in this Delegation were also arranged accordingly, and further detailed in the "Overseas Events" chapter. By selecting the above areas, the delegates wish to convey the sound insights in the coming chapters.

Overseas Events

- Seminar with Ir Iain Seymour-Hart
- Exploring Rangitoto Island
- Museum of Transport and Technology
- Waterview Connection
- City Rail Link and New Lynn Station
- Exchange Gathering with IPENZ _Auckland Branch

Ngatamariki Power Station

Aratiatia Hydropower Station

Your Waterfront, Auckland

University of Auckland

Christchurch International Airport

University of Canterbury

Recovering from the Canterbury Earthquakes

Exchange Gathering with IPENZ
– Christchurch Branch

Wind Turbine Prototype at Gebbies Pass

29 March PM

Seminar with Ir Iain Seymour-Hart

Ir Iain Seymour-Hart, Fellow of the HKIE, currently works and resides in Auckland. Previously, he took up many important posts in Hong Kong, the most recent being the Head of Department, Automotive Engineering at the Vocational Training Council in Hong Kong from 1984 to 2007.

Ir Seymour-Hart introduced several significant climate change and global warming occurrences around the world, the primary cause being the increasing human population. In the southwest of Greenland, the melting rate of the Jakobshavn Glacier is rapidly increasing. Satellite measurements showed that in the summer of 2013, the glacier moved at a record speed of 17km/year. Other severe weather incidents, like the floods and fires in Australia, show that global warming causes calamities to both humans and the Mother Nature.

Another phenomenon caused by human activity is "global dimming", which describes the way pollution clouds in the atmosphere cut down the amount of sunlight reaching the earth's surface. This global dimming effect alters weather and rainfall patterns and is believed to be the major cause of the Ethiopian famine in 1984, which killed over a million people.

To improve the current situation of global warming and global dimming, actions to reduce reliance on fossil fuels, cut down emissions, introduce smart and green alternatives, and reverse the rate of deforestation need to be taken. Innovative solutions are able to reduce roadside emissions and lessen the carbon footprint of motor vehicles. Hybrid technology, with its electric drive system matched to an internal combustion engine, is one such available technology. Another example is the liquefied petroleum gas (LPG) injection retrofit system for buses and freight vehicles, which lowers fuel consumption and reduces vehicle emissions.

After the seminar, the delegates had the opportunity to voice their views on climate change at an exchange dinner with Ir Seymour-Hart. Although the living environments in Hong Kong and New Zealand are very different, severe weather and changes in the environment are still clearly felt in both areas. The delegates shared their ideas on how each region can do their part in improving the situation.

The delegates joined the Rangitoto Explorer Tour introducing the formation and history of Rangitoto, a volcanic island in the Hauraki Gulf near Auckland. There are three main routes to and from the summit - Summit Track, Lava Caves Track, and Wilson Park Track.

Rangitoto, meaning "bloody sky" in Maōri, was formed by a series of eruptions about six hundred years ago. The eruptions occurred in two episodes, approximately ten to fifty years apart, the first of which erupted most of the volcanic ash that mantles the adjacent Motutapu Island. The second episode formed most of Rangitoto, expelling all the lava flows and main scoria cone at the apex. In total, 2.3km³ of material erupted from the volcano, equivalent to the combined material produced from all previous eruptions in the Auckland volcanic field, which were spread over more than two hundred and fifty thousand years.

Now Rangitoto Island is a public reserve managed by the Department of Conservation on behalf of all New Zealanders. All its forests, plants, and wildlife are protected. Stoats, rabbits, mice, rats, cats, and hedgehogs remained a problem on the island, but the Department of Conservation aimed to eradicate them beginning with the poisoning of rats and mice in August 2011. Traps can be seen along the paths from the pier to the crater of the volcano.

Volcanic rocks can be seen everywhere and vegetation has also grown and covered much of the island. At the top of the summit is a beautiful panoramic view of the Auckland CBD. Future eruptions may occur within the volcanic field in the future, but Rangitoto is unlikely to erupt again.

Exploring Rangitoto Island

30 March AM

30 March PM

Museum of Transport and Technology

MOTAT is home to an outstanding collection of items signifying the engineering and technological development throughout the history of New Zealand. Major collections include road transport vehicles, pioneers of aviation, life of early Auckland, and other fascinating show rooms.

The history of the museum begins with the mid-Victorian brick pump house and the nearby Western Springs Park. In the 1870s, Auckland government engaged the construction of the pump house and dammed the nearby springs to form a lake, providing a reliable water supply for early Auckland. The pump house was decommissioned in 1936 and Auckland City Council decided to put the land to new uses by establishing a park by the lake, now known as the Western Springs Park, and offering the land and building of the old pump house to a group of transport and aeronautical enthusiasts to form a museum in 1964 [1]. The giant beam engine of the old pump house, one of only three working ones in the world, remains a major attraction of the museum to this day [2].

Throughout the fifty years since its opening, the museum has become New Zealand's largest transport, technology, and social history museum. True to its name, road transport is one of MOTAT's largest collections, including horse-drawn vehicles, commercial vehicles, and various other automobiles highlighting the development of road transport. MOTAT's Aviation Display Hall showcases impressive exhibits of aircrafts in Australasia. A large fleet of military aircrafts highlights New Zealand aviators' contribution in the times of war, and a large collection of civil aircrafts displays the success of aviation pioneers throughout history. The two sites of MOTAT are connected by an old electric tram, exhibiting an important reminder of a `green` transport system, used even in the old days.

The breadth and variety of engineering displays restored by MOTAT is astonishing, and provides an excellent showcase that demonstrates how the advancement of engineering and technology closely integrates with the development of the society. The varied innovative ideas throughout engineering history have greatly impacted the engineering society and our way of living.

Waterview Connection, part of the Western Ring Route, consists of a 2.4km twin tunnels, three lanes in each direction. This tunnel section will complete the motorway ring route around the Auckland City, reducing the regional congestion. It will also provide a direct link between the international airport and the CBD, and the Northwestern and Southwestern motorways of Auckland. The tunnels are being constructed by an earth pressure balance tunnel boring machine (TBM) named Alice, the 11th largest TBM in the world and the largest in Australasia at a diameter of 14.4m. Tunneling by Alice began in November 2013, and had travelled 1.5km at the time of writing. Mr Peter Spies, Mr Ray Chang, Mr Bryan James, Mr Bob Mawdsley, Mr Chris Hick, Mr Stuart Oakey, Mr Eddie Jim, and Ms Jenny Chu, engineers and managers from the Well-Connected Alliance, shared different aspects of the project, such as planning, public consultation, construction, contract type, environment, and safety.

One of the spotlights of this project is the construction method. There are sufficient lands for surface route in Auckland; however, tunneling method has been adopted to avoid disruption to two rail corridors and several main motorways. During the planning and public consultation phase, TBM was introduced to the public, and, after communicating the benefits of this construction method, community support for the TBM option over the surface road option was overwhelming. Along with reduced disruption, improved infrastructure and landscaping at the surface including walkways, cycling routes, and open spaces will further benefit nearby communities. The environmental assessment on settlement, noise, air, ecology, water quality, and traffic flow, are also monitored closely under the Environmental Protection Authority's (EPA) protection act.

Various challenges had to be overcome as the project commenced. Transporting the TBM to the construction site involved checking that the roads and bridges used could support its load. Construction of temporary recreation areas, diversion of major roads and streams, and relocation of the proposed ventilation stack minimized disturbances to the community. The Alliance procurement model encourages partners to work towards delivering the project on time, by early 2017, and under budget, at an estimated 1.4 billion New Zealand Dollars (NZD).

Map of Western Ring Routes [3]

City Rail Link and New Lynn Station

31 March PM

In order to connect Auckland's railway network and to meet the rapid growth in traffic demand, three stations and corresponding rail totaling a distance of 3km will be constructed uphill from North to South. CRL, a project led by Auckland Transport, will connect the existing Britomart Station to the southern area and provide a solution to close the current "dead-end" problem. It is planned to commission by 2021. As introduced by Mr Steve Hawkins, CRL Design Manager, the choice of construction method depends on the geology and topography. The reclaimed land in the northern part can be mined by cut-and-cover method. In contrast, stations and track trench which sited in volcanic rock at southern part of the project will be constructed by TBM.

To achieve a balance between construction and culture preservation, unique design themes will be applied to the three stations, Aotea, Karangahape, and Newton stations. The ecology, geology, culture, and history in the local area will form the design concept for each station. Thus, passengers can appreciate the culture and environment of the station's locality during their ride.

After a project briefing by Mr Peter King, New Lynn Project Manager, the delegates travelled by train to New Lynn station, which will be the largest redeveloped station in Auckland. Initially built as a surface station, the station and its rail tracks were moved below ground to reduce traffic congestion. A 1km long trench, confined to a 20m wide construction corridor, was dug through the middle of the town area adjacent to the existing railway to facilitate works. Four new bridges were built to further improve road traffic. The station integrates with shopping malls and a transportation hub where transfers can be made to and from bus services. Residential properties and recreation facilities are being constructed nearby the station to further revitalize the New Lynn area. A number of stations along the Auckland railway are undergoing similar upgrades and further development.

A social gathering with the Auckland Branch of the Institution of Professional Engineers New Zealand (IPENZ) took place in the evening. Similar to the HKIE, IPENZ is the professional body representing professional engineers from all engineering disciplines in New Zealand, and also acts as the registration authority for chartered engineers.

The evening started with a casual stand-up reception with food and beverages. The delegates mingled with many young engineers of IPENZ Auckland's emerging professionals' group, Engenerate Auckland, a group aimed at organizing events for engineers with less than eight years of work experience. The HKIE President Ir Raymond Chan thanked the hosts and delivered a presentation on the recent developments of HKIE. Delegation Manager Mr Vincent Leung presented on the growth of YMC and the objectives of this Delegation. Delegates then presented on Hong Kong's recent engineering developments with regards to the three study areas. Engenerate Auckland members Mr Nick Etherton, Transportation Engineer, Mr So'o Fagamalo, Electrical Engineer, Ms Anna Zhan, Chemical Process Engineer, and Mr Chris Goodin, Engineering Geologist, presented their varied work experiences and what it is like to be an engineer in New Zealand. The young engineers were very enthusiastic and continued to share their working experiences after the presentations, and several young engineers from New Zealand expressed their interest to work in Hong Kong. After the official event, the exchange continued over dinner and drinks.

31 March PM

Exchange Gathering with IPENZ – Auckland Branch

Ngatamariki Power Station

1 April AM

The Ngatamariki Power Station is owned by Mighty River Power and was commissioned in September 2013. This 82MW power station generates power by utilising geothermal energy, expanding Mighty River Power's geothermal power production to 40% of its total energy output [4]. Mr Ewen McKenzie, Production Team Leader, and Mr Jim Lord, Mechanical Engineer gave an introduction in-house before the delegates visited the plant.

Ngatamariki is the largest singular binary power plant in the world. The binary power plant can economically generate from geothermal reservoirs even at lower temperatures, unlike dry steam and flash steam plants, which are more suitable for high-temperature reservoirs. Seven geothermal wells with a maximum depth of 3.5km each were drilled, along with twenty-one sentinel and monitoring wells. Drilling wells with such extreme depths are often the greatest challenge and cost of constructing a geothermal power plant, and Ngatamariki was no exception.

The three production wells extract geothermal fluid consisting of brine and steam, which reach temperatures of 280°C at depth, from the geothermal reservoir to the surface. The extraction of the fluid is regulated by control valves which optimises the fluid pressure to maximise the system efficiency. The high temperature fluid transfers its heat energy to the pentane, which boils at 36°C and is pressurised. The high-pressure vapour drives the turbine and the generator converts the mechanical energy into electricity. The pentane vapour is condensed back to liquid and 100% reused in this process. The cooled brine is injected back into the reservoir via four reinjection wells. With an injection rate of 98%, there is no adverse impact to the underground or surface environment.

As the construction of Ngatamariki required a large area of land, public consultations were held to minimise local impact. The land is leased from stakeholders and environmental regulations are stringently upheld. Pipelines and wells are protected to prevent any leakage of brine to the shallow aquifer, which would contaminate the community's drinking water. For greening and landscaping, various florae were planted and the shade of green paint that covers its infrastructure was carefully selected, blending into the surrounding environment.

Hydropower is one of the main renewable energy sources for electricity generation in New Zealand. It is rain-fed and flexible, as the output can be increased or decreased quickly and efficiently. Owned and operated by Mighty River Power, the Aratiatia Power Station is a hydroelectric power station situated on the Waikato River of the North Island. Mr Alan Johnston, Station Superintendent for Taupo Control Gates, Aratiatia and Ohakuri, warmly welcomed and guided the delegates through the visit to this power station.

Aratiatia is the first hydroelectric power station on the Waikato River, commissioned in 1964 [5]. The power station is located 13km downstream of Lake Taupo and is the first hydropower station along the Waikato River, receiving turbulent flow released from the control gates of the lake. Lake Taupo mainly receives surface runoff from rainfall and snowmelt from the mountains. As a backup resource, an artificial lake behind the station is used for temporary storage.

The power station is a largely run-of-the-river station - turbulent water naturally falls 28m over one kilometre and is diverted through a tunnel to the power station, reaching a rate of up to 90,000L/s [6]. The energy of the water pushing through the vertical turbines is transformed by the power-generating equipment in the powerhouse into mechanical energy for electricity generation. The powerhouse accommodates three Swedish-made 31.3MW vertical Francis turbines with a horizontal shaft and transformers [7]. With a generation capacity of 78MW, Aratiatia supplies 331GWh annually to the National Grid [8].

The power station has one on-duty site staff in case of emergency, but the operations are remotely controlled by the control centre in Wellington. Since repair works and overhaul are not often required, most works are contracted out to an automation company. The transformers are divided into three units instead of putting all phases into one tank, as the latter arrangement would be risky, similar to putting all your eggs into one basket. The existing transformer will be replaced by a three-phase unified transformer made in China, as it is reaching the end of its design life.

Aside from generating environmentally-friendly hydroelectric power at the Aratiatia power station, the Aratiatia Rapids adjacent to the plant is also a tourist attraction, boasting the largest rapids in Australasia.

Your Waterfront, Auckland

2 April AM

As one of the largest marinas in the southern hemisphere, Auckland's waterfront has played an important role in the economy and tourism of New Zealand. Aucklanders have shown strong support for better public access to and along the waterfront, as well as the provision of new parks and open spaces. As part of the Auckland Plan, a plan dedicated to improving and developing the waterfront was initiated.

The Waterfront Auckland agency was established in 2010 by the Central Government to lead a strategic approach to develop the Waterfront. Mr Alan Gray, Senior Urban Designer, Mr Rod Marler, General Manager Development, Mr John Hong, Asia Pacific Investment Advisor, and their colleagues gave us an introduction of the Waterfront Plan and toured us through the Wynyard Quarter area.

The Waterfront Vision is to become a world-class destination that celebrates its maritime history in a sustainable way, and five key goals have been set to achieve this. The new waterfront will provide a key destination and location for business residents and visitors, as well as a means to link people from city centre to the waterfront.

Five key goals set by Auckland Waterfront to promote sustainability (http://www.waterfrontauckland.co.nz/)

Sustainable features can be seen in various elements of the waterfront. For example, rain gardens of over 600m² were built at Jellicoe Street, serving a catchment area of 9,000m² [9]. The rain gardens lower the stormwater peak and acts as filter before stormwater is discharged to the sea, and also irrigates the street vegetation. New green buildings incorporate various sustainability features, such as a light reflector tunnel that directs natural light into the interior, metallic sun screens and vertical fins as façade which reduces heat build-up inside the building, and a rainwater harvesting system that supplies water for toilet flushing and landscape irrigation. Various features have been incorporated to increase the ease of public access. The paddling pool at Wynyard Quarter provides a place for youngsters to have fun in the water during summer time, and the concept of shared space is also incorporated into the waterfront area. Plenty of leisure areas are available for the public to enjoy.

The reaction from the public has been positive since the consultation process. However, through consultation feedback, some Aucklanders have expressed their concern on the potential costs of developments, impacts on commercial access to the waterfront area, and proposed reclamation across the waterfront. In addition, an international peer review of the draft plan was commissioned, which, alongside other technical work, has been incorporated into the final plan. The development and revitalization at the waterfront will guide the future development of the whole Auckland region, and bring about a more enjoyable and competitive waterfront.

The University of Auckland was established in 1883 and is now the largest university in New Zealand with approximately 40,000 students including 5,000 international students [10]. UoA is a leading research university located in Auckland and is particularly strong in energy generation and transmission and seismically resistant buildings. Before touring the campus, the delegates met the professors and engineering students at the Engineering Building of the university.

After the delegates provided an introduction of HKIE and presented various engineering projects in Hong Kong to the participants in the exchange gathering, Professor Nawawi Chouw gave our delegates a presentation of some current researches in Earthquake Engineering at the university. The current seismically resistant building design code and the latest mitigation measures for structures adopted in New Zealand, which were tested for their robustness during the recent earthquakes, may be updated in the near future. The results of other research, such improved connection details for building structures and bridges to enhance their stability against seismic load, are highly anticipated by the engineering community. Professor Chouw's current research is on the use of coconut fiber as an admixture to fresh concrete to improve the concrete strength so as to resist the extreme loading under seismic event. Once research has proved this method to be effective, he will look to promote its adoption for buildings in New Zealand. As the use of coconut fiber as an admixture in concrete is also highly cost effective, this method could be very attractive to structural designers and project owner

University of Auckland

2 April PM

After the presentation, the delegates were guided by engineering students from various departments to visit different engineering laboratories, including the tsunami testing facility in the hydrology lab and test halls in the materials, geotechnical, and environmental laboratories. From the lab facilities, it could be seen that great emphasis is placed on environmental studies, such as the effects of geothermal and rainwater discharge into the ground, and the effects of natural phenomenon on the build environment, such as earthquakes and river erosion.

3 April AM

Christchurch International Airport

As the second largest airport in New Zealand, Christchurch International Airport is the gateway to the South Island. The airport's new integrated domestic and international terminals are an important part of a ten-year development plan to provide airport customers with improved facilities, retail offerings, and services. This initiative will also enhance New Zealand's position as a leading tourist destination, commonly known as "the Great Outdoors." Mr Mike Parker, Terminal Facilities Manager, and Ms Janet Vincent, Apron Operations Manager, introduced the various new features and functions throughout the visit.

The completion of the integrated terminal in April 2013, which included an expansion project on the runway, installation of a groundwater heating, ventilation, and air conditioning (HVAC) system, terminal upgrades, and a new policy on overnight travellers, has enabled significant improvement in customer service performance. The service standards will be further enhanced through the coordinated service performance ethos across the total campus titled "One Team: Best Airport." To better facilitate the airport services, visitors are not permitted to lie on the floor or furniture, nor set up bedding. Anyone in the terminal late at night or early in the morning would be inquired about their purpose of stay. The airport does have an Air Lounge for travellers who would fly in after 10:30pm or fly out before 8:00am. This not only enhances the airport's services, but also enhances the overall security, providing a safe and comfortable environment for customers.

After three years, the recovery from the Christchurch Earthquake is progressing well. Christchurch International Airport Limited (CIAL) has taken a proactive stance in developing initiatives to stimulate South Island tourism, including an umbrella programme titled "South." This programme is designed to work with the South Island Regional Tourism Organizations to drive increased tourism volumes into the South Island, through Christchurch International Airport. The availability of accommodation in Christchurch and the timing of additional capacity being brought on stream will influence the recovery outlook for the expected tourism volumes. CIAL will continue to present Christchurch as the tourism gateway, to ensure that when Canterbury tourism infrastructure recovers, tourism volumes will return to the city within a short period of time.

A technical exchange was conducted in the afternoon with the Department of Civil and Natural Resources Engineering of the University of Canterbury (UC), well-known for its seismic studies and home to some outstanding research, including Low Damage Systems in building design.

The delegates presented to the academics about the Natural Challenges, Natural Resources and Transportation Development in Hong Kong. Professor Mark Davidson, Head of Department, introduced UC and shared on the recovery process and future development after the major earthquakes that their campus experienced in 2010 and 2011. The earthquakes caused widespread damage and disruption to classes, as several buildings of the campus collapsed or became unsafe to occupy. During the rebuilding works, the campus was designed to provide more laboratories and parts of the research areas will be constructed in coming years.

After a casual exchange with the professors and research students, a tour of the laboratories highlighted the importance placed on seismic design applied in various forms of structures. During the tour, the delegates explored finished and on-going studies and researches, including the Shake Table Testing of an Integrated Low-Damage Building and some academic findings from students displayed along corridors.

