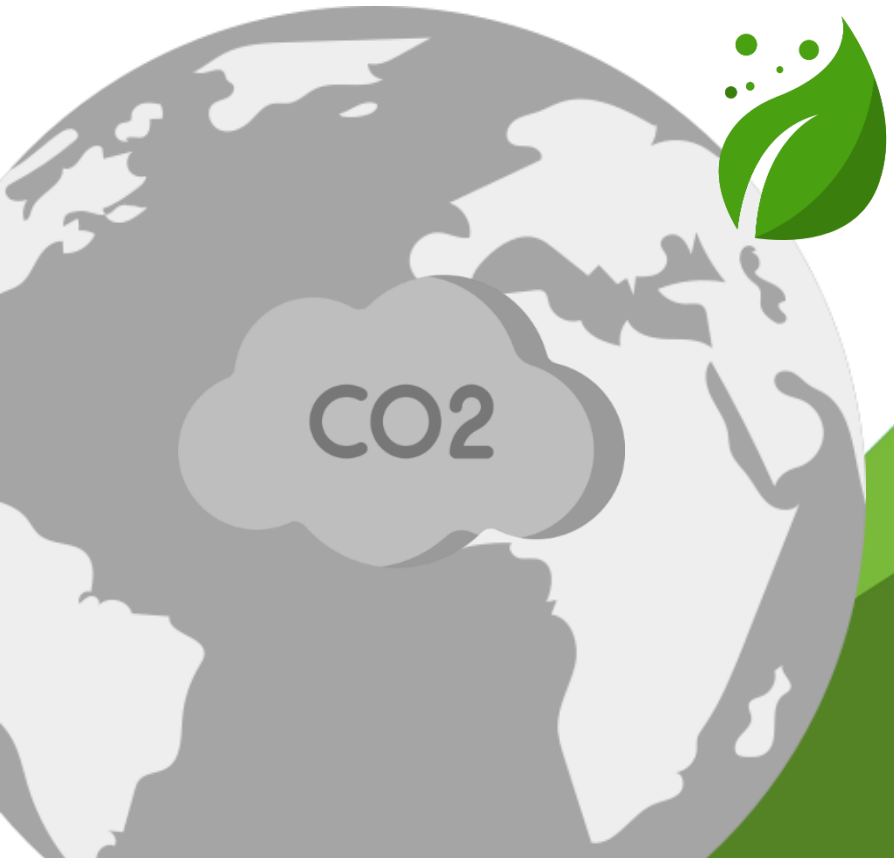
# Green Airports Recognition 2022

# Carbon Management



ACI Asia-Pacific advances the collective interests of the region's airports with governments and international organizations, and leads, facilitates and promotes professional excellence in airport management and operations.

# GREEN AIRPORTS RECOGNITION 2022: CARBON MANAGEMENT

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# INTRODUCTION AND ACKNOWLEDGEMENTS

The Green Airports Recognition (GAR) was established by ACI Asia-Pacific with the support of the ACI Asia-Pacific Regional Environment Committee. The Recognition's objective is to promote environmental best practices to minimise aviation's impacts on the environment and to recognise ACI Asia-Pacific's airport members who have outstanding accomplishments in their environmental projects.

Since 2019, many more forward-looking countries and airports have voluntarily pledged Net-Zero Carbon Emissions by 2050 in response to climate change challenges. As the voice of airport operators and in alignment with ACI's long-term carbon goal, ACI Asia-Pacific selected ***Carbon Management*** as the theme for Green Airport Recognition 2022. The objective is to accentuate its importance in sharing best practices among airports along the decarbonisation journey, specifically in Scope 1 and Scope 2[1] carbon emission reduction.

On the topic of greenhouse gas emissions and climate change, the ***ACI Policy Handbook, 10th edition*** provides directions on how airports should decarbonise: "Airports should assess, minimize and mitigate greenhouse gas emissions under their direct control while guiding and influencing other aviation stakeholders at the airport to assess, minimise and mitigate theirs. Ultimately, an airport operator should try to achieve zero emissions, net or carbon neutrality as interim to zero emissions."

Carbon neutrality can be achieved through reducing emissions to the minimum with the residual emission compensated for by purchase of carbon credits. The ***ACI World Long Term Carbon Goal Study Report 2021*** has confirmed a global goal of Net Zero Carbon by 2050 for airports is feasible. The new Net Zero Carbon landscape, which shifts the reliance on offsetting to renewable energy demonstrates a leap forward in emission cut.

Energy transition from fossil fuel-based sources to renewable energy sources is the key for the airport industry to achieve the unified goal. The common strategies include but are not limited to national grid electricity system; renewable energy power purchase agreement; renewable electricity generation and/or zero-emission vehicle programme. Ultimately, carbon removal technologies should be applied to residual emission. Examples of

[1] Scope 1 covers direct emissions from owned or controlled sources e.g., fuel used for vehicles. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company.

