ADAPTING AIRPORTS TO A CHANGING CLIMATE IN THE REGION

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EXECUTIVE SUMMARY

Climate change is a threat to the globe and since aviation industry is relatively vulnerable to the climate impact, the industry has done substantial work to combat climate change and strengthen business resilience. The Hong Kong International Airport ('HKIA') is also well aware of the climate challenge and have taken a lot of initiatives over the past decades. This paper will first explain the climate impact observed in Hong Kong and the subsequent effect on HKIA operation. Further, focus will be placed on two fronts to combat climate change, which includes mitigation measures to reduce carbon emission and adaptation measures to get prepared for possible disruptions. Strategies and action plan adopted by HKIA will be described in detail as references. While infrastructure forms the foundation of climate adaptation, the green features of HKIA terminal and future Three-runway System will also be demonstrated. Last but not least, as it is a global task to resist climate change, joint effort and collaboration from regional and international level is crucial, thus approaches to call for concerted efforts among different airports will be suggested as concluding remark.

INTRODUCTION

According to the United Nations, 'climate change refers to long-term shift in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle, but since 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas.'

Burning fossil fuels will generate greenhouse gases and as identified by the United Nation Framework Convention on Climate Change (UNFCCC) in Kyoto Protocol, there are six key greenhouse gases – carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafloride (SF6). Among them, CO2 is the most common greenhouse gas emitted by human activities, thus it is often used as shorthand for greenhouse gas which also explains why greenhouse gas emission is collectively known as carbon emission. The greenhouse gases released to the atmosphere will act like a big blanket and trap heat released from the sun and eventually lead to increase in temperature of the Earth. While the Earth is in fact a big and complicated system, the increase in temperature will subsequently bring tremendous effect including the intense droughts, melting in polar ice, rise in sea levels, catastrophic storms, etc.

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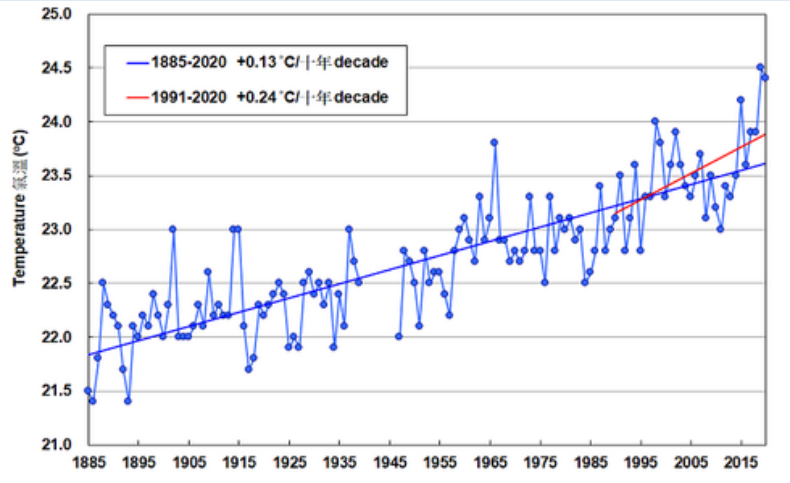
Aviation industry relies heavily on fossil fuels. It is published by International Civil Aviation Organization ('ICAO') that international aviation consumed approximately 160 megatons (Mts) of fuels in 2015. Depending on the advancement in technology and various factors, it is anticipated that by 2045, the fuel consumption would increase by 2.2 to 3.1 times compared to 2015. This has revealed that, while aviation industry continues to bloom to benefits from globalization and economic growth, the effect to the climate shall be taken into consideration for a sustainable growth.

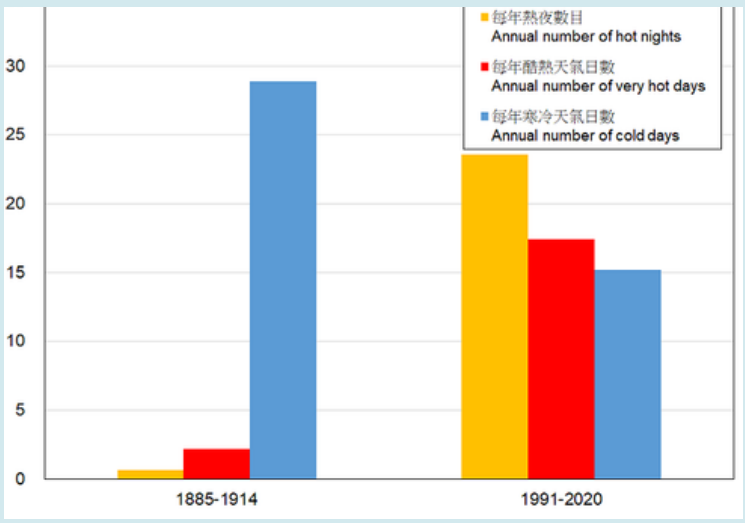
While there is an imminent need to combat climate change, concerted efforts shall be made by aviation industry on two fronts: (1) mitigation measures to reduce carbon emission; and, (2) adaptation measures to get prepared for possible disruption. This paper will focus on the case of Hong Kong International Airport ('HKIA') with initiatives highlighted to demonstrate how HKIA faces the challenge brought by climate change.