Shake Table Testing aids in the development of various low-damage earthquake-resistant structural and non-structural systems. The on-going studies aim to enable these systems to withstand high levels of drifts or deflections with negligible damage due to ground motion. Systems that are currently being developed at UC include the PREcast Seismic Structural System (PRESSS) rocking post-tensioning frames, articulated floors with energy dissipaters, non-structural systems adopting Low-Damage Systems, and Base Isolation. Combined testing on a single study is seldom found in Hong Kong research centers and institutions, and the delegates gained a deeper level of understanding in seismic design through UC's various studies.

3 April PM

University of Canterbury

Recovering from the Canterbury Earthquakes

4 April

After the September 2010 and February 2011 earthquakes, the Canterbury Earthquake Recovery Authority was established by the New Zealand Government to show leadership and enable a concentrated and coordinated recovery effect towards rebuilding the city.

A visit through Christchurch was led by Mr John O'Hagan, Development Director – Anchor Projects of CERA, who had previously come to Hong Kong to share his experience in earthquake rebuilding at the International Conference on Sichuan (5.12) Reconstruction in November 2013. Also with his team were Mr Mike Jacka, Mr Jan Kupec and Mr John Hare.

After the earthquakes on 4 September 2010 (Magnitude 7.1), 22 February 2011 (Magnitude 6.3), 13 June 2011 (Magnitude 5.7), and 23 December 2011 (Magnitude 6.4), widespread liquefaction and severe structural damage to buildings and roads affected the city of Christchurch and towns around Canterbury.

The cause of the liquefaction was associated with the ground conditions of the Canterbury area, with soil conditions comprising approximately 1km thick of silts, sands, and gravels, materials which have high liquefaction potential, overlying volcanic rocks. Some of the immediate responses after the earthquake were to evacuate the city, to demolish the buildings in danger of collapse, and to help with safe coordination of the rescue operations for collapsed buildings. The delegates gained a deeper understanding of the damaging effects of the earthquakes, as well as appreciated the difficulties Canterbury faces in rebuilding while being located near a highly active fault zone.

Following the February 2011 earthquake, cordons were set up to protect the public by keeping them away from buildings at risk of imminent collapse. The Canterbury area was then divided into three zones: RED – Unsafe and no one was allowed access except engineers; YELLOW – Restricted use, meaning no public access without an engineer; and GREEN – Unrestricted public access. This enabled engineers to evaluate safety of buildings by zones and could adjust the level of access after carrying out the required demolition works. The cordoned area, areas deemed unsafe, was progressively reduced in size with ongoing recovery efforts.

Liquefaction observed after the earthquake in September 2010. (Photo by Asher Trafford) (http://keithwoodford.wordpress.com/2011/02/22/understanding-the-christchurch-earthquake-building-damage/)

At the residential Red Zone in the Canterbury area, severe cracking of the roads and structural damage to the buildings were observed. The area had experienced ground subsidence of over 1m, and extensive rebuilding works is still needed before citizens can return to their homes.

At the hill sides, boulder falls had occurred when the earthquake struck, destroying any homes in its paths. Characterisation of these boulder falls are difficult, due to large areas of natural hillsides and large number of rock boulders. Slope failures induced by the earthquake threaten many homes, as the failure face continues to recede, and homes come closer and closer to the edge of the cliffs. With the help of some advanced technology such as laser scanning, LiDAR models, and 3D mapping, detailed analyses to evaluate the impact of these geological hazards are ongoing.

Since September 2010, Christchurch has experienced serious damage throughout the city. 31% (659 km) of the sewer system has been damaged, 52% of the urban sealed roads (1,021 km) need rebuilding, and 69 km of water supply mains need to be replaced. The Canterbury area continues to be hit with aftershocks daily.

The building assessment and the demolition process of dangerous buildings was formalised to increase efficiency and safety. Buildings were prioritised for assessment based on the age of the structure, type of construction, location in the city, and known damage. With most of the demolition works completed, the focus has now moved to the rebuilding of the city. At an estimated cost of 40 billion NZD (267.5 billion HKD) to meeting the recovery vision, the Christchurch rebuild is the largest construction project ever in New Zealand.

Key projects of the Christchurch Central Recovery Plan, also known as "The Blueprint Plan" [11]

After the visit to CERA, the delegates travelled towards south to Lyttelton, a major trade gateway to the South Island and the main port of the Canterbury/Christchurch area. The severe earthquakes had damaged the port structure and reduced the earthquake resistance. Being an important trade location for importers and exporters, as well as for delivering of goods to the Christchurch area, operation was fortunately not seriously affected. One interesting feature at the port is the ongoing reclamation project. After the earthquake, a sustainable solution was proposed for the disposal of clean earthquake demolition materials to be used as reclaimed materials. To date, the reclaimed area is over 5.35ha, and will continue to grow to provide space for critical port infrastructure and support the rebuilding efforts [12].

Exchange Gathering with IPENZ – Christchurch Branch

4 April PM

A social gathering with the Canterbury Branch of IPENZ took place in the evening, organized by the Engenerate Canterbury group. The evening started with a casual stand-up reception with food and beverages and delegates mingled with engineers from various disciplines.

The event was officially kicked off by Mr Andrew Read, Deputy President of IPENZ, who gave a welcome speech. HKIE President Ir Raymond Chan then delivered a presentation on the recent developments of HKIE, followed by Delegation Manager Mr Vincent Leung, who presented on the growth of YMC. After introducing the objectives of this Delegation, the floor was passed to the delegates, who then presented on Hong Kong's recent engineering developments with regards to the three study areas. Engenerate Canterbury Chair Ms Fritha Bevin-McCrimmon, Site Engineer, and Mr Chris Maguire, Project Manager and Water Resources Engineer, both shared their experiences as engineers working on the rebuilding of Christchurch.

Throughout the exchange event, the engineers of New Zealand shared their unique reasons for coming to or staying in Christchurch during this difficult time. Although many engineers were not native to Christchurch, or even New Zealand, they felt the need to contribute their expertise to this worthy cause, and agreed that it is an engineering opportunity that, hopefully, only happens once in a lifetime. The delegates thoroughly enjoyed the sharing session, and thank IPENZ Engenerate Canterbury for their warm hospitality.

Wind Turbine Prototype at Gebbies Pass

The island country of New Zealand provides a long barrier across the prevailing westerly wind, providing the country with a large resource. New Zealand wind farms generate, on average, at 40% of rated output, which is very high by world standards [13]. During the trip, the delegates visited Gebbies Pass, where Windflow Technology's prototype wind turbine Windflow 500 is installed.

Richard Trudgian, John Schurink, and Pete Scott of Windflow Technology led us on the hike and visit. Wind farms in New Zealand are categorised into three classes: small (rating <100kW), mid (rating 100kW – 1 MW), and big (rating >2MW). Windflow 500 is classified as a mid-class wind turbine. Studies have indicated that it has the potential to generate more electricity at wind speeds of 6m/s or greater. However, there are practical limits to the proportion of wind generation the electricity system can accommodate, owing to the fluctuating outputs of the wind turbine. Increasing the level of wind penetration requires additional "reserve" generation, like hydropower station, thus imposing additional costs.

The wind turbine stands at about 30m tall and has a two-bladed design, which is lightweight and easy to be transported. This prototype is equipped with various technology, including a supervisory control and data acquisition (SCADA) control system, a synchronous generator which produces smooth power output, and a power transformer which steps up the output voltage for connecting to the national power grid.

In designing a wind turbine, the weight of the rotor, gearbox, cost, output quality, means of installation, visual impact, acoustic impact, and compliancy to power grid are all considerations. In order to make wind power more attractive to the client, the design life and return period are carefully designed; for this wind turbine, they are 20 years and 8 years, respectively. That means, apart from construction and installation cost of about 1.2 million NZD, the wind turbine begins making a profit after about 8 years of operation. Undoubtedly, return period is a very important consideration in the energy industry.

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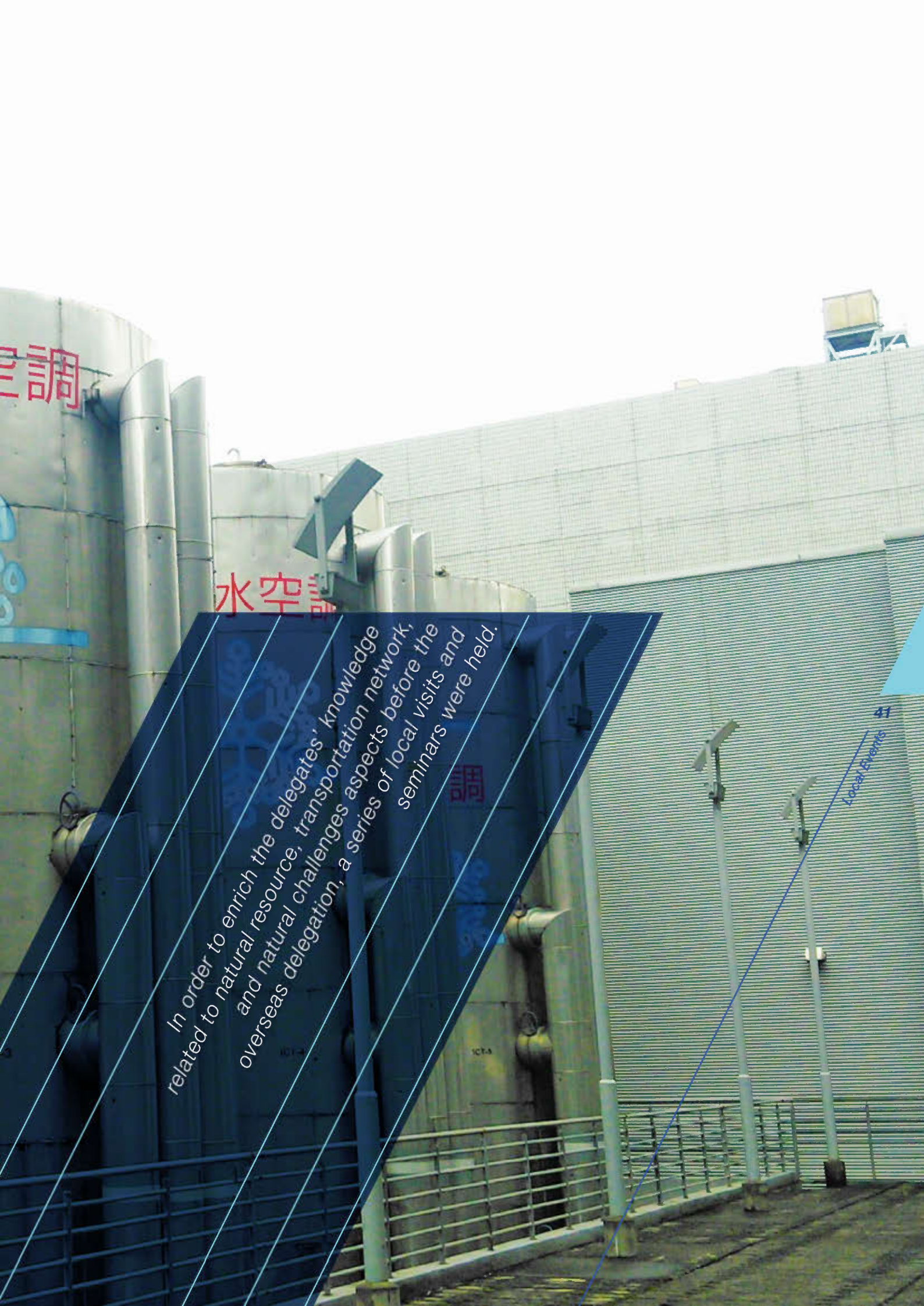
Local Events


In order to enrich the delegates' knowledge related to natural resource, transportation network, and natural challenges before the overseas delegation, a series of local visits and seminars were held.

Wind is one of the vital renewable energy sources of the world and is one of the main developing renewable energy technologies in Hong Kong. The commissioning of the Lamma Winds marked a new chapter in Hong Kong's electricity supply history. Wind power can now be harnessed on a commercial scale in Hong Kong to supply electricity to local businesses and residents.

The wind turbine station occupies a land area of 2,500m² at the hilltop of Lamma Island. The turbine is comprised of three rotor blades with a rotor diameter of 50m. As introduced by Mr Eric Ho, the representative of HEC during the visit, the turbine has a service life of 20 years and can provide a rated power of 800kW.

Rated power	800 kW
Rotor diameter	50 m
Hub height	46 m (the height of a 15 storey building)
Cut-in wind speed	3 m/s
Wind speed at nominal power	14 m/s
Cut-out wind speed	25 m/s
Survival wind speed	65 m/s
Rotor speed	15/24 rpm
Total weight	80 tonnes

Technical Data for Lamma Winds [1]

Apart from the wind turbine at Lamma Island, wind power has also been utilized by the Hong Kong Observatory (HKO) at several automatic power stations since the year 2000. A typical wind-powered generator is capable of generating 50W of electrical power, sufficient to support an automatic weather station. To date, wind-powered generators have been deployed at eight automatic weather stations at Lantau and in islands near the airport at Chek Lap Kok [2].

Another natural resource used for power generation in Hong Kong is natural gas. CLP Black Point Power Station is one of the world's largest gas-fired combined cycle power stations. It is owned by the Castle Peak Power Company Limited and is operated by CLP since 1996, making CLP the first electricity supplier in Hong Kong to use natural gas for power generation.

Compared with coal-fired power plants, the use of natural gas produces far less total CO_2 emissions. For this reason, CLP is planning to increase the usage of natural gas for power generation when more gas becomes available. Nevertheless, according to Ms Leung Fung Ping, the representative of CLP in the visit, CLP has to take into account the expensive cost of natural gas for this proposal.

The methods to collect natural gas from deep underground, the network of natural gas supply pipeline from China, and the different types of energy currently available in Hong Kong, such as coal, natural gas, wind, and nuclear, were introduced during the visit.

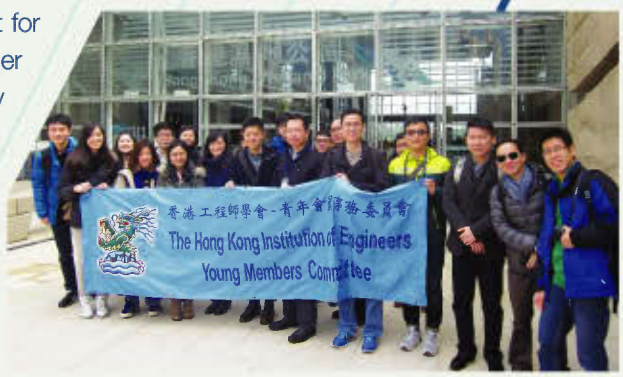
Education Path on Natural Gas in CLP Black Point Power Station

To further study energy efficiency, renewable energy technologies, and sustainable development, the delegates visited the EMSD Headquarters, which utilises various types of energy-saving elements in its building design. One of the most stunning features is an array of over 2,000 photovoltaic panels, which altogether has a total area exceeding 3,000m², on full display from a rooftop viewing gallery offering a breathtaking view. The EMSD headquarters was also designed to make use of the existing structure of the former HACTL building as much as possible, achieving the goal of reducing construction waste.

Although Hong Kong does not have any viable sources of geothermal energy, the ground can still be utilized to reduce energy consumption. The Geothermal Heat Pump (GHP) A/C System installed in the Hong Kong Wetland Park is the first of its kind adopted in Hong Kong.

The GHP A/C system has a total cooling capacity of 2,500kW, providing air conditioning to the 10,000m² visitor centre. The system consists of 468 nos. of 32mm diameter vertical geothermal high-density polyethylene (HDPE) pipes buried underground at 50m deep beneath the visitor centre area. These pipes are inserted into boreholes and embedded in bentonite clay cement grouting for better conductivity.

According to Mr Michael Lee of EMSD, although the initial cost for installing a GHP A/C system is relatively high compared to other traditional heat exchange systems, the running cost will be substantially reduced because of its higher system efficiency. Another advantage of adopting GHP A/C system is that the heat is absorbed and dissipated into the ground when cooling is required, keeping the surrounding environment quiet and undisturbed.



Connected with Efficient Network

To sustain Hong Kong's position as a regional and international aviation centre, the Civil Aviation Department (CAD) was established to develop a safe and efficient air transport system. A visit guided by CAD staff demonstrated how sustainable, educational, and environmental-friendliness concepts implemented into the design of the new CAD headquarters.

The new headquarters, with its green roof and natural daylight elements, provides a friendly working environment to facilitate enhanced efficiency and synergy; furthermore, it also provides a better one-stop service to the industry and the public. The new air traffic control center and the aviation education path inside the new CAD Headquarters shows its historical development and future plans, promoting to the public the importance of aviation and its related technology. Having contributed to the local civil aviation industry in the past few decades, the CAD continues planning forward to support the rapidly growing industry in the future.

Aside from the aviation industry, the railway network also serves as the backbone of the transportation system in Hong Kong and brings about the prosperity of the city.

A seminar delivered by Ir Albert Yuen and Ir Veronica Choi provided a background of MTRC development including the MTRC Network in Urban Area (1975-1989), Railway Network in New Territories, Tuen Mun Light Rail Transit (1988), Airport Railway (1989-1998), Tseung Kwan O Extension (1998-2009), and other recent railway lines.


A Model of the CAD New Headquarters

From diesel train in the past to the modern generation of electric trains, there have been ongoing improvements throughout the decades. Nowadays, MTRC plays a core role in the urban metro system development in Hong Kong, carrying an average of 5.1 million passengers every weekday. With trains arriving at 2 – 3 minute intervals at peak hours, the railway network in Hong Kong is considered to be highly convenient as compared to other railway systems worldwide. Within the next decade, MTRC will complete five new strategic rail extensions; they include the West Island Line, Guangzhou - Shenzhen - Hong Kong Express Rail Link, Shatin to Central Link, Kwun Tong Line Extension, and South Island Line (East). Upon completion, it will represent a further expansion of the existing 218km railway network.

In order to relieve the severe road congestion, the Government has planned different modification works to the existing road networks, including Central Wanchai Bypass (CWB), one of the large-scale road network improvement projects. The bypass is located along the northern shoreline of Hong Kong Island, connecting the western and eastern districts, targeting to reduce traffic along the existing main roads.

According to the project manager of Leighton Asia, Mr Andrew Lau, two bridges and one cut-and-cover tunnel would be constructed in Central and existing roads would also be realigned. Since the bypass is located in the heart of the CBD, logistics and social impact are the main concerns of the project; therefore, a Central Community Liaison Centre was opened to ease public concerns regarding the project.

Other than CWB, the road widening works at Tuen Mun Road also helps to alleviate the traffic congestion issue, as introduced by the Highways Department and their resident site staff during a site visit. Since many residential buildings are situated adjacent to Tuen Mun Road, noise mitigation measures have been implemented to minimize the noise impact from the high speed road. To provide a better environment to the surrounding residents, the concept of vertical and roof greening was implemented to the design of the noise barrier at Tuen Mun Road.

