HKIE 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

Digital Transformation . Energy Transition . Sustainable City

Overseas Delegation
GERMANY

HKIE YMC 2023

The Moment of Engineering Evolution

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Chapter
One

MESSAGES

Ir Aaron K M BOK

President, The HKIE

Proud to be Engineers!
It's more Proud to be Bold Young Engineers!!

I recall when Thomas, TK and I went to meet Stefanie Seedig, the Consul General of Germany, last year, we were still wearing masks. The Covid pandemic is still around. To plan an oversea delegation, which has been suspended for 3 years, during time of uncertainty would require strong determination and courage. I commend the bold step taken by the YMC on their unity and teamwork in making their visit to Germany a great success!

It is common in one's life career, especially for professional engineers, to make difficult decision. On one hand, there is no zero risk in real life; while on the other, making choice haphazardly is not a professional move. What required is robust risk assessment, good planning, teamwork support and passion. This applies to our personal development as well as daily engineering work.

I'm glad to know that despite of the Covid, with careful planning and coordination well ahead, the trip to the Volkswagen factory, the new urban development area HafenCity, the German Energy Agency, the technical universities in Berlin and Karlsruhe and a range of German prominent companies and engineering institutions, covering areas of Digital Transformation, Energy Transition and Sustainable City was successfully conducted with a total of 16 participants. The 3 topics covered are all at the hottest echelon affecting the future advancement of human civilization. No doubt, the various activities in the visit would broaden the vision of our young members.

But what's more encouraging is, as part of the delegation, I saw the participants had acquired both professional and administrative knowledge through the planning process and exchanges with professionals/government official, both locally and overseas. This surely would help enhance their administrative and communication skill. I trust that the 16 young members should now have better equipped for their advancement in future endeavour in their career as professional engineers.

It once again verifies the long established norm in HKIE that the YMC Overseas Delegation has always been an annual highlight event for young engineers to explore engineering marvels and unique culture.

Let me once again congratulate Ir Thomas LAM, Ir TK Cheung and their team for accomplishing this successful mission for the YMC.

HKIE is Proud to have YMC!
Carry On!!

Ir Dr Barry C H LEE

Senior Vice President, The HKIE

I would like to extend my warmest congratulations to all of you for having a successful and informative trip to Germany. Your dedication and commitment to excellence have made this delegation program possible, and your efforts in studying digital transformation, energy transition, and sustainable cities will undoubtedly benefit the engineering community in Hong Kong.

I am thrilled to see that the Overseas Delegation 2023 consisted of three major areas of study, namely, Digital Transformation, Energy Transition, and Sustainable City. Your exploration of these topics will provide invaluable insights into the latest developments in German engineering practices and technologies, as well as the potential applications for Hong Kong.

In particular, I am impressed that the delegation studied the implementation of Industrie 4.0 solutions in Germany, as well as the experience of Germany in nurturing an innovative culture. Your exploration of the opportunities and challenges of innovation development in motivation, talent, intellectual property protection, market condition, etc. will be valuable for the development of the engineering industry in Hong Kong.

I would also like to commend that the delegation's study of the German strategy for achieving carbon neutrality and energy security, as well as the latest technology of renewable energy including offshore wind farms and hydrogen as an energy carrier are equally important for the sustainable development of Hong Kong.

Lastly, I would like to express my appreciation to all the guests and officials who have keenly supported this delegation program. Your contributions have made it possible for the delegates to benefit from this overseas trip. I would also like to thank the organizers and officials who have worked tirelessly to ensure the success of this delegation.

Once again, congratulations on this achievement, and thank you for your ongoing commitment to elevating the engineering profession.

Ir Eric S C MA

Vice President, The HKIE

My sincerest gratitude for being an Advisor of this year's Delegation and heartfelt congratulations to the Young Members Committee for another resounding success in organising such a fruitful Delegation demonstrating a passion for engineering and sustainability that is truly inspiring.

This year's theme "The Moment of Engineering Evolution" is a timely selection given that Germany has long been recognised as a global leader in engineering and technology and it is a privileged opportunity to learn from their expertise firsthand. This delegation provided us a chance to gain valuable insights into the latest advancements and strategies in digital transformation, energy transition, and sustainable city development, which will be instrumental in promoting Hong Kong's development towards a smart and sustainable city. With continued collaboration between stakeholders in government, academia, engineering associations, and the private sector, Hong Kong can achieve its goals of becoming a more sustainable, efficient, and livable city for all.

Last but not least, my appreciation to Delegation Manager, Ir TK Cheung, for leading a rewarding and successful Delegation.

Ir Alice K T CHOW

Vice President, The HKIE

I would like to congratulate all young engineers for making your successful stories and exploring the evolutionary moments here in Germany.

It is my honour to be invited amongst my spirited and brilliant colleagues, you – the YMC. To leverage your uniqueness and distinct thoughts for The Moment of Engineering Evolution, the group enjoyed the fruitful adventures of technology led journey of Digital Transformation, Energy Transition, and Sustainable City during the past 11 days.

This year in Germany, you have opportunities of witnessing the successful implementation of Industry 4.0 solutions; study the latest renewable energy technology as well as study the sustainable city development mythologies. I am confident our delegates have gained many insights to bring back to strengthen our practices in Hong Kong.

Looking ahead, the global challenges of Climate Change and Resource Depletion will drive a relentless demand for Smart Infrastructures. Germany and Hong Kong share similarities of actively enhancing our knowledge to be better equipped facing challenges. My sincere hope is to see all of you gearing up to guide and support Hong Kong to become and maintain its position as a sustainable developed compact city.

On behalf of the Institution, my hearties tribute to the organizers, the Chairman Ir Thomas Lam, Deputy Chairman Ir Tin King Cheung and their team for setting this theme 'The Moment of Engineering Evolution' in support of the institution's overarching strategy this year to raise esteem and public profile of professional engineers in the community.

Ir Edmund K H LEUNG

Past President, The HKIE

I am indeed privileged to be invited back as a delegation advisor to HKIE YMC Overseas Delegation.

I found it most enjoyable to support YMC, as I believe they are the future leaders of our Institution. Apart from participating in local activities, a trip overseas will help them to open up their vision, and to compare the relative merits of Hong Kong and our overseas counterparts.

Germany is renown for their industrial leadership, but they are also in the forefront in application of new technology and in protection of environment. It will be worthwhile to learn of their successes, and may be their shortfalls. Not all of these will be useful lessons for Hong Kong as we are vastly different in culture, resources and in size, but I firmly believe that, given the right mindset, we can always learn something from others.

Equally important is the preparation they have made before the visit. I encourage them to understand our own system, our strengths and weaknesses, and our Government's plan for technological development and environmental protection. It will help us to tell a Good Hong Kong Story and provide a useful benchmark for comparison with the visiting country.

I am sure they have accomplished their goals, and I take this opportunity to congratulate the whole team of this delegation and hope they will share the knowledge they gained with other young members.

Ir Dr Otto L T POON

Past President, The HKIE

In spite of the political tension in Europe, I must compliment and congratulate the YMC Overseas Delegation 2023 ably led by Ir T.K. Cheung for organizing the visit to Germany safely and successfully; as well as acting as ambassadors for the engineering profession telling their hosts the latest successful story of Hong Kong SAR.

This year's study areas are Digital Transformation, Energy Transition and Sustainable City which are respectively most relevant to the new I&T policy, low carbon economy, development of Northern Metropolis, and creation of land at Kau Yee Chau of Hong Kong SAR.

I am certain the experience gained on the visit to Germany, which is power house of Europe and exemplary in the three study areas, will benefit the career development of the Delegation members for the years to come.

Ir Peter C K CHAK

Chairman, CPDC, The HKIE

I am thrilled that the YMC Overseas Delegation can be resumed in 2023 as its organisation had been impacted by the COVID-19 pandemic since the last delegation to Israel in 2019. The 2023 Delegation to Germany was set forth perfectly with an interesting and contemporary theme "The Moment of Engineering Evolution" focusing in three major areas, namely Digital Transformation, Energy Transition and Sustainable City. The engine of the delegation is ignited by the well-defined objectives, and propelled by an excellent planning, being fuelled by the strong passion of the delegates. One of its key success factors is the excellent preparation work, as evidenced by a series of related local visits or seminars engaged by the delegates and reflected by the well-thought-through itinerary with detailed arrangement.

During my meetings with the delegates, I greatly appreciated their active listening, dedicated commitment and unstinting teamwork. They drew all-rounded attention to their areas of study, looking from the Political, Economic, Social and Technological (PEST) perspectives. For example, in analysing the Energy Transition, they had covered a wide array of factors pertaining to Security/Safety, Affordability and Decarbonization (SAD). Harnessing on the well preparation, the trip was conducted fruitfully with a great success in achieving the defined objectives. On top of widening their knowledge horizons and enhancing their personal competences, the delegates had indeed exercised the roles of an ambassador in fostering a good relationship between HKIE and overseas institutions while promoting Hong Kong and its engineering practices. The participants had also acquired the latest or cutting-edge technologies, as Germany is one of the leading countries in engineering.

It is believed that the participants will seek for the applicability of the relevant best practices in Hong Kong, such as benchmarking the "Industry 4.0" strategies in Germany for the new industrialisation in Hong Kong. Their exposures in the application of renewables and hydrogen energies will also spark their new thoughts regarding the "Net Zero Carbon" by 2050 in Hong Kong.

The delegates did not forget the later stage of the Plan, Do, Check, Act (PDCA) cycle, and had carried out a thorough review to identify the room for improvement, serving as an added-value input for the next delegation. In short, the trip has unleashed their talent, polished their interpersonal skills, developed their resourceful network and reinforced their competences. I would like to express my heartfelt gratitude to Delegation Chairman Mr Thomas Lam, Delegation Manager Ir T K Cheung, all the participants and other members contributing to such a successful trip. Their hard work has translated into incredible achievements. The trip is instrumental in building the talent pipeline of the participants or our young generation. I wish them to keep on the momentum in sailing to new frontiers and prevailing over the challenges ahead with confidence, sturdiness and innovativeness.

Mr Thomas LAM

Delegation Chairman
Chairman, YMC, The HKIE

International exposure and exchange are important for young engineers to explore their mind and gain insights on the engineering profession. With the relief of the pandemic condition, we were pleased to have continued to organise our flagship overseas study that took place in Germany this year, under the theme of "The Moment of Engineering Evolution".

Thanks to the delegation team's effort, we have completed a comprehensive study that covered desktop review, a range of technical seminars and visits in Hong Kong and a trip to Germany covering visits to the government agency, universities and companies that strived for our common goals of energy transition, digital transformation and sustainable city. Apart from the technical aspects, we had the opportunity to meet with young engineers in different engineering institutes in Germany, promoting Hong Kong's engineering and strengthening our connection for potential collaboration in the future.

My heartfelt appreciation to the team for the dedication of pursuing a study for Hong Kong's better development. This report will summarise our findings and recommendations on the concerned topics, which is hoped to benefit the HKIE members and the engineering industry at large.

Ir TK CHEUNG

Delegation Manager
Deputy Chairman, YMC, The HKIE

Engineering has been core to human progress throughout history, enabling enhancement in the standards of living around the world. At present moment, it become more apparent that the engineering field is now undergo a pivotal evolution. The mega trends are fostered by the powerful technological and social forces converging. The needs and demands of society have been experienced a swift shift with the expedition by COVID. At the same time, there is a growing recognition to the grand challenges of our era, including climate change and sustainable development, which require highly coordinated global cooperation across borders.

As young engineers, we have a unique perspective and a responsibility to shape the future of our profession. As such, the YMC has organized the YMC Overseas Delegation 2023 to Germany under the theme of "The moment of Engineering Evolution" to serve as an inspiration for young engineers to rethink proactively our roles under these mega trends.

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.

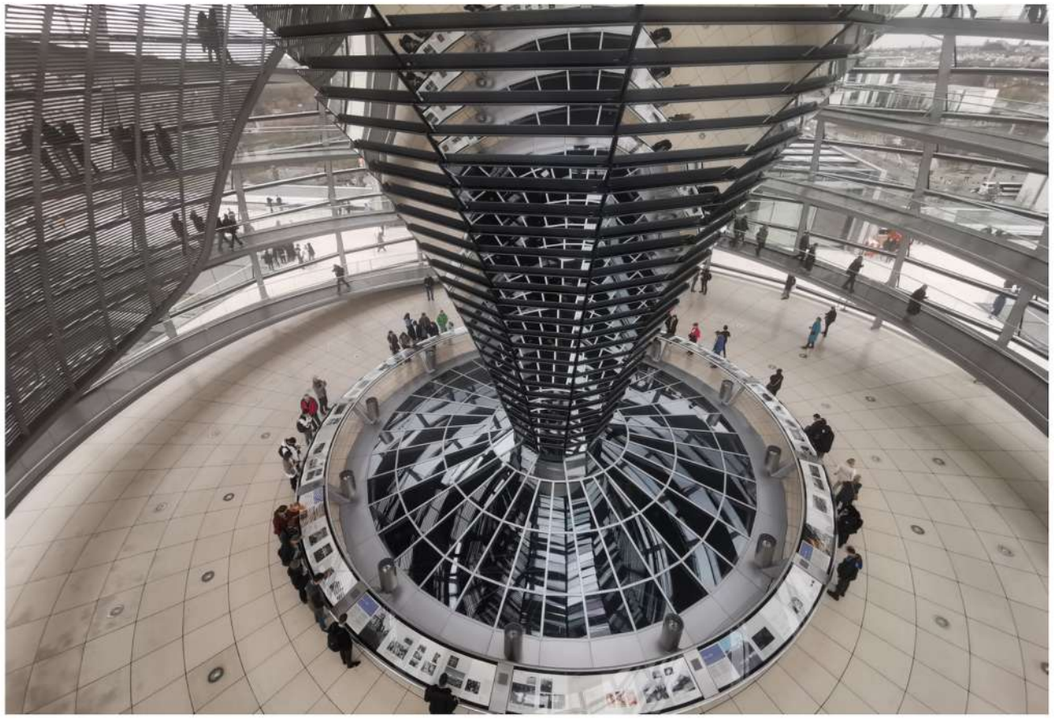
I would also like to express our greatest gratitude towards all receiving organizations for giving us an insight into our key study areas. Particular thanks are given to Stefanie Seedig, Germany Consulate General in Hong Kong, Verein Deutscher Ingenieure (VDI) and Institution of Mechanical Engineers (German Branch).

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 Aaron K M BOK, Ir Dr Barry C H LEE, Ir Eric S C MA, Ir Alice K T CHOW, Ir Edmund K H Leung, Ir Dr Otto POON, Ir Peter C K CHAK. The advisors had given considerable supports in conducting interview and providing advise in meeting during planning stage. Their guidance during this process was valuable to this trip as well as our delegates.

Last but not least, I must express my truthful thanks to all delegates, especially the Delegation Chairman Mr Thomas Lam, and the two Deputy Delegations Managers, Ir Herman Lai and Mr Dick Yan, for their contribution and great efforts to make this delegation truly memorable and successful. This would be be my honor to be a part of the Team.

Chapter Two

INTRODUCTION



Background of YMC Delegation

Since 1991, YMC has been organising delegations to different parts of the world with the following objectives:

- To appreciate the latest engineering practices around the globe and assess the applicability of these practices in Hong Kong
- To enhance the relationship between HKIE and Mainland / Overseas Institutions
- To promote Hong Kong and its engineering practice
- To widen young engineers' knowledge horizons on overseas engineering practices for the continuing professional development purpose.

These objectives will continuously be achieved through the delegation visits and pre-/post-trip local seminars and visits related to the delegation theme.

Theme and Objectives

Following the success of the overseas delegation to Israel in 2019, through which young members have explored the formula of Israel's success as an innovation and entrepreneurship hub, as well as overcoming the city's challenges and enhancing the quality of citizens' lives through innovation, the YMC has planned to organize another overseas delegation in 2023 to Germany.

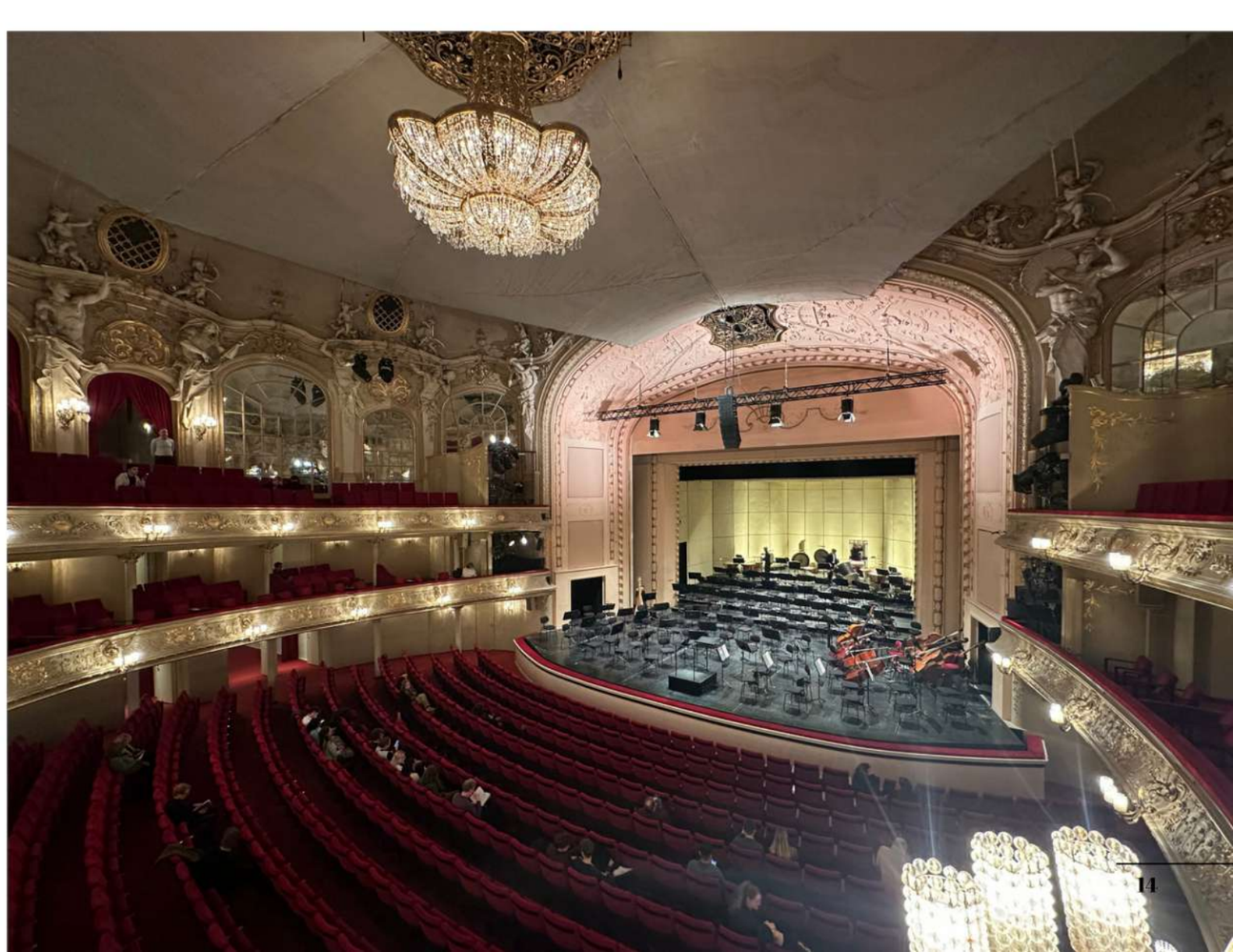
With advancements in technology, changing global dynamics, and increased focus on sustainability, the engineering field is now undergoing a significant period of rapid development and transformation. This year, the Overseas Delegation 2023 is themed as "The Moment of Engineering Evolution".

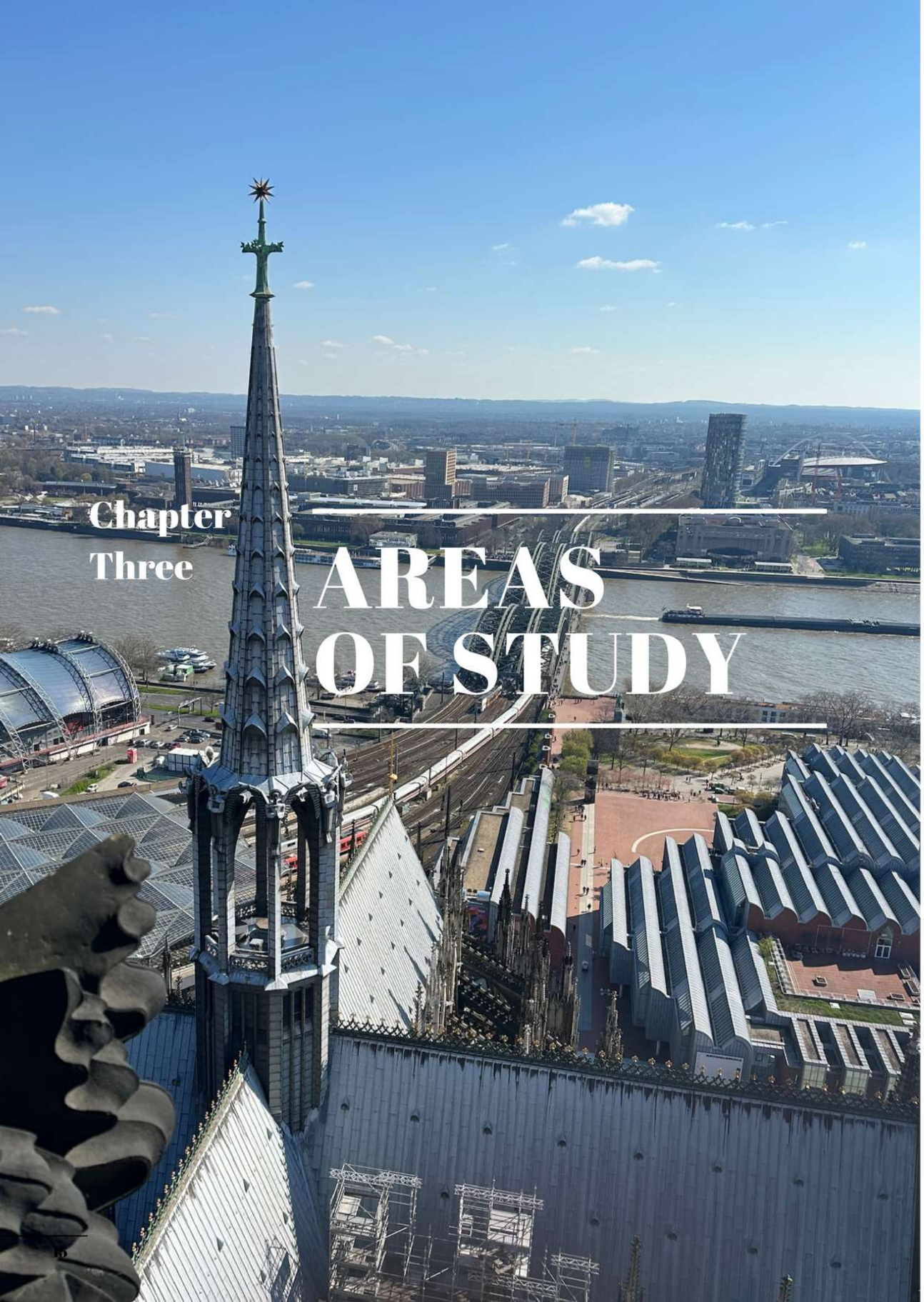
The overseas Delegation 2023 aim to inheritance the successful stories of German in Hong Kong. The oversea delegation team 2023 to Germany would study how the industry is evolving along the mega-trend in a sustainable way with focus on digital transformation, energy transition and sustainable city. The delegates will also appreciate German working culture and strategies that let Germany maintain a leading role in engineering industry.