IMPACT OF CLIMATE CHANGE TO THE AIRPORT

In line with the global trend of rising temperature, Hong Kong is experiencing an increase in temperature. The annual mean temperature of Hong Kong for the period from 1885 to 2020 has shown a rise of 0.13 degree Celsius per decade. The rise in temperature has surge up to 0.24 degree Celsius per decade between 1991 to 2020. Extreme weather events are as well predicted to be more frequent and at shorter intervals according to the latest trend of climatic observation. As an example, the hourly rainfall record has reached record high in 2008 with up to 145.5mm per hour while the previous records were set in 2006 with 115.1mm and in 1992 with 109.9mm. The hourly rainfall record used to take several decades to break but the recent record breaking events happened within a decade. Another anomaly observed would be the annual number of hot nights (with minimum temperature of 28 degree Celsius or above) and very hot days (with maximum temperature of 33 degree Celsius or above). Between 1885 to 1914, the number of hot nights and very hot days were 1 and 3 days only, but for 1991 to 2020, the figures sharply increased to 24 and 17 days respectively. On the contrary, the annual number of cold days has dropped nearly half from 29 days between 1885 to 1914 to 15 days between 1991 to 2020. From the airport perspective, increase in average temperatures can increase the cooling demand for airport buildings, and extra capacity might be needed for the airport to maintain ambient temperature. Rise in temperature can also reduce the take-off performance of the aircraft which will thus limit the carrying capacity of aircraft. Extremely hot weather also lowers the productivity of ground staff and expose them to higher health and safety risks.



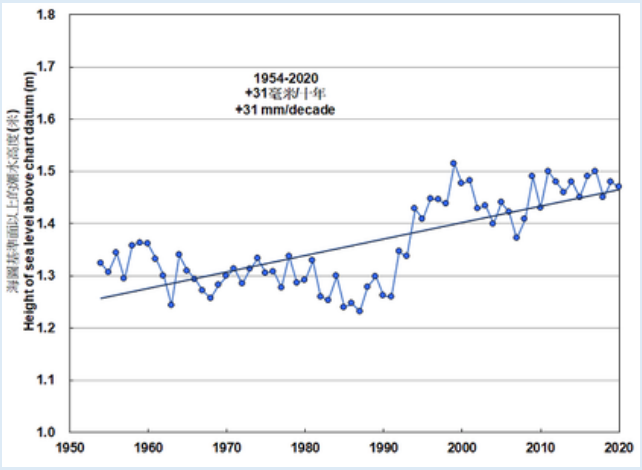
Annual mean temperature recorded at the Hong Kong Observatory Headquarters (1885-2020). Data are not available from 1940 to 1946.



Changes in the annual number of hot nights, very hot days and cold days in Hong Kong.