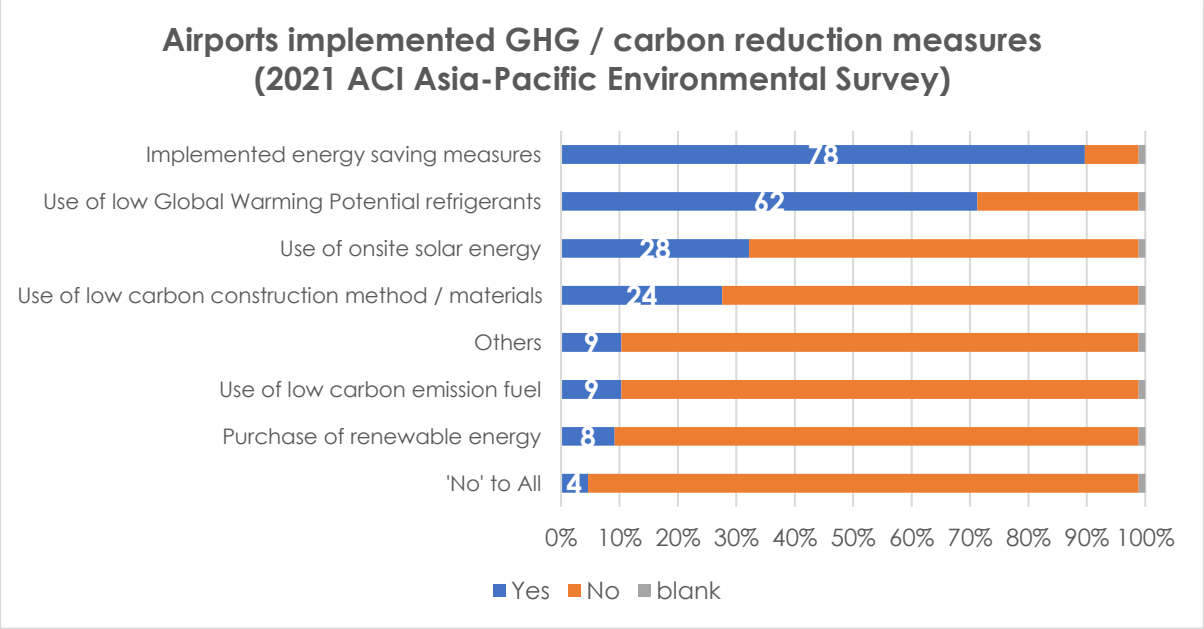
technologies are bio-energy carbon capture storage, gas separation technology for carbon capture storage and direct air capture devices. Rally leadership and support from governments would be imperative in implementation of the above-mentioned programme, initiatives or projects, and the industry's journey towards Net Zero Carbon.

For airports in Asia-Pacific and the Middle East, due to its expected air passenger traffic growth and the shortfall in the projected abundance of renewable energy, more efforts are needed for the region to achieve this target. These efforts include close collaboration and partnership with governments and industry, as well as development of appropriate sustainable business cases, and carbon removal using negative emissions technologies.

Over the course of the last decade, ACI Asia-Pacific airport members have proactively undertaken significant actions to reduce emissions from their operations. These include voluntarily participating in the *Airport Carbon Accreditation* programme, the global industry carbon emission reduction standard for airports. As of April 2022, 64 out of the world's 395 accredited airports are from Asia-Pacific and the Middle East regions, which collectively handle 41.2% of the region's air passenger traffic. Seven airports in the region have already reached carbon neutrality status. This means they have been accredited for having absolute long-term emissions reduction targets, aligned with the Paris Agreement (IPCC scenarios) of net zero carbon emission.

Since the declaration of the COVID-19 pandemic, ACI Asia-Pacific has been doing what it does best in raising awareness, advocacy, best practices sharing and capacity building by providing periodic webinars on the topics such as Airports' Long Term Carbon Goals and renewable energy at airports.

According to the ACI Asia-Pacific Environmental Survey 2021, energy saving measures, low global warming potential refrigerants and onsite solar energy are the top three GHG / carbon reduction measures implemented by airports, there is an increasing trend of airports installing onsite solar energy (28 airports in 2021) and purchase renewable energy (eight airports in 2021) over the last five years. ACI Asia-Pacific encourages airports to follow these best practices.




Our airport members' efforts are consistent with the United Nations, which in 2015 established ***17 Sustainable Development Goals (SDGs)*** to promote more sustainable development around the world. ***Goal 13 of the SDGs*** calls for urgent action to combat climate change and its impacts. Hence, understanding sustainable carbon management practices are essential to the aviation industry.

Twenty-three eligible GAR 2022 submissions were received from member airports, representing 22% of the total passenger traffic in Asia-Pacific and the Middle East regions. This year's submissions showcase many innovative best practices for equipment and infrastructure energy management and onsite generation or purchase agreements of renewable energy. There are also projects with a strategic roadmap for net zero carbon, nature-based carbon sequestration, a collaborative approach towards decarbonisation and addressing waste to reduce carbon emissions.

Included in this publication is Hong Kong International Airport's Weather Forecast for Air-conditioning Control System, which is the first--of-its-kind in Hong Kong and around the world for implementing a predictive control system for air-conditioning based on real-time passenger flow and weather information, saving electricity use and reduced carbon emissions. Christchurch International Airport shared its innovative use of ground source heat systems that has removed most of its Scope 1 emission which has subsequently been shared with others in the region to enhance the wider region's decarbonisation. Kempegowda International Airport and Hawke's Bay Airport demonstrated their leadership and responsible approach in achieving 100% renewable

electricity by the implementation of renewable energy on site or green purchase agreement.

Apart from the efforts in Carbon Management, a number of member airports also demonstrated their efforts in reducing the environmental impact and creating positive benefits through other environmental management initiatives such as implementing Green Airport Infrastructure, Waste Minimisation, Water Management, Air Quality Management and Energy Management, which were demonstrated in previous Green Airports Recognition.