Why Germany?

Germany would be the leading country in engineering for centuries. Currently German would be the third-largest exporter and the fourth-largest national economy among all countries around the globe.

It is foreseeable that the transformation that Hong Kong is going to experience in the near future is now happening in German. In 2011, the German government launched the "Industrie 4.0" national strategic initiative that was pursued over a 10-15 year period to drive digital manufacturing forward, which has achieved a promising result and the transformation has been accelerated under COVID-19. With the global demand for decarbonization, Germany is driving towards net-zero carbon by 2050 with the development of renewable energy and hydrogen power and has a strong vision for the growth of sustainable building and transport transition under the German Sustainable Development Strategy. German is in a leading place in all these mega trends.





Chapter Three

AREAS OF STUDY

Digital Transformation

Why are we here?

Hong Kong has become a predominantly service economy since a massive relocation of manufacturing industries to the Mainland China and other emerging markets in the 80s and 90s. While the manufacturing sector's contribution to Gross Domestic Product (GDP) has continued to hold up in most of the Four Asian Dragons, Hong Kong's has dropped to 1% in 2021. It has come to an attention that the de-industrialisation has hinder the development of innovation and technology in Hong Kong. The HKSAR Government ("The Government") have published the "Hong Kong Innovation and Technology Development Blueprint" to address the short fall including the promogulated the new industrialisation. New industrialisation involves a frog leaping of latest technology application to help Hong Kong progress towards performing high value functions in the industrial value chain. For successful implementation, lessons from other countries' best practices are to be learnt.

Where are we from?

When compared with previous industrial revolutions (i.e. The use of mechanical production and steam power in the 1st industrial revolution, the use of electricity and mass production in the 2nd industrial revolution, and the use of computing and robotic in the 3rd revolution), the fourth industrial revolution (aka Industry 4.0) through the use of cyber-physical systems (CPS) is evolving at an exponential pace. Building on the foundations laid by the first three Industrial Revolutions, modern technological advancements are transforming the world as we know it. In manufacturing, CPS enables the development of autonomous productive processes, which, based on double representation, become intelligent: through communication and decision algorithms, the components can decide on their configuration and their path in the line of production.

Where are we going?

We are now struggling on the path of digital transformation to boost the work productivity by reaching an optimization of resources in the workplace. Notwithstanding, the Government has been positioned as the international innovation and technology centre in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) under the People's Republic of China's 14th Five-Year Plan. Along with recent promulgation of the Hong Kong Innovation and Technology Blueprint with eight strategies under four broad development direction for the coming 5 to 10 years, the Government continues to channel capital investment to technology industries in Hong Kong and the GBA, and expediting the innovation and technology and industrial development, namely Smart Manufacturing Factory, in Hong Kong and the GBA.

What is Germany doing?

Germany is well known as a country of innovation with worldwide innovative products and services. Germany is one of the ten most research-intensive economies in the world. The concept of Industry 4.0 was first formulated in the "High-Tech Strategy for Germany 2020" in 2011. Under the "Industrie 4.0" national strategic initiative, there are currently more than 40 billion euros invested in research and development in Industry 4.0 and an additional 153 billion euros of economic growth is created through Industry 4.0. There are more than 200 practical examples that demonstrate that innovative processes showing the successful implementation of Industry 4.0 solutions in Germany.

What is Hong Kong doing?

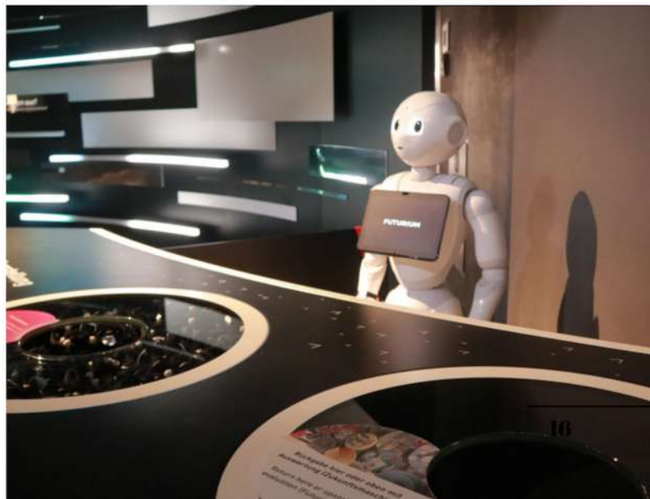
Hong Kong has been promoting reindustrialisation over the recent years to develop manufacturing industries tfor economic transformation towards a high value-added production and advanced manufacturing industry. In 2021 Policy Address, the government promoted innovation and technology development by investing more than HK$130 billion aiming to develop Hong Kong into an International Innovation and Technology Hub. In 2022, the Innovation and Technology Bureau was restructured as the Innovation, Technology and Industry Bureau, aiming to enhance the policy function of new indusctialisation and build a more complete Innovation & Technology industry chain and ecosystem.

What have we done?

The Digital Transformation Team has conducted desktop review of the policies and practices, digital strategies in respect of innovation and technology in Hong Kong and Germany, and analysed the technology readiness on digital transformation and technology and their potential adoptions in Hong Kong.

Composition of the Digital Transformation Team:

- Team Leader: Mr. Herman LAI
- Members: Mr. Justin CHENG, Ms. Jasmine NG and Mr. Desmond LAU



Energy Transition

Why are we here?

The subject of energy transition has been around for more than a few decades. It was firstly brought to the attention of ordinary people during the Energy Crisis in the 70's, or should we say a chaotic market crisis coordinated by the oil exporting countries plus America's policy of restricting the use of its own underground fossil reserves; and then about two decades ago, scientists were warning more and more of a warming planet, though later to a changing climate. Humans' use of fossil fuels is often thought to be the cause of such change.

Where are we from?

We observe that our species was once on a path from utilising natural energy sources such as wind and solar, as in windmills and storing the Sun's energy in crops and plantations (for food and combustion), to discovering a way to unleash the immense energy in fossils, and that unlocked the essence of our modern life: predictability over unpredictability by means of industrial production (capital production), the concept of which later infiltrated to every aspect of our lives and our daily life.

Where are we going?

We are now struggling on the path of returning to using natural energy sources as our main source of power, even though with the advent of renewable technologies, on which it would unmistakeably paint a shade of uncertainty, especially to those industrialised economies which have to be export-oriented – they rely on a stable price of electricity. In this same going, different countries have found, and probably will still be finding, different ways of achieving the goal of trying to reduce their carbon footprints, mostly by making use of their most abundant resources around their own lands and oceans.

Both Hong Kong and Germany have committed to carbon neutrality.

What is Germany doing?

With the blessed landscape of the more prominent North Sea, Germany is building more offshore wind farms around there, as well as rather isolated onshore wind turbines, but in need of a method to transmit such electrical energy produced to their load centres which are located in the traditional industrial South. Enactment and policy are two tools used by the German Federal Government in trying to push through the hard part. While for the utilities, transfer by grid, inter-national grid connections and hydrogen storage and are the three methods using, or to be used. The maintenance of a vastly geographically distributed energy system remains a big challenge in cost-wise and power quality-wise. That said, we notice that Germany has reached the state of having around half of its electrical energy generated from renewables. The Federal Government shows a determination to achieve carbon neutrality by year 2050 by means of a huge subsidy to the energy sector.

What is Hong Kong doing?

In Hong Kong, the SAR Government puts a higher weighting on the affordability and the reliability of electricity supply. With the geographical constrains, the Government is targeting to have around 15% of renewable compositions in 2030, with an adaptive approach on hydrogen technology, which carries with it a basket of technological and legislative challenges yet to be resolved. The Administration is also planning to have its first offshore wind farm by 2035. While the rest, before any advancements in fusion, will be in a make-up of natural gas, with the help of the Offshore Liquefied Natural Gas Terminal near Lamma that is under construction for ensuring source supply by accessing the global market.

What have we done?

The Energy Transition Team has studied the energy transition policies and practices, in the three majorities of electricity production, transportation and buildings, in Hong Kong and Germany, and analysed the technology readiness on renewable and hydrogen technology and their potential adoptions in Hong Kong.

Composition of the Energy Transition Team:

- Team Leader: Mr. Dick YAN
- Members: Mr. Alex SZE, Mr. Frankie KUNG, Mr. Kelvin TO, and Mr. Michael MA

Sustainable City

Why are we here?

Sustainable city development has become increasingly important in recent years, as cities around the world face challenges such as climate change, resource depletion, and urbanization. Germany is known for its leadership in sustainable city development, with cities like Freiburg and Hamburg recognized for their innovative approaches to green urban planning. Hong Kong, on the other hand, faces unique challenges due to its dense population and limited land resources. By studying Germany's approach to sustainable city development, Hong Kong can gain valuable insights and recommendations for its own urban planning. By focusing on areas such as resilience infrastructure, green building, , Hong Kong can develop a more sustainable and resilient city for its residents.

Where are we from?

The concept of sustainable development first recognized in the 1980s with the Brundtland Commission report and 1992 Rio Earth Summit. In 2015, the United Nation set 17 Sustainable Development Goals, including Goal 11: Sustainable cities and communities. As cities around the world face increasing challenges related to climate change and urbanization, it is essential to invest in sustainable city development to ensure a livable and prosperous future for all.

Where are we going?

On 2020, The council for sustainable development has launched a Public Engagement on the Long-term Decarbonization Strategy and set the target to achieve net zero carbon emission by 2050. Later in 2021, the HK government announced the "Hong Kong's Climate Action Plan" to set a clear road map to achieve Carbon Neutrality though four major area, including "Net-zero electricity generation", "Energy saving and green buildings", "Green Transport" and "Waste reduction".

What is Germany doing?

Resilience infrastructure is a key aspect of sustainable city development in Germany. Germany has invested heavily in infrastructure that can withstand natural disasters and other disruptions, such as floods, earthquakes, and power outages. This includes measures such as flood protection systems, backup power supplies, and emergency response plans. Hong Kong can learn from Germany's approach to resilience infrastructure by assessing its own vulnerability to natural disasters and developing strategies to mitigate those risks.

Green building is another important aspect of sustainable city development in Germany. Germany has been at the forefront of energy-efficient building design, with strict building codes and standards to ensure that new buildings are designed to minimize energy consumption and greenhouse gas emissions. This includes measures such as using sustainable building materials, installing energy-efficient lighting and appliances, and incorporating renewable energy sources like solar and wind power. Hong Kong can benefit from studying Germany's approach to green building by incorporating similar building codes and standards in its own urban planning and construction efforts.

What is Hong Kong doing?

To achieve the sustainable development of the city, the Council for Sustainable Development and the Hong Kong Green Building Council was established in 2003 and 2009 with respectively to promote sustainable development. The Hong Kong Building Environmental Assessment Method was launched in 1996 and till now there are more than 3000 accessed projects in Hong Kong, saving more than 1million Tons of CO2e per year.

What have we done?

The Sustainable Cities Team has conducted desktop review of the policies and practices, strategies in respect of sustainable city development in Hong Kong and Germany, and analysed their potential adoptions in Hong Kong.

Composition of the Sustainable Cities Team:

- Team Leader: Mr. JR SEOW and Mr. Kenny SIU
- Members: Mr. Jerry CHEUNG, Ms. Jessica FAN and Mr. Jimmy HUI

Chapter Four

LOCAL EVENTS

Techincal Visits

21 January 2023
Visit to Yuen Long Bypass Floodway

11 February 2023
Visit to SenseTime at HKSTP

18 February 2023
Visit to InnoCell at the Hong Kong Science and Technology Park

26 February 2023
Visit to Ammonia-Powered Electric Vehicle Fuel Cell Workshop

Technical Seminars

19 January 2023
Seminar on Digital Twin for HKUST Campus

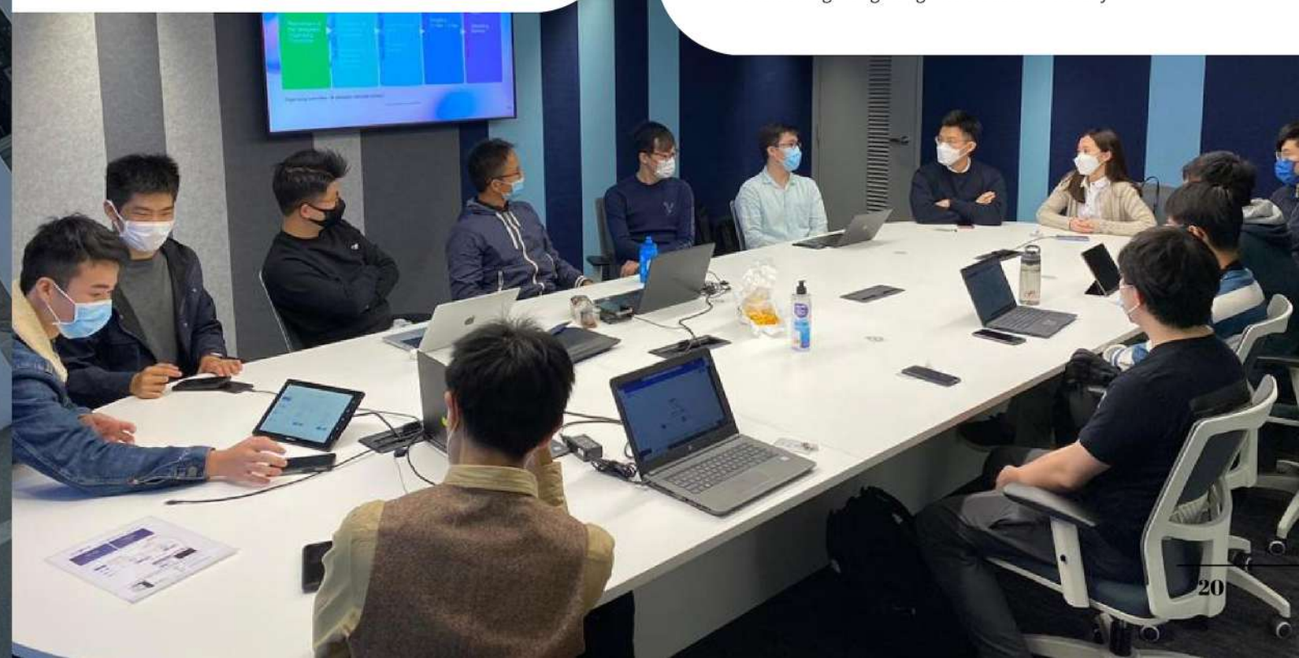
01 March 2023
Seminar on Hong Kong I&T Development Blueprint

02 March 2023
Webinar on Offshore Wind Farm

08 March 2023
Seminar on Hong Kong's Climate Action Plan 2050

22 March 2023
Seminar on Green Building and Construction Technologies in Hong Kong

23 March 2023
Seminar on Salient Water-related Nexus Issues in Transitioning Hong Kong into a Sustainable City



19 January 2023

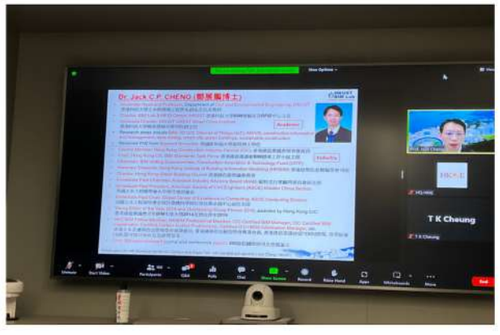
Technical Seminar on Digital Twin for HKUST Campus

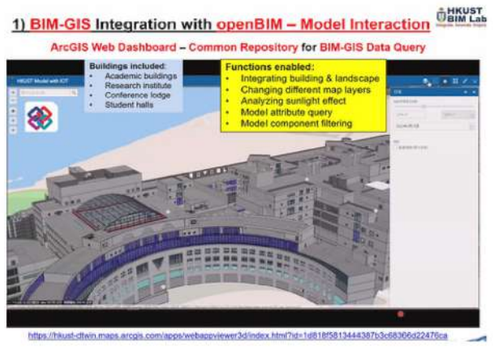
As the first local series event in Overseas Delegation 2023 to Germany, an informative technical seminar regarding digital twin for HKUST Campus was successfully conducted online on 19 January 2023 by our distinguished speaker Professor Jack Cheng who is the Associate Head and Professor in Department of Civil and Environmental Engineering. The technical seminar received an overwhelming response.

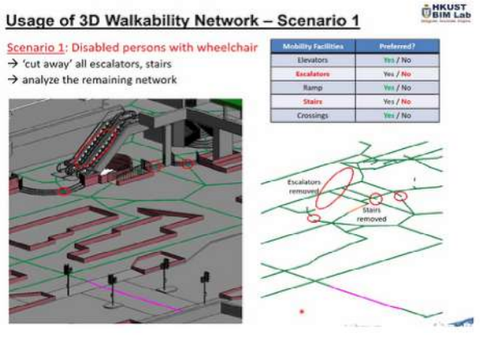
The seminar covered the objectives, challenges, methodology, implementation, innovation, outcomes of the digital twin project and its lessons learnt and future directions. Professor Cheng started the seminar by stating that built environment was the least digitalised among the global industry and highlighted the importance of asset management (AM) and facility management (FM). HKUST applied digital twin by the combination of Asset Information Model (AIM) and Internet of Things (IoT) for AM/ FM so as to achieve better planning for facility management activities. This could improve building performance as well as time, money and resources saving in the operation and maintenance phase, which cost accounted for 85% of life-cycle cost.

Digital twin refers to a digital replica of physical assets, processes and systems. HKUST was the first university adopting digital twin for its entire campus with the objective to create a smart and sustainable campus. The project was divided into two phases with phase 1 to generate the 3D Building Information Modeling (BIM) models for the whole campus with more than 60 buildings, and phase 2 for data integration. It integrated different facility systems into a common data environment (CDE) with data integrated from BIM, Geographic Information System, IoT and Building Management System with open standards for data interoperability and exchange. There were many applications for the digital twin, for instance, monitoring the indoor air quality and assisting the real-time fire evacuation. Professor Cheng stressed that the correctness, consistency and completeness of data were the key success factors of CDE.

The technical seminar was fruitful and it was a precious opportunity for all participants to gain insights on the development and application of digital twin for the HKUST campus.







21 January 2023

Technical Visit to Yuen Long Bypass Floodway

Yuen Long Bypass Floodway is a 3.8-kilometre-long drainage channel in the South of Yuen Long completed in 2006. The purpose of the floodway project is to alleviate flooding in Yuen Long Town and its peripheral village areas. The floodway was built to intercept 40% of the runoff of the Yuen Long catchment, divert it to the downstream of Kam Tin River from the Shan Pui River through Yuen Long Town before discharging it to Deep Bay.

The visit started from San Tin Stormwater Pumping Station followed by a guided tour along the floodway itself. The pumping station is a part of the San Tin drainage system which aims to reduce the flood risk of 7 low-lying villages in the area. The stormwater would be stored by its stormwater storage pond and pumped to the adjacent channel. An information center in the pumping station introduces the development of Hong Kong's flood prevention strategies and demonstrates examples of the measures taken including Yuen Long Bypass floodway.

The guided tour along the floodway introduced the features of it. The inflatable dam close to the merging point with Kam Tin River was usedused to prevent polluted water downstream from flowing back into the floodway under normal circumstance, as we saw at the time of visit. The dam would be deflated during heavy rainstorms to discharge excessive upstream floodwater into Kam Tin River if it exceeds the pumping station capacity.

The bypass floodway also incorporates environmental designs including bends, shallow ponds and wetland. Its 7-hectare engineered wetland provides a sustainable ecological habitat for different wildlife animals. The flow of the bypass floodway is not carried straight to the sea, but through those regimes, to achieve such an enrichment. Along the channel, a natural riverbank could be seen as the herbaceous plant covering its bottom and slope, which is both aesthetically pleasing and ecologically friendly.

Overall, Yuen Long Bypass Floodway is a well-balanced engineering application in achieving flood resilience, ecological mitigation, and landscape design. The combination of water pumping systems and inflatable dam provides the flexibility to cope with different weather conditions and scenarios of water flow. Together with the ecological enhancements, the floodway has become a solid example of components of a resilient city.

11 February 2023

Technical Visit to SenseTime at HKSTP

SenseTime is a top-notch unicorn in Hong Kong founded in 2014 focus on Artificial Intelligence (AI) software. SenseTime targets tocreate a better AI-empowered future through innovation. With its focus on computer vision and deep learning, SenseTime develops technologies such as SenseCore AI Infrastructure, intelligent Automobile Technology, Decision Intelligence, Medical Image Analysis, etc, laying a solid foundation for achieving more powerful AI capabilities.

This visit started with a tour led by Mr Sunny Yau, to their showroom and workshop, firstly with the current applications and guided demonstration of their four major sectors, namely Smart Business, Smart City, Smart Life and Smart Auto. In view of the rapid development and investment in autonomous cars in China, Mr Yau illustrated Smart Auto with the successful pilot scheme of autonomous driving, in partnership with Higer Bus Company Limited, and road testing on public roads. The platform, namely SenseAuto, is based on the effective utilization of vehicle data, trained by SenseCore with industry-leading computing power and algorithm iteration efficiency. In addition, the AI technology extends further to SenseFoundry software platform, future-oriented urban management platforms to monitor the conditions of public facilities, to track incidents and the impact of natural disasters, and to facilitate digital city operations.

After the guided tour, the Consulting Director Mr. Lewis Fung, provide us a presentation of how Sensetime positions in the enterprise via partnership with educational institutions and other companies was given as a summary the technological applications and infrastructures to satisfy the societal and clients' needs from various cities by leveraging the use of the general architecture of application layer, platform layer, edge layer, and front-end layer across various sectors. A broad range of use cases in Smart Business was introduced. For example, human intrusion at the toll plaza could be detected via an image recognition model to trigger the alert, thus minimizing safety risks. Meanwhile, Mr Yau also shared the information of Sense spring – Industrial Quality Control Platform across 41 major industrial sectors, and how this platform enables a single platform to handle the entire process of production line, including image data augmentation, defect detection, quality control, etc.