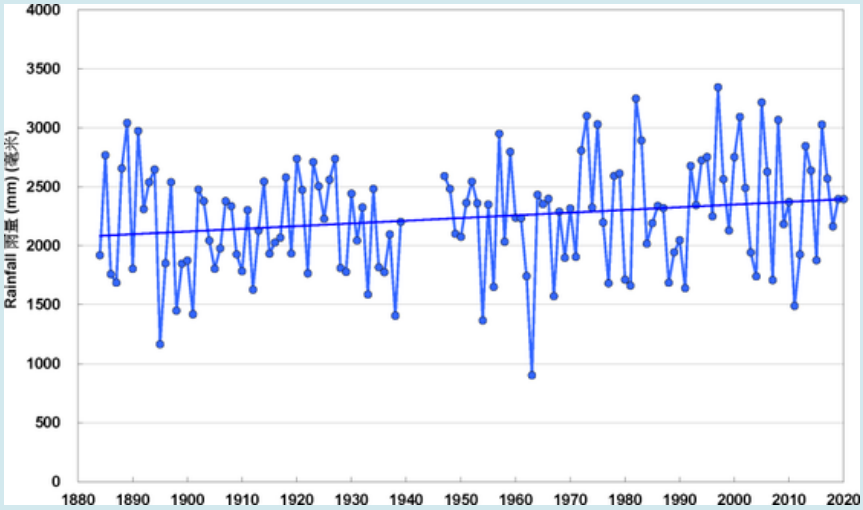
Furthermore, the melting of the icebergs is the consequential effect of global warming which will lead to the rise in sea water level. On average, the mean sea level in Victoria Habour of Hong Kong rose at a rate of 31mm per decade during 1954 to 2020. With the rise in sea level, more water is available in the natural water circulation flow and thus more rainfalls are expected. The annual rainfall of Hong Kong has shown an average rise of 2.3 mm per year from 1884 to 2020 while the average annual number of heavy rain days has shown a rise of 0.2 day per decade from 1884 to 2020. This is a threat to a lot of airports including HKIA which is located on remote island as coastal flooding and normal tide events may damage the airport infrastructure and facilities. Protective measures such as sea walls is required to be maintained to safeguard the low-lying airport infrastructure. For the case of Hong Kong, the seawall of the North runway is +7.186mPD and that for the South runway is +6.555mPD. In addition, regular monitoring of the reclaimed land settlement rate, groundwater and sea level are required.

The historical data demonstrated the intensified and far-reaching impacts resulted from climate change. With more challenging environment ahead, the aviation industry shall take prompt actions to play their role in combating climate change. As one of the major international aviation hubs in the region, HKIA has always shouldered the responsibility and proactively dealt with the climate challenge to make HKIA more climate-ready in the long-run.



Annual mean sea level at Victoria Harbour (1954-2020)

Annual rainfall at the Hong Kong Observatory Headquarters (1884-2020). Data are not available from 1940 to 1946.



MITIGATION MEASURES

REDUCTION IN CARBON FOOTPRINT

Since climate change was brought by excessive emission of greenhouse gases from burning of fossil fuels, to tackle the problem at source, one of the way-forward would be to minimise the carbon emission with the aim to attain net zero carbon emission in the long run. This aligns with the recent long term goal set by Airport Council International ('ACI') for the member airports, 'ACI member airports at a global level commit to reach net zero carbon emissions by 2050 and urge governments to provide the necessary support in this endeavour.' It also echoes to the recent call by Intergovernmental Panel on Climate Change to reach net zero carbon emission by 2050. As one of the member airports of ACI, HKIA is committed to meet the target with the aviation industry.

HKIA has long recognised the importance of carbon reduction and has made the first carbon reduction pledge in 2010, aiming to reduce carbon intensity by 25% over 2008 levels by 2015. The pledge was backed by a comprehensive carbon reduction programme, aiming to accelerate the rate of carbon reduction through working closely within the airport community. To strengthen the incentive for reduction in carbon, a carbon reduction award was set up to recognise the business partners' efforts and promote best practices. The actual reduction was then recorded to be 25.6% in 2015 which is higher than expected. Subsequently, the second carbon reduction pledge was made in 2016, committed to a further 10% reduction in carbon intensity over 2015 levels. by 2020. In assuming a leading role in the carbon reduction journey and in pursuit of its pledge to make HKIA the world's greenest airport in 2012, multi-pronged initiatives were introduced. Three of the distinctive initiatives which have contributed to the significant reduction in carbon were summarized in the following paragraphs.

ELECTRIFICATION JOURNEY

It has become a global trend these years to reduce carbon emission and relieve air pollution problem through replacing fossil fuels vehicles with zero emission electric vehicles. Back to year 2010, with the support from the airport community, HKIA has taken a step ahead of others and had begun its 3-phase electrification journey of airside vehicles. The electrification journey officially kicked start in May 2012, with phase 1 covering all saloon type vehicles, followed by phase 2 commenced in August 2017 extending to cover all private cars with gross vehicle weight under 3 tonnes. Upon completion of phase 2, phase 3 will kick in which will target on all light goods vehicles with gross vehicle weight under 5.5 tonnes.

Meanwhile, HKIA has been studying the market availability of other types of vehicles, wishing to further extend the coverage of the electrification programme. Airside passenger bus has been identified as one of the electrification targets and thus HKIA has begun to replace the entire fleet of passenger buses, targeted to complete by 2024. By then, HKIA will possess 50 electric buses which will contribute to annual reduction of carbon emission by 1,200 tonnes.