We would like to thank all judges for their expertise and valuable time. The submissions were reviewed by a panel of judges comprising:

- Mr. Christopher Paling, Senior Lecturer in Environmental Management, Manchester Metropolitan University
- Mr. Christopher Surgenor, Editor/Publisher, GreenAir Online
- Ms. Juliana Scavuzzi, Senior Manager, Environment, ACI World
- Dr. Panagiotis Karamanos, Aviation Environmental Consultant
- Mr. Stefano Baronci, Director General, ACI Asia-Pacific

After a collective assessment with eight relevant criteria, the panel of judges recognised the following airports:

### Over 50 million passengers per annum:

- Platinum – Hong Kong International Airport
- Gold – Kuala Lumpur International Airport
- Silver – Beijing Capital International Airport

### Between 15-50 million passengers per annum:

- Platinum – Kempegowda International Airport
- Gold – Taoyuan International Airport
- Silver – Rajiv Gandhi International Airport

### Between 5-15 million passengers per annum:

- Platinum – Christchurch International Airport
- Gold – Queen Alia International Airport
- Silver – Bahrain International Airport

### Less than 5 million passengers per annum:

- Platinum – Hawke's Bay Airport
- Gold – Nadi International Airport
- Silver – Darwin International Airport

The outstanding work of the above 12 airports plus other submissions are summarised in this publication to promote best practice sharing.

It should be emphasised that all airports in this publication deserve to be recognised because of their commitment to Carbon Management and willingness to share their stories with the airport community, fully reflecting the objective of this Recognition.

## ACKNOWLEDGEMENT OF ALL PARTICIPATING AIRPORTS

The outstanding work of the above 12 airports plus other submissions is summarised in this publication to ensure best practices are shared. However, it should be emphasised that all airports (23 airports in total) in this publication deserve to be recognised for their commitment to ***Carbon Management*** and willingness to share their stories with the airport community, fully reflecting the objective of this recognition.

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

BAC
شركة مطار البحرين
BAHRAIN AIRPORT COMPANY

### Bahrain International Airport

### Bahrain International Airport New Passenger Terminal Building Project

Airports' Carbon Footprints are commonly dominated by purchased electrical consumption, and Bahrain International Airport (BIA) is no exception. In BIA's journey to minimise carbon emissions, the focus was to invest in improving the performance of the built environment in order to reduce Scope 2 emissions due to purchased electricity which constitute around an average of 80% of the Carbon Footprint over the last decade.

BIA Environment committee comprising all stakeholders to tackle different environmental topics and introduce the 3-phase project which focuses on achieving Carbon Zero by 2050.

As there are currently multiple retrofit projects and new developments going on at the airport's facilities with the aim of elevating the energy performance of infrastructure to reduce emissions, one of the key developments that contributed to such reductions is the development of the Passenger Terminal Building (PTB) which became operational in January 2021.

The PTB is LEED Gold certified and will reduce more than 25% of energy usage (equivalent to 12,565 tons of CO2 annually) compared to a conventional PTB elsewhere in the industry. Projections of savings were made according to the Energy Model of IES (Integrated Environmental Solutions) calibrated by on-site testing of installed systems and building air-tightness. The Energy Model was a key tool used to test the integration of different sustainable strategies in the building.

Energy reductions were achieved via sustainable architecture and the tightness of the building envelope, in which low heat transmittance is attained for all materials, eliminating potential thermal bridges. Other implemented strategies include the integration of a comprehensive shading scheme suitable for all seasons and façade orientations, an efficient cooling system that will lead to 23% of energy recovery; and a Building Management System (BMS) that will control the installed equipment according to changing demand of systems like HVAC, artificial lighting, leak detection, etc. In addition to 30% of

energy recovery in the Reverse Osmosis system which all reflect the Carbon footprint reductions achievements of BIA.

## Project Graphics

BIA Passenger Terminal Building

South façade of the new
BIA Passenger Terminal Building model

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

北京首都国际机场股份有限公司
Beijing Capital International Airport Co.,Ltd.

### Beijing Capital International Airport
### Application of Green Prefabricated Building

The total construction area of the project, which is used to improve the living facilities of the tower for apron control staff, is 1080 square meters. The project is equipped with 387 photovoltaic modules and an energy storage system, which forms an operation mode of "energy storage as the main power supply and municipal power as the standby power supply". According to the actual operation monitoring data, the photovoltaic power generation and energy storage system can basically meet the power demand for a whole day and achieve the operation state of energy self-sufficiency with an estimated annual carbon emission reduction of 119800 kg. The project successfully made the first assembled modular zero energy consumption demonstration building project for the capital airport.

The project adopted a standardised and modular box design, which was convenient, economical, safe and efficient. The whole building was composed of 43 standard boxes, which were produced in the factory and assembled on site.

In addition, the project adopted BIM technology, and integrated building integrated photovoltaic system, energy storage system, Emergency Management System, high efficiency DC variable frequency air conditioning, graphene nanocarbon electrothermal film heating technology, solar cell water heater system, ventilation system with heat recovery and haze removal, photovoltaic cleaning robot system to form a complete set of green and energy-saving building system.

The project was honoured with the "Demonstration project of four characteristics airport in 2020" by civil aviation of China, and was awarded the demonstration project in green building and building industrialisation of "The China National Key R&D Programme during the 13th Five-year Plan Period".

## Project Graphics

Graphene nanocarbon electrothermal film

Project panorama

Building Integrated Photovoltaic System


Fabricated construction

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

### Gimpo International Airport
### Introduction of Eco-friendly Electric Circulation Buses

Gimpo Airport is promoting the establishment of electric vehicle charging infrastructure and the conversion of business vehicles to low-emission vehicles by replacing three shuttle buses with electric buses for the first time in Korea. Although CNG (Compressed Natural Gas) buses were introduced because they are more environmentally friendly than diesel vehicles, they took a step forward in reducing greenhouse gas emissions by replacing them with more eco-friendly electric vehicles. If the five CNG buses operating at Gimpo Airport are replaced with electric buses, it is possible to reduce carbon dioxide emissions by 180 tons per year, which is calculated to have a reduction effect of 91% compared to CNG buses.