Facing the Natural Challenges

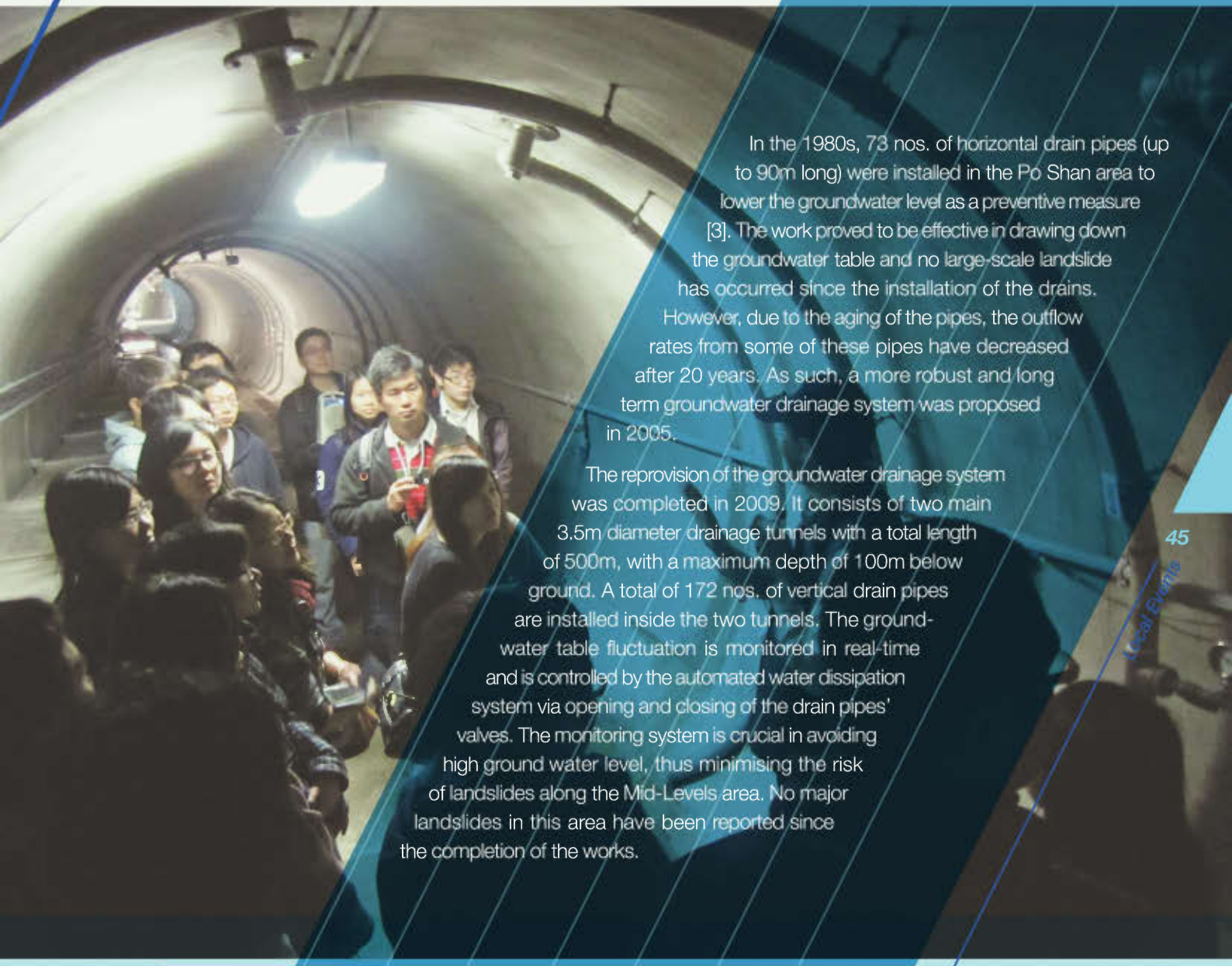
Dr. Guo Da Jiang, a former Professor of the University of Hong Kong, shared his experience in the Sichuan rebuilding works after the 512 - Sichuan Great Earthquake. In the sharing session, the seismic-resistant building design codes in Mainland China and different construction approaches catering for seismicity such as the base isolation and energy dissipation methods were discussed.

Dr. Guo also shared his experience in leading a team of volunteer students to design and supervise a project of rebuilding an elementary school in Sichuan after the earthquake. Although the funding was limited and many cultural challenges in handling a construction project in Mainland China were encountered, the project was successfully delivered within budget and on time.

Unlike Sichuan, the risk of a major earthquake in Hong Kong is considered low. Nevertheless, earthquakes with varying intensities have occurred in Hong Kong, the most recent one being the Tai Tam earthquake in 2013. The seminar delivered by Ir Raymond Koo introduced the history of seismic events in Hong Kong and the background of seismic studies including the measures used to define earthquake ground motion, seismic wave, magnitude and intensity scales, and earthquake probability. The recent studies related to seismic hazard assessment and seismic microzonation of Hong Kong, conducted by the Geotechnical Engineering Office (GEO) were also discussed.

In Hong Kong, landslides are the major natural challenge as developments are always inevitably located in close proximity to steep slopes. The technical visit to Po Shan Groundwater Drainage System at the Mid-Levels, guided by Ir Philip Chung, demonstrated a practical measure to mitigate landslide risk.

Mid-Levels area has significant historical landslide records. The most serious one would be the Po Shan Road Landslide occurring on 18th June 1972, which resulted in 67 fatalities. After a detailed study by GEO, it was found that the Mid-Levels area is underlain by a thick layer of colluvium, which was old landslide debris deposited approximately fifty thousand years ago. This colluvium layer is susceptible to high groundwater levels, which normally occurs after long hours of heavy rainfall, developing the ideal conditions for landslide occurrence. Thus, groundwater drainage works were proposed to lower the groundwater in the area to reduce the risk of large-scale landslides.



In the 1980s, 73 nos. of horizontal drain pipes (up to 90m long) were installed in the Po Shan area to lower the groundwater level as a preventive measure [3]. The work proved to be effective in drawing down the groundwater table and no large-scale landslide has occurred since the installation of the drains. However, due to the aging of the pipes, the outflow rates from some of these pipes have decreased after 20 years. As such, a more robust and long term groundwater drainage system was proposed in 2005.

The reprovision of the groundwater drainage system was completed in 2009. It consists of two main 3.5m diameter drainage tunnels with a total length of 500m, with a maximum depth of 100m below ground. A total of 172 nos. of vertical drain pipes are installed inside the two tunnels. The ground-water table fluctuation is monitored in real-time and is controlled by the automated water dissipation system via opening and closing of the drain pipes' valves. The monitoring system is crucial in avoiding high ground water level, thus minimising the risk of landslides along the Mid-Levels area. No major landslides in this area have been reported since the completion of the works.

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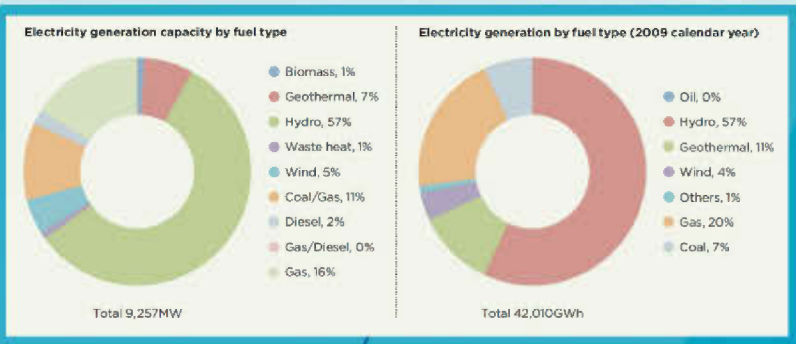
Insights


Natural Resources Utilisation
Connected with Efficient Network
Facing the Natural Challenges

Available Resources and Current Energy Mix

Fuel Mix - New Zealand

Compared to Hong Kong, New Zealand is relatively rich in energy resources and has until recently enjoyed low energy costs as it is less affected by the rise of fossil fuel costs. Around two-thirds of New Zealand's electricity is generated from renewable resources, including hydro, geothermal, and wind. Nuclear power has been ruled out and this seems unlikely to change, whereas a moratorium on thermal power plant development imposed by the previous Government has been rescinded. Hydropower and coal are key resources in the South Island, while the North Island has a wider variety of resources that include gas, hydropower, geothermal heat, coal, and wind. New Zealand has a number of gas fields which are small by global standards, with only the Taranaki region having been extensively explored and developed. The geographic location and type of main energy sources in New Zealand is shown below.



Fuel mix of New Zealand in 2009 [1]

Fuel mix of Hong Kong in 2012 [2]

New Zealand main energy sources by geographic location and type [1]

Fuel Mix - Hong Kong

In contrast, Hong Kong is a city that mostly relies on fossil fuels (75%) and nuclear energy (23%), while renewable energy is uncommonly used and occupies less than 2% in the fuel mix, based on the usage in 2012 [2]. Most of the fuels of power stations in Hong Kong are imported from Mainland China or Asia (e.g. India). Nuclear energy is imported from Nuclear Plant at Mainland China, Daya Bay.

[1] New Zealand Trade and Enterprise. (2012, April 1). The New Zealand Energy Sector. [online] Available at: https://www.nzte.govt.nz/media/344115/the_new_zealand_energy_sector_report_final.pdf [Accessed 2 May 2014]

[2] Environment Bureau. (2014, March 19). Future Fuel Mix for Electricity Generation Consultation Document. Available at: http://www.enb.gov.hk/sites/default/files/en/node2605/Consultation%20Document.pdf [Accessed 23 May 2014]

Space, Population, Geography, and Other Limitations

Population Distribution By urban area 1991–2006 Censuses				
Area of usual residence	1991	1996	2001	2006
	Percent of population			
Main urban	69.6	70.2	71.0	71.8
Secondary urban	6.9	6.5	6.3	6.0
Minor urban	9.0	8.7	8.4	8.1
Rural centre	2.3	2.3	2.1	2.0
Rural and other	12.2	12.3	12.1	12.0
New Zealand	100.0	100.0	100.0	100.0

Population Distribution in New Zealand [4]

New Zealand

Due to its geographic location, New Zealand experiences mild temperatures and long hours of sunlight – an average of 2000 hours per annum. It benefits from relatively strong and concentrated sunlight, which is fairly well spread throughout the year, providing a constant supply of solar energy. The average rainfall is moderately high and evenly spread throughout the year, and serves as an invaluable resource to develop hydroelectric power stations along rivers, such as the Waikato River located in the North Island. Hydropower accounts for over 50% of the total electricity generation in New Zealand [1]. The plentiful rainfall serves as an invaluable resource to develop hydroelectric power stations along rivers, such as the Waikato River located in the North Island. Its location also allows the country to benefit from strong and continuous winds from the Pacific Ocean for wind power generation [2].

Located at the Pacific Ring of Fire, New Zealand is constantly affected by the converging of tectonic plates. With most volcanoes situated in the North Island, most volcanic eruptions occur in the Taupo Volcanic Zone [3]. Despite the damages brought by these frequent eruptions, the geographical advantage allows New Zealand to develop geothermal resources as a renewable energy source.

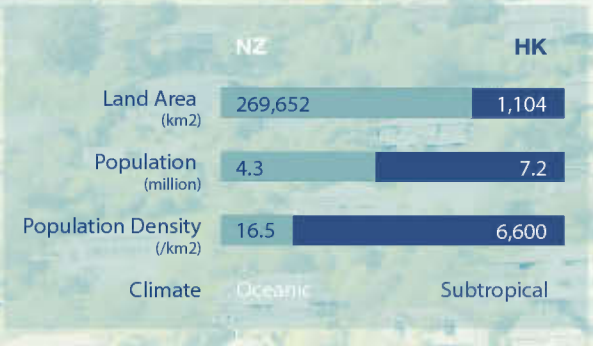
Statistic record shows that the population is mostly concentrated in urban areas such as Auckland, Wellington, and Christchurch, leaving large areas of rural land to provide sufficient space for the construction of renewable energy power plants for electricity generation.

These elements enable New Zealand to highly utilize its various natural resources for electricity generation. The natural resources include hydro, wind, geothermal, solar, biomass, biogas, and liquid biofuels [2].

Hong Kong

In contrast, Hong Kong experiences humid subtropical climate with monsoon winds and typhoons during summer, bringing occasional thunderstorms and high rainfalls. Rain clouds and suspended particulates from pollutants increase the density of clouds thus reduce the penetrability for sunlight reaching the land.

Due to its geographic and topographic conditions, the city by itself does not have sufficient natural resources to be utilized for large-scale electricity generation. Moreover, with its hilly terrain and steep slopes, not to mention a large and increasing population, land is in high demand for infrastructure development. With these elements, Hong Kong has low potential for the development of large-scale renewable energy generation. However, even with the constraints Hong Kong faces, renewable energy sources are still utilized. For example, photovoltaic systems and wind turbines are installed on the rooftop of buildings. With proper installation and design, the output from the generation of the limited renewable energy in Hong Kong can be maximized.



Population and climatic conditions in New Zealand and Hong Kong [5, 6 and 7]

[1] Ministry of Business, Innovation and Employment. (2013). Energy of New Zealand 2013. [online] Available at: http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-in-new-zealand-2013/Energy-in-New-Zealand-2013.pdf [Accessed 24 May 2014]

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Future Development

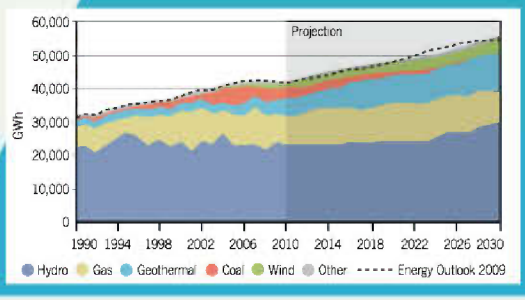
New Zealand

Trend for the Future Development

New Zealand has a strong competitive advantage in renewable energy systems, and has many opportunities for growing low-carbon technologies and services.

Looking into the future, there is already widespread interest and innovation in New Zealand in forms of development that reduce GHG emissions. In relation to the transport sector, many businesses, councils, and community organisations are undertaking initiatives that contribute to a low-carbon transition. The Government's Green Growth Advisory Group 201154 determined that New Zealand is well positioned for greener forms of economic development and called for a greening of strategies in every area of government activity and throughout the business sector [1].

Electricity Generation by Fuel in New Zealand [2]



Government Strategy

The government of New Zealand suggests that, over the next decade, renewable energy will continue to be a major source of new electricity generation.

The Government retains the target that 90% of electricity generation be from renewable sources by 2025 (in an average hydrological year) providing this does not affect security of supply. New Zealand has an abundance of renewable resources for electricity generation. Renewable energy has contributed to about 74% of electricity generation in 2010.

In 2010, the Government set up the Green Growth Advisory Group to evaluate and advise on opportunities for green growth to contribute to an increased rate of economic growth for New Zealand. The group will identify opportunities for smarter use of existing technologies and innovation, as well as greater development and adoption of new technologies (including clean technology) in the productive sectors [2].

Hong Kong

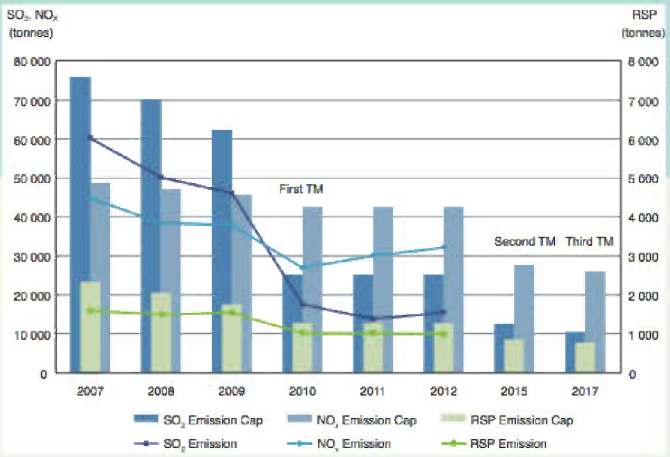
Power Generation

Electricity supply in Hong Kong has all along been provided by the private sector and has been meeting its electricity demand through importing fuel for local electricity generation or importing electricity from the Mainland China. Coal is majorly used for power generation in Hong Kong.

Consideration of Fuel Mix

In the future, Hong Kong will be faced with some difficulties in power supply, such as the retirement of some traditional resources, increasing demand of electricity and air pollution, etc. Reducing the greenhouse gas emission in Hong Kong is the most critical target in contributing to the global fight against climate change.

Further to the promulgation of the Fist and Second Technical Memoranda (TM) under the Air Pollution Control Ordinance (Cap. 311) in 2008 and 2010 respectively, Hong Kong issued the third TM in November 2012 to further tighten the emission caps for the power sector from 2017 onwards by 39% - 59% as compared with the 2010 levels.



Emission Caps of Air Pollutants for Local Power Plants [3]

Future Fuel Mix Options

To fufill the air emission target, Hong Kong's fuel mix will need to be adjusted. Two options for fuel mix planning had been raised up by the government for consideration.

Each option has its pros and cons and could meet the energy policy objectives. With a decision to be made in 2014 and depending on the fuel mix option Hong Kong decides on some of the infrastructure required could only be fully completed in around 2023.

Proposed Fuel Mix Opytions [3]

FUEL MIX		IMPORT		NATURAL GAS	COAL (& RE)
		NUCLEAR (DBNPS)	GRID PURCHASE		
Existing (2012)		23%	-	22%	55%[12]
OPTION 1*	Importing more electricity through purchase from the Mainland power grid	20%	30%	40%	10%
		Total : 50%			
OPTION 2*	Using more natural gas for local generation	20%	-	60%	20%

* The fuel mix rations aim at providing a basis for planning the necessary infrastructure for electricity supply. Flexibility should apply to actual deployment of each fuel type, having regard to the circumstances happening on the ground.

[1] The Royal Society of New Zealand. (2014, March). Facing the future: towards a green economy for New Zealand. [online] Available at: http://assets.royalsociety.org.nz/media/2014/05/Facing-the-future-towards-a-green-economy-for-NZ.pdf [Accessed 26 March 2014]

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Economics and Politics

In view of economic activities, New Zealand and Hong Kong are very different from each other. More than half of the total energy generated in New Zealand is supplied to commercial (including transportation) and industrial. The energy supply and consumption in New Zealand and Hong Kong is comparable in electricity generation while the average per capita energy consumption of New Zealand is about 3 times that of Hong Kong. Also, as the main economic activities in Hong Kong are financial and commercial trades, most of the land in Hong Kong is urbanized with high-rise buildings to increase the communication efficiency, and energy reliability is a great concern. Hence, Hong Kong has limited potential and land to develop renewable energy which is less reliable and requires large land areas.

Comparison of energy use in New Zealand and Hong Kong [1, 2, 3, 4, and 5]

	NZ (By 2009)	HK (By 2012)
Land area (km2)	268,021	1,104
Population (thousand)	4534	7155
Total Primary energy supply (PJ)	777	578
Consumer energy usage (PJ)	529	298
Loss between supply and consumption (PJ)	252	280
Average per capita energy consumption (GJ)	121	41
Energy generation capacity (MW)	9257	12625
Electricity generation (GWh)	42010	43031

New Zealand's energy use by sector [1]

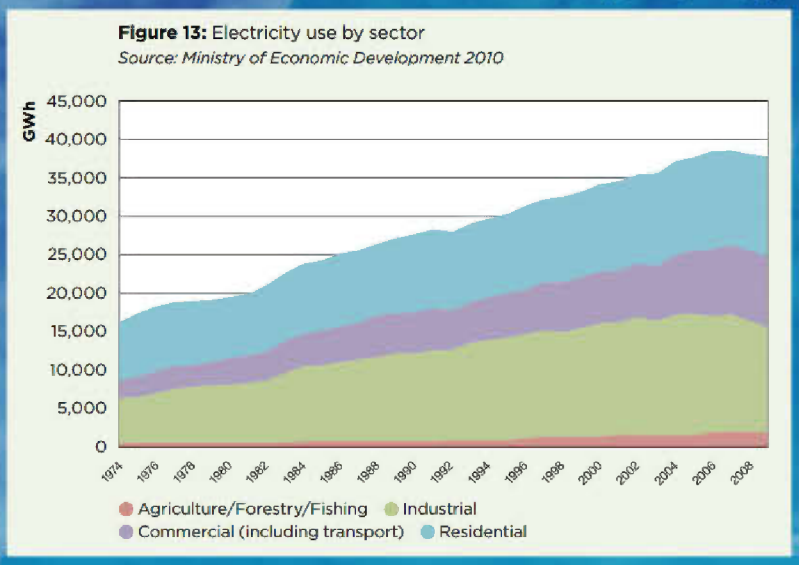


Figure 13: Electricity use by sector
Source: Ministry of Economic Development 2010

In the political view, New Zealand faces a similar problem when compared with Hong Kong. While there are significantly more resources available, these are limited somewhat by community attitudes to possible adverse environmental effects, as in the case of hydro and some wind developments [1].

In Hong Kong, the opposing powers against renewable energy development exerted by Hong Kong citizens and political parties are a hurdle in their future development in Hong Kong. Due to limited land area, new developments in Hong Kong are usually located near human activities or by means of reclamation. The adverse environmental effects to human or nature always send Hong Kong citizens away from any development under consultation stage; hence, development plans in Hong Kong are usually stuck in consultation period or taking a long period of time to implement.