Riding on the opportunity of the airfield transformation programme, HKIA has launched the Ground Services Equipment Pooling Scheme ('Scheme') (details of the Scheme will be further elaborated in the Paragraph 'Pooling Use of Resources') in 2018, which marked the beginning of electrification journey of ground services equipment ('GSE'). Under the Scheme, electric powered GSE, including conveyor belt loaders, lower deck loaders and passenger steps owned and provided by HKIA will progressively replace the existing diesel fuelled GSE owned by Ramp Handling Operators ('RHOs'). The Scheme was scheduled to be implemented in three phases, with phase 1 covering the Terminal 1 Midfield apron has already been implemented in July 2018, followed by phase 2 covering the Terminal 1 apron and eventually move towards phase 3 to cover all the passenger aprons in HKIA in 2024. By then, HKIA will own more than 900 units of electric powered GSE and become the world's first international airport to adopt pooling of motorized electric GSE to such a scale. Comparing the data for 2018-2019, the fuel consumption has dropped 16.8% after the implementation of the Scheme and the percentage is expected to drastically increase upon full implementation of the scheme.

Prior to setting off on the electrification journey, HKIA had been well aware that provision of sufficient chargers and an optimal mix of suitable charger types were critical to the success of switching from fossil-fuel to electric vehicles. This is the reason why HKIA had started to expand the charger provision in early years. The ultimate target of charger-electric vehicle ratio would be 1:2 by 2024 while as of today, HKIA has offered 1:0.7 charger-electric vehicle ratio to ensure sufficient infrastructure provided for business partners to switch into electric vehicles. Considering the charger for GSE, while the electrification is still in progress, it is expected to reach a charger: GSE ratio at 1:2.5 by early 2022.

To keep up with the pace of technology advancement, in particular the charging and battery development, there is a need to review the infrastructure supply from time to time and provide necessary upgrade. HKIA is therefore studying the feasibility to upgrade part of the chargers into high voltage charger to look for shorter charging time and higher efficiency. Meanwhile, market research is on-going to incorporate more vehicles types to be electrified. Taking the advantage on the establishment of the new third runway in HKIA with necessary infrastructure planned ahead, more vehicles and GSE will be electrified by the end of this decade.

POOLING USE OF RESOURCES

Reducing the use of energy or increasing the energy efficiency can reduce the consumption of fossil fuels and thus is another aspect in reducing carbon emission. With the increasing demand of energy due to the projected growth of the industry, HKIA has spent efforts in re-engineering the existing business model to look for further enhancement in efficiency. Pooling use of resources is one of the solutions that is proven successful in HKIA.

To begin with, HKIA has introduced the Ground Services Equipment Pooling Scheme in 2018, which was part of the electrification journey as mentioned in earlier paragraphs. Prior to the Scheme, the three RHOs at HKIA owned their GSE. Given that all aircraft parking stands are common use resources in HKIA, the RHOs need to manoeuvre their own GSE to different parking stands for serving aircraft turnaround. The deployment and the searching of suitable GSE created extra traffic in the airside and at the same time, hindered the efficiency of aircraft turnaround. With the implementation of the Scheme, critical GSE, including conveyor belt loader, lower deck loader and passenger steps are now provided by HKIA which are housed in designated parking areas in every parking stand for RHOs to serve aircraft turnaround. RHOs no longer need to search for GSE or mobilise the GSE between parking stands. GSE chargers were provided in every parking stand such that the daily manoeuvring of the GSE will be confined in the parking stand only. Furthermore, a fleet management contractor is assigned with a dedicated fleet management system to centralise the deployment of GSE in order to optimise their usage and maximise the asset life. The Scheme has thus eliminated unnecessary GSE apron traffic which hence enhance efficiency as well as reduce the consumption of energy.

Reviewing the advantages brought by pooling use of resources and the successful implementation of the Scheme, HKIA has extended the resources pooling idea towards apron vehicles beginning with private cars in November 2021. Under the newly introduced apron vehicles pooling service, an operator is licensed to provide conveying and escort services on demand, for both passenger and goods, in the airside. The licensed operator is required to equip with a vehicle fleet and qualified drivers in order to provide the service. The services are offered to all airside companies such as airlines and ground services operators who need to mobilise labour resources between different parking stands and apron. With the introduction of the service, it is expected to reduce the number of apron vehicles operating in the airside and hence reduce the airside vehicular traffic. While the deployment of the apron vehicles will be centralized, unnecessary travelling distance would be minimised such that the overall energy consumption will also be minimised.