In addition, the Korean government recently announced at the 26$^{th}$Conference of the Parties on Climate Change (COP26) that it would join the Global Methane Pledge. The CNG bus emits 7.4g of methane gas per 1km, so the annual methane gas emission of 2 tons is also zero.

Three out of the five CNG shuttle buses were replaced with electric buses, and two 200 kW charging stations were installed in the airport. The average daily operating distance of the electric bus is 150km with the capacity to operate 300km on a single charge. Gimpo Airport plans to replace the remaining two CNG buses with electric buses by 2023.

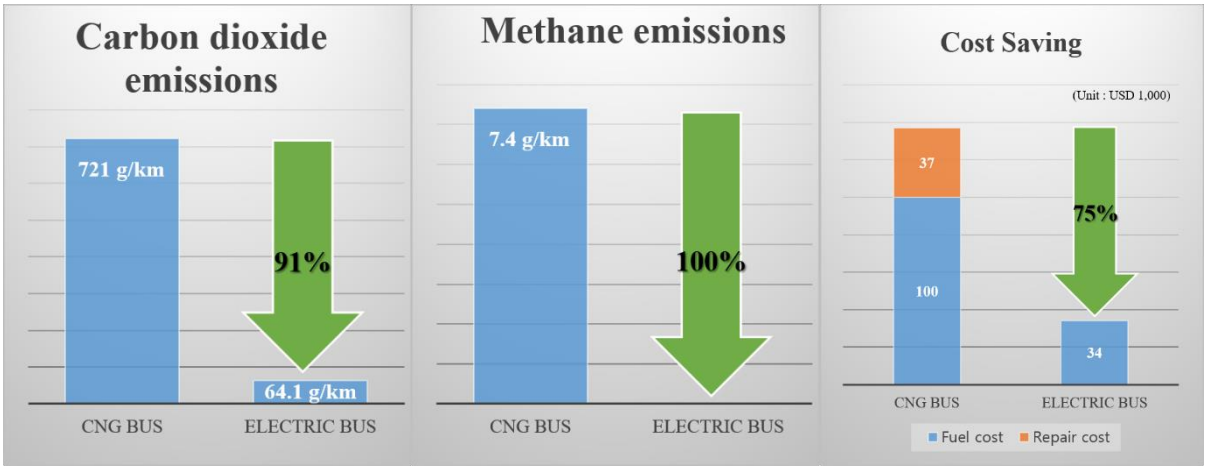
Since electric buses do not emit carbon, assuming that 64.1g of carbon dioxide per km is emitted based on the amount of carbon dioxide generated by thermal power generation, CNG buses generate 721g of carbon dioxide per km, resulting in 180 tons of carbon dioxide reduction annually. It was also investigated that there was an effect of reducing methane gas by 2 tons per year. Also, fuel and repair costs are reduced by 75% from USD138,000 to USD34,000 per year, or about USD104,000.

Besides, passengers can use the airport more comfortably through the use of electric buses with much less noise and vibration.

## Project Graphics


Electric buses

Charging station




Emission reduction (per vehicle)

Cost saving (per vehicle)

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

### Hong Kong International Airport
### Weather Forecast for Air-conditioning Control System (Weather FACTS) Project

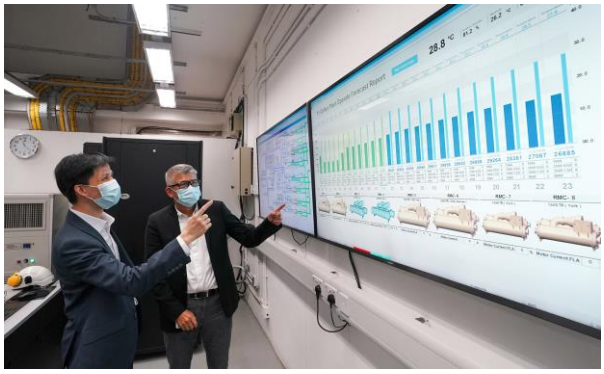
Airport Authority Hong Kong (AAHK), CLP Power Hong Kong Limited (CLP Power) and Hong Kong Observatory (HKO) have jointly developed a Weather Forecast for Air-conditioning Control System (Weather FACTS) to enhance the Hong Kong International Airport (HKIA)'s energy efficiency and reduce carbon emissions.

Weather FACTS commenced operation at HKIA's Terminal 1 in 2021. It collects hourly data including HKIA's passenger flow from flight information and weather data, such as temperature, humidity, cloud amount, wind direction, wind speed and solar radiation, from the HKO and half-hourly electricity consumption of HKIA from CLP Power. By employing big data analytics and machine learning, the system can forecast the terminal's cooling demand with 90% accuracy over the following 24 hours. Based on the forecast, the chillers can deliver the appropriate amount of cooling volume needed, eliminating unnecessary energy consumption while also maintaining travellers' comfort.

HKIA is the first of its kind in Hong Kong and around the world to implement a predictive control system for air-conditioning based on real-time passenger flow and weather information. Weather FACTS can save an estimated 1.7M kilowatt-hours (kWh) of electricity, which is approximately 4% of the total energy consumption of the chiller plant and 630 tonnes of carbon emissions reduction. Since the system does not require any modification of existing equipment, the initial investment cost is relatively low.