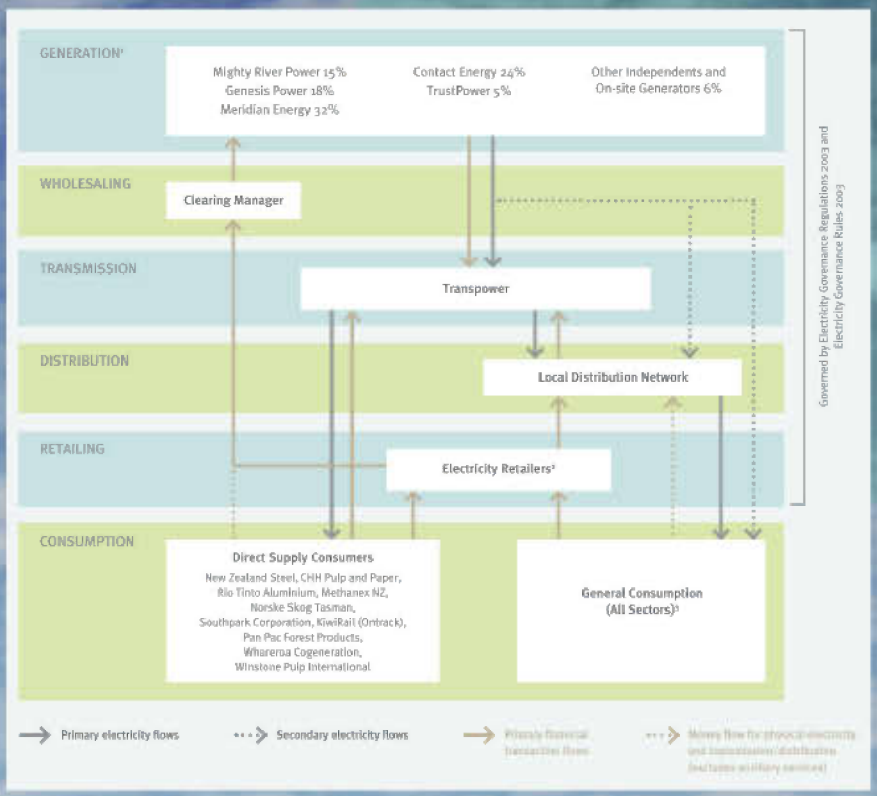
Also, as Hong Kong is a city in China, Hong Kong alone has less power to make a full strategy of development while New Zealand is a sovereign country which can implement strategic developments more easily. Even though Hong Kong has been returned to China for more than 15 years, the society still have a strong sense of uncertainty in future. Even in terms of energy development, Hong Kong is facing several uncertainties which make it keep to be a close market operation (i.e. Vertical integration from generation to retails) until this moment though there is plan to "open up" the market in the following years. However, the implementation of it is still a doubt.

Compared to New Zealand energy market operation and worldwide energy markets, Hong Kong experienced a lead behind situation that though reliability and cost effectiveness is remaining in a high standard, the technology development is in a conservative way and breakthrough is less to be made in Hong Kong compared to worldwide natural resource utilization. Also, facing the pressure from the public under legislative system, developing hardly come truly. For example, recently, CLP Power pushes back construction of Sai Kung wind farm for study as it is a big investment which should be carefully reviewed under the close market scheme of control [6]. Certainly, apart from the "procedure" and cost effectiveness factors, the uncertainty in political environment of the industry is also a concern.

Discussion

With all these differences between New Zealand and Hong Kong, the development of Hong Kong towards Renewable energy comparable in New Zealand is still a long way to go. However, Hong Kong has its own advantages in its close relationship to China and their energy development, which has a large potential with sufficient land and natural resource and may be beneficial to Hong Kong in the future as well. Nevertheless, even energy development could be done in Mainland China and be exported to Hong Kong, its overall environmental impact to human and nature is still a concern.

How to utilize the advantages in political and how to balance cost, life quality and caring to the environment are always questions and dilemmas for Hong Kong engineers and planners to consider carefully. Learning from New Zealand that though it is under a close market operation in view of energy supply, citizens cannot enjoy a lower cost of energy as expected due to several constraints such as difficulty in development. As Hong Kong situation in political view is similar to New Zealand, it can be expected that the energy supply situation may not able to be improved even if it is "opened". Hence, instead of thinking how to tackle the problem in political action, maybe allowing the energy market driven by power supply company freely is an option.



New Zealand electricity market structure for 2009 [1]

[1] Ministry of Business, Innovation and Employment(2013). Energy of New Zealand 2013. [online] Available at: http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-in-new-zealand-2013/Energy-in-New-Zealand-2013.pdf [Accessed 24 May 2014]

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Public Education

New Zealand

The New Zealand Association for Environmental Education (NZAEE)

The NZAEE is a national, non-profit organisation that promotes and supports lifelong learning and encourages behaviours that lead to sustainability for New Zealand. NZAEE is an independent voice for environmental education, empowering people to respect and nurture the environment, recognising its link with the social, cultural, and economic aspects of sustainability.

The Canterbury branch of NZAEE successfully hosted the 2014 Conference in January [1] & [2], bringing people together from throughout New Zealand and overseas. It was a great opportunity for many to experience the destruction and difficulty of living in the earthquake-affected city of Christchurch, and also to see the resilience and innovation that the Canterbury people are bringing to the reconstruction process.

Guidelines for Environmental Education in New Zealand Schools

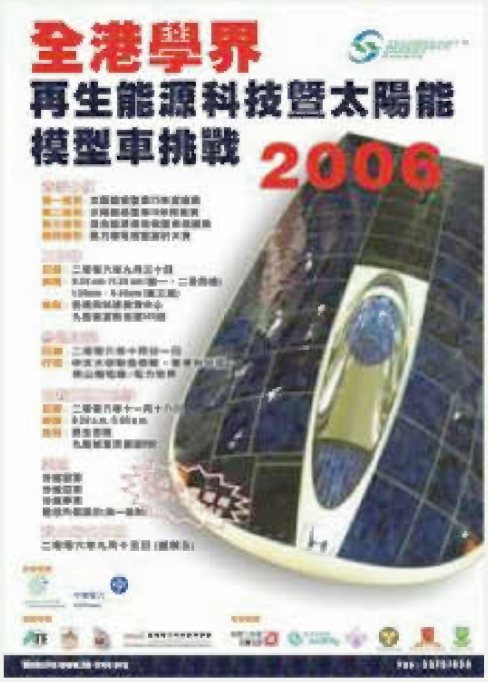
In response to the growing awareness on the importance of the environment, the New Zealand Government has taken action in both international and national contexts. International agreements are signed on climate change, biodiversity, protection of the ozone layer, and sustainability. In the local context, international concern about sustainability has been reflected in the Resource Management Act 1991 [3]. This Act provides the legislative framework within which New Zealand's natural and physical resources are sustainably managed.

Hong Kong

Government Commitment

The Council for Sustainable Development was established in March 2003 to promote sustainable development in Hong Kong [4]. The First Sustainable Development Strategy for Hong Kong was issued with the target to organize more public education programme on renewable energy and sustainable energy consumption and link these issues to local and global sustainable development. The "Hong Kong Renewable Energy Net" of EMSD is also developed aiming to provide information and knowledge to the public about the renewable energy.

The government held number of events to spread the environmental spirit to the public.



School Education

Climate Change Teacher Professional Development Programme jointly organized by Environmental Campaign Committee, World Wide Fund for Nature Hong Kong and The Hongkong and Shanghai Banking Corporation Limited. The programme aims to enhance secondary school teachers' knowledge and provide teaching resources on climate change and sustainability. The content of the programme is developed based on the Liberal Studies curriculum in New Senior Secondary. Teacher will understand the impact of climate change towards the issues such as quality of live, natural environment, social policy and globalization through talks, workshops and field trips.

Though different promotion actions had been engaged, environmental education still plays a minor role in the primary education syllabus in Hong Kong which is the future challenge for Hong Kong school education.

To change the mind of environmental protection of people in Hong Kong, more propaganda could be carried out. Also, guidelines for environmental education in kindergarten, preliminary school and high school should be set up and more events such as conference, competitions among schools can be carried out.

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[2] New Zealand Association for Environmental Education. (2014, February 26). [online] Available at: http://www.nzaeeconference.co.nz/ [Accessed 28 May 2014]

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Social Impact and Hurdles

New Zealand

With more than 50% of the nation's electricity coming from renewable energy, New Zealand must ensure high energy security from its renewable resources to minimize outages and social impact to its citizens. As climate change becomes more apparent, severe weather will affect the reliability level of energy resources, especially hydro and wind power, which New Zealand is highly dependent on. Currently, hydro and wind power are two of the main contributors to the nation's electricity at 53% and 5% respectively [1]. Although there is continuous development on hydro and wind, the decreasing reliability of renewable energy resources due to climate change signifies that it is necessary for New Zealand to further develop and explore other opportunities in new and emerging technologies, such as geothermal, marine, biofuels and tidal power. Moreover, as some available resources lie within the seismic active zones, the energy systems must have the resilience to cope with shocks and changes. To enhance these opportunities, the Government has developed relationship with international energy agencies and prioritized funding on energy research, development, and deployment support on the country's resources based on her resource strengths and unique characteristics [2]. A clear strategy structure is developed to focus in making the most of the country's energy potential by diverse resource development, environmental responsibility, efficient use of energy and secure and affordable energy.

Under the Resource Management Act 1991 (RMA), district and regional councils are responsible for making decisions on the applications for renewable electricity generation projects. The RMA introduces potentially significant benefits to electricity generation, however, the benefits of these projects can come at the cost of valued elements of the local environment [3]. The RMA does not clearly establish the significance of the benefits of renewable electricity generation projects and at certain stage the decision-making process is intervened by the Minister. It is necessary for the Government to make balancing judgment between renewable energy and the environment. Although the country has large areas of uninhabited land, the public draws significant attention to the development of infrastructures to the environment. As the development for renewable energy generation may affect local landowners and communities [4], to facilitate the consenting process and public consultation for local decision-making, developers shall allow sufficient time in preparing for resource consent to satisfy decision-makers with the potential environmental effects associated with renewable electricity generation projects.

Hong Kong

On the other hand, Hong Kong has a different aspect on social impacts. Rather than a simple process of identifying solutions to the energy problems, Government policy settings determine whether the markets develop and operate efficiently [5]. Currently, the major challenges Hong Kong faces include the changes in the political system, future economic growth and continuous issues arising from different stakeholders. Depending on the importance and urgency of the issue, the Government prioritizes them and tackles them one by one. In the context of sustainability, renewable energy use over burning coal for electricity generation is one of the many proposals for a greener Hong Kong. However, due to the planned annual budget, the financial budget is distributed to sectors, which requires support based on their performance. As coal burning for electricity generation is satisfactory to the majority of customers, changing the source for power generation is comparatively being less focused on.

At a local level, it brings social impacts during the stages of site development and construction such as creating nuisance to the local communities during construction and affecting local roads [6]. Also, the level of public awareness and understanding on renewable energy is limited. Social acceptability is also a major hurdle putting on the resistance to the development of renewable energy in Hong Kong. Despite the advantages of renewable energy in reducing carbon emissions in the Hong Kong region, the public only sees visual, noise, and environmental impacts at a local level as their major concerns.

Discussion

Currently, both our main electric power generation companies, CLP Power and Hong Kong Electric, are involved in renewable energy deployment. The Government can definitely take the lead in exploiting renewable energy and encouraging private sectors to participate in renewable energy power generation and to sell electricity to the power companies or feed into the grid. However, it is necessary for the government to review the regulations and policies to identify barriers that can be removed, to stimulate the renewable energy market, and to promote regional development.

Renewable resources are often considered as an expensive approach with a long turnover period. At the current minimum wage of $30 HKD per hour [7], the basic charge for electricity usage is affordable for the general public. With the change of electricity from renewable resources, the cost will undoubtedly be borne on the general public. People and political parties will react immediately and put the Government under pressure in raising the minimum wage to an acceptable level covering the increase of electric bills. To an alternate path, the Government can initiate policies to subsidize renewable energy costs at the beginning of the policy implementation on the domination of renewable energy use for electricity generation. Through this approach, the general public will progressively gain better understanding in the benefits and importance that these energy resources can bring about a sustainable environment.

Public consultation also plays a significant role in the development of renewable energy. A public project, whether in small-scale or large-scale, requires supports from the general public to gain consent before commencing. By addressing the local communities and landowners to the project, public support can effectively enhance the delivery of success to the project.

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Railway Development in New Zealand

In New Zealand, railway serves as the major transportation method for freight and cross-country travel. Being the largest city in New Zealand, Auckland requires a well-functioning railway network in order to accommodate its citizens. To cope with increasing demand, the Government has invested 600 million NZD to upgrade the railway network in Auckland, two major projects include the electrification of railway and the City Rail Link (CRL).

Electrification is a major upgrading project carried out on the railway in Auckland. Before electrification, railway in Auckland is powered by diesel. Although New Zealand's first electric rail opened in 1923, it was not until 1980s that electric rail started to develop in New Zealand. In order to enable Auckland's suburban rail network is to cope with new models of electric trains, which will be faster, quieter and more energy-efficient, the Government carried out electrification on 80km of the railway in Auckland, which project began in 2011. In upgrading of the network, all passenger lines will be running with a 25kVac traction system. To allow for sufficient height for the overhead cable, preparation works including the replacing of bridges which hinder the cable and lowering of tracks were carried out around the network. Since electrification is a new idea to Aucklanders, education is also given to Aucklanders to pay attention to height restrictions on road crossing as well as avoiding the high-voltage overhead cable.

HEIGHT RESTRICTIONS AT LEVEL CROSSINGS IN AUCKLAND

New electric trains are on their way for Auckland. This means changes for some road users at level crossings.

Changes for road users

*The overhead electrical wires needed to power the trains are now being progressively installed around the rail network. There will now be height restrictions at all **31 level crossings** within the Auckland electrified area. These height restrictions are in place to keep road users and rail passengers safe, by ensuring nothing touches the wires or comes too close to them. The height restriction at the majority of level crossings will be 5 metres. At 11 level crossings a lower restriction of 4.25 metres is necessary.*

Signs

Signs at level crossings will warn road users of the presence of overhead electrical wires and the height restrictions.

How to apply

- *If the operator of a vehicle establishes that any part of the vehicle or its load exceeds the safe height (as sign posted), including radio aerials, they must obtain written permission from KiwiRail before crossing.*
- *To obtain permission contact the KiwiRail Operations Support desk on **04 474 2323** or email: crossing.permits@kiwirail.co.nz or visit **www.kiwirail.co.nz**.*
- *Allow at least five working days for the permit application to be processed. These are additional requirements to NZTA's general operating requirements for over dimension vehicles as laid down by Land Transport Rule: Vehicle Dimensions and Mass 2002 and its amendments.*

Be safe

- *If carrying or towing a high load or object check the height of your load (including radio aerials), plan your journey well in advance and make sure that everything you are carrying or towing is under the height restriction.*
- *Always obey all warning signs and alarms at level crossings and do not queue on a level crossing or begin to move across one until you are certain your vehicle can completely clear it.*
- *In the event of an emergency on or near a Level Crossing call the Train Control Emergency line on **0800 808 400**. All overhead wires must be treated as live at all times. Stay safe, by staying clear of them.*

KiwiRail

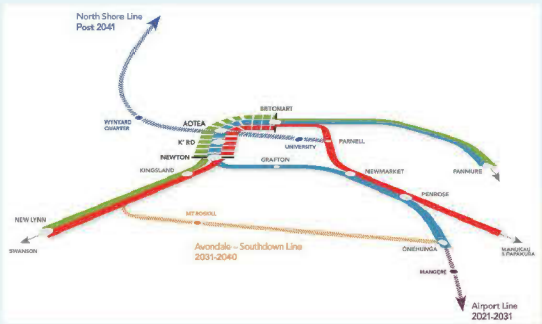
Published August 2011

www.kiwirail.co.nz

Height Restriction at Level Crossings in Auckland Brochure to educate citizens on safe use of level crossings of electrified railway. (Source: http://www.kiwirail.co.nz/uploads/Publications/overhe-ight-loads-brochure.pdf)

For CRL, a twin track rail with three new stations with a total length of 3km will be built in the city centre of Auckland, adding up to the current 120km rail network of the city. Similar to the railway development in Hong Kong, the CRL project aims at meeting the increasing population demand as well as to prompt the economic development around the CBD. Moreover, upon the completion of CRL, it is expected that the road density, and hence, the pollution and traffic congestion, in the CBD would be relieved. A major reason for the CRL project is to increase the current capacity of the network. The existing Britomart station is a dead end terminal station. With only two tracks available, trains need to leave using the same track they arrive on. Since Britomart is a busy station, a bottleneck effect is created and hence limits the capacity of the whole network. The introduction of CRL loops up the network, providing a path for the trains to leave Britomart and hence allowing for the train service to run up to a five-minute frequency. The CRL project is estimated to be completed by 2021. The capacity of the rail network can be increased to 30,000 per hour, which is double that of the current capacity, resulting in an estimated 11 million passengers every year [3].

The proposed CRL, upon completion, will close the loop of the city rail network and increase the capacity of the network. (Source: http://www.bettertransport.org.nz/wp-content/uploads/2013/05/AT-CRL-map-large.jpg)



Future rail links in Auckland (Source: https://at.govt.nz/projects-roadworks/city-rail-link/city-rail-link-route/)

One of the signature upgrading projects is the New Lynn station, which was originally situated on ground level and hindered the traffic on road every time a train passed by. Due to increasing traffic congestion at-grade, the rail and the station were sunken into a trench using diaphragm wall as the method of construction. The New Lynn rail trench and platform opened in 2010. Measuring about 1km long and up to 8m deep, the trench enabled the separation of road and rail in New Lynn, and eliminated two level crossings to relieve major traffic congestion and improved public safety. The old station was changed to a transportation hub and was connected to the bus interchange. The construction of the New Lynn station also prompted urban redevelopment and private development in the surrounding area. The Government encouraged business owners to invest in new development by selling the land around the station to them. The re-building of the station had created a new look for the district and enabled development of the nearby spaces.

New Lynn before.
(Source: http://www.kiwirail.co.nz/projects/major-projects/dart.html)

New Lynn after.
(Source: http://www.aucklandcouncil.govt.nz/EN/newseventsculture/OurAuckland/News/Pages/newlynnhighrisestreetinthesky.aspx)

One special feature about the Auckland railway upgrading projects is its contract form, Early Contractor Involvement (ECI) contract. In traditional contracts, the Contractor is brought in at a later stage of the project, in which key design decisions have been made. Clients and Designers carry out design work to the best of their knowledge according to the information available at an earlier stage. While in ECI contracts, the Contractor is brought in at an earlier stage. ECI can be described in two stages. In the first stage, the Contractor is invited by the Project Engineer to proceed with the design development. In the second stage, the Project Engineer chooses the most suitable solution as per the Client's expectation and tenders out the Contract, yet the Contract will not necessarily be awarded to the Contractor who carried out the earlier design work. This ECI contract allows designs utilizing the Contractor's experience to be made at an earlier stage, and hence the consideration of buildability can be brought in at an earlier stage, which could have benefits to the cost-effectiveness and time-saving side of the project.

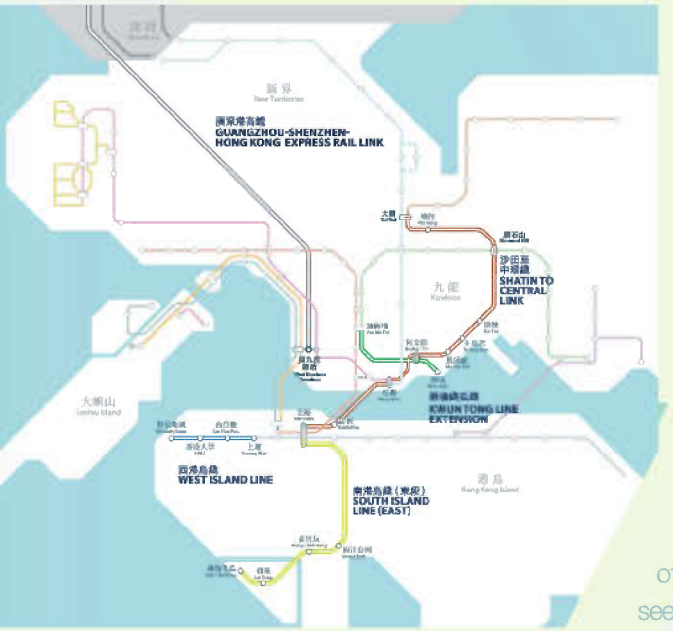
Railway Development in Hong Kong

Railway serves as a backbone of transportation in Hong Kong. The recent railway development in Hong Kong aims to meet the increasing transport needs due to population growth, continued developments, and strengthening links with Mainland China in a sustainable manner. Upon the completion of the various railway projects under the Railway Development Strategy, Hong Kong's railway network will expand to 274km [2]. At present, the railway network in Hong Kong is operated by one single company, MTR Corporation Limited.

Numerical figures related to railway in Hong Kong [2].

In Hong Kong, railway development is not solely developed to meet the demand of transportation, but also enhances the connectivity of newly developed town centres and facilitates the revitalisation of old districts. For example, the construction of the Tseung Kwan O Line assisted the development of the Tseung Kwan O New Town. Similarly, the South Island Line currently in construction aims to revitalise the old industrial district into a new tourist spot in Hong Kong.

Furthermore, in order to maintain Hong Kong's economic development, it is essential to enhance the city's connectivity with adjacent regions. A high speed railway connecting to Mainland China, the Express Rail Link (XRL), is currently under construction. The Hong Kong section of the XRL will run in the form of an underground tunnel from the West Kowloon Terminus in the city centre to the border town of Guangdong for subsequent connection with Mainland China's high speed railway network. With operation speeds of over 240km/h, it is anticipated that the travelling time by train from Hong Kong to Beijing could be as short as 8 hours.



Five major line under construction of railway in Hong Kong [2].