AIRPORT COLLABORATION DECISION MAKING

Burning of aircraft fuel is a significant source of carbon emission and thus HKIA has introduced the airport collaboration decision making ('A-CDM') to reduce carbon emission by aircrafts, especially the non-productive burning of fuels during aircraft queuing on taxiways waiting for taking off. With the aim to improve operational efficiency and the on-time performance, and at the same time enhancing resources deployment and reducing carbon emission, the first generation of A-CDM was introduced in 2008 while the second generation was implemented in three phases beginning in July 2017. A-CDM is a tailor-made system aiming to provide more accurate and high-quality information sharing. Through A-CDM, instead of relying solely on the estimated time of departure (ETD), stakeholders can now have more updated information through the A-CDM platform, in particular, the more updated target start up approval time is now also available to facilitate decision making.

With better sharing of information, stakeholders can have better prediction of the take-off time and thus can have better time management. It is observed that the queuing time for aircraft has significantly reduced after the implementation of A-CDM and at the same time, the usage of runway capacity is maximise, consequently, carbon emission is reduced.

ADAPTATION MEASURES

ENSURE AIRORT RESILIENCE

While a lot of mitigation measures have been put in place, the effect of climate change is cumulative, and it takes time to slow down or even reverse the impact of the climate change. Airports are important infrastructure to sustain economic developments and therefore, it is crucial to have robust adaptation measures to respond to the imminent climate change and to minimise the disruption from random climate events to the airports.

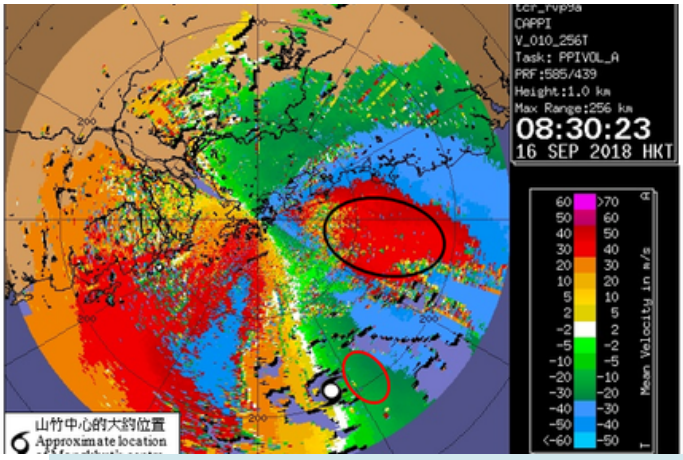
As an important precautionary measures, HKIA has maintained a Business Continuity Manual which provides guidance to handling disruptions to airport operation. Regular drills and exercises are conducted to allow the community to familiarise with the disruption handling procedures. HKIA also maintains an operational risk registry and annual assessment will be conducted on the risk registry to evaluate the respective risk level based on the latest development of the airport. Additional measures will be incorporated whenever necessary to contain the risk level to acceptable range. Among the risk registry, several weather-related scenarios have been identified as high risk or high severity and therefore specific handling procedures have been established in the Business Continuity Manual.

WEATHER PREPAREDNESS - HANDLING OF TROPICAL CYCLONE

In Hong Kong, tropical cyclone is one of the weather phenomena that is very common which poses immediate threat on HKIA's operation, thus, extra efforts have been devoted to prevent damages to airport facilities and ensure speedy post-tropical cyclone operational recovery. Whilst warm sea surface will favour the formation of tropical cyclone, with global warming, the occurrence of stronger tropical cyclone is projected to increase under the effect of climate change. In early 2021, the Hong Kong Observatory has forecasted that 5 to 8 tropical cyclones will be entering 500km of Hong Kong and the onset of the tropical cyclone season will be advanced to June or before. When a tropical cyclone hits Hong Kong or comes close to Hong Kong, depending on the magnitude of the tropical cyclone, the weather of Hong Kong will turn bad quickly with cross wind and heavy rainfall. Airport operation will almost be paralyzed. Taking the super typhoon Mangkhut in September 2018 as an example, which had a peak intensity maximum sustained wind of 250 km/h near the centre, it had led to cancellation of 889 scheduled flights on 16 September 2018 and HKIA had to handle 1,099 flights throughout recovery and the traffic backlog was cleared until 18 September 2018.

In the old days, departing passengers tended to come to airport early upon issuance of tropical cyclone warning signal due to lack of accurate and timely update of dynamic changes in flight schedules. Meanwhile, because of the lack of coordinated flight schedules and disruption in transportation system due to bad weather, arriving passengers would be stranded in the airport. As a result, food supplies would be tight and there was insufficient manpower to handle the stranded passengers. Worse still, since aircraft take-off and landing would be suspended for a period of time, extra time was required to digest the flight backlog as it would overlap with the operation in the upcoming days. Sometimes, additional two to three days were required to get the airport completely recovered from the effect of the tropical cyclone.