The success of this project showcased the benefits of collaboration between various stakeholders, including airport operator, public utility and government for better energy management. It also serves as an exemplary case for leveraging advanced smart technology to empower smarter and more efficient energy savings with minimal investment. Notably, the prediction model for air-conditioning could also be widely adopted by other airports and commercial buildings. As a way forward, AAHK will expand this smart system to other terminal buildings.

## Project Graphics



The Weather FACTS – a predictive control system for air-conditioning commenced operation in 2021

The Weather FACTS is applied in the new energy-efficient chiller system at Terminal 1


AAHK senior management has actively promoted this technology in Hong Kong via symposiums and seminars, such as Smart Energy Symposium 2021


AAHK has pledged to achieve Net Zero Carbon at HKIA by 2050

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

### Nadi International Airport

### Nadi International Airports (NIA) Terminal Modernization Project - Carbon Emission Reduction Initiative

The Nadi Airport Terminal Modernisation Project (NATMP) was completed in April 2017. The goal of this massive infrastructure upgrade was to enhance the end-to-end passenger experience.

In the planning phase, greener airport/environmental goals were incorporated to ensure our ambition to reduce our carbon emissions were being implemented into the project. Nadi International Airport's electricity accounted for 94% (2014) of carbon emissions from our daily operations and this became an aspiration for our carbon emission reduction initiative.

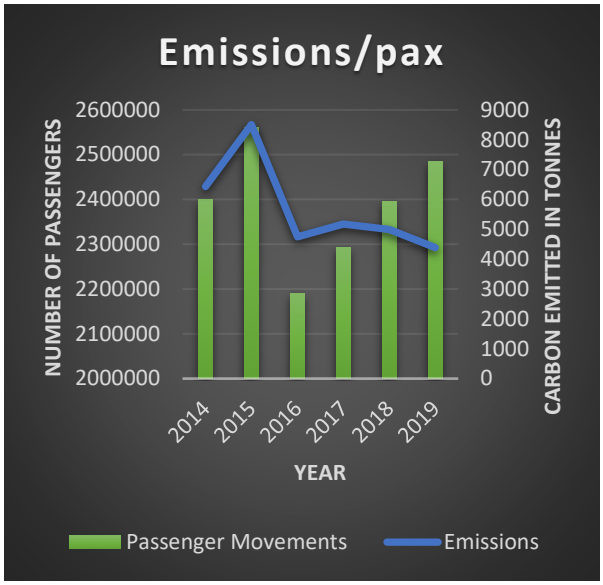
The key improvements that assisted in our drive to reduce carbon emissions include:

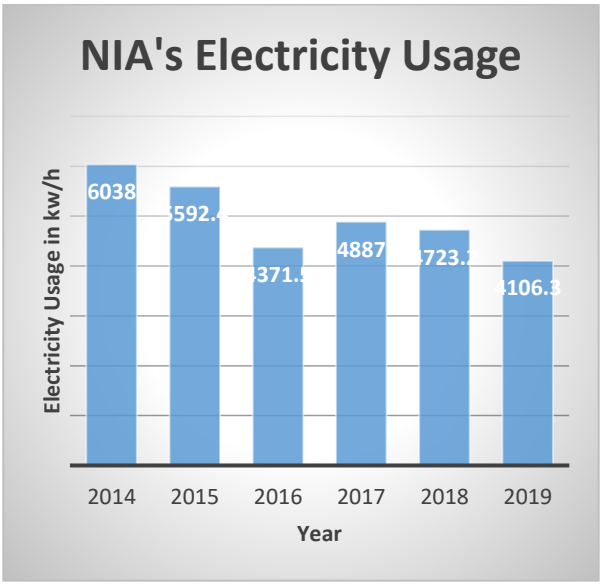
- LED lights installed throughout the terminal building;
- The centralised Chiller Cooling System is environmentally friendly compared to the old refrigerant-based air-conditioning system;
- Installation of the Building Management System (BMS) software; and
- High raised ceilings in the international check-in and departure lounge allowing more natural light to filter in were the accentuating environmental aspects of the upgrade.

The BMS was the main feature in achieving energy efficiency due to its ability in monitoring and controlling the electricity consumption of the entire Nadi International Airport Terminal.

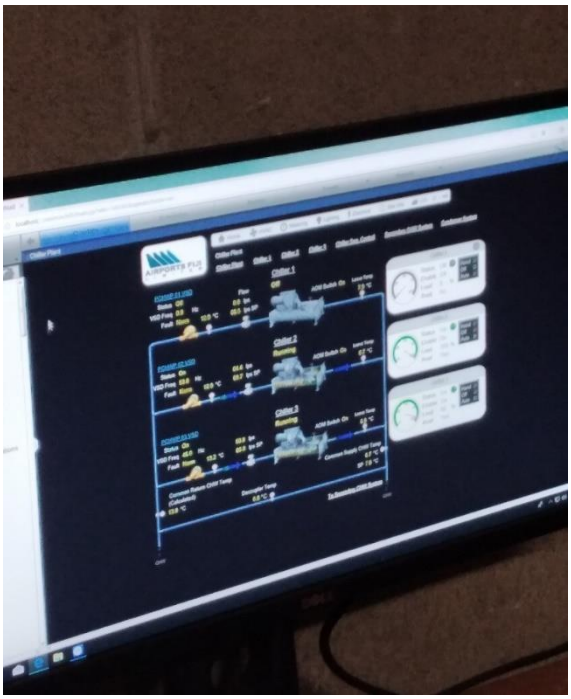
Nadi International Airport managed to reduce its carbon emissions by 32% in 2019 with 2014 as the baseline year.