Discussion

The approach to relieve congestion on road is solved by constructing a railway system underground for both cities. Due to scarcity of land, the Island Line in Hong Kong was built deep underground to avoid congestion on road surface, which is similar to New Lynn station, where space at-grade were released for vehicles by sinking the whole station structure and railway to underground.

The extension of the railway network promoted development near the stations. In Hong Kong, residential properties were developed at the Olympic station, Tung Chung station, and LOHAS Park station, and city malls were also built to cope with the need of the increasing popularity of these places with direct connection to the railway network. The type of private development over a government subsidized railway is also seen in New Lynn, where the Government encouraged private development near the renovated New Lynn station. Therefore, the construction or extension of a railway network not only enhanced the connectivity between different places in the city, but also led to the development of new city centres and new towns.

Continuous improvements were developed along with the increasing need of the community. With increasing population, more stations were needed to connect people from the residential areas to the CBD. Other than connecting people in New Territories to the CBD, the Shatin-Central Link also links up the east and west part of the New Territories by linking up the Ma On Shan Line with the West Rail Line. Similarly, the CRL not only construct more stations in CBD to cope with the increasing demand on the railway network, but also provides a solution to the dead end situation in Britomart by looping up the railway network. From the two cases, we can see that the upgrading of the railway not only increases the network capacity, but at the same time enhances the connectivity throughout the whole network.

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Road Planning

New Zealand

In New Zealand, most people prefer driving rather than taking public transport. However, an incomplete motorway ring route around the city has led to traffic congestion between the CBD and suburban areas. To resolve this problem, the Western Ring Route was planned under the Government's infrastructure and transportation programme, "Roads of National Significance [1]" (RoNS). Western Ring Route completes the motorway connection around the city, so as to minimize the congestion problem. This ring route also provides a direct link between the Auckland International Airport and the CBD. As part of this ring route, a 2.4km long three-lane twin tunnel will be constructed under the Waterview Connection Project [2]. The twin tunnel connects the Northwestern and Southwestern motorways in Auckland. In this lowly populated country, tunnel construction was considered over surface roads mainly to minimize nuisance to the public. Furthermore, during the planning stage, tunnel construction was concluded to be more cost efficient than the combined option of surface road and cut-and-cover trenches. Other than improving the motorway connections between the CBD and suburban areas, associated infrastructures and improvement works such as landscaping, sports and recreation assets, and walking and cycling paths were also recommended in the project, providing further benefits to the society.

Completed View of Western Ring Route [1]

In New Zealand, the options of reliable public transport services also helps to reduce severe congestion, and frees up routes for the quicker movement of people and freight, for example, the integrated ticketing and real-time information systems.

Tens of thousands of commuters use Wellington's buses and trains every day. The recent rollout of real-time information systems means commuters can save time and reduce frustration by finding out exactly when their next bus is due from bus stop digital displays, smart phones, or the web before they leave home or work. It can further boost public transport use in the capital, especially when coupled with integrated ticketing.

To further improve efficiency in the operation of the public transport system, Auckland transport department is also starting to investigate on the review of Wellington bus network to improve route design and timetabling; review of a substantial fare structure; high quality trains and improvements to railway stations and bus stops; and examining options for a high quality, high frequency public transport corridor from Wellington Railway Station to the hospital.

Central Wanchai Bypass - The 4.5km long road running along the northern shore of Hong Kong Island to link Central and North Point [4]

Hong Kong

Hong Kong is one of the busiest cities in the world and is famous for its high population density at 6,544person/km^2. Traffic congestion is a daily nuisance to road users. In order to relieve the severe congestion, the Government has planned different modification works to the existing road networks, including Central Wanchai Bypass (CWB), one of the large-scale road projects [5]. The bypass is located along the northern shoreline of Hong Kong Island, connecting the western and eastern districts, targeting to reduce traffic along the existing main roads. In this project, two bridges and one cut-and-cover tunnel will be constructed and existing roads will also be realigned and reconstructed. Since the bypass is located in the heart of the CBD, logistics and social impact are the main concerns of the project. A Central Community Liaison Centre (CCLC) is opened to introduce the planning of the project and to manage any public concerns regarding the project.

Other than CWB, the road widening works at Tuen Mun Road also helps to alleviate the traffic congestion issue. Since many residential buildings are situated adjacent to Tuen Mun Road, noise mitigation measures have been implemented to minimize the noise impact from the high speed road. Noise barriers integrated with vertical and roof greening are constructed at residential areas, providing a better environment to the residents.

Similar to New Zealand, Hong Kong is also famous for convenient public transportation. The real-time train services "Next Train" is developed for the train services, but not yet in bus transport. To improve efficiency in the operations of complete public transport system, more research is suggested on bus route design, timetabling, and fare structure.

Discussion

Hong Kong and New Zealand have large difference in population density; however, just by comparing their CBD situations, both areas are faced with similar road planning issues. The concern is dealt with in a similar approach as well. The Western Ring Route completes the motorway network around Auckland CBD and the CWB project provides an alternative route around the Hong Kong CBD both target to relieve the current traffic congestion by improving the road network system. Aside from relieving the road network issues, a residential environment standpoint is also as important to comprehend with. Construction of Waterview Connection was constructed underground with TBM instead of cut-and-cover tunnel while noise barriers with vertical greening works were provided at Tuen Mun Road, both minimizing nuisance to residents. Both cities can learn from each other in the different types of greening works or improvement work to preserve and enhance the environment for the residents. These works will definitely create a sustainable future for the society.

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Shared Space at Auckland Waterfront

Shared Space in New Zealand

The main function of road is separating vehicle pathway from pedestrian. Shared Space is an urban design concept that aims to combine the use of road for vehicle and pedestrian where pedestrians have right of way. One of the major elements of the concept is to remove road kerbs and install a single level pavement across the whole width of the street. More room for pedestrian, outdoor dining, and other street activities are provided by removing the traditional distinction between pedestrian walkway and vehicle. For instance, upgrading the Fort Street area to shared spaces has provided an additional 1,191m² of space for people with over 85% of the road reserve for pedestrians activities [1]. Road furniture, such as road markings, roadside railing and barriers, bollards and conventional traffic control devices are kept to a minimum within the shared space but signature of shared space is shown at the entrance and exit of the street. Road lighting is specially decorated and shaped to better suit the culture and environment of the street.

Other than an attractive destination for people to visit, spend time in and shop, shared space is also an excellent way to upgrade an old street. By increasing the flexibility in the use of street, diverse range of street activities can be held without calming the traffic capacity nearby. Over 75% of shop and property owners said it was valuable being sited near or adjacent to a shared space. It creates a vibrant street area that can better support business and attract investment [2].

Shared Space at Auckland Waterfront

Safety is one of the main concerns for the shared space concept. During the visit, the designer of shared space pinpointed that there is no reportable accident in the common-used area since its launching in 2012. Report also shows that over 80% of users said they felt very safe in the area, as pedestrians and drivers are encouraged to engage more carefully with each other and with their surroundings [3]. When cars approach and enter the shared space, the drivers will instinctively slow down the vehicles and make eye contact with pedestrians. On the contrary, the pedestrians should be aware of vehicle movement even when they have the right of way.

To ensure the well functioning of shared space, the streets are code. Any illegal parking or violation of the aforesaid law and road code may result in ticketing. Nevertheless, the self-behaving spirit and caring from New Zealanders contributes the most to the well operation of shared spaces.

Pedestrianisation in Hong Kong

To improve the overall pedestrian environment, Hong Kong Transport Department launched the pedestrian schemes since 2000. The department aims to develop an environmental friendly approach to manage traffic and transport matters in Hong Kong. Criteria of being a pedestrian street include pedestrian capacity and safety, impact of pedestrianisation on the local traffic, and the land use in that area.

With shops, restaurants, and commercial companies established nearby, pedestrianisation facilitates commercial activities and attracts investment. Thus shop owners are more willing to develop their business in that area, and resulting in rent sky-rocketing. The pedestrianisation also provides space for artistic events and public forum. Hence, pedestrian prefers walking through the designated zone. The pedestrian safety and mobility, overall environment and air quality are expected to be greatly improved.

Pedestrianisation in Hong Kong is sub-divided into three types: full-time pedestrian street, part-time pedestrian street, and traffic calming street [4]. The former two are basically streets with same road furniture and design as normal roads with vehicle prohibition in specific time frame except for emergency services vehicle. During the specified period, pedestrians have absolute priority in the street. Vehicular access will resume normal outside the specified period. These two types of pedestrianisation are mainly implemented in areas with intense commercial activities and high demand of pedestrian.

In contrasts, vehicle can always access the traffic calming street with lower speed. Features such as speed table, kerbs build-out, and road narrowing are implemented on the street to slow down the vehicle. Parking is also strictly prohibited in the street. Footpaths are widened as far as possible for the pedestrian, though they should still cross the street cautiously. Neither pedestrian nor vehicle has the right of way, therefore there is no likelihood for public events to be held in this type of pedestrianisation.

Kerbs build-out at Lock Road

Full-time Pedestrian Street at Paterson Street

Part-time Pedestrian Street at Sai Yeung Choi Street South

Road Narrowing at Hankow Road

Discussion

The concept of shared space in New Zealand is similar to the combination of part-time pedestrian street and traffic calming street in Hong Kong. Both of them aim to support leisure and recreational activities without impacting the traffic. The delegates observe that civic-minded New Zealander contributes to the success of shared spaces.

In view of environment and public order, New Zealanders are doing a great job as compared to Hong Kong. By removing all road furniture and providing resting facilities, shared spaces are designed for citizens to rest and to enjoy their leisure time. New Zealand citizen not only keep the street clean and healthy, but they also help in keeping the street in good order. The delegates seldom heard shouting and honking in the street as pedestrian are considerate to keep the shared spaces in peace.

In New Zealand, restaurants and shops are closed early at night whereas those in Hong Kong operate until mid-night. Therefore Hong Kong resident who live just next to pedestrianisation suffer serious noise pollution generated from routine commercial activities. Together with the strong and flashing lighting from advertisement on the street, the resident can hardly live a normal life.

Apart from the overall atmosphere, how the shared spaces being policed is a bit different from that in Hong Kong pedestrianisation. Vehicles in New Zealand can travel freely in every shared space while the admittance of vehicle in Hong Kong pedestrian zone is subject to the type of pedestrianisation and the pre-set time frame.

The delegates believe that shared space is advanced in achieving the objective for setting up pedestrianisation. In Hong Kong, vehicles which originally plan to travel through pedestrian zone are redirected to other road during restricted hours. The re-directied traffic demand causes traffic jam to the neighboring roads. Nevertheless, the absolute restriction creates a vehicle-free environment, which is beneficial to pedestrian in term of safety.

To further enhance pedestrian safety when crossing the shared spaces, New Zealand government should adopt suitable road design other than solely rely on eye contact between pedestrians and drivers. For example, by setting up speed table in front of a frequent road crossing zone, vehicle will be forced to decelerate so that a confirmed signal and sufficient time is given to pedestrian to safely cross the road.

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Academic Support on Seismic Study

New Zealand

The Magnitude 6.4 earthquake which hit Christchurch downtown in New Zealand is sitting on active fault lines and therefore it is not surprised that there are frequently active seismic activities happening at cities in New Zealand. Nevertheless, the tragedies can be minimised by adopting better building technology. Through the technical exchanges with the professors and students in UoA and UC, the delegates acquired a better understanding on how New Zealand Government financially support academic institutions in their seismic studies. The professors emphasised that their academic researches would not only benefit the reconstruction works of Christchurch, but also the development of the whole New Zealand. They pointed out that the most crucial part is to find a way to implement academic findings into practical construction.

During the exchange gatherings, it is understood that some researches were sponsored by Foundation for Research, Science and Technology (FRST). It is an organisation partly formed by the New Zealand Government. The PhD students also remarked that they have high degree of freedom to choose their study topics. Students are encouraged to discuss with their professors on the proposed research topic and to apply for research fund.

Hong Kong

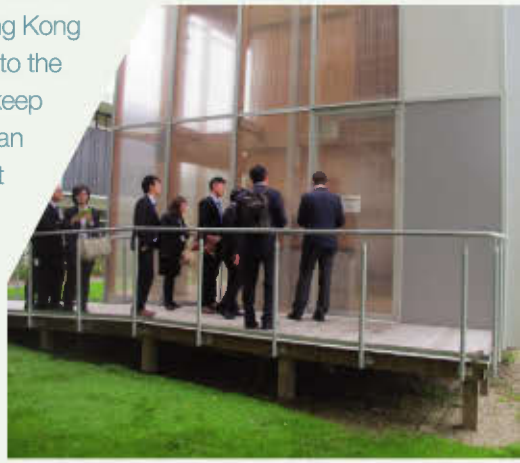
As discussed with a professor from the Hong Kong Polytechnic University, there are three main sources of research funds available in the Hong Kong academic research industry. They are the Central Research Fund (CRF), Construction Industry Council (CIC) and Innovation Technology Funding (IFF). It is understood that each of the funding institutions will setup their own criteria on the research topics and would affect the freedom of research topics. Some Government departments and authorities such as the Buildings Department (BD) and the Housing Authority would contain internal funding on seismic research. The studies were normally be on fixed topics and the researches would be carried together with consultancies and academic institutions.

Engineering Department of the University of Canterbury

Discussion

In Hong Kong, most of the available research results are shared by the electronic version. It is not common to see any research findings displayed in Hong Kong academic institutions like the ones found in UoA and UC. It may be due to the fact that there is insufficient space in Hong Kong academic institutions to keep the tested specimens. It is highly recommended that if the Government can subsidize and provide more space for academics research and sharing, it would provide a full picture of the research and inspirations to other scholars.

Besides, there is a high tendency in the implementation of seismic resistant design in Hong Kong's code of practice. It would benefit the local academic industry if the findings are coming from local researches rather than just adopting schemes and approaches from other nations. It is highly recommended that the Government could value the research nature but not only in seismic studies.



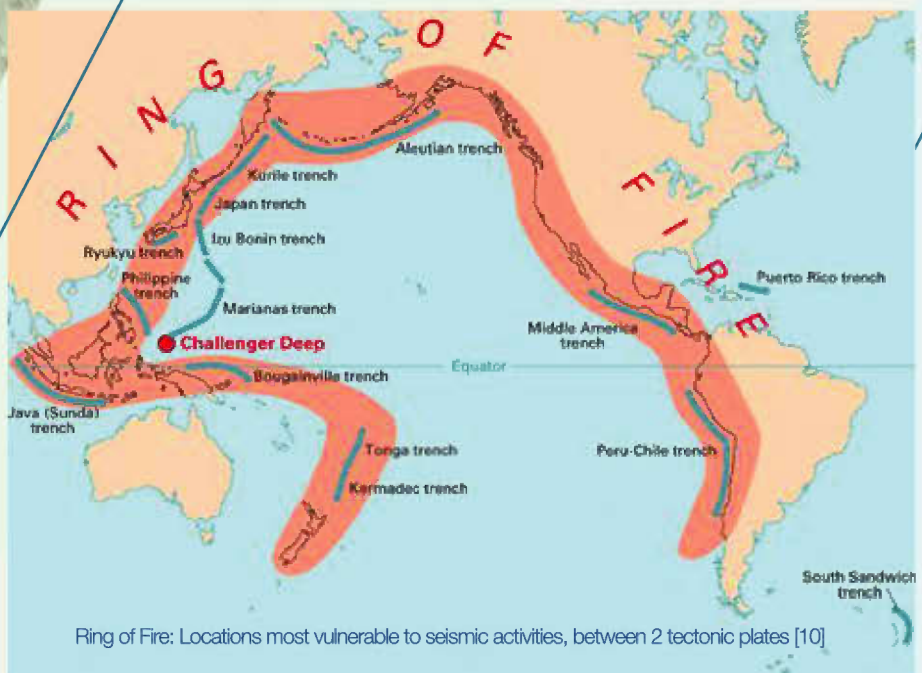
Research Display of Seismic Resistant Design in Wooden Structures at UC

Displays on Students Research Results along the Hallway of UC

Comparison of the seismic design requirement between New Zealand and Hong Kong

Seismic-Resistant Building Design Standards – New Zealand

With New Zealand located at the "Ring of Fire" as shown below, seismic activities can almost considered as unavoidable. The recent devastating earthquake occurred in New Zealand was the Magnitude 6.3 earthquake which struck Christchurch on 22 February 2011, resulted in 185 fatalities and over 8,500 injuries [4]. As most of the cities in New Zealand are located at active seismic zone, there is no doubt that the structural design codes in New Zealand would require buildings to be designed to resist a certain level of seismic intensity subject to their locations.



Ring of Fire: Locations most vulnerable to seismic activities, between 2 tectonic plates [10]

Seismic-Resistant Building Design Standards – Hong Kong

Comparing to New Zealand, Hong Kong is not situated within any active seismic belts and is considered as a region with low to moderate risk of seismic activities. According to the study carried by the Buildings Department, 169 earthquakes of varying intensities were recorded in Hong Kong between 1905 and 2012 [1]. Most of them were of Intensity V or below on the Modified Mercalli Scale (MMS) and none had caused any casualties.The strongest earthquake ever recorded in Hong Kong was the one happened in 1918 near the Shantou area. It has a measured Intensity of VII on the MMS. It caused some damages, mainly cracks in walls, to a few buildings in Hong Kong which were constructed to the less advanced building standards at that time. No injuries or casualties in the territory were reported.

For reference, the MMS with description of the impact at different levels of intensity is shown in the table below. Currently, the design manuals in Hong Kong only require engineers to allow for seismic loading on several long design life structures such as bridges and Water Supplies Department's service reservoirs. However, seismic resistant design is not a compulsory requirement for private buildings in Hong Kong.

Modified Mercalli Scale

Mercalli Magnitude	Effects observed
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably by persons indoors, especially on the upper floors of buildings. Many do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken, books off shelves, some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight.
VII	Difficult to stand. Furniture broken. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.
IX	General panic. Damage considerable in specially designed structures, well designed frame structures thrown out of plumb. Damage great even in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level distorted. Objects thrown into the air.

Discussion

While the current Buildings Ordinance (Cap. 123) does not require private buildings in Hong Kong to meet specified seismic-resistant design standards, it is worth noting that, internationally, many major cities located in areas of seismicity comparable to that of Hong Kong, including Shanghai, South Korea, Thailand, Australia, France, Germany and New York City, have all introduced statutory seismic-resistant design standards for new buildings [2]. In view of this, Buildings Department has prepared a consultation paper and is now seeking the views from stakeholders of the building industry, academics and the general public on whether statutory seismic-resistant building design standards should be introduced in Hong Kong.

According to a consultancy study commissioned by the Buildings Department, local buildings are basically safe in the event of an earthquake, although they may suffer some degree of structural damage depending on the earthquake's intensity [3]. The study observed that the introduction of seismic-resistant building design standards should not, generally speaking, lead to a substantial increase in construction costs, but would significantly reduce damage costs to the structural elements of the buildings due to earthquakes. Moreover, the number of fatalities in the event of a major earthquake would also be significantly reduced. It is understood that the study on this subject is still in progress. As an engineer, we look forward to seeing the final decision of the Buildings Authority.

Recovery Plan in Christchurch and Sichuan

Recovery Plan after the Quake - Christchurch

The Magnitude 6.4 earthquake which hit Christchurch downtown in February 2011 resulted in 185 fatalities and over 8,500 injuries [4]. Shortly after the quake, CERA is established to be in charge of the ongoing recovery works in Christchurch.

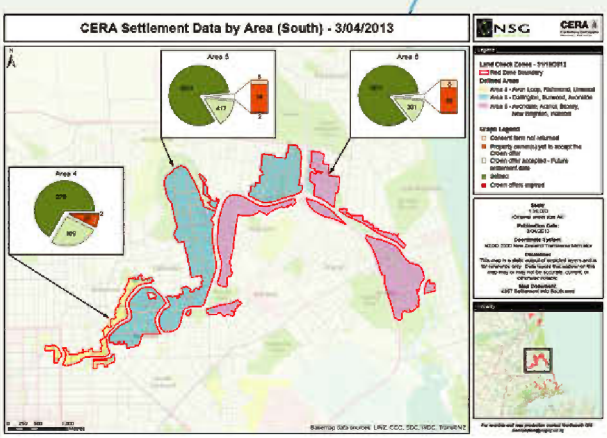
A famous picture taken during the earthquake of Christchurch in 2011 [13]

A Collapsed Building in Christchurch after the Quake [11]

A widespread liquefaction was observed throughout the city after the earthquake shocks. This phenomenon is mainly due to the ground conditions of Christchurch. The geology under the city comprise roughly 1km of silts, sands and gravels over lying volcanic rock. There is also a network of surface and sub-surface natural waterways meandering through and under the city. It was the combination of the subsurface soil conditions, high water table, and the severe shaking that led to the widespread liquefaction. The resolution of CERA was to evacuate the city away from the source area. They established a 390 hectare cordon around the central city and was manned by the army. The fenced cordon protected the public by keeping them away from source of buildings, which were at risk of imminent total collapse. It is commonly known as the Red Zone in the Christchurch Central City. If the land is categorized as Red Zone, no redevelopment including re-building the house on the land will be allowed. In other words, the land is considered as too vulnerable to earthquake and is not suitable to reside anymore. To date, with most of the demolishing works completed, the focus has now moved to the rebuilding of the city.