Passenger stranded in HKIA when tropical cyclone Vicente hit Hong Kong in July 2012



Radar imagery showing the Doppler velocity of Mangkhutat 8:30 a.m. on 16 September 2018

In view of the significant impact towards operation and the high probability of occurrence, with accumulated experiences, HKIA has developed a comprehensive procedure to handle tropical cyclone impacts. Critical elements of tropical cyclone handling are highlighted in the following paragraphs.

To begin with, HKIA will maintain close coordination with the Hong Kong Observatory ("HKO") and Air Traffic Control ('ATC') at early stage to track and assess typhoon impact to flight operation. When deemed necessary, typhoon coordination meetings will be called to alert HKIA stakeholders with the latest weather forecast, including the gusts, crosswinds, windshear and turbulence, etc. In case massive flight operation disruption is expected, flight rescheduling control system ('FRCS') will be activated. The purpose of FRCS is to handle traffic backlog in an orderly manner after a disruption, such as the suspension of operation after tropical cyclone, by optimising the use of arrival and departure slots available whilst at the same time avoiding any over stretching of airport facilities such as parking stands and airbridges. The fundamental input to the FRCS is the slots available for the upcoming recovering period projected by ATC based on the latest weather information provided by HKO. Normally such slot information would be announced at least 24 hours in advance and airlines would submit their slot requests in accordance with the quota agreed. The HKIA would then allocate the slots in accordance with the agreed allocation criteria and disseminate the information through established online platform. With the confirmed slot, airlines can then inform their passengers and mobilise their resources accordingly. Although massive flight cancellation is unavoidable, announcement can be made to the public in advance and passengers will wait for notification from airlines instead of rushing to the airport by all means and then being stranded in the airport, waiting for departure. Meanwhile, airlines could also rearrange the flights for their passengers to transit / transfer at HKIA and hence chaotic situation in the airport is significantly reduced.

During the weather response, airport emergency centre ('AEC') will be activated to manage the incident response in a more expeditious and coordinated manner. Although different operation control stations are scattered around the airport, stakeholders including airlines, air traffic control, ramp handling operators, etc. will send representatives to AEC and share the latest action and status through an established communication platform to foster communication. While time is critical in handling the weather response, the latest weather forecast will also be disseminated in AEC for prompt action.

Airport Emergency Centre (AEC) of HKIA

BUSINESS CONTINUITY - OTHER NATURAL DISASTER

HKIA is located in a remote island in Hong Kong and majority of the airport land came from reclamation. Same as other seaside airports, tsunami will pose serious threat to the airport. Hinged on the sheltering effect of the land masses of Taiwan and the Philippines, the risk of Hong Kong being affected by tsunami is very low. In fact, since early 1950's, only four insignificant tsunami (i.e. a tsunami height of less than 0.5m or lower) were recorded. However, in view of the immense damages brought by tsunami, with the long-term rise in sea levels which is a multiplying factor, HKIA has devised a tsunami business continuity plan to ensure an integrated and coordinated response.

Depending on the wave heights projected by the HKO, if the wave may inundate part or the whole of the airport island, tsunami precautions may be activated. Given that the closest seismically active area nearby Hong Kong is in the Manila Trench, any tsunami waves propagated by seismic events will take less than 3 hours to reach Hong Kong, therefore the tsunami plan also maintains a list of airport building heights as a quick reference when devising immediate response plan based on the tsunami wave heights.