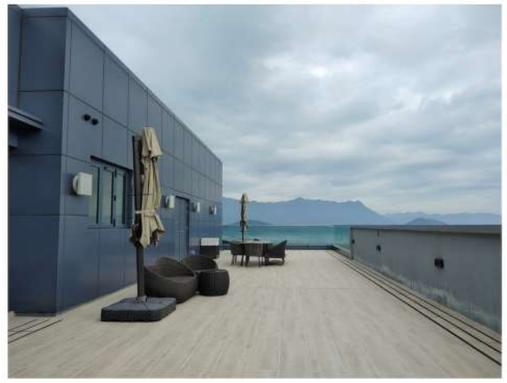
The technical seminar was fruitfully ended up with a Q&A session. It was a precious opportunity for all participants to gain insights on the development and application of artificial intelligence for handling and resolving challenges faced in business, city management, and auto sectors.

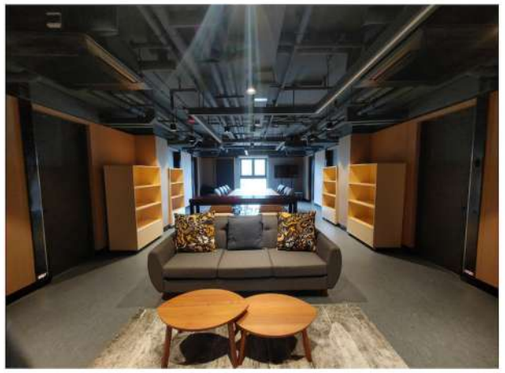
On behalf of HKIE and all participants of the event, we would like to express our sincere gratitude to our distinguished speaker for his generous sharing and ideas brought to the young engineers.

18 February 2023

Technical Visit to InnoCell at the Hong Kong Science and Technology Park

InnoCell is a green and sustainable building in Hong Kong that offers a unique living experience for its residents. The building was constructed using Modular Integrated Construction (MiC) technology, which significantly reduced the construction period to only 2 years.





One of the key features of InnoCell is the use of natural sunlight to illuminate the living spaces. The building has been designed to allow maximum natural light to enter the rooms, which not only reduces the need for artificial lighting but also creates a comfortable and welcoming living environment for the residents.

In addition to the living spaces, InnoCell also offers a common area for community engagement. This area is designed to encourage social interaction among residents and promote a sense of community within the building. The area includes a variety of facilities, such as a gym, a rooftop garden, and a BBQ area.

InnoCell is not only sustainable in terms of its construction and design but also in terms of its operation. One unique feature of InnoCell is the intelligent control of house appliances by smartphone. This technology allows residents to control and monitor the energy consumption of their appliances from their smartphones, which promotes energy efficiency and reduces the building's overall carbon footprint. The building has also implemented a range of energy-saving measures, including the use of solar panels and a rainwater harvesting system, which reduces the building's reliance on traditional energy sources.

In conclusion, InnoCell is a prime example of green and sustainable building design. The use of the latest sustainable construction and operation technology all contribute to a comfortable and sustainable living environment for the residents. The building's energy-saving measures and sustainable operation further demonstrate its commitment to sustainability. InnoCell serves as a model for future green building designs and offers a unique living experience for its residents.

26 February 2023

Technical Visit to Ammonia-Powered Electric Vehicle Fuel Cell Workshop

The development of ammonia-powered fuel cell electric vehicles (EVs) by the Hong Kong Polytechnic University (PolyU) represents a significant breakthrough in the global shift towards sustainable and environmentally friendly transportation. As countries around the world aim to attain carbon neutrality and combat climate change, the need for alternative sources of energy to power up vehicles has become increasingly urgent.

The technical visit to PolyU and their EV lab saw a successful and working prototype developed by Prof. CHENG and his team. It was understood that Eric was one of the first pioneers in academia to have successfully developed a working prototype of battery electric vehicle (BEV) known as "MyCar" in the last two decades that later proved to be actually propelled the whole industry.

Eric advised that the heating ideology among members of society of converting all vehicles in Hong Kong into BEV would be utterly challenging, if not entirely impossible, as that path would imply a seven times of more electricity demand compared to the present level. Such huge amount of electricity demand would require a massive investment, long constructing years as well as to dig in even more of the already congested underground space for laying power cables.

The ammonia-powered fuel cell system developed by Professor CHENG and his team offered several advantages over conventional BEV powered by lithium-ion batteries and hydrogen-fuel vehicles. The new system not only emitted zero carbon but also offered higher efficiency and safer energy storage compared to hydrogen-powered vehicles.

The underlying principle was to use ammonia as the carrier of hydrogen for fuel cells to overcome the safety concerns associated with hydrogen, making it a safer, more efficient and more stable alternative as zero-carbon fuel.

Unlike hydrogen, which needed over 700 bars of pressure to liquify and was highly flammable, ammonia required only eight bars of pressure and was more stable, this made a significant difference in the requirements of onboard storage tank, which was of utmost importance to a vehicle, not to mention the land storage units. Ammonia had a pungent smell, alerting drivers if there was a leakage. For sure, such leakage would not cause explosion as would in the case of hydrogen, especially in tunnel and underground car park settings.

To power ammonia-powered fuel cell electric vehicles, ammonia was stored in its liquid form inside a cylinder. It then went through a 'cracker' and was broken down into nitrogen and hydrogen by catalysts developed by Prof. CHENG's collaborator, the University of Oxford in the United Kingdom. While 99.9% of the ammonia could be transformed, the remainder was filtered out by a gas purifier. On the other line, two hydrogen atom were combined with one oxygen atom to become a water atom, and in the process, electrons were released, powering up the vehicle's battery and electric motors.

The success of the ammonia-powered golf cart developed by the team paved the way for the application of this technology to public vehicles such as long-distance electric minibuses and even heavy trucks (Prof. CHENG showcased the ammonia tank weight was only a fraction to that of a BEV in the stream of heavy duty vehicles). The research was supported by industry partners and funding from the Hong Kong Government's Innovation and Technology Fund, highlighting the importance of collaboration between universities and industry in driving innovation and progress in sustainable transportation.

The development of ammonia-powered fuel cell electric vehicles could have far-reaching implications for the future of transportation, offering a sustainable and efficient alternative to conventional vehicles powered by fossil fuels. As countries and cities around the world strive to become smarter and more sustainable, the work of Professor CHENG and his team at PolyU represented a significant step towards achieving these goals.

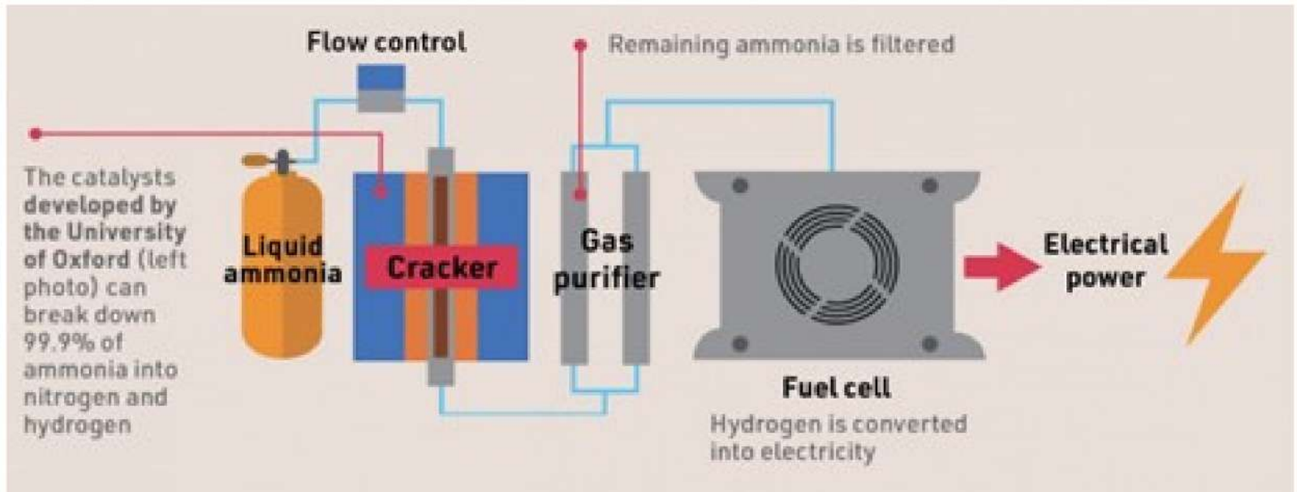
There was a meaningful discussion during the visit. A member of the audience asked of the method to secure the supply of ammonia. Prof. CHENG advised that there were a number of surrounding Chinese provinces around Hong Kong with established factories producing ammonia; and we could even import from S.E. Asia to doubly secure the supply. The member added that with the invention of the Haber Process by a German scientist & engineer in the 20th century, we could have virtually unlimited food supply because of vast amount of artificial fertilisers. And now, not only the conversion to ammonia vehicles would not disturb the food supply chain, but would only strengthen it, because by the laws of supply and demand, more factories would be built in face of the increasing demand, and by the very principle of industrial production, there would be surplus in the production of artificial fertilisers (just as we saw in the surplus of clothes and shoes these days, and all those face masks a few months after the surging demand during COVID times), and thus strengthening the supply of both food and fuel, or should we say, fuel for humans, and fuel for vehicles.

This could be a material middle stepping of converting our transportation industry, switching from fossil fuels to ammonia fuel, without recourse to the BEVs - which might be blooming in recent years because of worldwide governmental promotion by means of policy support - whose technology might not be just so green as many would have thought, if considering the life cycle, including the harmful mining process and the over-challenging disposal issue.

We appreciated that research and development (R&D) took a comprehensive lead time, and hoped the Government took this into considerations when sponsoring local researches and tertiary institutes, because the results of these are the essential foundation stones which lay the path leading to Hong Kong's net zero carbon future, making the Government's goal attainable.

After this visit, we cane to understand that successful knowledge transfer involved (1) funding, (2) R&D, (3) product realisation, (4) product commercialisation, and (5) closing the financial loop by sharing the profits among the Government, the academia and the commercial sector. By so doing – closing such loop – not only will not Hong Kong become lagging behind, by will also re-build its strong knowledge base for a new industrialisation, which was of prime importance for re-building its global status as an international financial centre, because without hinterland, not financial hub could survive. And that hinterland, could be a strong local economy. By these, we could prove ourselves to be benefiting not only to our country, but also to the whole human kind. We had the knowledge, we had the international connections, the only matter left is an Authority determined to close such loop by taking necessary and timely actions.

Written by: Mr. Alex SZE and Mr. Dick YAN



01 March 2023

Technical Seminar on Hong Kong I&T Development Blueprint

Hong Kong industrial sector's contribution to the Gross Domestic Product (GDP) has significantly reduced since the Reform and Opening of Mainland China. As the manufacturingsector plays a pivotal role for long-term healthy economic development, the Government has introduced the Hong Kong Innovation and Technology Development Blueprint to encourage and sustain Hong Kong's innovation and technology (I&T) development. Four directions and eight strategies are formulated in the Blueprint. There are a few interesting points related to the future of young engineers thatworth to be noted, including the enhancement of I&T ecosystem and promotion of "new industrialisation" in Hong Kong, enlarging the I&T talent pool, as well as developing Hong Kong into a smart city.

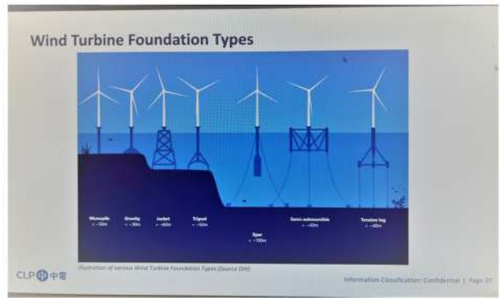
New industrialisation refers to the frog-leaping industry development by the use of innovative and novel technologies such as the Industry 4.0 technology, including Internet of Things (IoT) and artificial intelligence (AI) etc. to develop high value-added industries and related supply chains. It can be noticed that the technologies behind Industry 4.0 are generally related to the collection, process, and application of data and data-driven automation. For example, the IoT devices would automatically collect relevant data and feed it to AI for further processing before the system would automatically self-optimise based on the acquired data.

In order to achieve the new industrialisation goal and enhance the entire I&T ecosystem, a large pool of I&T talent is required to perform basic research and development of innovative technologies, as well as the implementation of such technologies into the sustainable industry. It can be foreseen that the demand for researchers and engineers in various fields would significantly increase in the coming future.

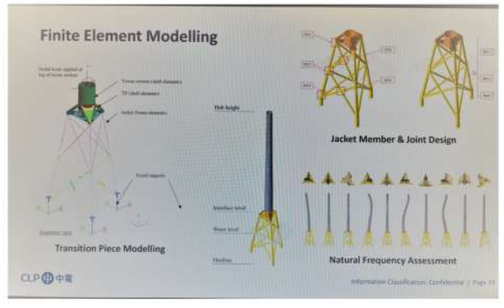
Smart city is the foundation of further development of I&T, as the digitalisation of activities as well as easy access of open data and technologies would allow accelerated development and rapid implementation of I&T. Smart city is also a crucialway to promote I&T to the general public, in which the new generation might be attracted to become researchers and engineers to further contribute to the society.

02 March 2023

Technical Webinar on Offshore Wind Farm



Offshore wind energy is a rapidly growing sector globally, and Hong Kong is no exception. To support the Government's net zero carbon strategy and achieve carbon neutrality by 2050, a seminar on offshore wind farms was conducted by CLP Power Hong Kong Limited on March 2, 2023. Mr. Laam LEE (Senior Manager) and Ms. Andrea LI (Engineer) provided an overview of offshore wind farms in terms of planning, implementation and technologies, with a focus on wind energy and turbine foundation technology. The seminar introduced CLP's experiences in their pilot offshore wind farm in the Eastern part of Hong Kong and its potential to contribute to Hong Kong's long-term net zero carbon goals as outlined in the Climate Action Plan 2050.



The speakers discussed the significant growth in the offshore wind industry, with the global cumulative offshore wind installations expected to increase by 10 times by 2035. In 2023, a total of 53GW of offshore wind projects were commissioned globally, with 48% of them being in the Mainland China. This growth could be attributed to various factors such as the increase in capacity and rotor size of wind turbines, more efficient electricity systems, economies of scale, and improvements in the supply chain.

While for Hong Kong, the speakers advised that the location of offshore wind farms required consideration of several factors, including wind resource, water depth, marine traffic density, aviation impact, and environmental impact and coastal protection areas etc. The wind resource was the strongest in the western and southern waters, while shallow waters near the shore are more suitable for turbine foundations. Careful consideration was also needed to avoid conflicts with shipping lanes, fishing grounds, air traffic, and protected marine areas. Wind energy was a rapidly growing sector, and accurate wind data collection was crucial for the development of wind farms. The speakers shared that in their pilot system, how meteorological data were collected beforehand and sensors were installed in their pilot system during the implementation stage. Such data would be useful in expanding their distributed energy systems in the future, should the Government planned to get one step further in renewables in the form of harnessing wind energy.

Regarding the methods of wind data collection, similarly, our study also figured out that the most common method was through the use of meteorological masts. These masts are typically between 50 and 100 meters tall and were fitted with cup anemometers, wind vanes, LIDAR, temperature sensors, pressure sensors, and humidity sensors. These sensors were used to measure wind speed, wind direction, temperature, pressure, and humidity. The data collected from these sensors was typically transmitted to a central data logger in the form of a server-grade computer, where the data would be processed and stored. At-grade cyber security measures would have to be provided to protect these important and sensitive data. These might not be well aware of by too many as to this day.

To get a more accurate picture of wind conditions, sensors were installed at multiple heights on the meteorological masts. This allows for the measurement of wind speed and direction at different heights, which could vary significantly

due to factors such as topography and turbulence. Data collected from meteorological masts was typically reported as 10-minute means. This meant that the data collected over a 10-minute period was averaged to provide a single data point. This averaging helped to smooth out any fluctuations in wind speed and direction that might occur over short periods. The data measurement period for wind data collection typically lasted for a minimum of one year. This was because wind patterns could vary significantly over different seasons, and a minimum of one year's worth of data was needed to accurately determine the wind resource at a particular site.

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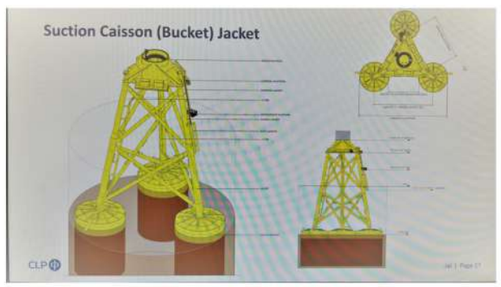
There were many ways of constructing the foundation for offshore wind farm. A suction caisson, also known as a bucket foundation, was a type of foundation which replaced traditional piles with suction buckets to secure each jacket foundation to the seabed. This method was included in the approved Environmental Impact Assessment (EIA) of Hong Kong. Suction caissons were gaining popularity due to their short installation time, minimal impact on marine life and seabed environment (as they do not require dredging or piling), and easy removal process at the end of the turbine's operational life through the reversal of the installation process. With this method, the suction buckets were sunk into the seabed and water was pumped out to create a pressure difference between the inside and outside of the bucket, which held the foundation firmly in place. The water pumping rate from suction caissons during foundation installation was being increased to improve the safety and efficiency of each installation process.

Submarine cable burial risk assessment was the process of evaluating the risks associated with the installation and operation of undersea cables which connected offshore wind turbines to the electricity grid. The assessment involved analysing the seabed conditions, water depth, tidal currents, and other environmental factors that could impact the installation and operation of the submarine cables. The main purpose of submarine cable burial risk assessment was to identify potential risks and develop strategies to mitigate them. These risks included damage to the cables from fishing activities, anchor drag, or other marine activities. The assessment also identified potential risks to marine life and the seabed ecosystem. The assessment typically involved a combination of numerical modeling, field measurements, and expert judgment to determine the optimal installation method and burial depth for the submarine cables. The assessment also included a review of the cable route, including the identification of any areas where the cable might be vulnerable to damage or interference.

Finally, the speaker discussed lab centrifuge testing as a physical modeling technique used in the design of offshore wind farms. It involved a centrifuge machine which simulated the gravitational forces acting on a reduced-scale model of the wind turbine and its foundation. The model was subjected to various loading conditions, including waves, currents, and wind, to assess its response and stability. The purpose of the test was to validate the design, investigate load transfer, to confirm compressive capacity, and to identify any potential design problems. The data collected from lab centrifuge testing was used to refine computer models and provide insight into the behavior of the foundation and wind turbine under different loading conditions, ensuring the safe and reliable operation of offshore wind farms.

Written by: Mr. Frankie KUNG



08 March 2023

Seminar on Hong Kong's Climate Action Plan 2050

On March 8, 2023, a seminar on "Hong Kong's Climate Action Plan 2050" was held, featuring Mr. WONG Chuen Fai, JP, Acting Commissioner for Climate Change, as the keynote speaker. The seminar focused on the goal of reaching net zero by 2050 and the role of engineers in achieving carbon neutrality for Hong Kong.

Mr. WONG highlighted the crucial role of engineers in achieving carbon neutrality. He emphasised the importance of developing innovative solutions, such as renewable energy sources, energy-efficient technologies, and green buildings, to reduce carbon emissions. He also emphasised the importance of collaboration between engineers, policymakers, and stakeholders to achieve this goal.

Regarding net-zero electricity generation, he stressed the need to increase the use of renewable energy sources, such as solar and wind power, to replace fossil fuels, proportionally. It was understood that Hong Kong was greatly limited by its geography in this regard. He also discussed the importance of energy-saving measures, such as energy-efficient appliances and lighting, and the need to reduce energy consumption.

Mr. WONG highlighted the importance of green buildings, which can significantly reduce energy consumption and carbon emissions, as buildings were one of the three major energy-consuming sectors in the city (the other two being electricity generation and transportation). He discussed the need to incorporate sustainable design features, such as embodied carbon (EC), green roofs and walls, passive solar heating, and high-performance insulation, into buildings. It was understood that buildings were built to last, but not built to fade. Hence, all these were extremely important considerations and features.

Regarding green transport, the speaker emphasised the need to shift towards low-emission vehicles, such as electric cars, and the importance of developing sustainable public transportation systems, such as mass transit and cycling infrastructures.

Mr. WONG also addressed what young engineers could do to contribute to this goal. He encouraged us to develop innovative solutions and to collaborate with others to develop sustainable technologies. He also stressed the importance of continuous learning and staying up-to-date with the latest trends and technologies in the trades.

The seminar even had had the chance to touch upon financial methods such as the green initiatives disclosure required by the Hong Kong Exchange (HKEx) and Hong Kong's future potential roles to be developed into a global hub for carbon trading and green finance, so as to support mega-scale infrastructures planned for carbon reduction in the Asia Pacific Region, or even internationally.

In conclusion, the seminar highlighted the crucial role of engineers in achieving carbon neutrality and emphasised the importance of collaboration and innovation in reaching the net-zero goal. The speaker also discussed the importance of green electricity generation, energy-saving measures, green buildings, and green transport, which were all crucial components of Hong Kong's Climate Action Plan 2050.

Written by: Mr. Kelvin TO

22 March 2023

Seminar on Green Building and Construction Technologies in Hong Kong

On 22 March 2023, we invited the Hong Kong Green Building Council (HKGBC) to conducted a technical seminar on Green Building and Construction. The seminar was divided into three parts, which included the framework for Hong Kong green building and construction, green building materials, and BEAM Plus.

The first part of the seminar emphasized the importance of achieving Net Zero (or carbon neutrality) in 2050 by focusing on three priorities: upfront embodied carbon, operational carbon reduction, and climate risk assessment and disclosure.

Embodied carbon refers to the greenhouse gas emissions that are associated with the production, transportation, and installation of building materials and components. Electricity consumption has been the major operating carbon for Hong Kong for years, and baseline, targets, and certification systems will be established based on these two types of carbon emissions.

During the talk, the speakers highlighted the significance of setting benchmarks for assessing different types of buildings. By taking references from other cities, the target and progress should also be feasible and achievable regarding local conditions for building owners to follow. The energy performance indicator (EUI) should be constantly updated and tailor-made for Hong Kong to meet the needs and requirements of the government.

Moreover, listed companies and financial institutions are also taking part in the framework, with a responsibility to disclose their practices and task force in promoting Environmental, Social, and Governance (ESG). Climate risk assessments are encouraged to be carried out by various parties, including the adoption of resilience planning and implementation to prevent specific climate risks in Hong Kong under global warming.

Under this framework, two certification systems have been established to evaluate the green building materials and overall sustainability performance of buildings.

The definition of Green building materials is wide, it could be any materials with at least one positive environmental characteristic, like low emissions or high recyclability. In 2019, a Green Product Certification was established by the Construction Industry Council (CIC) and HKGBC to assess the environmental performance of building materials. Building materials are assessed based on the amount of embodied carbon, while building products are classified into 25 categories and assessed under three key aspects: human health, ecosystem impacts, and resource consumption.