## Project Graphics




| Passenger movement vs carbon emissions | Electricity usage (2014 – 2019) |
|---|---|



| Structural design – High-raised glass ceiling | Building management system controls |
|---|---|

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

مطار الشارقة
Sharjah Airport

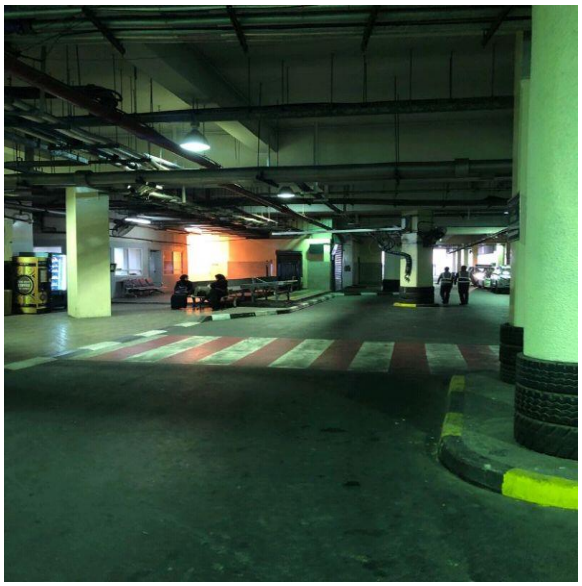
**Sharjah International Airport**
**Cargo Terminal Lighting Project PNP:468**

Sharjah Airport (SAA) is accredited with Level 3+ neutrality of the ACI Airport Carbon Accreditation programme and become the first carbon neutral airport in GCC and second in the middle east by optimising its direct emission and offsetting the residual emission. In line with its strategic value of sustainability, SAA developed a carbon management plan in 2016 to reduce its direct carbon emission. As 75% of the airport's direct emission is from its electricity consumption, a detailed energy audit is conducted in 2016 as per the carbon management plan. Based on the output from the energy audit number of retrofit projects were planned as a part of the carbon reduction initiative to optimise energy consumption, which include the replacement of existing lighting and cooling system on a timely basis as both contribute a major share of energy consumption.

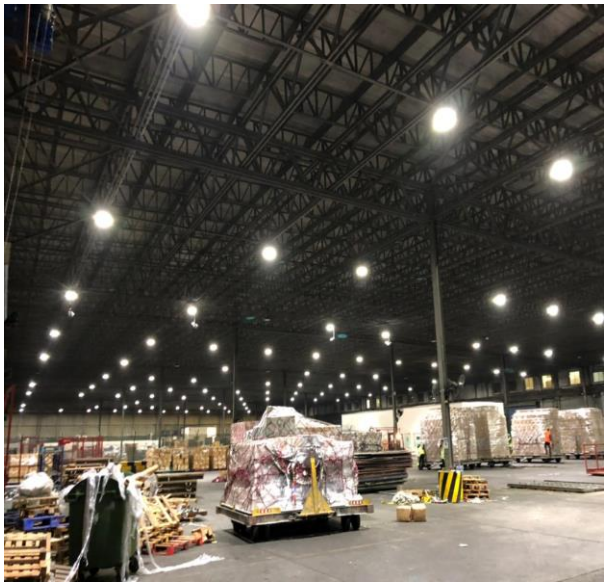
As per the energy audit, 28% of energy consumption is for lighting and SAA management prioritised the replacement of old halogen and fluorescent lighting with the latest energy efficient LED lighting as a part of the SAA Carbon management plan. A total of 40 plus lighting Projects were completed after 2017 and a few are in progress.

The cargo terminal Lighting project (PNP:468) reduced the energy consumption while enhancing the coverage of lighting to five additional areas of the project location with an improved luminance level. The project improved the lux level in the project locations at an average rate of more than 100%. The project brought an annual savings of 617773.32 kWh with a monitory saving of AED: 271820/year. This will reduce 263 tons of carbon from SAA's total annual emission. Different energy optimisation projects implemented between 2017 and 2020 reduced SAA energy consumption from 47893945 kWh in 2017 to 39173501 kWh in 2020 with a reduction of scope-2 emission from 32376 tons to 16680 tons in the same period. It highlights the relevance of optimising energy consumption in SAA's total carbon reduction. The below datasheet showcases the project benefit with a comparative study of old halogen/Fluorescent lighting with new LED lighting.