Ariel picture of HKIA

Another noteworthy climatic phenomenon is the lightning strikes which is fatal to personnel and can result in delays, disruption to operations or damages to infrastructure. It is observed by the HKO that the increasing annual number of days with thunderstorm is in line with the trend of heavy rain days. Since climate change will lead to melting of icebergs, eventually, more rainfalls with lightning strikes is expected. Since HKIA is located in a remote island with vast open areas which is more susceptible to lightning strikes, to minimise the risk of lightning strikes to airport workers, HKIA has been the forerunner amongst major international airport equipped its Airport Lighting Warning System ('ALWS') and associated airport workers response instructions soon after its commencement. Under the ALWS, when lightning is detected within 10km radius with intense echoes within 15 km radius from the airport, amber warning signal will be issued to alert airport workers to suspend all non-essential activities in open area and be aware of upcoming lightning. When lightning is detected or forecasted to strike within 1 km boundary, red lightning warning signal of that zone will be issued, such that all outdoor works must be ceased immediately and all personnel shall take immediate shelter. Although most of the lightning cases are temporary, prolonged lightning warning will cause trouble to airport operation. A case of extended lightning warning was recorded in 2012 which has resulted in 4-hour delay of arrival bags and passengers were stranded in the baggage reclaim hall. In addition, prolonged lightning warning will lead to a sudden surge in demand of parking stands as all ramp operation will be suspended. HKIA therefore works closely with the ATC and maintains a procedure to handle prolonged red lightning warning, which mainly focus on provision of mitigation parking areas and temporary holding for arrival and departure aircrafts on taxiways in an orderly manner. With the aforementioned A-CDM, airlines and its ground handling operators now become more able to prioritise the deployment of aircraft tractors in order to clear the parking stands within a short period of time.

SUSTAINABLE AIRPORT CONCEPT

NOW AND FUTURE AIRPORT

NOW AND FUTURE AIRPORT

Existing Terminal 1 of HKIA

In addition to the initiatives implemented, a sustainable infrastructure design will yield twice the effect with half the effort in combating climate change. Although HKIA was built more than two decades ago, green elements have been embedded in its design. The terminals of HKIA has used modern glass façade and building envelops to reflect heat and cooling loads. Besides, the north-facing roof skylights optimise the natural light during daytime but minimise the heat gain from direct sunlight. Light sensors were also installed to detect the lighting intensity and reduce the indoor lighting when there is sufficient sunlight. With the advancement of technology, upgrade and replacement of the infrastructure was in progress to further trim down energy consumption, such as the replacement of end-of-service-life LED lights in the terminals, replacement of high-efficiency chillers for the buildings, installation of battery energy storage system at generator houses and application of advance chiller control system, etc. Recently, HKIA has pioneered to adopt big data and machine learning to forecast the cooling demand for terminals in the upcoming 24 hours in order to reduce unnecessary energy consumption. Together with the newly replaced chiller in Terminal 1, an estimated 5.1 GWh of electricity could be saved a year, which is close to the annual energy consumption of 1,200 households.

NOW AND FUTURE AIRPORT

Future 3RS of HKIA

Moving onwards, HKIA is expanding into a Three-runway System ('3RS') with the scale almost equivalent to building a new airport. The cost of the project is up to HK$141.5 billion and is expected to be completed by 2024. The project requires reclamation of approximately 650 hectares at north of the existing airport to build a 3,800m runway with new concourse and associated apron and extensive building services and airport systems. While the 3RS is still in construction stage, environmental friendly design and construction principles have been adopted. In fact, HKIA has conducted a comprehensive Environmental Impact Assessment ('EIA') for the expansion which included more than 250 mitigation measures to address the potential impact on different environmental aspects. As an example, with the 40% of reclaimed land being located on contaminated mud pits, deep cement mixing method was introduced instead of the conventional seabed dredging so as to prevent the leaking of contaminated mud to minimise environmental impact on surrounding waters. Furthermore, eco-enhanced design was adopted in building the artificial seawall aiming to enrich the marine biodiversity. Comparing to normal artificial seawall blocks, eco-enhanced seawall blocks consist of small-scale pools, grooves and pits to increase surface heterogeneity for providing habitats fir intertidal organism.