BEAM Plus is a green building certification system that utilizes a comprehensive set of performance criteria and assessment tools to evaluate the sustainability of buildings in Hong Kong, covering various aspects from building design and construction to operation, including energy efficiency, water conservation, indoor environmental quality, and innovation. It is tailor-made for Hong Kong, taking into account the unique sub-tropical climate and high-density built environment, with requirements based on local codes and regulations. By providing GFA concessions and better mortgage plans, there has been a 50 % increase in the adoption of BEAM Plus by owners in recent years.

However, there is still a long way to go for sustainable development in Hong Kong, and HKGBC is continually improving the system with a more flexible scope and rating tools to encourage private sector involvement in BEAM Plus. BEAM Plus is not just an assessment tool, but also a locally tailored solution that reflects Hong Kong's needs and challenges for sustainable development.

23 March 2023

Technical Seminar on Salient Water-related Nexus Issues in Transitioning Hong Kong into a Sustainable City

Dr. Frederick LEE holds a PhD degree in Urban Planning from MIT. He is the Executive Director of the Centre for Water Technology and Policy at The University of Hong Kong. In this Seminar, Dr. LEE provided the audience with a new perspective of the water story for Hong Kong.

Dr. LEE firstly presented with a set of solid data to demonstrate that Hong Kong had changed from a water scarce city from the 60's to the 70's to a water abundant city, after the immense infrastructural works on legal reserve, water gathering grounds, catchwaters, water treatment works and trunk mains; as well as the two major impounding reservoirs (Plover Cove and High Island) for the water buying agreement with the Mainland Chinese Provincial Government.

However, even with the above changes, the views embedded in the Administration's narrative of Hong Kong's water story still remained the same as in the last century, and that might not be particularly beneficial to Hong Kong as a whole, especially when the public was now demanding re-development of much of the country parks and even Hong Kong's reservoirs. The country parks were one thing but with many purposes, that they were for wildlife protection, as greening belts, for people to enjoy the countryside, and most importantly, as natural barriers to protect the water resources from city pollutions.

He further advised that the extension of the existing co-use arrangement of the waterbodies in Hong Kong's waterworks would help to protect Hong Kong's precious water resources and all those beautiful green legacies. International examples such as in the States were given to showcase the feasibility of the extension of such arrangement and pollution to the reservoirs could actually be controlled to an acceptable level. Dr. LEE showed an immense love for wide life and a deep care for the Mother Nature that he explained in many different occasions the linkages between water and ecology – which were essential to the task of mitigating biodiversity loss – one of the two nexus issues for Hong Kong in his view.

Another nexus issue was that the obsolete view from the earlier era of Hong Kong's water resource situation was diverting the Government's water planners away from the interconnections between water use, energy consumption and carbon emissions—which were tied to the task of protecting the global climate system. In a desktop study carried out by the Energy Transition Team, it was noted that many jurisdictions around the World had already closed their water management cycles, such as in the case of Singapore's PUB (Public Utilities Board), nevertheless, the water cycle in Hong Kong was still divisively managed by two government departments, i.e., the Water Supplies Department and the Drainage Services Department. These divisions might not prove particularly useful in optimising the use of public money, in managing precious natural water resources, and in reusing treated sewage effluent, floodwater and rainwater; not even in the perspective of energy saving. Unfortunately, due to the very limited time of this seminar, these issues were not touched upon in-depth at spot but in the ensuing dinner discussions.

During the half-an-hour Sharing & Discussion Session, Hong Kong's fellow water planners, professional engineers and trade practitioners were engaged to foster a meaningful exchange with Dr. LEE. All brought home with a good will to initiate some small but important changes by a critical mass of people to nudge Hong Kong to transition into a sustainable city.

When asked of by a member of the audience, he agreed that with the Handover, Hong Kong's part of Hong Kong's water supply from the Mainland would only be more secure than ever before. The member responded that this implied that Dr. LEE's dream of resolving these two nexus issues could really come true in the foreseeable future.

In this seminar, Dr. LEE unpacked unfounded beliefs that permeated the public's imagination on Hong Kong's water resources situation, and proffered an alternative view of a more sustainable Hong Kong with, for instance, the co-use of various waterbodies in the future. He provided the professional engineering community with a much-needed clarity to appreciate why water-related nexus issues should command their priority attention in the 21st century.

Frederick is also conducting a research project funded by the HKSAR Government's Strategic Public Policy Research Funding Scheme. The project integrates a number of Internet of Things and data analytics technologies to generate innovative measures that aim at reducing per capita domestic water consumption in Hong Kong, another nexus issue he determines to resolve.

Written by: Mr. Dick YAN

Chapter Five

OVERSEAS EVENTS

Visit to Autostadt GmbH (Volkswagen)

(04 April 2023 pm)

Volkswagen has been heavily investing in digital technologies and automative production to enhance efficiency and sustainability in their production processes. According to Volkswagen's annual report for 2020, the company has invested around €4.2 billion in digitalization and automation, which is expected to save around €2.6 billion in costs annually.

The company has also integrated Internet of Things (IoT) technology into its production processes, which has significantly increased efficiency and reduced errors. According to a report by McKinsey, IoT technology has the potential to reduce costs by up to 20% and increase productivity by up to 25%. Volkswagen has been able to increase their production efficiency by 30% using IoT technology.

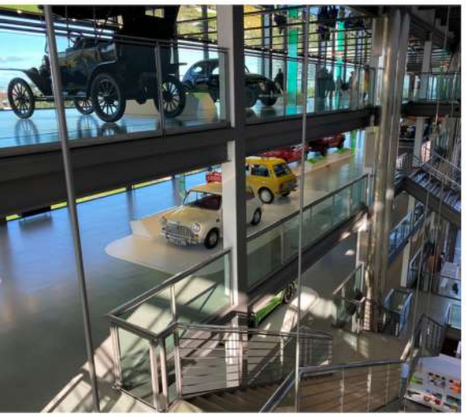
Volkswagen has also highly integrated the use of robots in their production processes to perform repetitive tasks, such as welding and painting. Volkswagen has installed over 1,500 robots in their production processes which increasethe efficiency and reduce human error. According to the International Federation of Robotics, the number of industrial robots installed worldwide increased by 85% between 2010 and 2019.

Furthermore, Volkswagen has implemented virtual reality (VR) and augmented reality (AR) technologies in their production processes. Volkswagen has been able to significantly reduce costs and save time by designing and simulating production processes in a virtual environment using VR technology.

In terms of future planning, Volkswagen has set a goal to sell one million electric vehicles (EVs) annually by 2025, and invest over €30 billion in EV technology development. According to a report by the International Energy Agency (IEA), global EV sales reached 3.1 million in 2020, a 43% increase from 2019. The IEA also predicts that the global EV market share will reach 10% by 2025 and 30% by 2030.

Additionally, Volkswagen has announced its plan to become carbon neutral by 2050, emphasizing their commitment to sustainability. In the past decade, renewable energy costs have declined significantly, making it more cost-effective than fossil fuels in many regions. Volkswagen has already implemented renewable energy sources, such as wind and solar power, in their production processes, and plans to increase their use in the future.

In conclusion, the figures mentioned above show the significant investment and development that Volkswagen has implemented in digital technologies, automation production, and future planning. These efforts demonstrate their commitment to remain a key player in the automotive industry while reducing their environmental impact.



Visit to Bausch+Ströbel (B+S)

(06 April 2023 am)

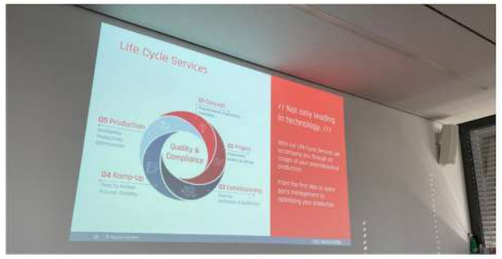
Bausch+Ströbel is an experienced company in the pharmaceutical industry specializing in filling and packaging systems, with 90% of machinery shipping around the world. Our visit to Bausch+Ströbel in Germany enables us to see firsthand how the company is leveraging digital technologies to improve the quality and safety of its products. The tour started with a presentation on the company introduction and recent technologies implementation. A visit to the VR technology and the showcases of machines were followed by the presentation.

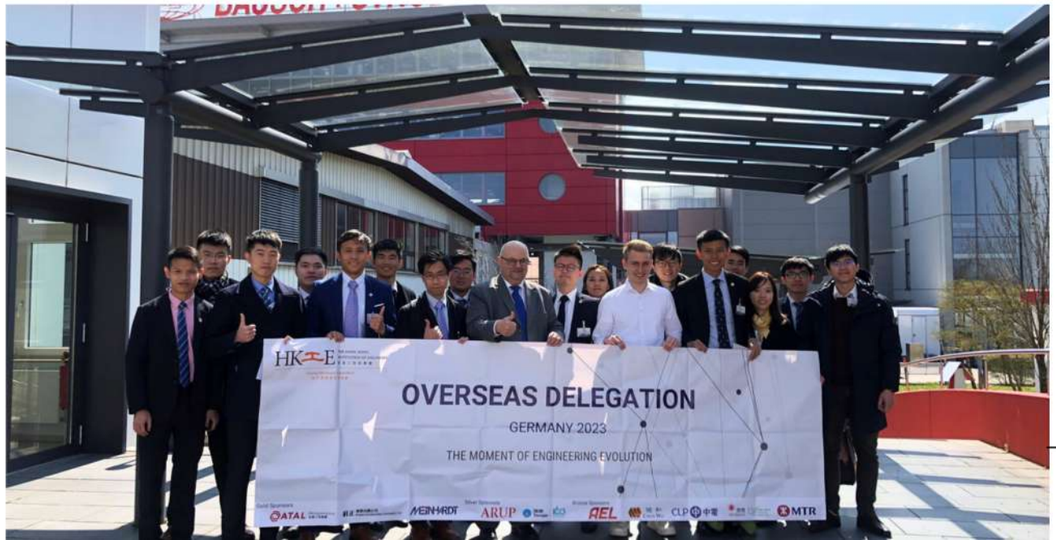
3D replicates would be built for all their machine products, with a level of detail down to single components. The model will be used for computational fluid dynamics modelling (CFD) during the design process and later in the design review process with virtual reality (VR) technology.

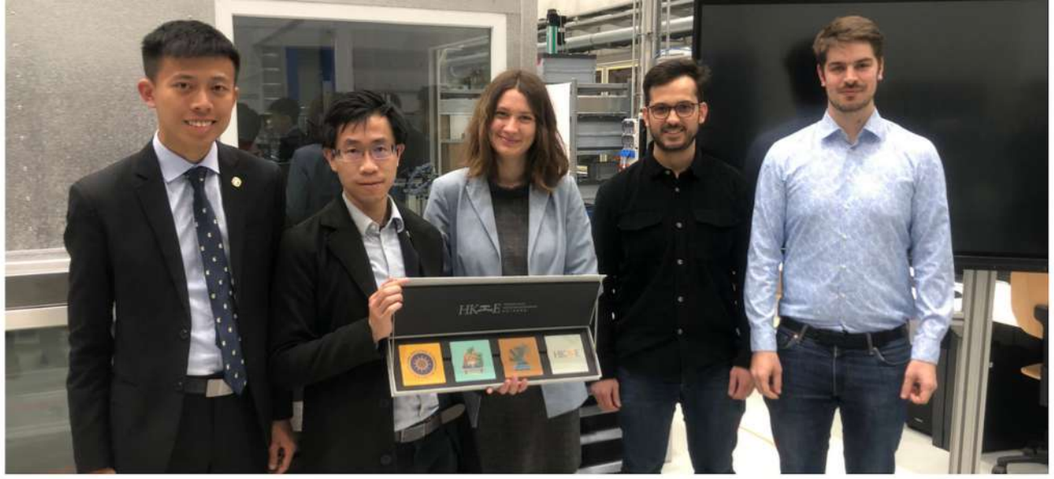
One technology featured at Bausch+Ströbel is Computational Fluid Dynamics (CFD). The pharmaceutical industry has a high requirement on cleanliness. By using CFD simulations, the company is able to analyze airflow conditions on virtual machines and lines, hich can identify potential problems in the machine operating area early on in the product development process. This can lead to enhanced machine design, optimized particle monitoring and improved quality of the final product. The CFD results can also be presented by VR technology.

Another key technologies that we saw in action was virtual reality (VR), which is being used in a variety of ways to enhance the product development process. For instance, Bausch+Ströbel implemented VR in the area of machine design review . By using VR technology, the company can create a realistic and detailed representation of its machines, which allow clients toexplore and interacte with in a virtual environment before the product manufactured. We were particularly impressed by the use of VR Mockup, which offers a standardized tool for ergonomic testing on the virtual machine. This tool can complement a conventional wooden or cardboard mockup, saving time and money while improving the accuracy and reliability of the testing process. In this visit, we were also invited to experience their virtual machine learning, in which the immersive experience would better engage the operators and maintenance staffs with more effective development and reduce the machine downtime.

All in all, our visit to Bausch+Ströbel was a fascinating and informative experience. We were impressed by the company's commitment to innovation, quality, and customer satisfaction, as well as its use of digital technologies to improve the product development process.







Visit to Karlsruhe Institute of Technology (KIT)

(06 April 2023 pm)

During our delegation visit to the Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany, Ms. Nadine Berends, Mr. Patrick Schaible, and Mr. Kamal Husseini presented us their latest research achievement in the industrial development in the form of the agile modular manufacturing process, circular economy industry and the development of Industry 4.0.

The agile modular manufacturing process is one of the main research focuses of the Karlsruhe Research Factory under the Karlsruhe Institute of Technology. Compared to traditional manufacturing line which is rigid and requires lots of resources and downtime to switch to producing other products, the agile modular manufacturing process emphasises the modular concept, where the entire manufacturing process is split into multiple stages, each handled by one single module such as robotic arms, welding machine, etc. By switching and rearranging modules, the agile modular manufacturing process could quickly switch to manufacturing other types or models of products without the traditional long downtime and resources. This process allows the manufacturing plant to quickly adapt to or even benefit from the volatile environment such as logistic chain issues and shifting demands which has caused significant distortion to the traditional and just-in-time manufacturing process.

Based on the agile modular manufacturing process, KIT is also researching the reversible production process. A used automobile lithium battery pack that could be disassembled and recycled was showcased during the visit. As the world moves towards carbon-neutral, battery-powered vehicle is expected to become the future of mobility. The battery disposal will become problematic after their designlife within a decade. The recycling of lithium battery will greatly benefit the circular economy principle and leading to overall sustainable society.

The use of artificial intelligence in manufacturing has also been discussed during the visit. KIT has developed a system to facilitate plant and equipment condition-based maintenance using artificial intelligence to analyse the current condition of the plant and equipment. This implementation allows the plant to reduce the manpower, equipment and consumable cost to perform traditional preventive and corrective maintenance.

Energy Transition

Visit to Deutsche Energie-Agentur GmbH (Dena)

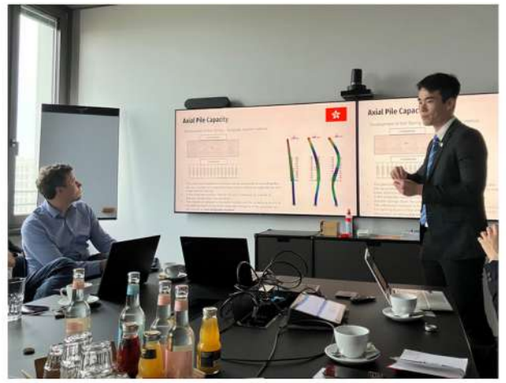
(31 March 2023 pm)

Dena, or the Deutsche Energie-Agentur GmbH (German Energy Agency), is a German government-owned corporation that was established in 2000 with the aim of promoting the transition to renewable energy sources and reducing greenhouse gas emissions. Dena is a key player in Germany's energy transition, which is also known as the Energiewende.

The speakers of Dena provided us with valuable information about how Germany managed the issue of energy transition. The Energiewende was a long-term project which aimed to transform Germany's energy system from one heavily reliant on fossil fuels to one based on renewable energy sources such as wind, solar, and biomass. The Energiewende was launched in the wake of the Fukushima disaster in Japan in 2011, which led to a public outcry against nuclear power in Germany.

Dena played a crucial role in the Energiewende by providing expert advice to the German government and industry on how to achieve the transition to renewable energy sources. They were also involved in a wide range of projects and initiatives aimed at promoting the use of renewable energy and reducing greenhouse gas emissions.

One of Dena's most important roles was to promote energy efficiency. Energy efficiency was a key component of the Energiewende, as reducing energy consumption was an important way to reduce greenhouse gas emissions and to promote the use of renewable energy sources. During the meeting, we observed that the lights were turned off to make use of natural lights and heating was turned off and manual ventilation was deployed. We were impressed. The organisation provided advice and support to businesses and households on how to improve energy efficiency, for example by providing information on energy-efficient building materials and appliances.



Working closely with the German government, policies and regulations were developed to promote the use of renewable energy, and provided support to businesses and households who are interested in installing renewable energy systems. They also conducted research into the most effective ways to integrate renewable energy into the grid, and provided advice on how to manage the variability of renewable energy sources. The speakers shared their experience that, with the adoption of more and more renewable energy systems, they found that it had now become necessary to also manage the supply-side. They further advised that in order to mitigate the intermittent nature of renewable energies, one of the methods was to inter-connect Germany's electricity grid to their neighbouring countries. In Germany, the consumers had seen a varying energy prices up to a few folds; and nationally speaking, Germany was transitioning from an energy-exporting country to a sometimes-energy-importing country, particularly during peak load seasons. From our team's study, the necessity of managing (by means of load prediction and satisfying) the demand-side was well known in the electricity industry in traditional generation plants, yet, it was noted that managing both the supply and demand sides at the same time might not be entirely impossible, but would inevitably induce a situation just as we saw in the market cycles.

Dena was also involved in promoting the use of electric vehicles in Germany. Electric vehicles were seen as an important way to reduce greenhouse gas emissions from the transportation sector, which was one of the largest sources of emissions in Germany. Dena provided advice and support to businesses and municipalities on how to install charging infrastructure for electric vehicles, and also conducted researches into the most effective ways to integrate electric vehicles into the grid, taking into considerations the paper work required for such application.

Dena had been an important working arm for the Federal Government, in the sense that it worked as a business, but not a government department, so it was not subjected to those rigid government rules and procedures (universal among all governments worldwide). This duality role had long worked. Despite its important role in the Energiewende, Dena had faced some criticisms in recent years due to changing public views in the topic of energy transition. Some critics argued that Dena had not done enough to promote the use of renewable energy sources, and that it had been too slow to adapt to changes in the energy sector. Others had criticised Dena for being too closely aligned with the interests of the fossil fuel industry, and for not being transparent enough in its decision-making processes.

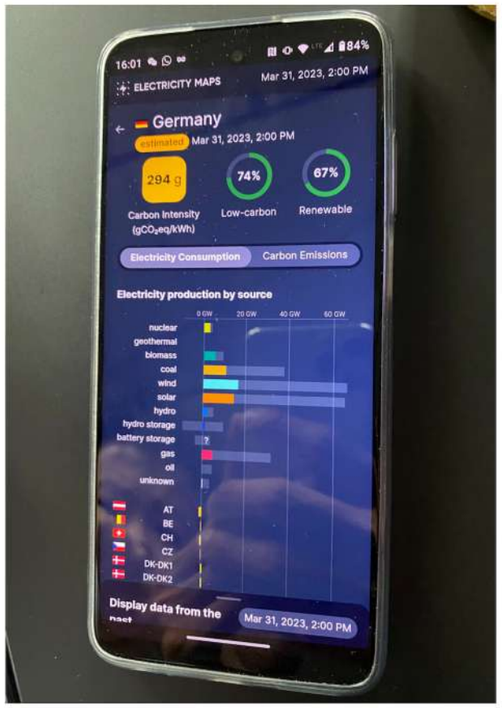
In response to these criticisms, Dena had taken steps to improve its transparency and to address concerns about its alignment with the fossil fuel industry. Dena had also increased its focus on promoting the use of renewable energy sources, and had launched a number of new initiatives aimed at accelerating the transition to renewable energy.

Overall, Dena played a crucial role in Germany's energy transition, and its work was likely to have a significant impact on the future of energy in Germany and beyond. While there was still much work to be done to achieve the goals of the Energiewende, Dena's expertise and experience will be essential in making the transition a success.

In the last part of the meeting, we had the chance to share Hong Kong's situation, and the Hong Kong Government's plan toward net zero carbon by year 2050. We hoped that would strengthen our mutual understandings.

We have learnt a lot from Germany's experiences in their pathway in transitioning to a greener future and appreciated a lot the hospitality of Dena and the speakers.

Written by: Mr. Alex SZE and Mr. Michael MA



Visit to Technische Universität Berlin (TU Berlin)

(01 April 2023 pm)

On our overseas visit to Technische Universität Berlin (TU Berlin), a leading research university located in Berlin, Germany, we had the opportunity to learn about the latest research and development in the field of wind energy. The university is known for its focus on engineering, natural sciences, and technology, and is home to several research institutes and centers, including the Institute of Energy Engineering, which is a key centre for wind energy research at TU Berlin.

The institute's research focused on the development of advanced technologies for utilising wind energy, including the design and optimisation of wind turbines and the development of new materials and manufacturing processes. Our visit included a tour of the wind tunnel Growika, which was used to test and optimise the performance of wind turbines. The wind tunnel was equipped with advanced measurement and data acquisition systems to allow researchers to accurately measure the aerodynamic forces acting on wind turbine blades. This data was then used to improve the design and efficiency of wind turbines.

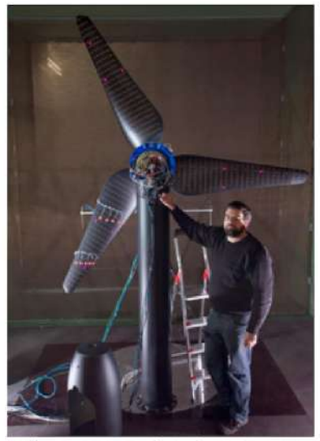


Fig 1.1 - The BeRT in Technische Universität Berlin

During the visit, we firstly attended to a presentation by Dr.-Ing. Christian Navid NAYERI, who discussed the university's recent projects in wind turbine blade in the field of aerodynamics and design. Dr. NAYERI highlighted the importance of optimising the shape and structure of wind turbine blades in order to maximise energy output and reduce costs. By limiting the size of offshore wind farms, it would also be possible to protect marine environment. The projects he discussed included prototypical turbines and blades, as well as the development of the QBlade software for blade design and optimisation.

One key area of research that Dr. NAYERI discussed was the optimisation of blade tip shapes. He explained that by carefully controlling the shape of the blade tip, researchers could reduce the amount of turbulence and energy loss at the end of the blade. This could significantly improve the efficiency of wind turbines and increase their power output, especially in a wind farm setting, because talking of fluid dynamics, the way the wind leaving the first row of wind turbines would be affecting the second row and thus their electricity produced. Dr. NAYERI also discussed the use of advanced materials, such as carbon fibre, to create lighter and stronger blades which were more efficient at converting wind energy into electricity. He also talked about the use of 3D printing technology to create complex blade structures which were difficult to manufacture using traditional methods.