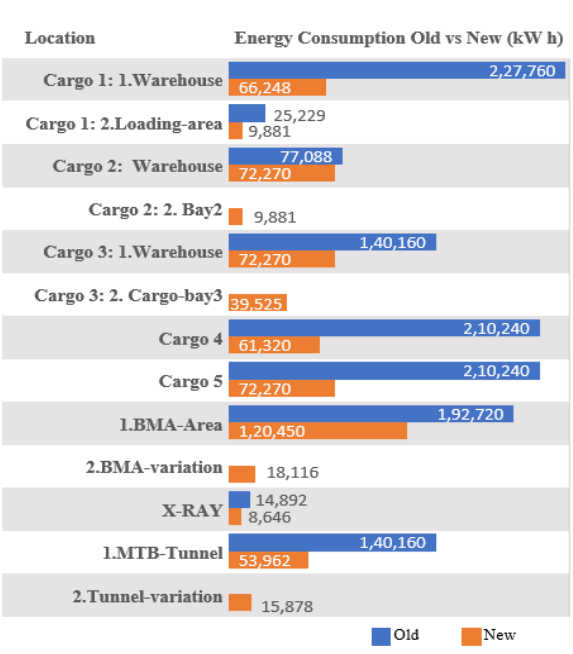
## Project Graphics



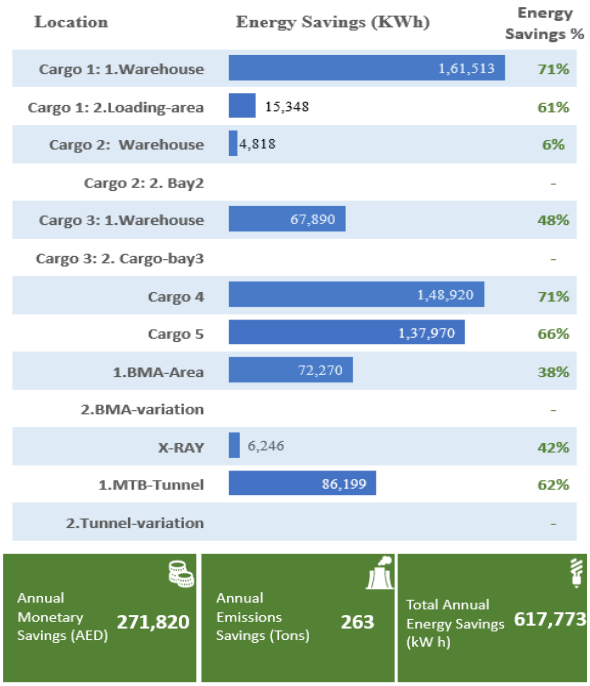
Old lighting



New lighting




Energy consumption- old vs new




Energy savings

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

### Singapore Changi Airport
### Partnering for Performance – EC FanGrid Energy Efficiency Enhancement

Optimising air-conditioning systems is vital to create comfortable and pleasant environments in airport terminals, and to maximise energy efficiencies.

Changi Airport Group maintains this balance between enhancing the airport experience and ensuring environmental sustainability by innovating to reduce Changi Airport's carbon footprint. As part of CAG's sustainability drive, our Engineering team collaborates with industry solution providers to trial innovative technologies to optimise energy consumption.

The team spotted an opportunity for improvements to be made to the Air Handling Units (AHUs) across passenger terminals. A key component of centralised air-conditioning systems, AHUs have fans installed in them to extract fresh outdoor air, which is filtered and centrally cooled before re-distribution into terminal spaces. With technological improvements, Electronically Commutated (EC) fans, as compared to conventional alternating current fans which were installed in the AHUs, were identified as being more efficiently powered, easier to maintain, and less susceptible to single-point failure coupled with shorter repair times.

The team, therefore, led an air-conditioning systems enhancement project, working with CAG's partners, including ENGIE Services Singapore. The first EC FanGrids were installed in 7 AHUs in Terminal 3. As the trial harnessed positive results, CAG Engineering continued its roll-out across Terminals 1, 2 and 3. To date, 48 EC fans have been installed in 9 AHUs, which distribute cool air to gatehold rooms, high ceiling areas in the transit zone, and public sky train lobbies.

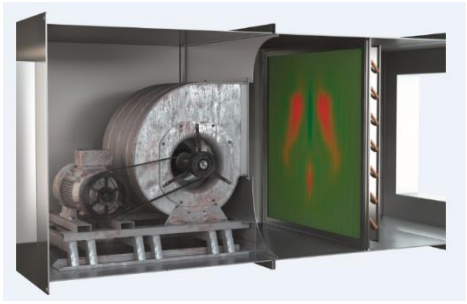
**Project benefits include:**

- Positive environmental impact: 25% reduction in energy consumption and reduced space needed for the smaller AHU footprint.
- Enhanced AHU redundancy and operational reliability: The EC FanGrid compensates for airflow loss from one faulty fan to keep the AHU running.

- Improved airport ambience and operations: EC fans deliver a 15% increase in airflow, as well as reduced unwanted air turbulence, pressure loss, vibration, noise and energy consumption.

## Project Graphics

Ms Moe Thandar Htay, CAG Engineering Management & Systems Planning Officer, led this air-conditioning systems enhancement project, in collaboration with ENGIE Services Singapore



Conventional AC belt-driven AHU fan requires more space and creates less uniform air flow (shown in red and green)

The EC AHU Fan uses fewer components and materials, takes up half the space and creates a more uniform airflow

Terminal 3 Arrival Immigration areas are pleasantly cooled by AHUs with EC FanGrids

## EQUIPMENT AND INFRASTRUCTURE ENERGY MANAGEMENT

### Queen Alia International Airport
### Heating, Cooling Systems Improvement

As QAIA's Airport Operator, 93% of CO2 emission sources originate from scope2, accordingly, since 2014 AIG worked on implementing energy efficiency projects to reduce CO2 emissions, it is worth to mention that during 2014 - 2019, the overall CO2 reduction from scope2 was -21%.