Reconstruction of Christchurch Downtown under Public Consultation [12]

Christchurch Red Zone Map at April 2013 [5]



Recovery Plan after the Quake - Sichuan

To date, there are no devastating earthquake ever happened in Hong Kong. However, there are other cities in Mainland China which have experienced destructive earthquakes. The most recent and devastating one would be the Magnitude 8.0 Sichuan Earthquake happened on 12 May 2008 which is also known as the Wenchuan earthquake (汶川大地震). The tremor resulted in more than 69,000 fatalities and almost 375,000 were injured [6]. Beichuan, Wenchuan and Yingxiu counties were almost entirely flattened.

Right after the disaster, the State Council established a counterpart support plan (《汶川地震災後恢復重建對口支援方案》). The Sichuan recovery plan is to arrange 19 provinces in Mainland China to collaborate and rebuild Sichuan on "one province to one affected county" basis. The Government of HKSAR also approved the injection of a total of nine billion HKD into the Trust Fund in support of the reconstruction work in Sichuan. Taking into account of the one billion HKD donations by the Hong Kong Jockey Club, the Government of HKSAR committed a total of about ten billion HKD to support reconstruction in Sichuan [6]. In addition, hundreds of volunteers from different charity groups in Hong Kong travelled to Sichuan to help on the reconstruction works. In 2012, the Chinese Government announced that the restoration and reconstruction works are completed.

According to Dr. Guo Da Jiang, who led a volunteer group in Hong Kong to rebuild a secondary school in Sichuan, most of the buildings were re-built at original locations while some villages were relocated to other areas after the quake.

A Picture Taken at Sichuan after the Great Earthquake in 2008 [14]

Discussion

According to official records, the earthquakes in Sichuan and Christchurch are classified as intensity scale of XI and IX respectively. In view of recovery plan, the delegates observed that the Government in Christchurch tended to reallocate all residents away from high risk areas such as the “Red Zone”. This approach is adoptable in Christchurch as its population is not very high comparing to other cities and there is sufficient land available in the region. In contrast, it is an impractical solution to Sichuan where flat areas are limited and population is much denser. In Sichuan, most of the villages were rebuilt at the same locations where they collapsed due to the earthquake, although with a higher standard of materials and construction details.

Rock Barrier
in Country Park [9]

Mitigation Measures for Natural Terrain Risks in New Zealand and Hong Kong

New Zealand

In New Zealand, having a large land area (243 times the size of Hong Kong), including many undeveloped hilly terrains, it is difficult for them to establish a systematic approach similar to Hong Kong to deal with natural terrain risk mitigation. Instead of conducting detailed research of the potential risks, past histories are reviewed to study the technical aspects of the hillside. Extensive plantation of trees had been implemented by New Zealand, as the roots of these features can stabilize the slopes. The taller trees may also act as a barrier to reduce the momentum generated in case of any boulder falls.

Hong Kong

Hong Kong has a land area of approximately 1100km², with 60% of our land being the natural hillside [7]. It is easily found that many of our developments and major roads are located in close proximity to the steep natural terrains. Because of the high seasonal rainfall, these man-made slopes and natural hillsides would pose a risk to the public. There is a need to mitigate the risk of natural terrain landslides.

The Geotechnical Engineering Office (GEO) has conducted studies and works to reduce landslide risk in Hong Kong since its establishment in 1977. In recent years, risks associated with natural hillside are rising due to more urban development or redevelopment near these hillsides, hence GEO launched a rolling Landslip Prevention and Mitigation Programme (LPMitP) in 2010 to systematically deal with the landslide risk to existing man-made slopes and natural terrains. Under the LPMitP, natural terrains will be selected for studies in each year based on a priority ranking system. Those with high risk, i.e. high consequence-to-life and economic consequence, would require priority detailed studying and mitigation measures to reduce the risk [8].

Today many substandard man-made slopes have been upgraded while protective rock barriers were installed to some areas to minimize the damage incurred by boulder fall. The technology is still evolving. Further development works are being carried out in order to enhance the reliability, cost-effectiveness and buildability of natural terrain mitigation measures.

Steep Slope Protection[9]

Discussion

The causes of landslides in Hong Kong and New Zealand are very different. Landslides in Hong Kong are mainly due to heavy rainfall, whereas in New Zealand is based on earthquakes. The failure modes of the natural terrains maybe different. The studying of natural terrains in Hong Kong are a lot more theoretical as many information regarding the natural terrains, such as ground information, aerial photograph, site survey would have been carried out prior to detailed studying of the terrains.

Whereas in New Zealand, it would be expensive to carry out such works, plantation is one of their cost effective ways in dealing with landslides but there is limited technical background to support such mitigation measure. It is purely based on the understanding of how plants are grown in grounds. Therefore, what we have in Hong Kong, the systematic approach to deal with landslide risk, will be more efficient when it comes to mitigating landslide risks.

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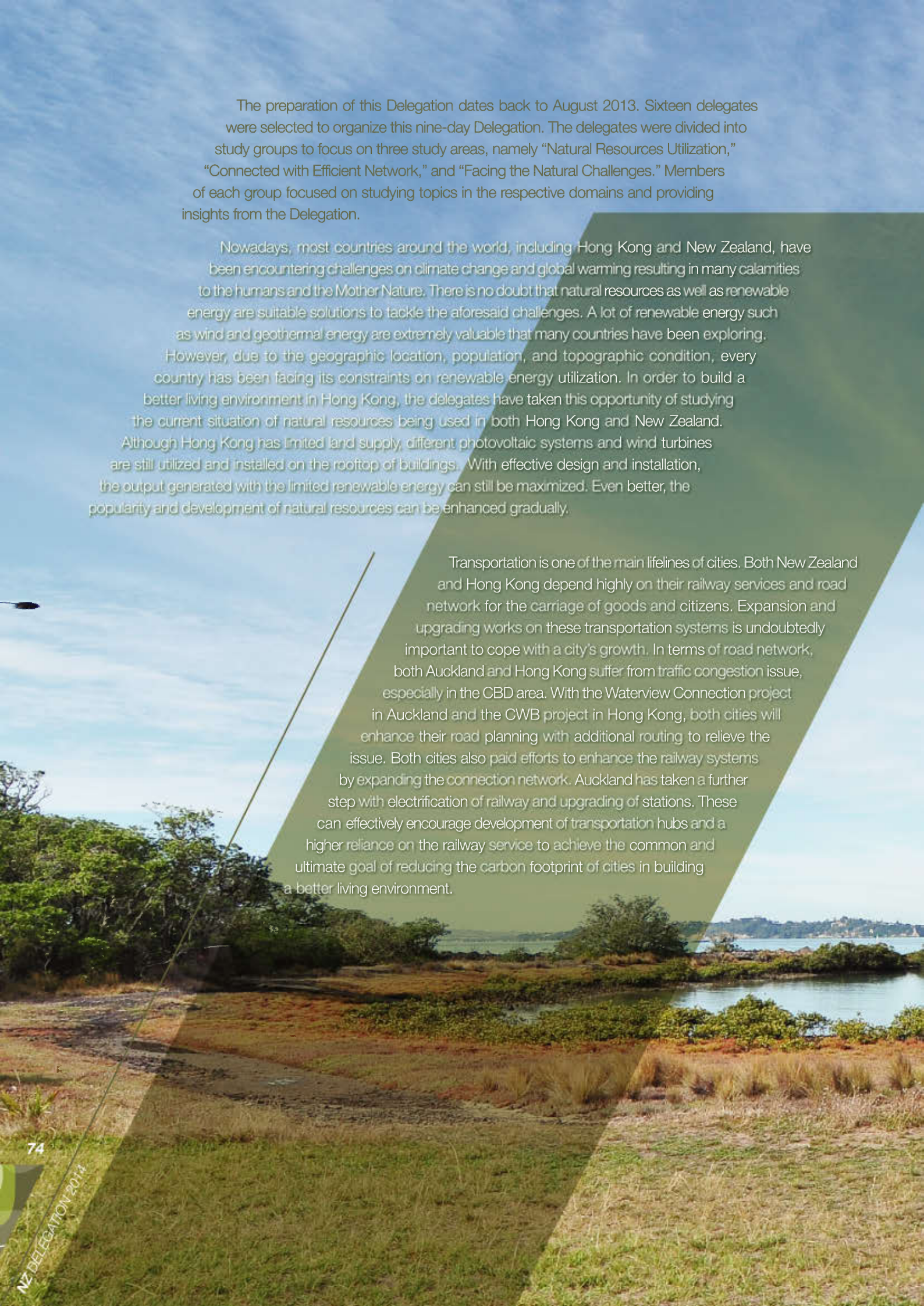
Conclusion

New Zealand, a country with close relationship between nature and technology, has always ranked high on international livability measures among other nations. Taking on the theme of "Perfection in Synergy of Nature and Technology", the delegates explored two of the largest cities, Auckland and Christchurch. Auckland, being the largest city of New Zealand, aims to become the world's most livable city with different strategic plans including expansion works on transportation networks, rejuvenation projects on waterfront development, growth on renewable energy tacking climate change, etc. Christchurch, after the devastating earthquakes since 2010, has experienced rapid growth with the success in implementing one of the largest revitalization projects - Christchurch Rebuild which envisages to build a more resilient Christchurch for future generations.



The preparation of this Delegation dates back to August 2013. Sixteen delegates were selected to organize this nine-day Delegation. The delegates were divided into study groups to focus on three study areas, namely "Natural Resources Utilization," "Connected with Efficient Network," and "Facing the Natural Challenges." Members of each group focused on studying topics in the respective domains and providing insights from the Delegation.

Nowadays, most countries around the world, including Hong Kong and New Zealand, have been encountering challenges on climate change and global warming resulting in many calamities to the humans and the Mother Nature. There is no doubt that natural resources as well as renewable energy are suitable solutions to tackle the aforesaid challenges. A lot of renewable energy such as wind and geothermal energy are extremely valuable that many countries have been exploring. However, due to the geographic location, population, and topographic condition, every country has been facing its constraints on renewable energy utilization. In order to build a better living environment in Hong Kong, the delegates have taken this opportunity of studying the current situation of natural resources being used in both Hong Kong and New Zealand. Although Hong Kong has limited land supply, different photovoltaic systems and wind turbines are still utilized and installed on the rooftop of buildings. With effective design and installation, the output generated with the limited renewable energy can still be maximized. Even better, the popularity and development of natural resources can be enhanced gradually.

Transportation is one of the main lifelines of cities. Both New Zealand and Hong Kong depend highly on their railway services and road network for the carriage of goods and citizens. Expansion and upgrading works on these transportation systems is undoubtedly important to cope with a city's growth. In terms of road network, both Auckland and Hong Kong suffer from traffic congestion issue, especially in the CBD area. With the Waterview Connection project in Auckland and the CWB project in Hong Kong, both cities will enhance their road planning with additional routing to relieve the issue. Both cities also paid efforts to enhance the railway systems by expanding the connection network. Auckland has taken a further step with electrification of railway and upgrading of stations. These can effectively encourage development of transportation hubs and a higher reliance on the railway service to achieve the common and ultimate goal of reducing the carbon footprint of cities in building a better living environment.

Natural hazards are threats which naturally occur and will incur negative effect on people and the environment. Many natural hazards are interrelated; e.g. earthquakes cause tsunamis and drought, resulting in famine and heavy rain and leading to floods and landslides. All cities around the world have to face their own natural challenges based on their city development scale, population, and geographical location, Hong Kong is no exception.

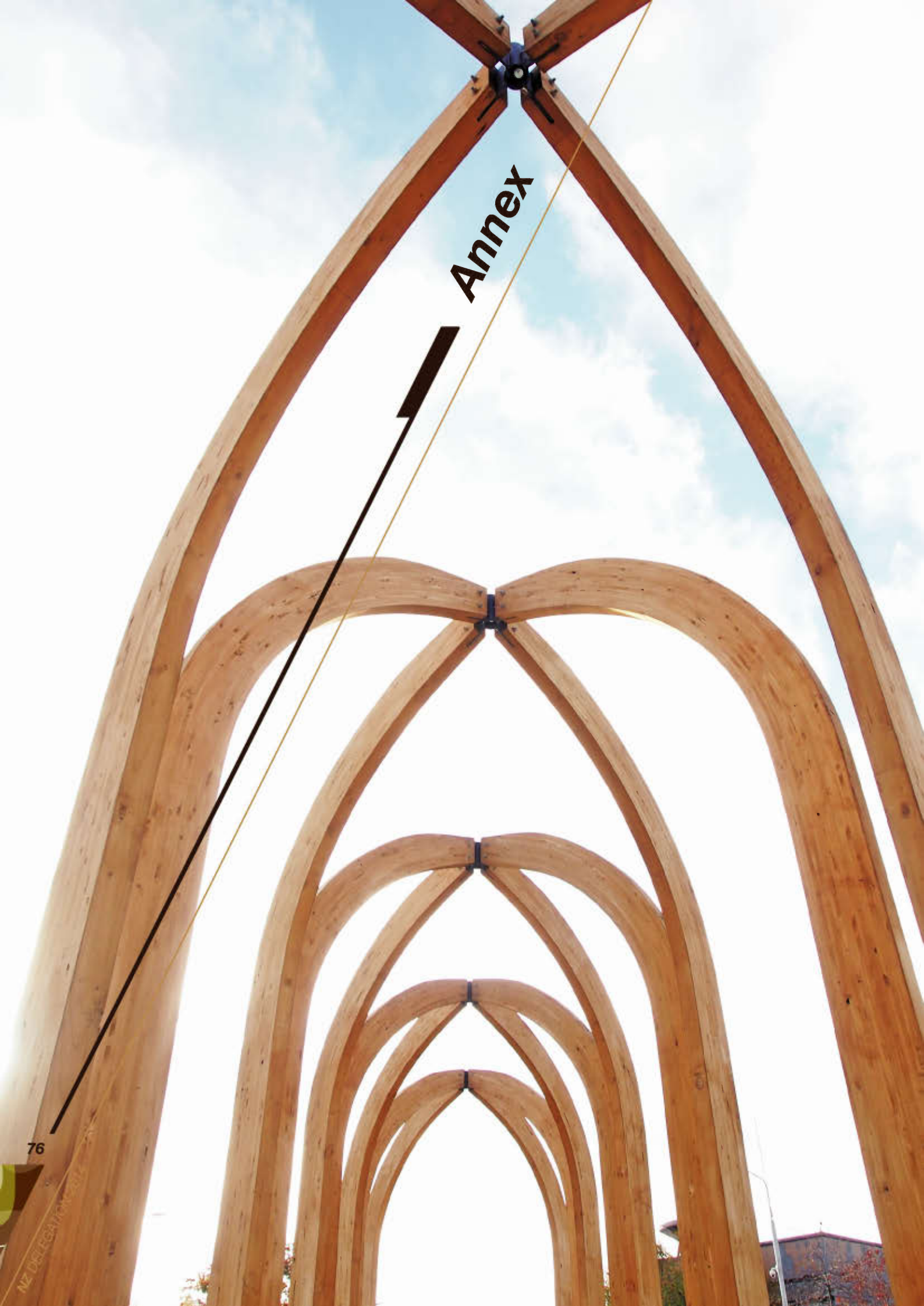
As an engineer, we are always looking for ways to "engineer" our city in order to make a better place for living. The delegates have taken this invaluable opportunity to learn the natural hazard risks which New Zealand is facing as well as the mitigation measures they adopt to tackle all these risks. Although there are many differences between New Zealand and Hong Kong in terms of population, geographical condition as well as natural challenges, there are quite a lot of fantastic and innovative development ideas in New Zealand, particularly their environmentally harmonised design, which we can consider and implement to the infrastructural development works in Hong Kong.

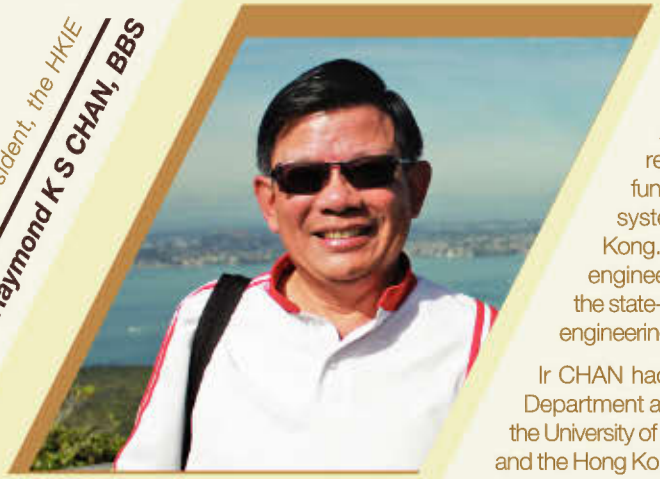
In addition to the technical studies and visits in New Zealand, the delegates were also delighted to visit overseas institutions such as IPENZ, UoA, and UC. Through the exchange sessions, the delegates gained a better understanding of the engineering culture and working environment as an engineer in New Zealand.

Locally in Hong Kong, the delegates organized a series of local seminars and visits on topics related to the theme of this Delegation for understanding the current situation in Hong Kong. Combining this knowledge with the findings from New Zealand provides a comprehensive study on the Delegation to share among other young engineers of the Institution.

The Delegation was held successfully with the support of advisors, local and overseas hosting organizations, and sponsors, not to mention the dedication and enthusiasm of the delegates. This Delegation is just a start. We sincerely invite you to join our efforts with the learning from this Report in sustaining our engineering profession and building Hong Kong into a better living place.

Annex





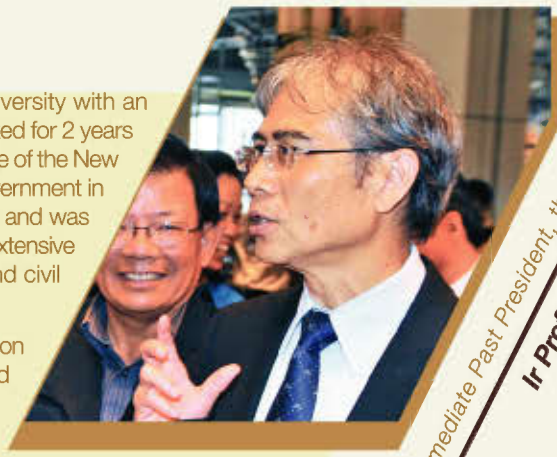
President, the HKIE
Ir Raymond K S CHAN, BBS

Ir Raymond CHAN Kin Sek, aged 61, was the Head of the Geotechnical Engineering Office of the Hong Kong Special Administrative Region of China 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 twenty five key-note lectures and the state-of-the-art papers on landslide risk management and geotechnical engineering practice in Hong Kong.

Ir CHAN had 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 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 was a member of the Scientific Committee of the international Integrated Research on Disaster Risk (IRDR) Program between 2009-2012. He is also an advisor to IRDR (China).

Ir CHAN has been an official Justice of Peace between 1997-2012. Currently he is the Guest Professor at the Hong Kong University of Science and Technology and the Senior Vice President of the Hong Kong Institution of Engineers. In December, 2012, he was conferred the Bronze Bauhinia Star (BBS) for his dedicated and meritorious service to the Government for over 34 years, particularly in significantly enhancing slope safety in Hong Kong.



Immediate Past President, the HKIE
Ir Prof. CHOY Kin Kuen

Ir Prof. CHOY was graduated in 1975 at the Hong Kong Polytechnic University with an Associateship in Structural Engineering. After graduation, Ir Prof. CHOY worked for 2 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 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 and civil engineering projects.

Ir Prof. CHOY is a Chartered Civil and Structural Engineer, a Fellow of the Institution of Structural Engineers and the Hong Kong Institution of Engineers, a Registered Structural Engineer under the Buildings Ordinance 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 HKSAR Government in 2011. Before then he was an Assistant Director of the Buildings Department.

He is now serving the Hong Kong Institution of Engineers as the President and the Professional Green Building Council as the Chairman.

Senior Vice President, the HKIE
Ir Victor C K CHEUNG

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 36 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 government, NGO's and professional bodies. He is currently the Vice President of the Hong Kong Institution of Engineers.