The QBlade software was another highlight in the presentation. It was a multi-platform aero-servo-elastic wind turbine design and analysis tool. QBlade used a blade element momentum (BEM) method to calculate the aerodynamics of wind turbine blades, and could simulate both steady and unsteady flows. The software included a graphical user interface (GUI) allowing users to design wind turbine blades, analyse their performance, and optimise their design parameters. QBlade was commonly used by wind energy researchers, students, and engineers for both educational and professional purposes.

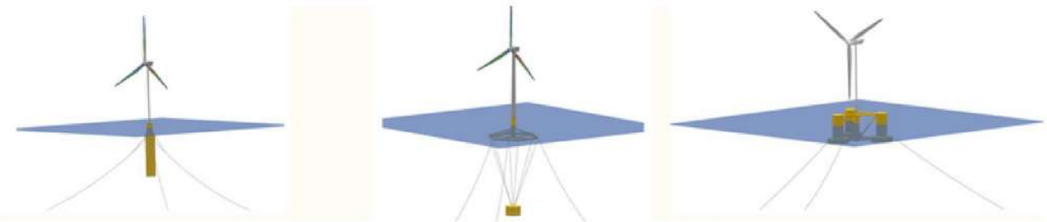


Fig 1.2 - QBlade Ocean and wave field simulation

Dr. NAYERI then introduced the Smart Blade – BeRT (Berlin Research Turbine), situated in a closed-loop wind tunnel facility. It was a wind turbine located at the Technical University of Berlin in Germany. The BeRT was designed as a research tool for investigating the aerodynamics and structural behavior of wind turbines. Consisting of a three-bladed horizontal axis wind turbine with a 3 m rotor diameter, the focus of the study was to understand the three-dimensional effects experienced by the rotating blade, in comparison to 2D approaches by means of XFoil simulations and 2D blade section experience. The BRT had been used for a wide range of research projects related to wind energy, including studies on aerodynamics, structural dynamics, control systems, and blade design. It had been an important tool for advancing the understanding of wind turbine technology and had contributed to the development of more efficient and reliable wind turbines.

Another focus was the technical maturity and the cost competitiveness of flowing offshore wind (FOW) turbines. Dr. NAYERI introduced FLOATECH, a research project funded from the European Union's Horizon 2020 research and innovation programme. It started in Q1 2021 and targeted to end at Q4 2023 with four academic partners (4 EU countries) and nine industrial partners. The objective of the research was to increase the technical maturity and cost competitiveness of floating wind energy by developing the design and simulation environment optimised for FOW and the FOW specific control technologies. The whole project includes three actions:

1. Action 1 : Simulation Technology
2. Action 2 : Smart Turbine Control
3. Action 3 : Economic Impact Evaluation

In Action 1, the TU Belin utilised QBlade to simulate and designed the ocean environment for design of offshore fixed-bottom and floating architectures. They also carried out verification against existing software to assess the uncertainty for uncertainty quantification assessment.

In Action 2, the researcher carried out Feed-forward wave-based control on the FOW. It was a control strategy used in marine engineering to reduce the motion and improve the stability of offshore structures, such as offshore wind turbines, in waves. This control strategy used real-time measurements of the incoming wave field to predict the future wave-induced motions of the structure, and then applied control inputs to counteract those motions before they occurred. The objective was to provide wave sensing & prediction, wave-based active turbine control for load reduction, and experimental validation.

Written by: Mr. Frankie KUNG and Mr. Kelvin TO

Wake mixing was a phenomenon occuring in the wake of a wind turbine, where the turbulent flow generated by the rotor blades mixed with the surrounding air. The wake of a wind turbine was the region behind the turbine where the wind speed is lower than the ambient wind speed, and the turbulence was higher. The research also used vortex-particle multilevel (VPML) method to understand how the wake of one turbine affected the performance of the turbines downstream.

In Action 3, Levelised Cost of Energy (LCOE) and market value evaluation were carried out and as parts of the Economic Impact Evaluation of offshore floating wind turbine. It typically involved a comprehensive analysis of the costs and benefits associated with the development and deployment of floating wind turbines. The evaluation was carried out by project developers, government agencies, or independent consultants, and may include a range of economic indicators and metrics.

During the discussion session, we noted that the maintenance cost of wind turbines would be an important factor to operators, that some operators chose to leave non-working turbines alone without fixing it in view of the cost.

Overall, our visit to Technische Universität Berlin Wind Energy provided us with valuable insights into the latest research and development in wind energy. The tour of the Growika wind tunnel demonstrated the importance of accurate testing and measurement in optimizing the performance of wind turbines. The presentation by Dr. NAYERI highlighted the significant progress being made in wind turbine blade aerodynamics and design, and the potential for advanced materials and 3D printing technology to revolutionise this field.

We left the visit with a deeper understanding of the challenges and opportunities in wind energy research, and a newfound appreciation for the innovative work being done at Technische Universität Berlin Wind Energy.

This report was written based on Dr. NAYERI's very detailed presentation, the ensuing site visits and our fruitful discussions. Special thanks are given to Dr. NAYERI and we truly hope him a very successful endeavour in the coming future.

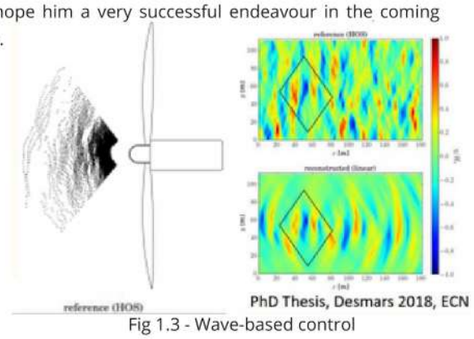


Fig 1.3 - Wave-based control

Sustainable City

Visit to Hamburg Harbour Side

(03 April 2023 pm)

The Hamburg Harbour Side is a prime example of how flood resistance infrastructure can be integrated with public leisure spaces to create a safe and enjoyable environment for residents and visitors simultaneously.

The Harbour Side is located on the Elbe River banks, where the risk of flooding is high due to the river's proximity. To combat this risk, a broad range of flood resistance infrastructure measures has been implemented. The city has developed a comprehensive protection concept consisting of diking, object protection, and dwelling mount. The dike system is designed to withstand the predicted seawater rising numbers, allowing the city to remain protected in the event of a flood.

Moreover, the Harbour Side has also invested in protective measures for individual buildings. This includes the use of 7cm thick glass for waterproof storm protection, which ensures that buildings remain safe and functional during storm surges.

In addition to these measures, the Harbour Side has also implemented a warning system that alerts residents and visitors of potential flood risks. This system is designed to provide ample warning time to allow people to be evacuated from the area.

The design life of the Harbour Side is also a key consideration. The city has developed a plan that takes into account the expected lifespan of the infrastructure and public spaces which incorporates the storm model developed by the Delft Institute for Water Education. This includes regular maintenance and upgrades to ensure that the Harbour Side remains safe and functional for years to come.

The integration of flood-resistance infrastructure with public leisure spaces has created a unique and delightful surrounding for residents and visitors alike. The Harbour Side offers a range of activities and attractions, including restaurants, shops, and public parks, all within a safe and secure environment.

In conclusion, the Hamburg Harbour Side offers a prime example of how flood resistance infrastructure can be integrated with public leisure spaces to create a functional and enjoyable environment. The protection concept, warning system, and protective measures for individual buildings ensure that the area remains safe during flood events. The Harbour Side is an excellent example of sustainable city development and serves as a model for other cities looking to integrate flood resistance infrastructure with public spaces.

Visit to HafenCity
(04 April 2023 am)

HafenCity in Hamburg, Germany, is a prime example of sustainable city development. The land is originally planned to be used as a harbour or storage area, Hafen means Harbour. This area is located outside the Hamburg city dike, which experiences real flood risk and shall not be permitted to have any residential usage historically.

One of the key features of HafenCity's flood resistance infrastructure is the construction of elevated buildings. These buildings are designed to withstand flooding, which is vital given the city's location on the banks of the Elbe River. The buildings have been constructed to an elevated level.Further, the level below the expected flooding level is constructed to be water resistant, which reduces the risk of flood damage and ensures the safety of residents.

Another important aspect of sustainable city development in HafenCity is the emphasis on walkability design. This includes reducing car parks and promoting car-sharing incentives. HafenCity has a low parking to apartment ratio of 0.4, which encourages residents to use public transport or walk. The city also offers car-sharing incentives to further reduce the need for car ownership.

The property development model in HafenCity is also noteworthy. The tenders were scored by their sustainable design concept instead of price, which has encouraged developers to create sustainable buildings. This has resulted in a well-designed and cohesive community that is both functional and visually appealing.

HafenCity covers an area of 157 hectares, which is a 40% enlargement of the historical city centre. The city is expected to house approximately 12,000 residents and provide jobs for 40,000 people. With over 30% of the area dedicated to open spaces, the city provides a healthy and sustainable living environment for its residents.

In conclusion, HafenCity is an exemplary model of sustainable city development. The combination of flood resistance infrastructure, walkability design, and a well-planned property development model has resulted in a thriving community that is both functional and visually appealing. The city's low parking-to-apartment ratio, fixed land price, and open spaces have made it an attractive destination for residents and businesses alike.

Visit to Global Tower in Frankfurt
(05 April 2023 pm)

We had the opportunity to examine the Global Tower in Frankfurt, Germany, a leading example of revitalizing historic buildings with a focus on sustainability. Similar to Hong Kong's BEAM PLUS, Germany has its own sustainability labeling scheme, the DGNB, with the Global Tower achieving Platinum Grade certification. The tower's efforts in sustainable facade and interior design are particularly noteworthy.

Revitalizing historic buildings involves a process akin to Alteration and Additions (A&A) Works in Hong Kong. This entails a structural appraisal to determine the building's structural capacity, followed by a survey to assess the structure's condition. Afterward, design calculations are performed for existing slabs, beams, columns, and foundations to evaluate the feasibility of adding new loading areas. If necessary, reconstruction may take place after reinforcement works have been completed. In the case of the Global Tower, height extension was restricted by city regulations, but revitalization was accomplished by using the same structural framework as the original construction.

Promoting sustainability in existing buildings is a challenging in both Hong Kong and Germany. In Hong Kong, one of the challenges for the council is addressing multi-partnerships in buildings and encouraging owners to participate in the scheme by highlighting potential property value increases. In Germany, the challenge lies in enhancing the appeal of sustainable features to attract international and local tenants seeking to meet their in-house HSG standards.

During our visit to the Global Tower, we observed their dedication put into sustainable facade and interior design. The facade design includes full-story height windows for energy efficiency and well-being, multiple layers of facade coatings to block UV radiation, double-glazing for improved thermal performance and impact resistance, and operable windows for comfort ventilation. Sensors are also installed on the facade to control adjacent ventilation systems for better energy conservation when windows are opened.

Additionally, the tower offers standardized, reusable internal partition walls that suit the building's fittings. This innovative feature allows for easy installation, layout adjustments, and reuse throughout the entire building, contributing to sustainability and efficiency. This concept is worth considering for inclusion in our own repertoire of sustainable building practices.

Visit to German Parliment Building

(31 March 2023 am)

On 31st March 2023, a visit was conducted at the Berlin Parliament building, also known as the Reichstag building, to gain a better understanding of its history and importance in German politics.

History

The Reichstag building has a rich and complex history. It was built in 1894 to house the parliament of the German Empire, but it was damaged by a fire in 1933 that was blamed on the Nazis. After World War II, the building was partially rebuilt and served as the home of the West German parliament until 1999, when it underwent a major renovation and became the seat of the reunified German parliament.

Visit

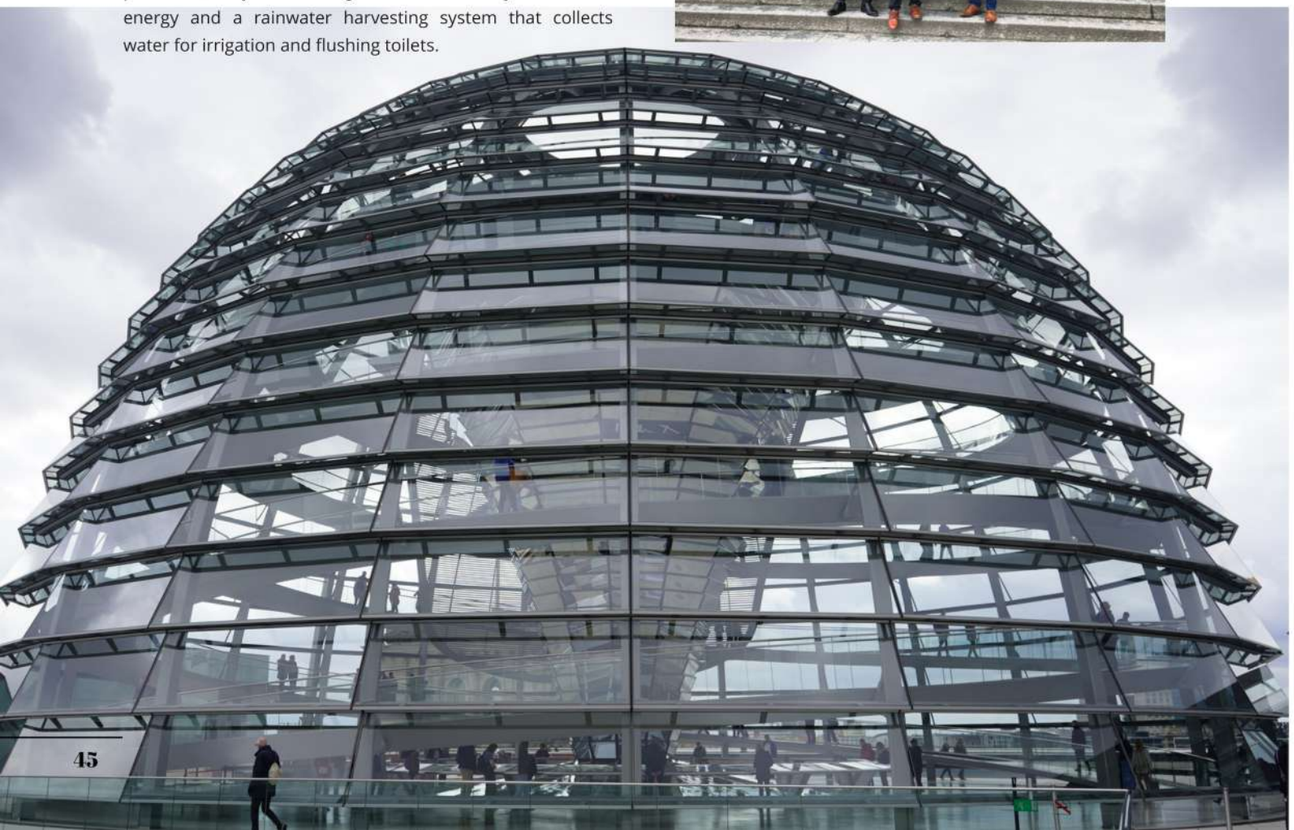
During the tour, we were able to appreciate the building's unique architectural design, which combines the old Neo-Renaissance facade with modern elements such as the glass dome. The dome, which was added during the renovation, symbolizes the transparency of the German government and offers a panoramic view of the city.

We also learned about the building's energy efficiency. Our tour guide explained that the Reichstag building uses geothermal energy for its heating and cooling system, which reduces its carbon footprint. Additionally, the building has a photovoltaic system that generates electricity from solar energy and a rainwater harvesting system that collects water for irrigation and flushing toilets.

Finally, we discovered some of the technological features of the Reichstag building. The building has a computerized system that controls the lighting, heating, and ventilation, and monitors the building's energy consumption. The building also has a state-of-the-art security system that includes biometric identification and surveillance cameras.

Conclusion

In conclusion, the technical visit to the Berlin Parliament building was an enlightening experience that allowed us to appreciate the building's history and importance in German politics. We were also pleasantly surprised to learn about its architectural design, energy efficiency, and technological features, which reflect Germany's commitment to sustainable building design and construction.



Visit to Futurium

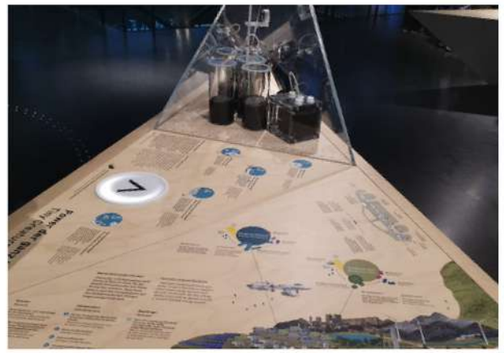
(01 April 2023 am)

Futurium in Berlin offers an insightful glimpse into Germany's vision for the future. The exhibition space is dedicated to exploring various possibilities for the future through interactive installations and thought-provoking displays. The overarching theme revolves around sustainability, renewable energy and technology. Futurium's overarching goal is to answer the fundamental question "How do we want to live?". The exhibition allows visitors to discover many possible futures, while the Futurium Lab helps them test their own ideas.

I began by exploring the fascinating exhibition featuring interactive displays showcasing various visions. Themes included technology, energy, nature and society. The key message was that the future is undetermined and shaped by our present choices and actions.

This resonated strongly as I saw displays highlighting renewable energy abundance and rapid growth, fueling hope that an energy transition away from fossil fuels is achievable with ambition and collective action. Organic solar cells that can be integrated into buildings particularly interested me, demonstrating renewable solutions to power cities.

In the Futurium Lab, I used interactive tools to visualize my vision for the future and analyze how current trends and factors may enable or inhibit it. This hands-on experience illustrated that shaping the future depends on ideas and actions from all of us today.



The exhibition also emphasized Germany's valuable contributions to renewable energy solutions and technologies that will help determine our collective future. As an energy consumer, I came away energized by Germany's potential to positively shape tomorrow.

One of the highlights is the 'Solar Tree' installation which demonstrates how renewable solutions can be integrated into architecture to generate renewable energy for powering cities in smart, sustainable ways. Another exhibit focused on the potential of graphene, a wonder material made of a single layer of carbon atoms. The exhibit highlighted current research on graphene for more efficient solar cells, longer-lasting smartphone batteries and ultra-fast computer chips. This demonstrates Germany's ambition to pioneer future technologies that could radically transform industries and lives.

An immersive projection installation speculates how new modes of transportation and urban planning can make cities more sustainable and livable in the future. The projections revolve around ideas such as underground logistics systems, drone delivery networks, and futuristic high-rise modular designs. Such concepts reflect Germany's vision for sustainable smart cities that leverage new technologies to improve mobility, energy efficiency and quality of life for citizens.

Overall, Futurium provides valuable insights into how Germany is preparing for the future by investing in renewable energy, sustainable technology and smart solutions for cities and transportation. The mix of interactive art installations and real-world case studies paint an optimistic picture of how innovation can drive positive change to address pressing issues such as climate change in the coming decades. Futurium is an eye-opening showcase of Germany's progressive mindset and ambition to shape a sustainable future.

Visit to Schloss Schwerin

(02 April 2023 pm)

On 2nd April 2023, a visit was conducted to Schloss Schwerin, a magnificent castle located in the city of Schwerin, Germany. This report aims to provide a comprehensive overview of the castle's history, architecture, and cultural significance.

History

Schloss Schwerin was built in the 10th century and was first mentioned in historical records in 973. Over the centuries, the castle was expanded and renovated several times by the dukes of Mecklenburg-Schwerin, who owned the castle until the early 20th century. The castle was heavily damaged during World War II and underwent extensive restoration in the 1990s.

Architecture

Schloss Schwerin is an impressive example of North German Renaissance architecture, which is characterized by its intricate ornamentation and use of brick. The castle's most striking feature is its towering spires, which dominate the skyline of Schwerin. The castle is also surrounded by a large moat, which adds to its visual appeal.

The castle's interior is equally impressive. The Grand Hall, which is used for official ceremonies, features a stunning ceiling fresco depicting the four seasons. The castle also houses a collection of antique furniture, paintings, and tapestries, which offer a glimpse into the lives of the dukes who once lived there.

Cultural Significance

Schloss Schwerin is an important part of Germany's cultural heritage. It is one of the most significant examples of North German Renaissance architecture and is a testament to the wealth and power of the Mecklenburg-Schwerin dukes. The castle is also a popular tourist destination, attracting visitors from all over the world who come to admire its architecture and learn about its history.

In addition to its architectural and historical significance, Schloss Schwerin is also home to several cultural institutions. The castle houses a museum that showcases the history and culture of Mecklenburg-Schwerin, as well as a theater that hosts performances throughout the year.

Conclusion

In conclusion, the visit to Schloss Schwerin was a fascinating experience that provided a glimpse into the history and culture of Germany. The castle's stunning architecture, rich history, and cultural significance make it a must-see destination for anyone interested in German history and architecture. The castle's restoration and ongoing preservation efforts are a testament to Germany's commitment to preserving its cultural heritage for future generations to enjoy.

Visit to Miniatur Wunderland

(02 April 2023 pm)

Miniatur Wunderland, located in Hamburg Germany, is a world-renowned indoor exhibition that showcases miniature landscapes and cities from around the globe. The exhibition is divided into several sections, such as Germany, Switzerland, Austria, the United States, etc. Each section has its unique design and features, providing a comprehensive display of engineering and architectural marvels. The Miniatur Wunderland could be considered as a pioneer conception of digital twin. A replicate to simulate the actual event in a modeling environment.

One of the most impressive features at Miniatur Wunderland is the day-night cycle. The lighting changes seamlessly from day to night every 15 minutes, creating a realistic and immersive experience. An automatic lighting control system is included to activate more than 480,000 LEDs. The lighting effects were particularly impressive in the model of Las Vegas, with the city lights and neon signs creating a vibrant atmosphere.

Throughout the exhibition, computer-controlled vehicles move around. The trains, buses, and cars move seamlessly through the miniature landscapes as they are controlled by computer program, allowing them to stop and start based on scenarios and making the movement through the exhibition fluid and realistic. The fire runs, controlled by a sophisticated software, are impressive. The firefighting procedures are constantly engaged by the fire brigades.

As the world's largest model railway, Miniatur Wunderland includes over 16,100 meters of track, 1,100 trains and more than 280,000 figures. The trains are equipped with sound and lighting effects, giving the impression of a real railway station. The railway landscapes include mountains, valleys, and bridges, providing a breathtaking view of the miniature world.

The Knuffingen Airport is also one of the astounding attractions in Miniatur Wunderland, which features a miniature airport with aircraft taking off and landing on an intricate runway system with realistic airport facilities. To glide the fleet of 47 aircrafts through the air, a catapult is implemented.

Miniatur Wunderland is a truly inspiring attraction. The exhibition showcases the amazing capabilities of engineering and architectural design with the railways and aircrafts model. It is a testament to the power of creativity and attention to detail, which make it as an impressive display of the miniature engineering and stunning craftsmanship.