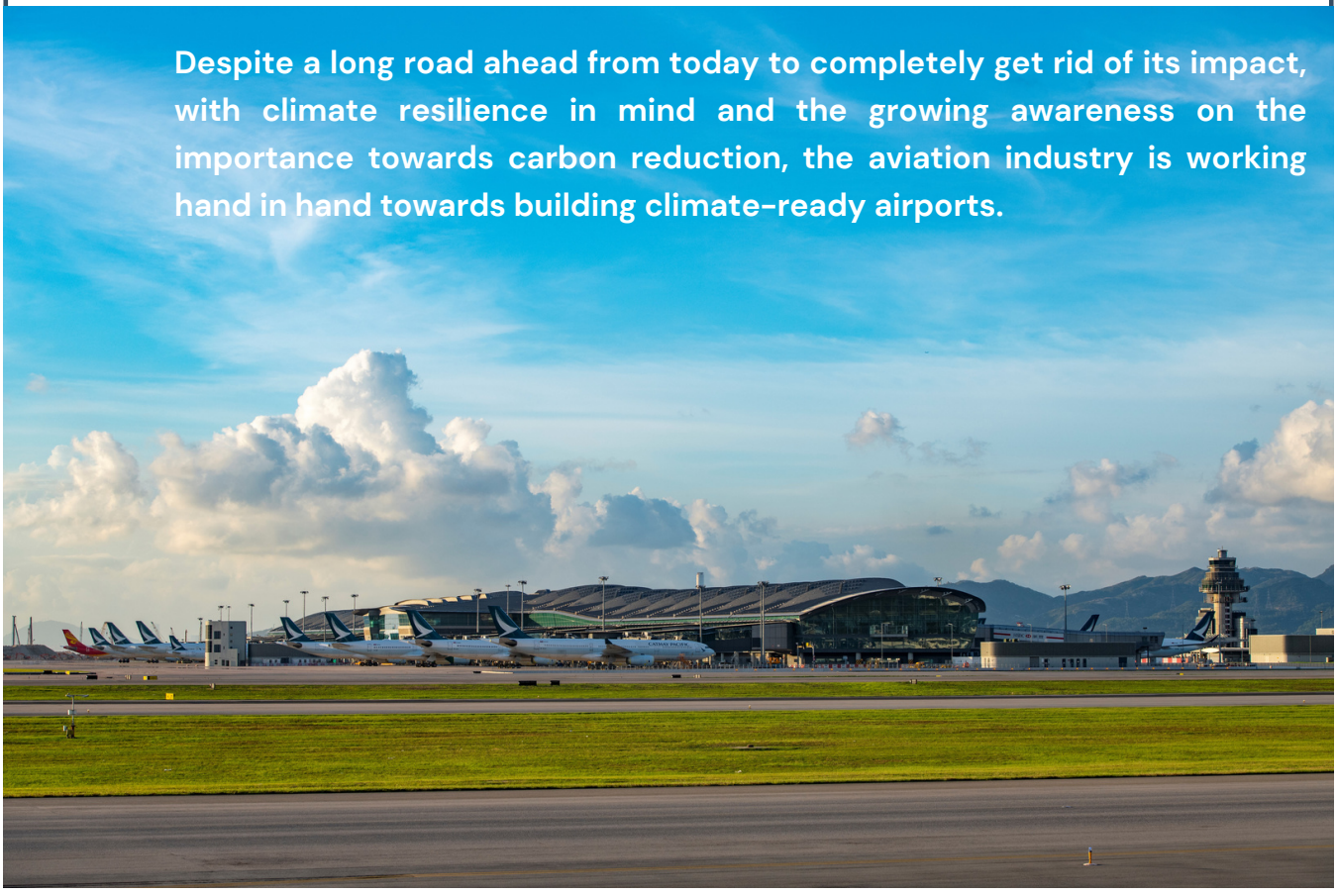
Following the design of the existing terminals, the new concourse will also adopt energy saving design and aim to be one of the world's greenest terminals when it has been completed. Lush indoor landscape with extensive use of sunlight can enhance passenger experience at the same time reduce energy consumption. On the apron side, comprehensive network of chargers with necessary infrastructure including substations and generators will be equipped to facilitate the future electrification initiatives in the 3RS apron.

CLOSING REMARKS

Climate change is a global phenomenon and joint effort and support from cross-sector and cross domain is required to initiate a change to the current status quo.

Reviewing the Paris Agreement agreed in 2015, although it does not include international aviation, there are several critical elements that can promote collaborations among parties are worthwhile to make reference to. To begin with, a precise target set can promote alignment towards a common goal. The Paris Agreement has set the goal to limit global warming to well below 2 degree Celsius, preferably to 1.5 degree Celsius while ACI has also acted similarly by setting up the goal to reach net zero carbon emissions by 2050. Meanwhile, under the Paris Agreement, countries are required to submit their plans for climate action, followed by establishment of enhanced transparent framework such that countries will report transparently on action taken and progress in climate mitigation. These two approaches together encourage the countries to set a tailor-made action plan with incentive to take prompt action. This can also be adopted by the aviation industry as airports can set up their respective action plan and share their best practices transparently among the collaborated network to promote healthy competition on climate action. Moreover, the Paris Agreement has provided a framework for financial, technical and capacity building support for those countries who need it. For the case of the aviation industry, airports with mature green programmes should provide assistance, such as the sharing of resources, technology and knowledge to other airports in need to establish their climate action plan and keep them abreast of the latest development in the global arena.

Despite a long road ahead from today to completely get rid of its impact, with climate resilience in mind and the growing awareness on the importance towards carbon reduction, the aviation industry is working hand in hand towards building climate-ready airports.



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