Vice President, the HKIE

Ir CHAN Chi Chiu , SBS, JP

Ir CHAN is a civil engineer by profession. After graduation from the University of Hong Kong in 1976, he worked in the then Highways Office and Drainage Division of the HKSARG for two years, and then continued his engineering career in the Water Supplies Department. He has been involved in the planning, design and construction of new water works projects, operation and maintenance of the water supply and distribution system, and the provision of customer services.

In 2008, he was transferred to the Civil Engineering and Development Department, taking charge of the planning, management and implementation of development and infrastructure projects in the North and West New Territories. In September 2010, he took up the post of Director of Drainage Services, overseeing all aspects of wastewater and stormwater drainage services, covering capital works for new infrastructure, improvement works to existing assets, operation and maintenance of existing systems and facilities, and collection of sewage services charges. He is currently a Vice President of the Hong Kong Institution of Engineers.

Ir Joseph CHOI Kin-hung is the Managing Director of Hsin Chong Construction Company Limited.

He has over 43 years of multi-dimensional and multi-functional experience across contracting and client organisations in Hong Kong, Chinese Mainland, Taiwan, Macau and overseas. Before joining the Hsin Chong, he was the general manager for the Kowloon-Canton Railway Corporation and MTR Corporation Limited responsible for the design and construction of various new railway lines.

Ir CHOI graduated from the University of Aston in Birmingham, United Kingdom with a degree of Bachelor of Science in Civil Engineering. He is a Fellow of the Hong Kong Institution of Engineers; Fellow of The Hong Kong Institution of Highways and Transportation; Member of the Institution of Civil Engineers, a Chartered Engineer, and a Registered Professional Engineer. Ir CHOI is a director of Engineering Forum Limited and a member of Engineers Registration Board. He is also a member of Departmental Advisory Committee for the Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University; a council member of Hong Kong Contractor Association; and a council member of The Hong Kong Institution of Highways and Transportation.

Vice President, the HKIE

Ir Joseph K H CHOI

Past President, the HKIE

Ir Dr. Otto L T POON, BBS, OBE

Ir Dr. 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, among others, Advisory Council on the Environment, Energy Advisory Committee, Solicitors Disciplinary Tribunal Panel, Council for Sustainable Development, Trustee Board of Institution of Mechanical Engineers, UK, Chinese Mechanical Engineering Society, PRC, as well as being the President of the Hong Kong Institution of Engineers (1998-99), President of Hong Kong Association of Energy Engineers (2004-08), President of Association of Energy Engineers, Hong Kong Chapter (2006-09) and Chairman of Hong Kong Climate Change Forum (2010-11).

He now serves, among others, as the Adviser to Bauhinia Foundation Research Centre, Member of School Advisory Committee of School of Energy and Environment of City University of Hong Kong, and President of the Hong Kong Federation of Electrical and Mechanical Contractors.

He was awarded OBE and BBS. He was conferred the University Fellowship by The Hong Kong Polytechnic University in 2007, Honorary Degree of Doctor of Technology (Hon DTech) by Coventry University, UK in 2011, and Honorary Fellowship by University of Central Lancashire, UK in 2012. He was also elected as an Outstanding Hong Kong Polytechnic University Alumni, an Outstanding IMechE Branch Member of the Year (2003-04) and an Honorary Member by The Chinese Mechanical Engineering Society. He was inducted into the Hall of Fame of the Hong Kong Institution of Engineers in 2010.

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

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

Graduated from the University of Hong Kong in Mechanical Engineering, he worked for the power utilities, a manufacturer, contracting and consulting organizations 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 organizations. In 2009 he re-embarked on full time work when he was appointed as the Managing Director of Hsin Chong Construction Group Limited. He retired again in 2012 but was subsequently appointed Chief Officer of Kowloon-Canton Railway Corporation in 2013.

He has been active in public services, and has extensive involvements in engineering and education sectors.

For engineering sector, he had served as the President of The Hong Kong Institution of Engineers, Chairman of the Hong Kong Branch and Council Member of the Institution of Mechanical Engineers in UK.

For education sector, he had served as Council Member and then Vice Chairman of the Hong Kong Council for Academic Accreditation, Council Member of Lingnan University, and Chairman of the Advisory Board for Vocational Education of the Vocational Training Council. He is an Honorary Fellow of the University of Hong Kong and of Lingnan University.

He is presently the Chairman of the Process Review Panel for the Financial Reporting Council and Deputy Chairman of The Hong Kong Institute of Directors. He had recently completed his terms as Chairman of the Energy Advisory Committee, Board Member of the Airport Authority Hong Kong, and Member of the Town Planning Board. He was conferred an OBE in 1996, appointed Justice of Peace in 1997, and awarded a Silver Bauhinia Star in 2009.

Chairman, Continuing Professional Development Committee, the HKIE
Ir CHAN Siu Tack

Ir CHAN is an Assistant Director (Estate Management) of the Hong Kong Housing Department, HKSAR 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 Structural Engineers and the Chairman of the HKIE Structural Division. He is currently the Chairman of the HKIE-Continuing Professional Development Committee, Council Member of the HKIE, and Deputy Chairman of the HKIE Structural Discipline Advisory Panel and the HKIE Building Discipline Advisory Panel.

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

Ir KO is an electrical engineer who started as a Graduate Trainee in CLP Power Hong Kong Limited in 1980. After 11 years with the power utility, he moved to the contracting business by joining Kum Shing Group as a Contracts Manager. 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 engineering contracts.

His past service in the HKIE includes Council Member, Chairman of the Electrical Division and Chairman of the Continuing Professional Development Committee. Currently, he is the Deputy Chairman of Gas & Energy Division and Chairman of the Professional Assessment Committee. In addition to the service to the HKIE, he is an Honorary Advisor of the Hong Kong & Kowloon Electrical Engineering & Appliances Trade Workers Union, Member of the Engineers Registration Board, Member of the Election Committee of the Chief Executive, Executive Member of Munsang College School Sponsoring Body and Vice Chairman of Admissions, Budgets and Allocations Committee of the Community Chest.

Delegation Chairman

Ir Annie O Y CHAN (Mechanical Engineering)

Annie graduated with a Bachelor Degree in Mechanical Engineering and obtained a Master degree in Building Services Engineering from the Hong Kong Polytechnic University. She holds the professional memberships with HKIE and IMechE and currently working as a Mechanical Engineer in the Water Supplies Department, HKSAR Government. Annie has joined the HKIE-YMC in Session 2006/07 as a helper and now she is Chairman in current session.

Delegation Manager

Ir Vincent C T LEUNG (Electrical Engineering)

Vincent received his Bachelor's degree in Electrical Engineering and Master's degrees in Electrical Engineering and Building Services Engineering from the Hong Kong Polytechnic University. He is currently working as an Electrical and Mechanical Engineer in the Drainage Services Department of the HKSAR Government and am responsible for management of the operation and maintenance of the sewage treatment facilities of the North District. Being an active member in the HKIE, Vincent joined HKIE-YMC as a helper in Session 2008/09 and further undertakes to work as a Committee Member. He is currently the Honorary Secretary of the committee in this session.

Deputy Delegation Manager

Ir Kenneth K W CHEUNG (Civil Engineering)

Kenneth obtained his Bachelor of Applied Science in Civil Engineering from the University of British Columbia in Canada and Master Degree in Infrastructure Project Management from the University of Hong Kong. He is currently the Project Engineer of China Harbour Engineering Company Limited responsible for construction works of the Reclamation project for the Hong Kong Boundary Crossing Facilities of the Hong Kong-Zhuhai-Macao Bridge. He has also been actively participating and contributing himself to HKIE-YMC and is now a Committee Member and the Honorary Treasurer of the HKIE-YMC.

Deputy Delegation Manager (Overseas)

Ms Emily H T YU (Geotechnical Engineering)

Emily obtained her Bachelor of Applied Science in Geological Engineering from the University of British Columbia, Canada. Before her move to Hong Kong, she worked in the environmental and oil and gas sectors in Canada. She is currently an Assistant Engineer of Atkins China Ltd., and has been involved in major projects such as reclamation works design for the Hong Kong-Zhuhai-Macao Bridge and as a geologist for the tunneling works of the Guang-Zhou-Shenzhen-Hong Kong Express Rail Link. She also contributes actively to the HKIE-YMC as a Committee Member, and enjoys organizing activities for the Sports and Recreation Group to encourage work-life balance amongst young engineers.

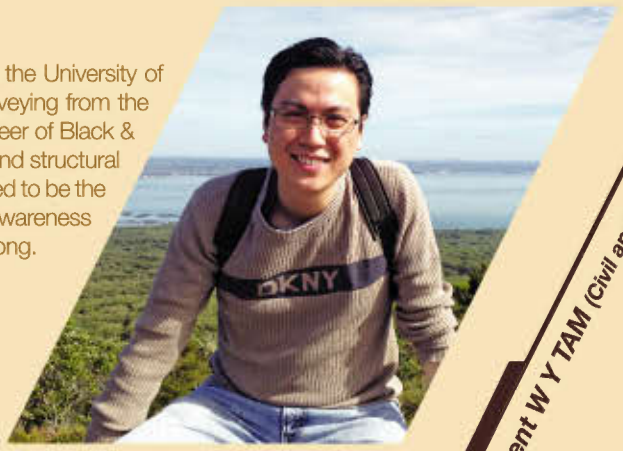
Secretary

Ms Yani Y Y KO (Electrical Engineering)

Yani obtained her Bachelor's degree in Electrical Engineering and pursuing Master's degree in Electrical Engineering at the Hong Kong Polytechnic University. She is currently working as a graduate trainee of the CLP Power Hong Kong Limited. Yani joined HKIE-YMC as a committee member in session 2013/14. She is the coordinator of Student Promotion Group of the committee in this session.

Treasurer

Ir Vincent W Y TAM (Civil and Structural Engineering)



Vincent obtained his Bachelor Degree in Civil Engineering from the University of British Columbia in Canada and Master Degree in Building Surveying from the City University of Hong Kong. He is currently the Principal Engineer of Black & Veatch Hong Kong Limited and has involved in a variety of civil and structural engineering projects in Hong Kong and worldwide. He was elected to be the co-opted member of YMC this year and wishes to promote the awareness of the engineering profession to the young engineers in Hong Kong.

Local Liaison Officer

Mr Sky M H LI (Civil Engineering)

Sky obtained his Bachelor Degree of Engineering in Civil Engineering from the University of Hong Kong in 2012. Upon graduation, he joined AECOM Asia Company Limited as a Graduate Engineer. He is currently a Graduate Member in the Civil Discipline of the Hong Kong Institution of Engineers. During his training, Sky has been actively involving in a variety of infrastructure projects in Hong Kong such as Tseung Kwan O – Lam Tin Tunnel.

Local Liaison Officer

Ms Eva X T YIN (Building Engineering)

Eva obtained her BSc in Building Engineering and Management at the Hong Kong Polytechnic Unviversity, and her Mphil in Construction Management at the University of Hong Kong. After graduation, she joined Henderson Land Group as a Graduate Engineer.

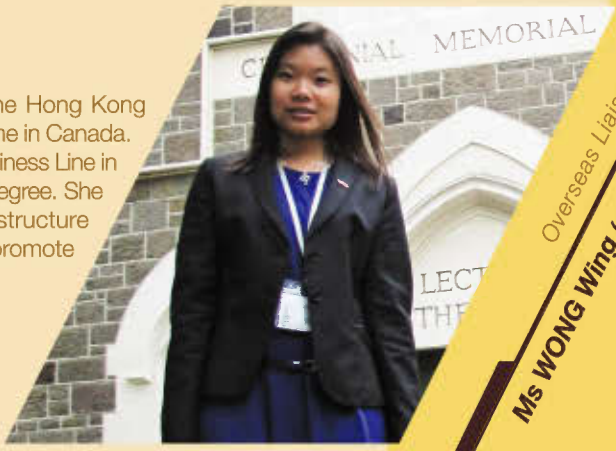
Overseas Liaison Officer

Ms WONG Lee Man (Information Engineering)

Lee Man obtained her Bachelor Degree in Electronic and Information Engineering from the Hong Kong Polytechnic University in 2012. After graduation, she joined Electrical and Mechanical Services Department (EMSD) of the HKSAR Government. She is currently pursuing a Master of Science in Electronic Engineering at the Chinese University of Hong Kong. Currently, she works as an Engineering Graduate who is responsible for project management of several business intelligence and process optimization projects.

Overseas Liaison Officer

Ms WONG Wing (Structural Engineering)



Wing obtained her Bachelor Degree in Civil Engineering from the Hong Kong Polytechnic University in 2011 and completed exchange programme in Canada. Her internship was in Beijing and joined the Building Engineering Business Line in AECOM as a Graduate Engineer upon her graduation of bachelor degree. She involves in engineering analysis on both foundation and superstructure projects, organising employee engagement events and wish to promote more of Engineering Profession to the Society.

Logistics Officer

Mr Joseph M K FISHER (Geotechnical Engineering)

Joseph graduated with a Master's degree in Civil Engineering from Imperial College London in 2011. Upon graduation he joined the Geotechnical Engineering Office of the Civil Engineering and Development Department as a Geotechnical Engineering Graduate. He is currently a Graduate Member in the Geotechnical Discipline of the Hong Kong Institution of Engineers. Joseph was selected as one of the President's Protégés in Session 2012/13 to shadow the HKIE President to gain further insight in the engineering industry. He currently serves as the Honorary Treasurer of the President's Protégés Club, in which he will seek to further promote engineering to others. Joseph will treasure this opportunity with the Young Members Committee to New Zealand to further expand his engineering horizon.

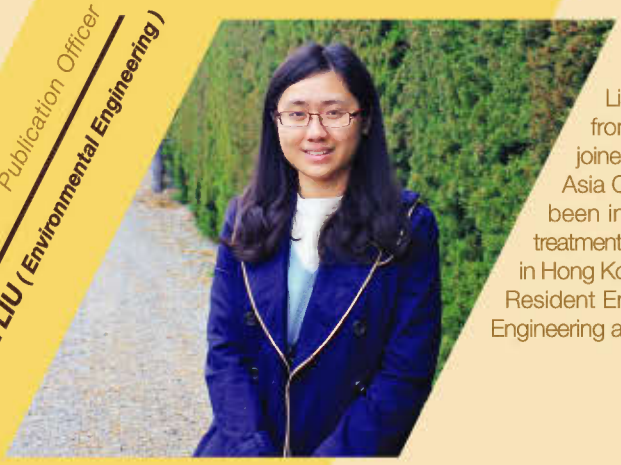
Logistics Officer

Ms Elizabeth W S LEUNG (Civil Engineering)

Elizabeth obtained her Bachelor Degree in Civil Engineering from the University of Melbourne, Australia. Upon graduation, she joined the Water Department of Atkins China Ltd. as a Graduate Engineer. She is currently pursuing a Master Degree in Infrastructure Project Management at the University of Hong Kong. In 2013, she participated in the joint duty visit arranged by the Drainage Services Department, Atkins China and Mott MacDonald HK Ltd. to visit the river restoration and flood control projects in Korea and Japan. During her training, Elizabeth has been actively developing her skills in designing for major projects such as drainage design for both the Hong Kong Link Road and Hong Kong Boundary Crossing Facilities of the Hong Kong-Zhuhai-Macao Bridge, and drainage diversion design for the Kai Tak Nullah (midstream section).

Publication Officer

Ms Lisa Q L LIU (Environmental Engineering)



Lisa obtained her Master Degree in Environmental Engineering from Hong Kong University of Science and Technology. She joined Water and Urban Development Department of AECOM Asia Company Limited in 2011 upon her graduation, and has been involved in a variety of engineering projects of sewage treatment, air quality monitoring and Environmental Impact Assessment in Hong Kong and overseas. She is currently working as an Assistant Resident Engineer for Wan Chai Development Phase II under Civil Engineering and Development Department's project.

Publication Officer

Mr Chris S K LUI (Civil Engineering)

Chris obtained his Bachelor Degree in Civil Engineering from the Hong Kong Polytechnic University. He joined the construction team of Leighton Contractors (Asia) Limited upon graduation. He is currently working as a Graduate Engineer responsible for construction work of the highway project for Central-WanChai Bypass and is now a graduate member for HKIE.

Publication Officer

Ms Queenie Y Y TSANG (Civil Engineering)

Queenie obtained her Bachelor Degree of Engineering in Civil Engineering from the University of Hong Kong. Upon graduation, she joined the HKSAR Government and is currently working as Civil Engineering Graduate in the Works Department. As a part of her training towards becoming a professional Civil Engineer, she is currently working at the site office of Wan Chai Development II.

Publication Officer

Ir Peggy P K WONG (Civil Engineering)

Peggy obtained her Bachelor Degree in Civil Engineering and her Master Degree in Management of Projects from the University of Manchester, UK. She joined Civil and Structural Department of Atkins China Ltd in 2008 upon her graduation. She was under the HKIE Scheme "A" Training and acquired professional training and practical experiences in design and construction projects such as railway projects and drainage treatment works. She joined Ove Arup & Partners HK Ltd. in 2013 and currently working as an Assistant Resident Engineer for Hong Kong Boundary Crossing Facilities Reclamation Works under Hong Kong-Zhuhai-Macao Bridge Related Hong Kong Projects.

Vincent

It was my great honor to work with the 15 selected diligent and enthusiastic delegates in the overseas delegation this year.

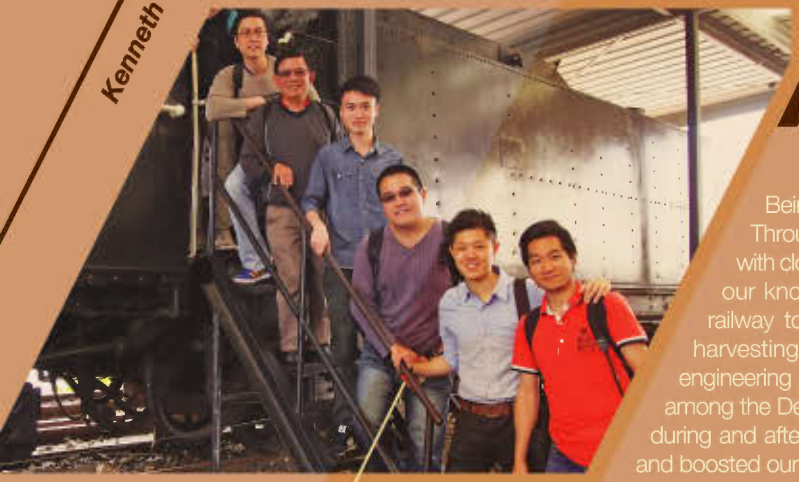
New Zealand is a beautiful country with very close connection with the nature. The engineers there play an important role in nature conservation and natural resources utilisation. I am particularly impressed by the passion and innovative ideas of their engineers to overcome the challenges they come across with the nature.

Having worked together with the delegates for more than 9 months since the formation of the team in late 2013, we experienced and gained far more than solely technical knowledge and overseas experience in our 9-day New Zealand delegation. We worked together; we visited together and we learnt together. This unique experience will definitely be one of the most important pages in my career life.

Annie

It is a memorable experience for me to join with 15 young engineers as well as our advisor in the New Zealand delegation. During the trip, I learnt the latest development on renewable technologies. In addition to technological aspect, I appreciate New Zealand engineers' serious attitude and passion on their job and their discipline. I am impressed and am motivated to continue to contribute myself to the industry.

Kenneth



Being part of this Delegation is an exciting and unforgettable experience! Through visiting New Zealand, which was widely recognised as the country with close relationship between nature and technology, has certainly broadened our knowledge in different aspects of sustainability, from development in railway to waterfront promenade, from facing different natural challenges to harvesting renewable energy, 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 "sust ainable" tomorrow.

Emily

Hills and valleys, volcanoes and glaciers, kiwis and penguins (and other exotic animals!) - New Zealand is renowned for its natural beauty, but as we discovered, there is so much more to New Zealand than meets the eye. With quintessential Kiwi hospitality, the locals shared with us their passion for innovation, improving their home to become world-class while showcasing its pristine nature and unique culture. The resilience of Christ-church was at once both heartbreaking and inspiring. Each person had their own extraordinary story to tell. These stories have touched hearts everywhere, in New Zealand and around the world, bringing together everyone's collective strength towards rebuilding this devastated area.

With every experience, we change and grow. My second YMC Overseas Delegation trip has given me many new experiences. Thanks to our advisors and the HKIE-YMC for their continuous support in our engineering journey. Thanks to all the delegates for their hard work and dedication – we most definitely worked hard AND played hard! Let's continue to engineer a better Hong Kong together!

Yani

The delegation has been a memorable and fruitful one which not only delivers us knowledge and experience, but also friendship, conscience, enthusiasm and many other stuff that could not be learnt without participating in it. It widened my horizon in area such as infrastructure planning and development as well as valuable knowledge in sustainable city planning with the experienced shared by Kiwi (New Zealanders). Furthermore, by organizing the delegation, I sharpened my management skills and met many new friends from other disciplines. I truly recommend young engineers to participate in the YMC Oversea Delegation.