Chapter Six

INSIGHTS

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

Digital Transformation

The industrial revolution has undergone several stages since the 18th century. The first industrial revolution (Industry 1.0) saw the adoption of mechanization and steam power, while the second industrial revolution (Industry 2.0) was characterized by mass production and assembly line techniques. The third industrial revolution (Industry 3.0) saw the rise of computerization and automation, leading to the development of new technologies such as robotics and artificial intelligence. Today, we are in the midst of the fourth industrial revolution (Industry 4.0), which is marked by the increasing integration of digital technologies and the Internet of Things into industrial processes. Industry 4.0 is characterized by the use of advanced technologies such as artificial intelligence, big data analytics, and the Internet of Things to optimize production processes, improve efficiency, and create new business models.

Industry 4.0 in Germany

Germany has been at the forefront of the Industry 4.0 movement, and the government has made significant investments to support research and development in this area. In 2011, the German government launched the "High-Tech Strategy 2020" initiative, which aims to promote innovation and technology in key sectors of the economy. As part of this initiative, the government has a huge investment in research and development for Industry 4.0 technologies and established the Industry 4.0 Platform, which brings together industry, academia and government to promote the development and adoption of Industry 4.0 technologies. In addition, the “Digital Hub Initiative”, which aims to create a network of digital innovation hubs across the country and the “Digital Strategy 2025” which outlines the vision for a digitalized economy were also established by the government. Through these policies and initiatives, Germany has established itself as a global leader in digital transformation and advanced manufacturing.

Technological Status in Hong Kong

The Hong Kong Innovation and Technology Development Blueprint sets out 8 strategies under 4 board development directions for Hong Kong Innovation and Technology (I&T) development over the next 5 to 10 years and targets to promote technology industry development and achieve “new industralisation” in Hong Kong. With the policy driven digital transformation and new industralisation, Hong Kong companies can work closely with universities, research institutes, and other organizations to develop new technologies that can improve efficiency, productivity and competitiveness and bring them to market.

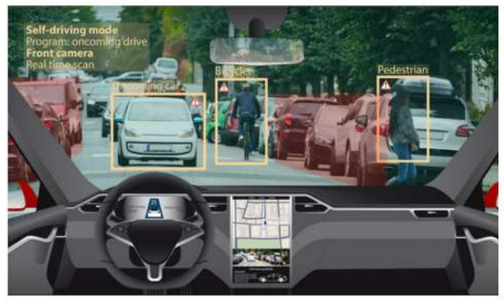
Key Takeaways in the context of DT

Our visit to Germany enables us to have the opportunity to meet with organizations and institutions that drive digital transformation. One of the key trends in German digital transformation is the move towards smart factories, where machines and systems are interconnected and can communicate via interface.

In Autostadt factory, which is a state-of-the-art automotive factory that makes use of robotics in its production line. Robots work alongside human workers to increase efficiency, reduce errors and improve safety. In Bausch+Ströbel, they specialize in the production of filling and packaging systems with the incorporation of virtual reality (VR), Computational Fluid Dynamics (CFD) and digital twins to streamline the design process and assembly. The streamlined production of machinery allows for greater automation and more efficient production processes. The launch of digital tools and gadgets was initiated as a result of realization of the values technology bring, e.g. reduction of abortive works in the early stage as per the clients' requirements, enhancement of production efficiency and obtaining client's buy-ins. In addition to delivery of solutions and services, the lesson learnt for Hong Kong companies is that proper transformation to digitalization and leverage of technology and advanced analytics could help differentiate their services, provide delightful customer experiences and streamline product delivery in the competitive world.

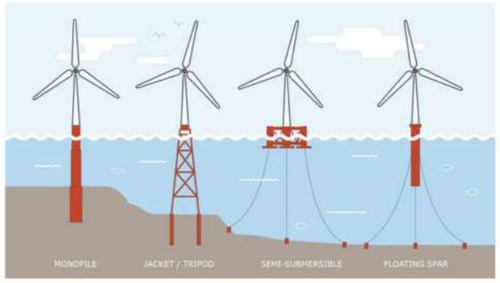
In Karlsruhe Institute of Technology (KIT), examples of the projects with AI focus were shared. For instance, image-based condition monitoring can be implemented for the modeling development of wear in ball screw drives using machine learning. By the implementation of data analytics and machine learning, decision making and streamline operations can be improved. German companies have been effectively to adopt artificial intelligence, robotics, and the Internet of Things to increase efficiency and productivity, and services that can compete in a global market.

In particular, the agile modular manufacturing process introduced by KIT is remarkable and exceptionally well suited for the implementation in Hong Kong. The agile modular manufacturing process is a highly configurable and adaptive process methodology. It is an approach to manufacturing that emphasizes flexibility and adaptability with the basic idea to break down manufacturing processes into smaller, modular units that can be easily reconfigured and combined to produce different products in response to changing customer demand or market conditions. Typical agile modular manufacturing may involve the use of advanced manufacturing technologies, such as robotics, sensors and controls to automate and optimize production processes by data analytics. Due to Hong Kong's relatively high capital investment and operating cost, it might be more suitable to treat Hong Kong as a pilot research and development (R&D) centre for high value-added industry as suggested in the Hong Kong Innovation and Technology Development Blueprint that promulgated by the HKSAR Government in 2022. Compared to traditional sense of R&D, the agile modular manufacturing process would drive Hong Kong to take more steps in the design and verification of mass-producing manufacturing line and to optimize performance in production. This would enable Hong Kong to improve its productivity and gain further competitiveness as compared to other regions in the world.



Energy Transition

Once upon a time, in a far, far world, numerous Christendoms and Catholic dominions co-existed in a congested continent, a very special type of coal was firstly discovered and put to use in the Netherlands, a new protestant country surrounded by hostile Catholic kingdoms. The Dutch's use of that coal as their source of energy had hugely increased their productivity, a thing never seen in the Chinese history, where from the firstly unified Qin to the authoritarian Ming, all upper structures were built upon a vast and ever-increasing population and land masses, which were susceptible to climate cycles. An isolated farming culture is like an enclosed engineering system which rejects all externalities and deals with all things within itself, having the merit of not affecting others but it can't be helped during disastrous situations...



A Scottish person called Mr. WATT out of curiosity after the English's Highland Clearance Policy occasionally improved the steam engine to a level that it could be used for practical production with its much-improved efficiency. The English out of commercialism sold his inventions around England and abroad to Europe. The English soon learnt that good news from the Dutch, and they discovered numerous shallow-level coals around the North-Western part of the British Isles, where we call Liverpool, Manchester, etc. today. They accidentally knocked on the door of industrialisation and opened up a way to modernity out of fear of the removal of nobles in the French continent. The English started to speed up moving abroad with their improved productivity by the use of energy and conquering indigenous peoples, including a barren rock with quite some fishing villages in Southern China, and that seemingly random act would later create a world-prominent city.

The European countries caught up with the British and started to use coals and internal combustion engines. With the curse-and-gift duality of energy, soon the countries in Europe caught out and fell into revolutions and busied themselves with nation building, forgetting that the prime thing was the economy, i.e. the livelihood of the people. They went into some notorious and horrific wars... The English brought with them the Scottish out of Europe and called themselves 'British', but they had no clue why they were better than their peers.

More and more countries around the globe learnt to use coals and then oils to increase their productivities and learnt to produce many useful by-products from oil, such as fertilisers, medicines, tyres, plastic, beauty products – some of the most important products to our modern life this day. Yet, no one foresees that a world-scale use of fossil fuels would generate greenhouse gases so much that the Earth's water-dominant climate system would be shaken beyond its system equilibrium. And unfortunately, no one at present appears to have discovered that the climate issue is a matter in the field of systems, and that a system does not necessarily behave in a linear way but a dampened way with many counteracting factors.

Some were afraid and got up yelling "stop using fossil fuels and let us go back to a simple living". What they have been imagining might be a pre-industrial live, when people were stuck in a place and could not move around easily and where physical supplies like food, medicines and consumer products were limited and unpredictable; where the Haber Process for industrial production of fertiliser that could sustain a huge population was not available, not to mention that the complete and sudden & unprepared stop of using fossil fuels would, in common sense, inevitably make us even more vulnerable during climate crisis.

Energy Fuel Mix

We found out that the existing world model of energy production is based on a centralised model, and observed that it was not possible to use renewables to completely replace fossil fuels, quantitatively. We envisage that it would be more viable and feasible to use a hybrid-centralised-and-distributed model for power generation, where fuels could be used as the base, while renewables with storage be for peak management. However, that would require many more civil infrastructures to support, and a vast amount of sensors and reliable communication networks to monitor, control, and coordinate such a geographically distributed generation system.

Hence, if we could not go for the ultimate step, or that the ultimate step might not even be reachable, we may as well do it 0.3 steps, 0.4 steps, 0.5 steps, keeping it closer, damping its system equilibrium to a level that we will be able to induce a critical mass for changing the trajectory. If the destination is not reachable, we may well stay in the path going toward it, and that going and walking is a middle step, but that middle step can be so long that we will never need to go to that final step. The same goes with our water system and transportation system – our vehicles (the mobility freedom giver) and our water (the life giver).

Words into Action

We have found this out in this very delegation. And we are in Hong Kong, this little spot and little place of our World, and we will be making a prominent position in history: we are suggesting the above, not going for a grand vision, nor a metanarrative, but to take a piecemeal approach and embark on scientific empiricism over philosophical rationalism, for with these, we will be able to coordinate the constituent parts of our systems, into one single machine, working on the same timeline and for the same purpose. We can abort at any time and stop, observe and think and re-do it, such that the system will truly be able to be realised, before going to unstoppably unworkable. This is our answer. We are suggesting the above and these will change everything. Please see the details in the relevant parts of this delegation report.

We have encompassed the areas of energy, chemicals, machines, robotics, computation, communication network, data infrastructure for informed decision-making. As human beings, we might not be entirely correct all the time (probably never will we), we may even mess some little things up from time to time, but we have seen the Truth, and we are coming back on this Great Commission to spread the Good News: so please do join hand with us to make the change happen, and leave a better Earth as a precious legacy for our many more generations to come. Join hand with us.

Written by: Mr. Dick YAN

Sustainable City

Cities around the world are facing an increasing number of challenges that require innovative solutions to ensure their long-term sustainability. Among these challenges are climate change, rapid population growth, resource depletion, and social inequality. In response to these challenges, cities are increasingly turning to sustainable development strategies that prioritize resilience infrastructure, walkability and cycling development, as well as green building development and certification.

Resilience Infrastructure

Resilience infrastructure refers to the physical and social systems that enable cities to withstand and recover from shocks and stresses, such as natural disasters, economic crises, and pandemics. In Germany, the Hamburg Harbour Side and HafenCity developments demonstrate a strong focus on resilience infrastructure. Hamburg's Harbour Side includes a flood protection system that is capable of withstanding a 1 in 100-year flood event. Meanwhile, HafenCity has implemented a comprehensive climate adaptation strategy that includes green roofs, permeable pavements, and rainwater harvesting to reduce the risk of flooding.

In Hong Kong, the InnoCell development and Yuen Long Bypass Floodway showcase the city's efforts to enhance its resilience infrastructure. InnoCell is a smart and green residential building that incorporates features such as natural ventilation, solar shading, and rainwater harvesting to reduce its environmental impact. The Yuen Long Bypass Floodway is a flood protection system that was designed to reduce the risk of flooding in the surrounding areas during extreme weather events.

Walkability and Cycling Development

Walkability and cycling development are essential components of sustainable city development. By promoting active transportation modes, cities can reduce traffic congestion, air pollution, and carbon emissions, while also improving public health and social cohesion. In Germany, the Gateway Garden development in Frankfurt is a prime example of a walkable and bike-friendly neighborhood. The development includes a network of pedestrian and cycle paths that connect it to surrounding neighborhoods and public transportation.

In Hong Kong, the city's government has been investing heavily in cycling infrastructure in recent years. The Hong Kong Cycling Alliance estimates that there are over 200 km of dedicated cycling paths in the city, with plans to increase this to 600 km by 2026. Additionally, the city's bike-sharing program, launched in 2018, has been growing rapidly, with over 1 million trips recorded in the first year of operation.

While the new territories have intensive cycling track being built, only limited or no cycling track is provided in the urban area of the territory given with the narrow street condition that runs with double decker buses. Despite limited cycling track is available, the urban area of Hong Kong is indeed suitable for cycling as the furthest distance across east west of Kowloon would be within 10km where the unavailable of cycling track reduces the incentive for public to treat cycling as the way for daily commute. One take-away from German's cycling infrastructure might be the incorporation of on-street cycling track where a different colored pavement is pave on the street to indicate track of cycling path. Nevertheless, given with the unprotected nature of the on-street cycling track as well as the dense populated characteristics of Hong Kong's urban area, further investigation and study is required for implementation of cycling infrastructure in the urban area.

Green Building Development

Green building development and certification are crucial for reducing the environmental impact of buildings and promoting sustainable urbanization. In Germany, the Frankfurt Global Tower is a highly sustainable and energy-efficient skyscraper that has achieved LEED Platinum certification, the highest rating for green building design. The tower incorporates features such as triple glazing, a green roof, and a high-efficiency HVAC system to reduce its energy consumption and carbon footprint.

In Hong Kong, the Hong Kong Green Building Council has been leading efforts to promote green building development and certification. The council's BEAM Plus certification program has become the dominant green building rating system in the city, with over 1,200 buildings certified to date. The InnoCell development mentioned earlier has been awarded the highest rating under the BEAM Plus certification program, demonstrating its commitment to sustainable building design.

Conclusion

In conclusion, sustainable city development requires a holistic approach that prioritizes resilience infrastructure, walkability and cycling development, as well as green building development and certification. Germany and Hong Kong are both making significant strides in these areas, with each city demonstrating best practices and key insights that can be applied to other cities worldwide. By learning from these examples and collaborating on sustainable development strategies, cities can build a more resilient, livable, and sustainable future.

Chapter Seven

CONCLUSIONS

The engineering world is now undergoing rapid evolution, driven by accelerating technological change and the global challenge of sustainability. Germany, a country with a long history to be a pioneer in the engineering industry, is symbolling in innovation and sustainability. Taking on the theme of "The Moment of Evolution", Germany would be a valuable place for delegates to explore its success stories.

The preparation of this Delegation has been started since Nov 2022, aiming to inspire our young engineers from an extraordinary perspective. Sixteen delegates were selected to organize this eleven-day Delegation. The delegates were divided into study groups to focus on three study areas, namely "Digital transformation", "Energy transition" and "Sustainable city". Members of each group focused on studying topics in the respective domain and providing insights from the Delegation.

Digital transformation has become a mega trend over the world, while the implementation paces depends on the respective economic status. In Hong Kong, deindustrialization started in the 1980s after the rise of the tertiary sector. Comparatively, the manufacturing sector of Germany is always the backbone of its economy. The German government identify Industry 4.0 initiative as the central area of action in 2014, aiming for a breakthrough in informatic technologies such as the Internet of Things and Artificial intelligence. The full supply chain in Germany allows the country to undergo rapid adoption and implementation of the latest innovative technology. Within ten years, Industry 4.0 successfully implemented cases have been spread all around Germany. The strategic importance of the manufacturing industries to develop Hong Kong into an international innovation and technology centre has now been recognized in the "Hong Kong Innovation and Technology Development Blueprint". Hong Kong shall not simply achieve re-industrialization but new industrialization, to frog-leap the industry development by the implementation latest novel industry 4.0 technologies and agile modular manufacturing processes.

The need for energy transition has been recognized since the Stockholm Declaration. However, there is always a tug-of-war between the environmental need and the commitment by states. After the first submission of the Paris Agreement nationally determined contributions and the release of the IPCC Special Report on Global Warming of 1.5°C, more and more organizations call for a science-based target. Since then, many countries and cities have committed to the net zero emission target by 2050, including Hong Kong and Germany. The ambitious target of Germany as a pioneer in adopting renewable energy and hydrogen provides us with a good case study for our future successful implementation of energy transition in Hong Kong. The multi-prong and progressive approach set out in the climate action plan 2050 allows Hong Kong to balance the affordability and the decarbonization need. Further, the cities with high penetration of intermittent renewable energy would foster the development of intelligent peak demand management technology. Hong Kong could spread out the capital burden by years and adopt after the decarbonization technologies become mature with reduced cost.

Cities across the globe are now facing an increasing number of challenges that require innovative solutions to ensure their long-term sustainability. Promising steps have been taken in both Hong Kong and Germany in the areas such as resilience infrastructure, active transportation and green building. For instance, the design of resilience infrastructure would now not only estimate the return period by historical data but also cater for the potential rise of sea level and the accelerating frequency of extreme weather events. In tackles to all these challenges, cities must adopt a holistic approach. In the area of green building, both cities have their green building certificate system, BEAM Plus and DGBN, both provide clear guidance with incentives and successfully motivate the industry to actively participate in sustainable urbanization.

The wheel of time turns, and we are in the middle of the megatrends. The delegates have taken this invaluable opportunity to understand the current situation in Hong Kong and explore the state-of-the-art technology in Germany. By staying up-to-date with the latest trends, young engineers could take the role to drive the adoption of emerging technologies and concepts in Hong Kong.

Chapter Eight

ANNEX

Ir Aaron K M BOK
President, The HKIE

Ir Aaron BOK is a RPE in Civil Discipline. He has served different departments and bureau in the Government including Water Supplies Department, Transport Department, Highways Department, Civil Engineering and Development Department (CEDD) and Development Bureau over his 37 years' services. Before retirement in 2021, he was the Head of Civil Engineering Office of CEDD. Currently, Ir BOK serves as Project Team Leader in the Health Projects Unit of CEDD under post retirement service term.

Ir BOK has wide experience on traffic and transport planning, new town development, policy formulation, major reclamations and planning, design and project management of major infrastructures projects, including the Hong Kong-Zhuhai-Macao Bridge and Central - Wan Chai Bypass. Ir BOK is the President of The Hong Kong Institution of Engineers. He was elected as an Election Committee Member (Engineering Subsector) in 2021. He is also a Director of the Engineering Forum and a Board member of Engineers Registration Board.

Ir Dr Barry C H LEE
Senior Vice President, The HKIE

Ir Dr Barry Lee is a professional engineer specializing in mechanical, building services, environmental, chemical and energy disciplines. He has 4 years of experience in operation and maintenance of power plant, 2 years of experience in vocational training and over 30 years of hands-on experience in the design, construction, operation and maintenance of energy, environmental facilities and infrastructural development projects which involved the application of engineering knowledge and collaboration with professional engineers across a wide spectrum of engineering disciplines. Ir Dr Lee is currently the Chief Executive Officer of Associated Engineers, Limited overseeing the overall management of this multi-disciplinary engineering company.

He has been actively serving various learned societies, universities' advisory committees and government advisory bodies for over 23 years.

Ir Eric S C MA
Vice President, The HKIE

Ir Ma is CEO of NWS Holdings Limited and an Executive Director of New World Development Company Limited. He was the Acting CEO of Hong Kong-Shenzhen Innovation and Technology Park Limited and Principal Consultant of the Hong Kong Science & Technology Parks Corporation. Ir Ma was previously the Secretary for Development of the HKSAR Government, overseeing policy areas ranging from urban planning to heritage conservation, and addressing the supply-demand imbalance in land and housing. He was an Executive Vice President, Civil & Infrastructure, Asia Pacific, of AECOM before joining the HKSAR Government.

Ir Alice K T CHOW
Vice President, The HKIE

Ir Chow is an Arup Fellow who leads Arup's East Asia Advisory Services. She is a Registered Professional Engineer in Civil and Structural disciplines. She leads dedicated teams of multidisciplinary financial & engineering professionals executing complex projects, large & small, all-over East Asia, including Mainland China, Hong Kong, Mongolia, Vietnam, Philippines, Korea, Taiwan and Thailand.

As a Vice President of HKIE, Ir Chow is also an active member with various appeal board committees and professional associations such as project management, engineering, healthcare, facility management serving the engineering profession and the Hong Kong community.

Ir Edmund K H LEUNG
Past President, The HKIE

Edmund Leung is a long time Past President of HKIE but remains passionate in nurturing young engineers.

He graduated as a mechanical engineer and started as a power station engineer, but moved to the construction industry, having led many transport infrastructure projects in planning, design and construction activities over the last 4 decades, including various stages of the Hong Kong Mass Transit Railway System and others in the region, and many road and tunnel projects in Hong Kong.

He was active with public services, and have served the Town Planning Board, Airport Authority Hong Kong, Energy Advisory Committee. He is presently the Chairman of the Drinking Water Safety Advisory Panel.

He was awarded OBE in 1996, JP in 1997 and SBS in 2010.

Ir Dr Otto L T POON
Past President, The HKIE

Ir Dr Poon is a Chartered Engineer with over 50 years of E&M engineering experience. He is the Founder and Chairman of ATAL Engineering Group. Over the years, he has been participating in public services both to the community and the engineering profession. He is a Past President of the HKIE, Immediate Past President of Hong Kong Academy of Engineering Sciences, and Life President of Hong Kong Federation of Electrical and Mechanical Contractors. Presently, he serves as the Honorary President of Hong Kong Fire Services officers Association, Member of Advisory Committee of the Department of Electrical & Electronic Engineering of HKU, Member of the International Advisory Committee of RISUD of PolyU and Member of the International Advisory Committee of SCRI of PolyU.

Ir Peter C K CHAK
Chairman, CPDC, The HKIE

Ir CHAK had worked in the Hong Kong and China Gas Company Limited with over 40 years of gas engineering experience. He is a Fellow of HKIE and IGEM (Institution of Gas Engineers and Managers). He actively serves the Hong Kong community and engineering profession. He is currently the Chairman of Continuing Professional Development Committee of HKIE, Council Member of IGEM and member of IVE Engineering Advisory Board. He was a Council Member of HKIE and Chairman of MIS Division, MIS Discipline and Gas & Energy Division. He was a Departmental Advisory Committee member and an Industrial Advisor of City University of HK, Department of Systems Engineering and Engineering Management. Also, he is a member of a few Government committees.

Mr Thomas LAM

Chemical Engineering
Chairman, HKIE-YMC

Thomas obtained his Bachelor Degree in Chemical and Environmental Engineering and Master of Science in Mechanical Engineering from the Hong Kong University of Science and Technology. He is currently working as a Senior Engineer in CLP Power Hong Kong Limited, responsible for the emission control projects in the power plant. He represented Hong Kong young engineers at overseas events, such as Young Engineers of the ASEAN Federation of Engineering Organisations Conference.

Ir TK CHEUNG

Mechanical Engineering
Delegation Manager
Deputy Chairman, HKIE-YMC

T.K. obtains his Bachelor degree from the Hong Kong Polytechnic University, a Master degree from The University of Hong Kong and a Juris Doctor degree from The Chinese University of Hong Kong. He is currently the Senior Engineer of the CLP Power HK Ltd. He is responsible for the design management on the construction of the combined cycle gas turbine in the Black Point power station. He has also been actively participating and contributing to the HKIE-YMC and is now the Deputy Chairman of the HKIE-YMC.