Vincent

Fresh air, blue sky and white cloud are my first impression of New Zealand. It is my first time to join YMC Overseas Delegation and what I learnt from this delegation is far more than what I expected. I am very impressed the way the delegates worked together and scheduled the whole trip starting from six months before the delegation. The technical seminars and visits are wonderful. Walking through the "Red Zone" of the Christchurch in person and witnessing the damage done on buildings by the earthquake are the most memorable part of the trip. Except the technical aspect, I am also glad to know another 15 enthusiastic young engineers in this delegation. I hope we can keep the friendship forever.

Sky

With nice people and pure environment, New Zealand is one of the most wonderful countries around the world. The 9-day fruitful delegation to New Zealand with 15 young delegates coming from a variety of backgrounds and engineering disciplines was truly a memorable experience to me. Not only could this delegation enrich my engineering knowledge, but also make friendship among the delegates. Through this delegation, I could definitely possess a better understanding on how renewable energy in New Zealand contributes both the society and environment, transportation system provides convenience to the public as well as the innovative seismic design being applied in this country.

I would like to take this opportunity to express my gratitude to HKIE-YMC and advisors for their continuous support, and all delegates for their contribution to the delegation. Eventually, I was very happy to have such a wonderful journey with all delegates.

Eva

It has been a great experience and advantage to me having joined this overseas delegation to New Zealand. Every sharing and learning moment during the trip was so fruitful and enriched with pleasant excitement that all of us could be inspired with engineering professionalism and real-life exposure. It was indeed a valuable learning trip which denotes a memorable experience. I am gratified that I can be one of the beneficiaries who have not missed the chance and worked with 15 joyful delegates.

Lee Man

With the hard works of all 16 delegates, we planned this nine-day incredible trip to explore New Zealand, which was really a valuable and wonderful experience. We not only acquire knowledge and experience, but also established deep and lasting friendship It enhanced my engineering exposure on various technologies namely seismic measuring, renewable energy, green building, and also strengthen my soft skills, such as communication skills, presentation skills and leadership skills. I would like to express my sincere gratitude and thanks to the advisors and HKIE YMC for organizing and supporting our delegation. It is truly an invaluable experience and unforgettable memory of my life.

Wing

The 10-days trip with experienced advisors and other 15 energetic delegates was fantastic and fruitful. New Zealand is widely recognised as one of the most pure countries who optimise her natural resources to strike a balance between development and conservation. The theme "Perfection in Synergy of Nature and Technology" was well defined, in which all the local and overseas visits were perfectly matched. Not only could it enhanced my engineering knowledge but also strengthened my interpersonal skills and to value the fruitful outcome between buddies collaborations.

I would like to give the deepest thankful to all of my lovely teammates. The friendship among delegates will not end with the successful journey. I am also grateful to the support from HKIE YMC in all aspects of advisory support. The delegation programme must definitely keep on moving in cultivating more all rounded young engineers.

Joseph

The YMC Overseas Delegation 2014 to New Zealand was a fruitful journey with 15 other enthusiastic delegates. Coming from different backgrounds and different engineering disciplines, we have worked together to exchange our views and appreciate what we all do as engineers.

New Zealand is one of the most beautiful countries in the world, friendly people, relaxing environment and amazing scenes. Through this delegation I appreciated how this country has committed deeply into renewable energy for a better environment; invest into transportation for better convenience to the public, as well as the different approaches they adopt to mitigate against natural hazards in this seismically active country. I have broadened my engineering horizon to experience the different issues and challenges New Zealand faces day to day.

I would like to thank the advisors and delegates for giving unlimited support to the delegation, as well as the HKIE YMC for organizing this delegation to broaden our experience as young engineers.

Elizabeth

The HKIE YMC Overseas Delegation was a fabulous trip in exploring the relationship between nature and technology in New Zealand. Through the delegation, we see strong interrelationship between the nature and the built environment, such as their approach on large-scale renewable energy utilisation, transportation infrastructures designed for efficiency and resilience to the damages from earthquakes. From the natural environment to built-up infrastructures, I appreciated how New Zealand has demonstrated the integrated design of various approaches that assisted in building a better environment. By drawing on the strong points of the practices applied in New Zealand, I believe we can make further improvements in the development in Hong Kong.

The delegation allowed me to gain invaluable experience and opportunities that broadened my horizons to the world of engineering. I would like to thank the HKIE-YMC, the advisors for their support and our delegates who worked collaboratively in bringing this successful delegation.

Lisa

The first sight of New Zealand gave me a big big shock that there is such clean, beautiful, developed and civilized country in the earth with such blue sky and green grass and clear water, etc. How come this country is so "green" and "livable"? With these questions, we started our journey in New Zealand. During the 9 days in New Zealand, I found that the people there have high conscious to protect the environment. Even the mobile toilet in the deep of a hill could be kept very clean which shocked me so much! People would protect the environment in every action in their daily life. Environment friendly could be found in every design of the city building, road construction and everywhere. Widely use of renewable energy contributes much less pollution to this country. I think there are many ways Hong Kong people could learn from this like keeping protect the environment in mind and action right now.

Thanks to our advisors and the HKIE-YMC for their support in our engineering journey. Thanks to all the teammates and delegates for their support and cooperation. To work with them is really a happy experience and I believe that the life and the future in Hong Kong could be better and better!

Chris

From preparing the delegation to visiting the youngest country in the world, New Zealand, it is my honor to work with 15 energetic and passionate young engineers from various engineering discipline for months.

Fully compacted with seminars and site visits, this fruitful delegation widens my engineering exposure on city redevelopment, natural resource utilization and natural hazard prevention. I appreciate the ambition of New Zealander to sustainability develop their city as well as protecting the natural environment. Undoubtedly the aspiration and technology can be useful and applied to Hong Kong for our New town development.

Queenie

Land of the long white cloud – the translation for the Maori name of New Zealand, is the best description for the country. No matter from the eyes of a tourist, or those of an engineer, New Zealand is a deadly attractive city. The way they make best use of their natural resources and how mechanics work well with nature is magnificent. Yet, the best part of the delegation is working in a team of lively and interesting delegates. We worked, we played, and shared fun and excitement, which made up the best memories of the trip.

What inspired me most was the engineers contributing in the reconstruction of Christchurch after the earthquake strikes from 2010. Despite the severely damaged public utilities and inconvenience of living in the city after the earthquake, engineers from around the world flew to the Christchurch to help rebuild the city, and some asked nothing for return. This reminded me of what engineers can do to improve our city. Our skills and techniques are invaluable assets that we process, and we can always utilize them in a way to contribute to the community. I hope the passionate of engineers to serve the community will never die.

Peggy

It was a very valuable experience being in this peaceful country, exploring the nature and the town planning of this geographically isolated country with other 15 delegates and advisor, Ir Raymond Chan. Through the preparation and participation of this delegation, I acquired not only the engineering knowledge, but also the environmental, social and cultural aspects which widened my horizon.

Apart from enhancing my technical knowledge, the Delegation also provided me an opportunity in gaining organization, communication and presentation skills. Friendship was also made with young engineers of different disciplines. We worked as a team, played as a team, making this journey a more fruitful and meaningful one. Thanks advisors! Thanks delegates!

Acknowledgement

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

Auckland Transport
Canterbury Earthquake Recovery Authority
Christchurch Airport
Civil Aviation Department
CLP Power Hong Kong Limited
Electrical and Mechanical Services Department
Geotechnical Engineering Office
Highways Department
The Hongkong Electric Company Limited
IPENZ Auckland Branch
IPENZ Canterbury Branch
Leighton Contractors (Asia) Ltd
Mighty River Power
MTR Corporation Limited
NZ Transport Agency
University of Auckland
University of Canterbury
Waterfront Auckland
Windflow Technology Ltd.

We appreciate very much the financial support from the following sponsors:

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The Hongkong Electric Company Limited
The Hong Kong and China Gas Company Limited
Kum Shing (K.F.) Construction Group Limited
Leighton Contractors (Asia) Limited
Ove Arup & Partners Hong Kong Limited

We would like to express our special thanks to the following people who generously assist us in this Delegation:

Ms Chan Nga Man
Mr Ray Chang
Ir Veronica Choi
Prof. Nawawi Chouw
Ms Jenny Chu
Ir Philip Chung
Prof. Mark Davidson
Mr Nick Etherton
Mr So'o Fagamalo
Mr Chris Goodin
Mr Alan Gray
Dr. Guo Da Jiang
Mr John Hare
Ir Iain Seymour-Hart
Mr Steve Hawkins
Mr Chris Hick

Mr Eric Ho
Mr John Hong
Mr Mike Jacka
Mr Bryan James
Mr Eddie Jim
Mr Alan Johnston
Mr Peter King
Ir Raymond Koo
Mr Jan Kupec

Mr Andrew Lau
Mr Michael Lee
Ms Leung Fung Ping
Mr Jim Lord
Mr Chris Maguire
Mr Rod Marler
Mr Bob Mawdsley
Ms Fritha Bevin-McCrimmon
Mr Ewen McKenzie
Mr Stuart Oakey
Mr John O'Hagan
Mr Mike Parker
Mr Andrew Read
Mr John Schurink
Mr Pete Scott
Mr Peter Spies
Mr Richard Trudgian
Ms Janet Vincent
Ms Wong Lee Man
Ir Albert Yuen
Ms Anna Zhan

Acronyms

A/C	Air Conditioning
BD	Buildings Department
CAD	Civil Aviation Department
CBD	Central Business District
CCLC	Central Community Liaison Centre
CERA	Canterbury Earthquake Recovery Authority
CIAL	Christchurch International Airport Limited
CIC	Construction Industry Council
CLP	CLP Power Hong Kong Limited
CPD	Continuing Professional Development
CRF	Central Research Fund
CRL	City Rail Link
CWB	Central Wanchai Bypass
ECI	Early Contractor Involvement
EMSD	Electrical and Mechanical Services Department
EPA	Environmental Protection Authority
FRST	Foundation for Research, Science and Technology
GEO	Geotechnical Engineering Office
HACTL	Hong Kong Air Cargo Terminals Limited
HDPE	High-Density Polyethylene
HEC	The Hongkong Electric Company Limited
HKD	Hong Kong Dollars
HKIE	Hong Kong Institution of Engineers
HKSAR	Hong Kong Special Administrative Region
HVAC	Heating, Ventilation, and Air Conditioning
HyD	Highways Department
ITF	Innovation Technology Funding
IPENZ	Institution of Professional Engineers New Zealand
LPG	Liquefied Petroleum Gas
LPMitP	Landslip Prevention and Mitigation Programme
MMS	Modified Mercalli Scale
MOTAT	Museum of Transport and Technology
MTRC	MTR Corporation Limited
NZAEE	The New Zealand Association for Environmental Education
NZD	New Zealand Dollars
PRESSS	PREcast Seismic Structural System
RMA	Resource Management Act
RoNS	Roads of National Significance
SCADA	Supervisory Control And Data Acquistion
TBM	Tunnel Boring Machine
TM	Technical Memoranda
UC	University of Canterbury
UoA	University of Auckland
XRL	Express Rail Link
YMC	Young Members Committee

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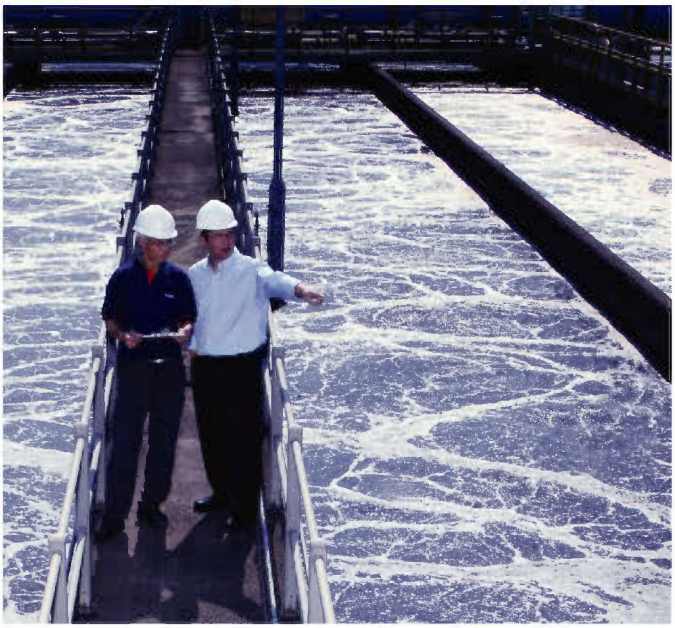

Scope of Business 業務範疇

Building Services	屋宇裝備工程
Environmental Engineering	環境工程
Data Centre Infrastructure	數據中心基建系統
Integrated ICT Solutions	綜合資訊及通訊系統
Intelligent & Green Building Solutions	智能及綠色屋宇系統
Lifts & Escalators	升降機及電扶梯
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Central-Wan Chai Bypass at Wai Chai East & HKCEC
中環灣仔繞道灣仔東段及香港會議展覽中心段

Building Construction 樓宇建築
Hong Kong International Airport SkyPlaza
香港國際機場翔天廊

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Image
Mamu rainforest canopy walkway, Australia

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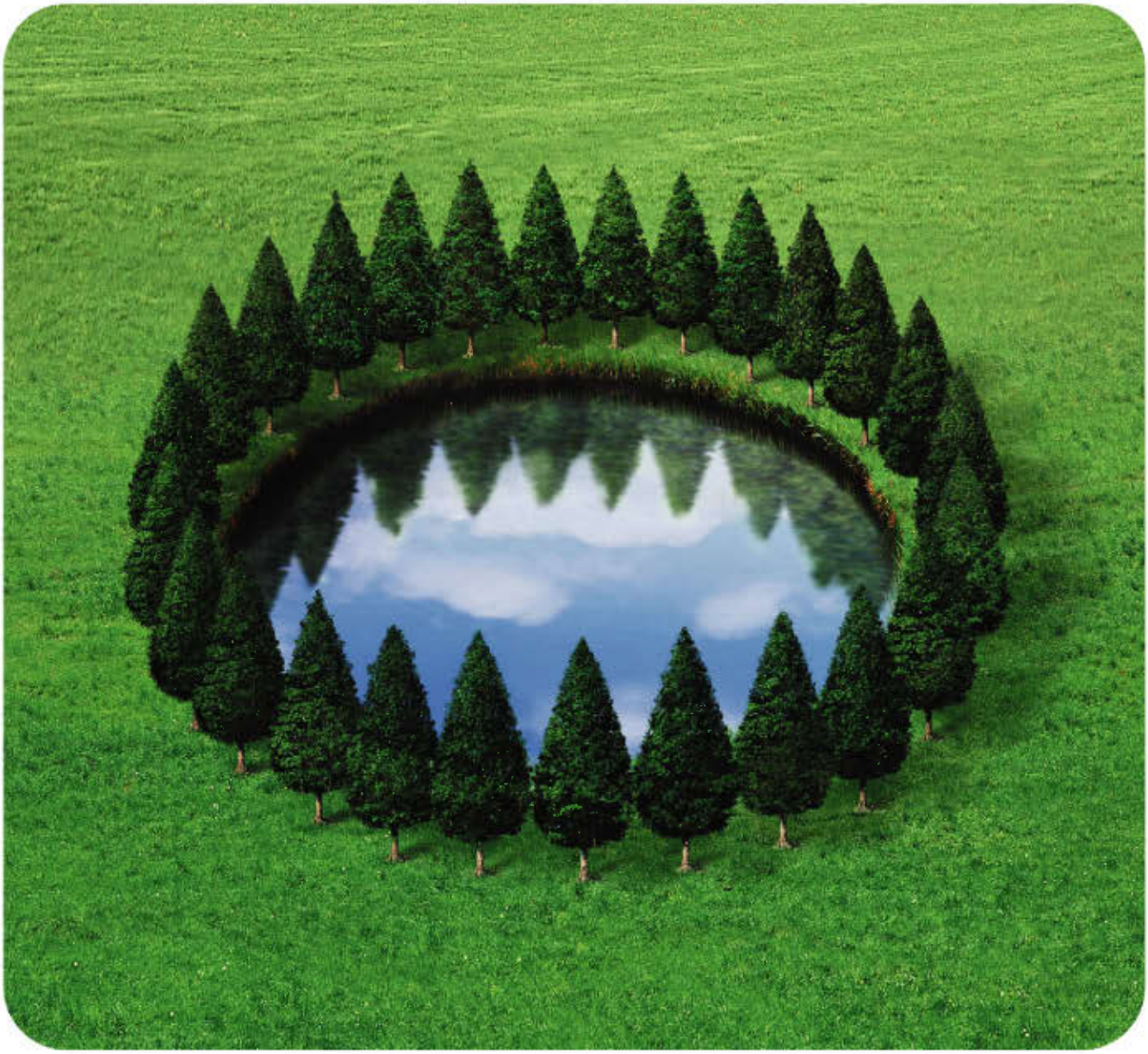
ARUP

Clean Energy To Provide a Green and Sustainable Future For Generations to Come



At Towngas, our aim is to be Asia's leading energy supplier and service provider, with an environmentally friendly focus.

As Hong Kong's oldest energy utility, our pioneering green initiatives date as far back as the early 70s, when we began using naphtha rather than heavy oil and coal to produce town gas. This move has reduced the emission of sulphur dioxide over the years, contributing to the prevention of acid rain. In 2006, we took another significant step forward, when we introduced natural gas as a feedstock in addition to naphtha. Together with the use of landfill gas for gas production purposes, we have been able to lower emissions of carbon dioxide even further to the impressive level of 20%. Looking forward, we are committed to the ongoing exploration and supply of clean energy to ensure a green and sustainable future for our young people and the generations to come.

Greening up your life

煤氣 Towngas

港燈 HK Electric

超凡卓越
時刻照亮香港
EXCELLENCE, ALWAYS.

百多年來，港燈一直是香港背後的動力，為香港提供源源不絕的電力，推動這顆東方之珠成為全球舉足輕重的國際都會和金融中心。

香港發展一日千里，港燈亦不斷求進，積極地提升服務水平、引進現代化設施及拓展服務範圍。時至今日，港燈的供電可靠性在全球首屈一指，高達99.999%的世界級水平，時刻為香港注入動力，保持城市脈膊運行不息。

推動我們努力不懈的，是我們對超凡卓越的追求，是我們為客戶及社會大眾竭盡所能的承諾。

港燈將承先啟後，時刻照亮香港。

For more than a century, HK Electric has been the power behind Hong Kong, making Hong Kong one of the world's leading cities and financial centres.

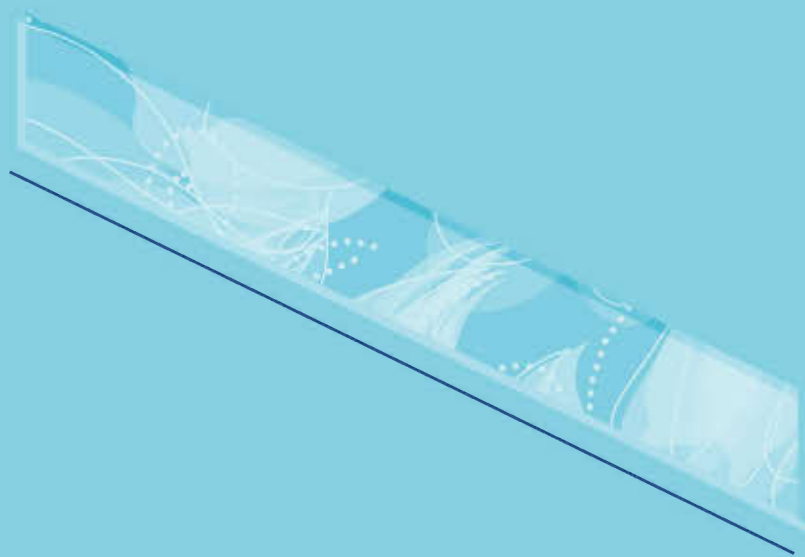
Over the years, we have continuously improved our services, modernised our facilities and enhanced our reach as Hong Kong grows. Today, we are a global leader in terms of supply reliability, maintaining a world-class record of 99.999% and providing the energy that keeps the heart of Hong Kong beating.

Driving these efforts is our pursuit for excellence and our commitment to doing our best to serve various stakeholders in the community.

Truly, we're always on for Hong Kong.

www.hkelectric.com

SEE YOU NEXT YEAR
in Another Part of the World



NEW ZEALAND DELEGATION 2014
Perfection in Synergy of Nature & Technology

THE HONG KONG INSTITUTION OF ENGINEERS
香港工程師學會

Young Members Committee
青年會員事務委員會

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