Ir Herman LAI

Civil Engineering
Deputy Manager

Herman obtained his Master's degree in Business Analytics at the Hong Kong Polytechnic University and Bachelor's degree in Civil and Structural Engineering at the University of Hong Kong. He acquired professional qualification from professional institutes of Hong Kong, United Kingdom and United States. He is an Associate in the Transport and Infrastructure team of WSP (Asia) Ltd, working on site formation and infrastructural works, traffic improvement in various private and public projects at stages ranging from Feasibility Study to Construction. He is responsible for taking the lead of multidisciplinary engineering teams to achieve project delivery and to collaborate among various stakeholders. As a delegate, he aspires to enhance his global vision in the engineering and technology field.

Ir Dick YAN

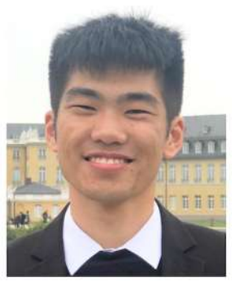
Electrical Engineering
Deputy Manager

Throughout Mr. YAN's career of nearly a decade in the engineering industry, he has been in various frontiers of the water industry, from fresh water, salt water, sewage to the latest grey water infrastructural provision. With this rich immersion encompassing the whole water cycle, his vision for the next decade to come, is closing the loop of the water cycle management for Hong Kong, his Homeland. By so doing, he will not only be able to counteract the climate trajectory by conserving the use of energy, but also actively dealing with the impacts brought by climate change on his fellow citizens, as firstly revealed in his Delegation Report from Iceland in 2017. He comes back with these missions.

Mr JR SEOW

Traffic & Transportation Engineering
Secretary

JR obtained his bachelor's degree in Transportation System Engineering (1st Class Honor) from the Hong Kong Polytechnic University in 2022. He is currently working in AECOM Asia Company Ltd, responsible to assist in traffic and transport planning of land transportation, covering the transport planning of new town, internal transport facilities, as well as evaluation of existing road design. He is particularly interested in the sustainable and innovative development of transportation systems.



Mr Kenny SIU

Civil Engineering
Treasurer

Kenny graduated from The University of Hong Kong with a bachelor's degree in civil engineering, minoring in Finance and Sustaining Cities. He is currently working in the MTR Corporation Limited as a Graduate Engineer on the planning and design of a new strategic railway corridor in the New Territories, while pursuing a master's degree in Transportation Engineering at HKU.

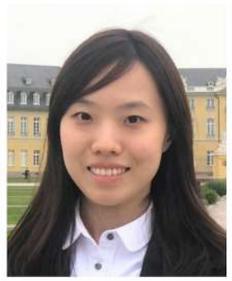
Through the delegation, he wishes to gain exposure to overseas engineering practices, and to share with the local engineering community and public at large. With the exchange of technical insights with engineers worldwide, he believed the experience gained would aid in shaping Hong Kong into a better city with engineering advancements.

Mr Frankie KUNG

Civil Engineering
Local Liaison Officer

Frankie completed his civil engineering degree at Hong Kong University of Science and Technology and is now employed as an Assistant Resident Engineer at Ove Arup & Partners Hong Kong Ltd. He is involved in pier improvement works under the maritime team and is also pursuing a master's degree in Geotechnical Engineering at the University of Hong Kong.

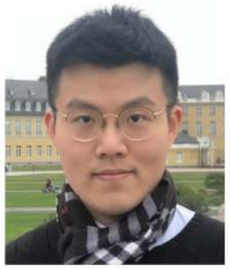
Frankie is keen to participate in an overseas delegation to broaden his knowledge of engineering practices and share his insights with the local engineering community and the public. He believes that exchanging technical knowledge with engineers from around the world will help improve engineering practices in Hong Kong and contribute to making the city a better place.



Ms Jasmine NG

Building Services Engineering
Local Liaison Officer

Jasmine obtained her Master's Degree in Building Services Engineering (Distinction) from the Hong Kong Polytechnic University and a Bachelor's Degree in Mechanical Engineering from the Hong Kong University of Science and Technology. She is currently working as a Project Engineer in Talent Mechanical & Electrical Engineers Ltd, responsible for providing M&E design consultancy services and project management. Jasmine has also been actively participating and contributing to HKIE-YMC as a helper since 2020 and obtained the Outstanding Helper Award. She wishes the delegation to be a precious experience to broaden the horizon and enrich knowledge for technological advancement in a global perspective.



Ir Alex SZE

Structural Engineering
Overseas Liaison Officer

Alex obtained his Master's Degree in Structural Engineering from the University of Hong Kong and a Bachelor's Degree (1st Hon) in Civil Engineering from the Hong Kong University of Science and Technology. He acquired professional qualifications in Civil, Structural, and Building Information Modelling (BIM) disciplines. Alex is currently working as a Senior Engineer at Asia Infrastructure Solutions Limited. He focuses on Structural Design, Design Automation, Modular Integrated Construction (MiC), and BIM.

Ms Jessica FAN

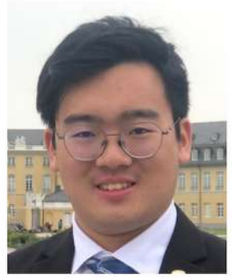
Civil & Structural Engineering
Overseas Liaison Officer

Jessica obtained her Bachelor Degree in Civil Engineering from the Hong Kong University of Science and Technology. Upon her graduation, she joined Mott MacDonald Hong Kong Limited as a graduate engineer responsible for designing various civil and structural project in Hong Kong. Now she is actively contributing herself to the HKIE-YMC as a helper.

Mr Justin CHENG

Electrical Engineering
Overseas Liaison Officer

Justin graduated from the Hong Kong Polytechnic University in 2020. He is currently working in CLP Power Hong Kong Ltd. as an assistant engineer and mainly responsible for power station generator unit improvement projects and maintenance works. He joined HKIE-YMC as a helper since 2020 and actively participated in HKIE events and activities. Justin believes that the establishment of New Industrialisation is essential for Hong Kong sustainable economy, and the Delegation to Germany will certainly bring insights towards this goal.



Mr Jimmy HUI

Civil Engineering
Logistic Officer

Jimmy is currently an undergraduate student studying Civil Engineering at The University of Hong Kong. He is interested in delegation as it provides an opportunity to explore state-of-the-art technological applications in the engineering industry, exchange ideas with local individuals, and gain new perspectives from their experiences. Additionally, he joined the HKIE Student Chapter – HKU as the Honorary Secretary in session 2021/2022 and is currently the chairman in session 2022/2023.

Mr Kelvin TO

Electrical Engineering
Logistic Officer

Kelvin graduated from The University of Hong Kong with a bachelor's degree in electrical engineering and joined The Hongkong Electric Co., Ltd. as a Graduate Trainee while pursuing a master's degree in power engineering. He is currently working in the operation department and leads a 24/7 emergency service team. His responsibilities include investigating, diagnosing, and analyzing electrical system faults, as well as performing emergency supply restoration and fault repair.

He believes that the delegation will provide opportunities for participants to learn about the latest technological advancements, exchange ideas with experts, and explore new perspectives. This can enhance his knowledge and skills in the field of engineering.

Mr Desmond LAU

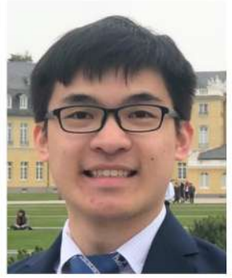
Civil Engineering
Publication Officer

Desmond Lau is a graduate in Civil Engineering from the University of Hong Kong, he currently serves as a Graduate Engineer at MTR Corporation Limited. Desmond focuses on the planning and design of stations, depots, and bridges as part of new line extension under Railway Development Strategy 2014. As a delegates to Germany, he aims to enhance his knowledge through global exposure and contribute to the competitiveness of Hong Kong. Desmond is particularly interested in exploring Germany's digitalization, which could be adapted to address Hong Kong's unique needs.

Mr Jerry CHEUNG

Traffic & Transportation
Engineering
Publication Officer

Jerry obtained his bachelor's degree in Transportation Systems Engineering from the Hong Kong Polytechnic University in 2020. He is currently working in MVA Hong Kong Limited, assisting in land transportation projects such as internal transport facilities, pedestrian road design, traffic impact assessments and transit-oriented development (TOD) consultancy.



Mr Michael MA

Building Services Engineering
Publication Officer

Michael obtained his Bachelor's degree in Electrical Engineering from the Hong Kong Polytechnic University in 2022. He is currently working in Hong Kong Housing Authority as a Graduate Engineer, who is responsible for the building services system design, calculation and simulation for Hong Kong's residential buildings. As a delegate, he aspires to enhance his global vision in the engineering field.

It was a compact but exciting study. The delegation enabled us to appreciate the latest development and challenges of Germany. What impressed me the most were the determination and discipline of people in Germany. Those attitudes are critical for engineers to embrace and tackle the challenges we face in our daily work, and have made Germany having significant achievement in different engineering fields.

It was my pleasure to work in a diligent and enthusiastic team of young members, who spent great effort to carry out local and overseas research, organised comprehensive local seminars and visits that were open to all HKIE members and arranged a fruitful trip to Germany. This unique experience widened our horizons and boosted our passions to move Hong Kong towards a digital, carbon-zero and sustainable city.

Thomas LAM

This would be my second time joining the HKIE YMC overseas delegation, from a delegate to a delegation manager, the YMC delegation always be an eye-opener.

Germany, synonymous of engineering and quality, has given me another mind-altering trip. I was highly impressed by the advanced automation adopted in Germany, and so do their ambitions for the promising future of sustainable development. Engineering is not only about cold machines, more importantly, they are developed for the people.

Together with the friendship gained among the delegation, the hour we work hard and the hour we have fun, this delegation would undoubtedly be a rewarding experience in my life.

TK CHEUNG

Germany, as a pioneer to build and establish the requirements for Industry 4.0 (Federal Ministry of Education and Research, 2016), and Europe's strongest economic and industrial power as described by National Geographics.

Visiting German companies and educational institutions enabled me to adhere to the pace of technology development in different sectors and to appreciate how Germany both combat the climate change and other challenges and enhance energy independence. The stoic character of german and active collaboration built between the educational institutions and enterprises have made me provoke a lot of thoughts and ideas that are likely to be implemented and to challenge the status quo in the territory.

The most impressive part of the delegation is the people we met and interacted in Germany. Through visits, I was deeply impressed by their strong desires to achieve precision in all matters, insightful vision in terms of readiness for change in the face of various constraints, and eagerness on shaping a better place. In short, I was very grateful to be part of the HKIE-YMC Overseas Delegation, and to have contributed to both local and overseas events in collaboration with other young engineers from different engineering disciplines. Also, I would like to express my heartfelt gratitude towards HKIE-YMC, delegates as well as our honorable advisors to drive a successful delegation.

Herman LAI

We are now at a triple cross road never seen in history: for we have well studied into the topic of Sustainability that it is now the time to act, and we will need to find a way to motivate our people – we are so lucky that in we are in Hong Kong, and we can push this forward by using gross floor area concessions; for we are not so sure about exactly as to how much and as to when should our energy systems be transformed to get the optimised and balanced solution, in the sense that mixing is not a simple linear equation but a complex system – and we should be glad that the academia have built up quite a bit in system theory, that by using piecemeal pragmatism rather than metanarrative & soundbites, we can induce a critical mass for a careful change over the course; for we are still at the early stage of digitalisation, that we can be part of the determining change to bring back a new industrialisation for our home city, a flameless industry. These are three topics, but they are one.

I am so lucky to be part of this Delegation. And I am not the one who will be coming, I am merely preparing the road: for we do not dump our solid past to walk into an unknown future, nor do we forsake our brighter future to stay in a faded past – we together are a bridge, for maintaining a continuous dialogue between the past and the future. This is what modernity really means, the essence of our existence.

Dick YAN

JR SEOW

Known as the country of automobiles, Germany is well-known for its engineering craftsmanship, particularly in the field of precision manufacturing where the country that boasts the largest concentration of OEM plants in Europe has been influencing the world in various aspects of social and economic perspective. The overseas delegation of HKIE YMC to Germany has provided a deep exposure and understanding of “behind-the-scene” German engineering which covers not just the technical aspect of the industry, but the social-economic and geopolitical issues that influence the progress of engineering development. One of the best aspects of the overseas delegation would be the chances given for conversation with local professionals. This has helped me to understand better the difference in engineering progression, such as the Germans building cycling tracks in the city centre but Hong Kong building cycling tracks in the rural new town which is caused differently from the political and social domain.

It has been my pleasure to be a part of the HKIE-YMC overseas delegates. Friendship, collaboration and enthusiasm are the greatest gain for us joining this delegation. I would like to express my gratitude to our advisors, delegates, Young Members Committee and everyone who has supported this delegation. Your full support and involvement are an indispensable element for the success of this delegation.

It is my pleasure to be one of the delegates for this year. With the institutional exchange, I had the precious opportunity to mingle with engineers in Germany, and thus established a long-term partnership with them. As taken up duties in logistics, through the planning and various study of visiting schemes, I had a better understanding of the German distribution of engineering sectors in correspondence to their geographical locations, in which they had a clear division of production roles with their natural advantages and transportation considerations.

The sustainability efforts of Germany, in particular their resilience to fight against climate change, are influential to us. In Hamburg, the harbourside integrated seawall with recreational purposes, whereas the walkways of the dockside facilitate walkability, whereas taking care of aesthetics and safety at the same time. Germany also has efforts in pushing the transformation on digitalization, though considered to be a highly-developed country. Their attitude of seeking precision and pushing beyond engineering limits is worthwhile for us to learn from.

Kenny SIU

Frankie KUNG

Our delegation witnessed Germany's leadership in sustainable development. German engineers and architects adopt a systems-thinking approach, considering the entire lifecycle of a building to minimize environmental impact while maximizing long-term economic viability.

During the visit, I learned that German cities have implemented innovative solutions to address the challenges posed by environmental issues. For instance, some cities have developed green spaces and parks in urban areas to improve air quality and provide recreational opportunities for residents. Others have implemented sustainable transportation options such as bike-sharing programs and electric buses to reduce carbon emissions and improve public health. I was also impressed by the emphasis that German cities place on the relationship between the environment and human well-being. For example, some cities have invested in green infrastructure to manage stormwater runoff, which not only reduces the risk of flooding but also creates beautiful and functional public spaces for the community.

Overall, it was fascinating to see how German cities have taken a holistic approach to addressing environmental challenges and improving the quality of life for their citizens.

It is a great honor for me to have been a part of the Delegation Team. Over the course of several months, we worked, studied, explored, and shared insights. Through this adventure, not only were friendships and collaboration established but also technical knowledge was gained from a series of local seminars, visits, and interactions with government officials and professionals. The delegation provided me with valuable insights into both local and global engineering practices and perspectives.

Germany is renowned for its innovation and technological advancements, particularly in the fields of renewable energy and sustainable urban development. During the visits to companies and institutions, the latest technologies and processes being employed to achieve the sustainable development goals were witnessed. The exchange with engineering associations such as VDI and IMechE in Germany also provided me with a unique opportunity to learn from the experiences of local engineers and gain insights into their best practices.

Throughout the delegation, taking up the duties in liaising and organizing events taught me a lot. I would like to take this opportunity to express my sincere gratitude to our honorable advisors and supporting organizations for their generous sharing of knowledge, which made this meaningful journey possible.

Jasmine NG

Alex SZE

Germany has established itself as a leader in sustainable development, exemplified by the green buildings we visited during our delegation. These structures feature state-of-the-art design elements such as green roofs, energy-efficient building envelopes, and natural ventilation systems, demonstrating the commitment to a holistic approach to sustainable construction. Rather than focusing exclusively on individual components, German engineers and architects adopt a systems-thinking approach, taking into account the entire lifecycle of a building. This approach enables them to minimize the environmental impact of their projects while maximizing their long-term economic viability.

During our visit, we also had the opportunity to explore a museum that presented forward-thinking concepts such as digital transformation, showcasing how cutting-edge technologies like Artificial Intelligence and Blockchain can enhance our quality of life and productivity. As the engineering profession continues to evolve and adapt to the challenges of the 21st century, professionals must integrate innovative practices into their work.

Lastly, I would like to express my sincere gratitude for the unwavering support from Germany and Hong Kong, which contributed substantially to the success of our delegation.

As a young engineer from Hong Kong, my delegation trip to Germany provided me with invaluable insights and self-reflection opportunities. Whether it was learning about the flood protection system along Hamburg's riverside, appreciating the urban planning in Hafencity, discovering the Heritage Innovation of Global Tower in Frankfurt, or attending policy decision-making sessions with the Energy Agency in Berlin, every experience left a lasting impression on me.

Also, I was especially inspired by the passionate investigations presented by German universities and the sharing sessions with enthusiastic young engineers from VDI young engineers among cities. All of these experiences have helped me grow both personally and professionally, shaping me into a more mature and knowledgeable individual.

I am eager to apply these insights and knowledge in my work as an engineer and continue contributing to the industry. Overall, this delegation trip to Germany has been an unforgettable experience that has enriched me both as a person and as a professional.

Jessica FAN

Justin CHENG

The HKIE YMC Overseas Delegation to Germany really broadened my horizon in both engineering knowledge and points to consider for a society. The technical visits and seminars have allowed me to have new ways of thinking for Hong Kong as a society and me as an engineer. The exchange with local young engineers also allowed me to understand the way of thinking of the Germans and why Germany is regarded as a country with exceptional engineers. Moreover, the planning process as well as the handling of unexpected obstacle during the overseas delegation has taught me the proper way to work in addition to the technical engineering knowledge. The overseas delegation really brought me insights and inspirations that otherwise would not be able to acquire.

I am very honoured to be part of the overseas delegation team and hence I would love to thank all the organisations and speakers who had provided us very meaningful insights and knowledges, as well as our advisors and fellow delegates for your suggestions and support throughout the entire delegation. I am looking forward to contributing to Hong Kong society by sharing our insights gained during the delegation.

During my delegation trip to Germany, I had the opportunity to witness first-hand the strides the country has made towards sustainable cities, digital transformation, and energy. The visit provided me with a deep understanding of how these areas are interconnected and how they impact society as a whole. I was particularly impressed by the innovative solutions implemented by German cities to tackle the relationship between environmental challenges and human. Like urban planning and design in applying innovative flood-protection system to the city's commitment to sustainability and safety. The area is built on elevated ground, and the buildings are designed to withstand flooding. Additionally, the city has constructed a network of canals and drainage systems to divert floodwater away from the area. The visit has shown me the importance of incorporating sustainable solutions in urban planning and development, and I believe that the strategies employed in Harfen City can serve as a model for other cities facing similar challenges. It was also inspiring to see how digital technologies have been integrated into various sectors to enhance efficiency and reduce waste. The delegation trip has broadened my perspective on sustainable development and has motivated me in enhancing reindustrialization in Hong Kong.

Jimmy HUI

Kelvin TO

Germany is a global leader in the field of Industry 4.0, which refers to the integration of digital technologies into manufacturing processes. This has led to increased efficiency, productivity, and flexibility in the manufacturing sector. Sustainability is also a key focus in Germany, with the country setting ambitious carbon reduction targets and investing heavily in renewable energy sources.

The Futurium Museum in Berlin is an excellent showcase of how these two fields intersect. The museum highlights innovative technologies and solutions that are driving sustainable manufacturing practices, such as the use of renewable energy sources and the adoption of circular economy principles. Additionally, the museum showcases cutting-edge digital technologies like artificial intelligence, the Internet of Things, and blockchain, which are driving the next phase of Industry 4.0.

By visiting the Futurium Museum, delegates can gain valuable insights into the future of manufacturing and how sustainable practices and digitalization will play a crucial role in shaping the industry's future.

Being selected as a delegate fills me with great honor and excitement. I am eager to delve into Germany's re-industrialization and urban planning, gaining insights that can shape the development of Hong Kong. I anticipate a blend of cultural and technical visits, allowing me to grasp the essence of the local community and history while learning from Germany's progressive engineering practices. To comprehend the factors behind Germany's competitive edge, I yearn to explore their state-of-the-art technologies and witness their implementation firsthand.

Engaging with local engineers during the delegation will be invaluable. I am keen to understand their core ideas for effective city planning and construction, extracting key lessons to apply in Hong Kong's urban development. Through these interactions, I aspire to forge lasting connections and foster a mutually beneficial exchange of thoughts and experiences. By embracing this opportunity, I wish to contribute to the advancement of Hong Kong and my personal career development, while also broadening my horizons as a young engineer.

Desmond LAU

Jerry CHEUNG

Germany is a wonderful place to visit and learn things from. Already well known to the globe is its strength in manufacturing, research and development, with their numerous companies, organisations and departments' decades of efforts building up the images of the nation. Through this delegation, not only these sides were learned from the different visits, but much beyond that has been explored.

The long history of German modernization and resource management mean the nation isn't fill with new things, but what amazes me are their buildings, infrastructure, and mindset in engineering advancement for the long time. Recently built and modified buildings inherit such "DNA" of course, extended with a series of innovation. The German engineering behind is truly fascinating.

The people I met there from all the visits, exchanges and sightseeing are also very nice and willing to help. Such an inclusive environment is a warming part of the days and further enriches the trip.

It is my pleasure to be a part of the delegation team. I have learnt a lot from both the events held locally and overseas, and the work with my 15 teammates, which made the whole trip a wonderful experience.

As a fresh graduate engineer, going to Germany for a delegation focused on sustainable cities, digitalisation, and energy transition can be a highly enriching experience. This trip provided me with an opportunity to learn about the latest technologies and initiatives being implemented in Germany, a country that is considered a leader in sustainability.

Each visit offers me a unique perspective on how Germany implements digitalization and renewable energy to create sustainable cities. The knowledge gained from the visit can be applied to Hong Kong's efforts to promote sustainability and reduce its reliance on non-renewable energy sources. Furthermore, the exchange with VDI can provide an excellent opportunity to network with German engineering professionals. The value of the experience was not just about knowledge gained, but more about communication skills and cultural exchange.

I am deeply grateful for the chance to join a delegation to Germany, as it will allow me to develop important skills and valuable partnerships. Working alongside other professionals on the trip will help me hone my communication and collaboration, while also expanding my network of contacts. I am thankful for this opportunity and eager to see what it will bring.

Michael MA

District Cooling System

The District Cooling System (DCS) in Hong Kong is a centralised cooling system which provides chilled water to multiple buildings in a designated area. The DCS works by producing chilled water at a central plant, which the chilled water is then distributed through a network of underground pipes to the buildings in the district. The chilled water is used to cool the buildings' air conditioning circuits at the interfacing consumer substations, the chilled water is then returned to the central plant to be re-chilled and redistributed. A DCS is beneficial in the sense that it reduces the amount of electricity needed to power individual air conditioning units by economy; minimises the footprint, noise and vibration of chiller systems in individual buildings, hence grossly increasing saleable areas and the value of properties; as well as mitigates heat island effect in a compact city like Hong Kong. In Germany, where heating demand is large in winter, district heating system has been widely used for decades with combined heat and power generation.

Type of Water sources

1) *Seawater*

Advantages

Seawater can be used as a cooling source for DCS in coastal areas, as it is often readily available, has a stable temperature and is more efficient than freshwater. Seawater is abundant and readily available around Hong Kong and the Kowloon Peninsula, the use of it helps to reduce the demand for freshwater resources. Seawater also has a relatively stable temperature, which helps to maintain the efficiency and performance of DCS.

Disadvantages

However, seawater may require additional treatment to remove salt and other impurities, and the intake and discharge of seawater cause environmental impacts, particularly to marine lives because of trapping, and increased water temperature and salinity. Seawater is corrosive and may cause damage to DCS system components such as pipes, valves, and heat exchangers. Scaling will also occur as the buildup of mineral deposits, such as calcium, magnesium, and silica, on the internal surfaces of the DCS components, such as pipes, and heat exchangers. These mineral deposits reduce the efficiency of the DCS and increase the risk of system failure.

Considering capital and O&M costs, seawater is suitable for DCS at coastal areas.

2) *Recycled Water*

Advantages

Treated sewage effluent (TSE) can be used as a source of cooling water for DCS. This helps to reduce the demand for freshwater resources, while also providing a beneficial reuse for wastewater. With the use of TSE for DCS, one single water droplet can be used for twice before releasing it back to the environment. Using TSE for DCS is more cost-effective than using potable water and salt water, particularly in inland areas as there is no need to find the water source, nor to pump a long distance to discharge the TSE). Early design considerations are required, e.g. flow rate, pressure, temperature of the chilled water, potential health mitigations and the compatibility of the cooling water with system materials; as well as design considerations for consumer-side cooling system, such as cooling towers, pumps, and piping.

Disadvantages

TSE requires further treatment and filtration to remove contaminants and ensure that it meets the quality standards required for DCS. The use of TSE for DCS may not be well understood nor accepted by the public yet, which may affect the perception and acceptance of the system. Effective communication and education efforts are necessary to address any concerns or misconceptions about the use of TSE as a source of water for district cooling. The use of greywater/wastewater in DCS may require modifications to the system design and components of effluent polishing plants (sewage treatment works).

Hence, TSE for DCS is suitable for the Northern District of Hong Kong, planned with huge population intake in the coming two decades.

3) *Rainwater*

Advantages

Using rainwater helps to reduce the demand for freshwater resources and promote sustainability in water use. Using rainwater reduces the energy consumption and environmental impacts associated with the treatment and distribution of freshwater, seawater or TSE.

Disadvantages

Rainwater needs to be collected, stored and treated, requiring additional infrastructure and equipment. The availability of rainwater is affected by seasonal variations in precipitation.

Therefore, rainwater can be used as a source of makeup water for DCS.

Types and Configurations of Chiller

The production of chilled water for DCS typically takes place at a central chiller plant, where large and efficient water-cooled chillers are used, as powered by compressors. For heat rejection of the chillers of a DCS, the said three types of water can be used, in configurations of once-through type (uses significantly more cooling water) or evaporative type. The type of chiller for DCS can be summarised as followed:-

1. Centrifugal chillers: Centrifugal chillers are high in efficiency and reliability. These chillers use a centrifugal compressor to compress and cool refrigerant, which is then circulated through a heat exchanger to transfer heat from the chilled water to the cooling water in the DCS.
2. Absorption chillers: Absorption chillers use a heat source, such as waste heat from a power plant or industrial process, to drive the cooling process. These chillers can be useful for the DCS in Tuen Mun area, where there are power plants and an industrial estate.
3. Screw chillers: Screw chillers use a screw compressor to compress and cool refrigerant. These chillers are for high cooling loads and high efficiency.
4. Reciprocating chillers: Reciprocating chillers use a reciprocating compressor to compress and cool refrigerant. These chillers are often used in smaller DCS or in areas where electricity costs are high.

Corrosion of Pipe in DCS

Corrosion of pipes in DCS can be a major problem that leads to leaks, equipment failure, and costly repairs. Material selection, coatings and linings, cathodic protection, monitoring and maintenance, water treatment, and system design can all be used, to prevent or minimise corrosion in pipes and system components. Materials such as stainless steel and copper are less susceptible to corrosion; coatings and linings provide a barrier against corrosion; Impressed Current Cathodic Protection (ICCP) can be used to protect pipes from corrosion when adopted in mainlaying design guidelines, with regular monitoring and maintenance help to identify and address corrosion before it becomes a major problem; water treatment to control the pH and water chemistry to prevent corrosion; and proper system design minimises the risk of corrosion. A complex approach to corrosion prevention and management helps to ensure the long-term reliability and efficiency of the DCS, ensuring return on carbon investment.

Written by: Mr. Frankie KUNG

Hydroelectricity

As renewable energy sources are intermittent in nature, high penetration of renewable energy will cause timing imbalance between peak demand and renewable generation. This phenomenon is well known as the "Duck curve", initiated by California Independent System Operator in 2012. Demand side management could be one of the preferrable methods to manage the power fluctuation economically. However, along with the increased penetration of renewable, demand side management alone would no longer be sufficient to flatten the large quantity of timing imbalance. Energy storage would be required.

Storage Schemes

There are a few candidates for such storage method, namely, Hydrogen Energy Storage (HES), Battery energy storage systems (BESS)and Pumped Energy Storage (PES). In Germany, Hydrogen is planned to use as energy carrier for the high energy intensity usage demand, such as factories. At the point of the time, Hydrogen has not yet develop to a mutual technology and a economic solution for Hong Kong. For BESS, there would be increased environmental concern on the disposal of drained batteries.

Implementation of PES

Therefore, the traditional PES could be one of the alternative to optimize the existing facility in Hong Kong, when it is coupled with the vast and precious waterworks in our city. In gist, when there is sufficient sunshine and/or wind (complementary in nature), the power generated should be sent via grid on HVAC to large pumpsets for pumping the raw water into reservoirs and/or fresh water into service reservoirs. When energy and/or water is needed, water is delivered by gravity, and taking advantage of this, we can also convert such potential energy into electrical energy for on-spot utilisation.

Types of Applicable Generator

1. *Synchronous generator:* Commonly used in large-scale hydroelectric power plants. It operates in synchronization with the frequency of the power grid and produces AC electricity in a high efficiency and constant speed manner even in a lower flow rate, which helps maintaining synchronization with the power grid, and thus provides better voltage and frequency control compared to other generator types. This also helps to ensure the stability and reliability of the power supply. Note that it has higher CapEx and OpEx (maintenance for in sync).
2. *Induction generator:* Commonly used in wind turbines. It operates using electromagnetic induction and can produce AC electricity without the need for brushes, slip rings nor gearboxes. It is low cost, simple construction and operation, and has low maintenance requirements, although requires a minimum speed (cut-in speed) and lower efficiency compared to other generator types.

In a hydroelectric power plant, the synchronous generator is coupled to a turbine, which is usually driven by the potential energy of water. As the turbine rotates, it turns the rotor of the synchronous generator, which then produces an AC current that is synchronized with the frequency of the power grid. The AC electricity produced by the synchronous generator is then stepped up in voltage through a transformer for on spot utilisation or transmitted to the power grid.

Types of Applicable Hydraulic Turbine

It should be noted that hydroelectric power generation is more predictable and can be controlled by adjusting the water flow, making it a more reliable energy source. Wind energy is intermittent and depends on varying wind speeds, making it less predictable.

Hydroelectric power plants primarily use hydraulic turbines coupled with electric generators to convert the potential energy of water stored at height into electrical energy. The choice of turbine depends on the site's specific head (height of water) and flow rate conditions. The most common types of turbines used in hydroelectric plants are:

1. *Pelton Turbine* (used for high head, low flow rate applications)

Pros:

- High efficiency at high heads
- Can operate at low flow rates
- Minimal wear and tear due to the absence of moving parts in the turbine itself
- Easy to maintain and repair

Cons:

- Limited to high head applications
- Requires a clean and consistent water supply
- Not suitable for low head applications
- High initial cost due to the need for specialized equipment and manufacturing processes

2. Francis Turbine (used for medium head, medium flow rate applications)

Pros:

- Well-suited for medium head applications
- Good efficiency over a wide range of flow rates
- Lower initial cost than Pelton turbines
- Can handle a wide variety of water sources

Cons:

- Limited to medium head applications
- Requires regular maintenance and repair due to wear and tear on the moving parts
- Efficiency decreases at lower flow rates
- Not suitable for high head applications

Grid Connection and Stepping up rqd

Firstly, electricity is generated by the turbine-generator unit at a specific voltage level (e.g., 13.8 kV). Once the electricity is generated, it is stepped up by transformers to a higher voltage level for efficient long-distance transmission. For example, if the generator produces electricity at 13.8 kV, it may be stepped up to 110 kV, 220 kV, or even higher, depending on the transmission network voltage levels in the region. High-voltage transmission lines carry electricity over long distances to the grid.

If the energy is transmitted and sold to the Chinese Mainland (>40km), then HVDC should be used for higher efficiency and lower infrastructural cost.

Written by: Mr. Kelvin TO, Mr. Dick YAN

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Acronyms

A&A	Alteration and Additions
AIM	Asset Information Model
AM	Asset management
AR/VR	Augmented reality / Virtual reality
BEAM	Building Environmental Assessment Method
BEM	Blade element momentum
BeRT	Berlin Research Turbine
BEV/EV	Battery electric vehicle / Electric vehicle
BIM	Building Information Modeling
CDE	Common data environment
CFD	Computational Fluid Dynamics
CIC	Construction Industry Council
CLP	China Light and Power
COVID	Coronavirus Disease
CPDC	Career Planning and Development Centre
CPS	Cyber-physical systems
Dena	Deutsche Energie-Agentur GmbH (Germany Energy Agency)
DGNB	German Sustainable Building Council
EC	Embodied carbon
EIA	Environmental Impact Assessment
ESG	Environmental, Socail, and Governmance
EUI	Energy performance indicator
FM	Facility management
FOW	Flowing offshore wind
GBA	Greater Bay Area
GDP	Gross Domestic Product
GFA	Gross Floor Area
GIS	Geographic Information System
GUI	Graphical user interface
HKEx	Hong Kong Exchange
HKGBC	Hong Kong Green Building Council
HKIE	The Hong Kong Institution of Engineers
HKSTP	Hong Kong Science and Technology Park
HKUST	The Hong Kong University of Science and Technology
HSG	Health and safety guidance
HVAC	Heating, ventilation and air conditioning
I&T	Innovation and Technology
IEA	International Energy Agency
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
KIT	Karlsruhe Institute of Technology
LCOE	Levelised Cost of Energy
LEED	Leadership in Energy and Environmental Design
LIDAR	Light Detection and Ranging
MiC	Modular Integrated Construction
PolyU	The Hong Kong Polytechnic University
PUB	Public Utilities Board
R&D	Research and Development
SAR	Special Administrative Region
TU	Technische Universitat
VDI	Verein Deutscher Ingenieure
VPML	Vortex-particle multilevel
YMC	Young Member Committee

ATAL

Engineering with Passion

A leading electrical and mechanical ("E&M") engineering service provider with operations in Hong Kong, Macau, Mainland China, United States and United Kingdom, providing multi-disciplinary and comprehensive E&M engineering and technology services in four major segments.

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Environmental Engineering

Information, Communications & Building Technologies

Lifts & Escalators

ATAL Engineering Group

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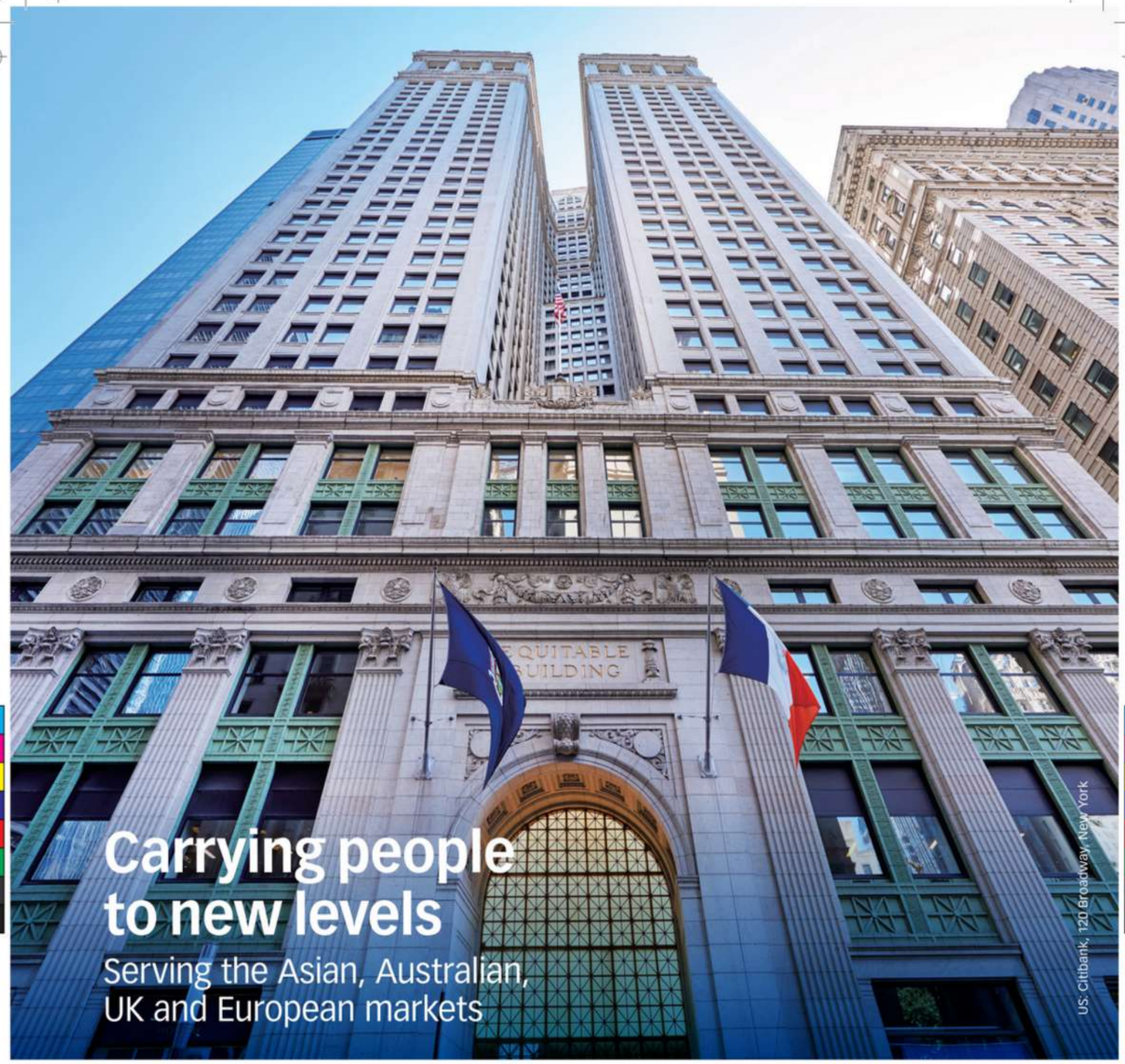


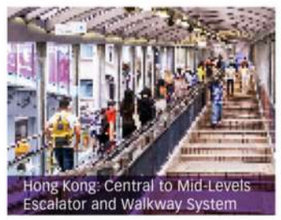
US: Citibank, 120 Broadway, New York

Carrying people to new levels

Serving the Asian, Australian, UK and European markets

UK: Sainsbury's Supermarket

South Korea: Dongtan Station



Hong Kong: Central to Mid-Levels Escalator and Walkway System

Australia: Melbourne Airport

Engineered for quality, safety and energy efficiency, Anlev's complete range of lifts, escalators and moving walkways provide truly reliable and efficient transport systems that represent a new level of riding experience for passengers in Asia, Australia, the Americas and Europe.

We offer our customers a total solution from one source, specialising in design and customisation, manufacturing, sales and installation, modernisation, refurbishment and maintenance.

ANLEV

A New Lift and Escalator Vision

Anlev Elevator Group

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PROJECT OF THE YEAR 2021

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Slope Stabilization / Site Formation / Piling

Specialist Contractor

Address: Rm 1122, 11/F, Pacific Link Tower (South Mark),
11 Yip Hing Street, Wong Chuk Hang,
Hong Kong

Tel: 2770 0122 Fax: 2580 0470

Email: info@fraserconstruction.com.hk

FRASER CONSTRUCTION CO., LTD.
科正建築有限公司

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With 1,200 staff in Hong Kong and China, our services cover all aspects of mechanical, electrical, civil and structural design for all types of construction projects, as well as project management and infrastructure such as bridges, tunnels, highways, ports, transportation, water services and waste management. We provide environmental consultancy across our projects and as standalone services. We also have a team of specialists providing services in all aspects of the façade of buildings and structures including curtain wall design, concrete repair and refurbishment.

Our clients include government bodies, agencies, private developers and end-users both in industrial and commercial enterprises.

Our award-winning projects have garnered recognition internationally and these awards serve to affirm our unrivalled reputation for innovative and inspiring engineering solutions.

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

The Association of Consulting Engineers of Hong Kong 香港顧問工程師協會

Quality Building Award 優質建築大獎

2022 R&D 100 WINNER

green building award 2021 環保建築大獎

HKGBC BEAM Plus 綠建環評

HKMOB AWARDS 2022

Our Projects

Hong Kong Children's Hospital
(Civil & Structural)

Cross Bay Link, TKO
(Infrastructure & Environment)

Northwest Kowloon Long Span Footbridge
(Infrastructure & Environment)

10/F, Genesis, 33-35 Wong Chuk Hang Road, Wong Chuk Hang, Hong Kong

Staff Activities

The Community Chest New Territories Walk for Millions 2022 at Cross Bay Link,Tseung Kwan O

Happy Hour Event at Woo Cheong Tea House, Wanchai

Lifewire Charity Run at Tung Chung

First Aid Training Course

Bowling Fun Day

Fellowship of Meinhardt Women's Chapter

Yoga Class

Basketball Team

Football Team

Hong Kong West Kowloon Station High Speed Rail
(Mechanical & Electrical)

Grand Central & Yue Man Square
(Mechanical & Electrical)

HKSTP Advanced Manufacturing Centre
(Civil & Structural)

www.Meinhardt-china.com I www.meinhardtgroup.com

ARUP

Making sustainability happen

Dedicated to sustainable development, Arup works closely with clients and partners across policy-making, city planning, design, critical infrastructure, and asset management. We continuously innovate and accelerate new approaches to help cities, communities and organisations decarbonise and build resilience to climate change.

Image
The first prototype of the ADPT circular building system, which was developed by Arup in partnership with Futur2K, was showcased at 'Folkwang and the City' exhibition' in Essen, Germany in May 2022.

www.arup.com


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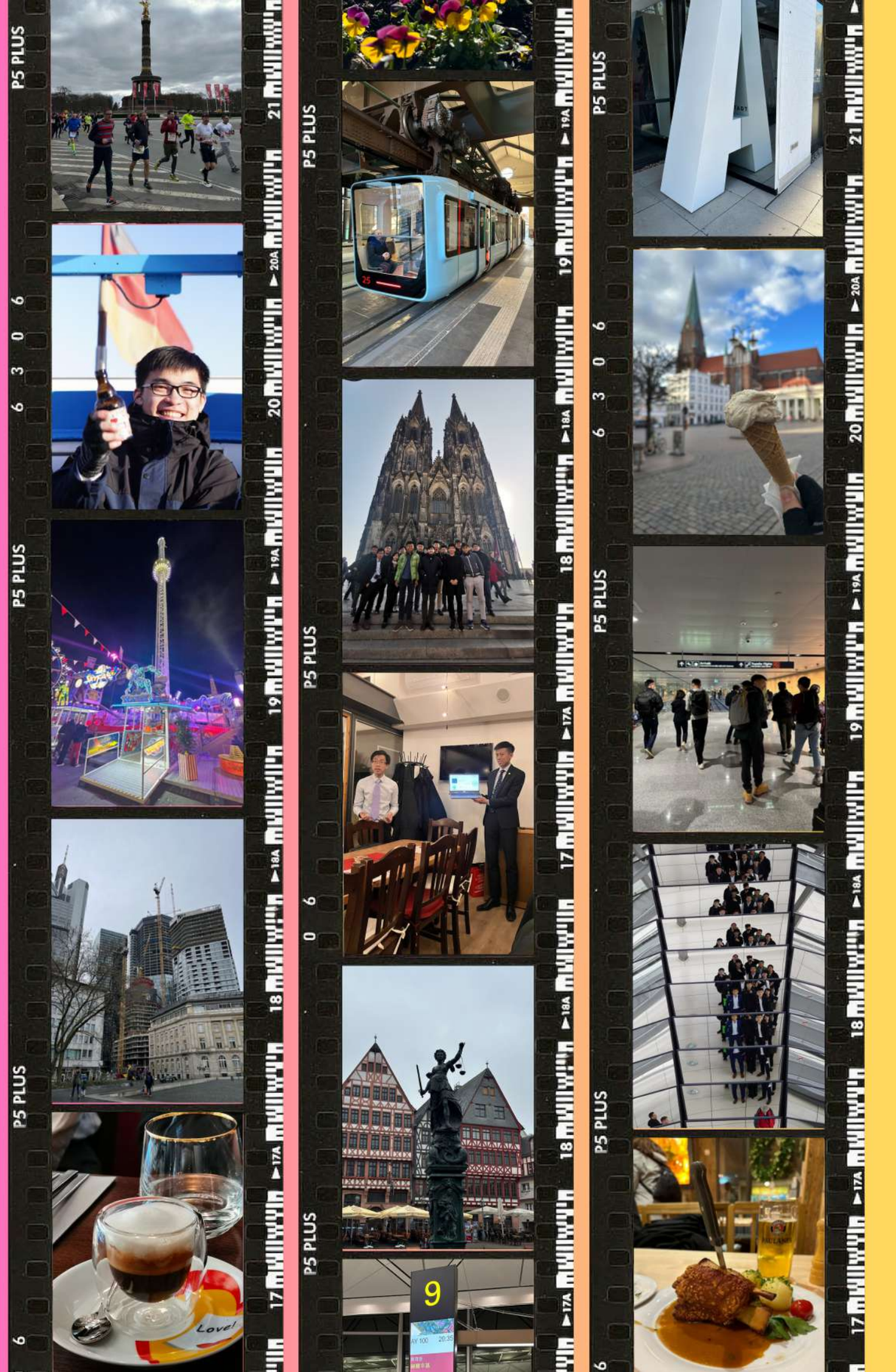
a green and low-carbon lifestyle!


OVERSEAS DELEGATI
GERMANY 2023
THE MOMENT OF ENGINEERING EVOLUTION
AEL


P5 PLUS
Love!
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