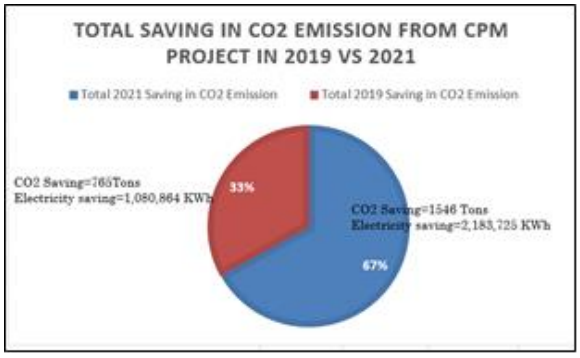
One of the major projects that AIG worked on was "Improvement of Heating & Cooling Systems at QAIA", the project planning started in 2018, to include two phases:

1. Introducing a Chiller Plant Management software: Implementing a smarter control over the chillers loading based on outdoor temperature/humidity conditions and building cooling loads, the implementation of this project started in Q1-2018, and was completed in Q1-2019, during 2019, the CO2 emission from chillers energy consumptions reduced -15% (the baseline year 2018), in addition, to a cost saving of around JOD,144,835JD in the same year.
2. Decommissioning of Central Utility Plant (CUP): Before 2013, the chillers & boilers at CUP were serving the terminal building & other buildings such as cargo hangar, investment building etc., and after completion of the new terminal building constructions in Aug 2016, a majority of the load on CUP have been disconnected. Accordingly, the boilers and chillers were operating below their full capacity taking in consideration that the chilled and hot water networks were deteriorating with several leakages and required high maintenance. In late 2019, as planned the works commenced in decommissioning/decentralising the CUP to reduce the consumption of electricity/fuel and maintenance costs. Due to COVID-19, the project was postponed till 2021 Q1 to be concluded in Q3 2021.

   The estimated reduction of CO2 from the chiller's energy consumption in the CUP in 2021 compared to 2019 (excluding 2020 data) was -96% in addition to, zero fuel consumption from boilers operation at CUP which

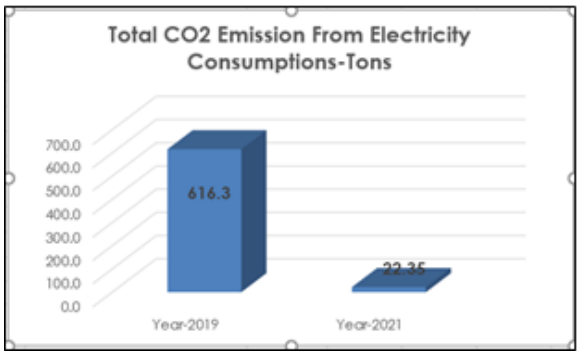
reduced the CO2 emissions to zero (-100%) compared to 2019 fuel consumptions data.

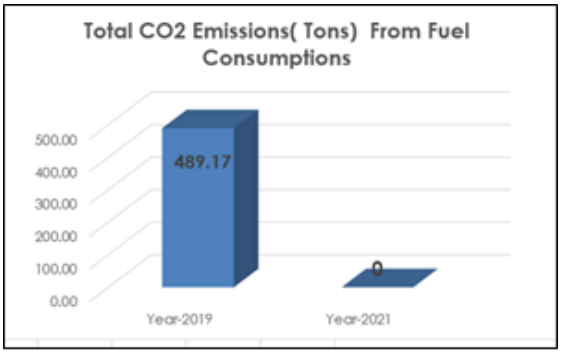
## Project Graphic




The Weather FACTS – a predictive control system for air-conditioning commenced operation in 2021

The Weather FACTS is applied in the new energy-efficient chiller system at Terminal 1




CUP decentralisation - CO2 emission saving from electricity consumptions

CUP decentralization - CO2 emission saving from fuel consumptions

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

Chhatrapati Shivaji
INTERNATIONAL AIRPORT
MUMBAI

### Chhatrapati Shivaji Maharaj International Airport
### Enhancement in Renewable Energy to Reduce Carbon Emission

Mumbai International Airport Limited (MIAL) is committed to reducing its Green House Gases (GHG) emissions to be in line with IPCC 1.5oC or 2oC pathways to become Net Zero by means of optimising its operations and implementing energy initiatives to reduce carbon footprint. MIAL understand and accept its responsibility toward climate change along with sustainable business development and therefore, implemented various energy conservation initiatives aggressively in the last few years. The installation of rooftop solar power panels for enhancing the consumption of renewable energy over non-renewable source power supply has been significantly marked by MIAL.

MIAL is one of the airport operators in India to implement a comprehensive Carbon Accounting Management System (CAMS) in line with ISO 14064-1:2006 and maintained the certification year-on-year at Chhatrapati Shivaji Maharaj International Airport (CSMIA). Furthermore, MIAL focuses on the conservation of energy, increasing the share of renewable energy and optimising the use of energy during operations, through the implementation of an Energy Management system based on ISO 50001 standard.

MIAL is annually maintaining Scope1, 2, and 3 carbon emission incentivisation and is periodically audited for improvisation. We communicate our emission inventory to stakeholders as part of the Sustainability Report along with Economic, Environmental and Social performances. MIAL has taken up a long-term target to achieve a 25% reduction per passenger in its own GHG emissions.

MIAL has always been proactive in implementing energy saving measures like replacement of conventional lights with LED lights, optimisation of HVAC and AHU operations, replacement of Aluminium blade of cooling tower fan with FRP fan blade, Building Management system, Chiller Management System, online water treatment system for chilled as well as condensate water, VFD for motors, Lighting control and monitoring system, timers for street lights, replacement of newly timer to a smart timer, old cooling tower nozzle with newly designed nozzles, installation of the in-situ renewable energy system, etc.

## Project Graphic

BUREAU VERITAS
Certification

*Greenhouse Gases Verification Statement*
*For*

**MUMBAI INTERNATIONAL AIRPORT LTD.**

Chhatrapati Shivaji International Airport
Terminal - 1B, 1st Floor, Santacruz (East), Mumbai – 400 099, Maharashtra, India.

**For Organization Boundaries**

1. Terminal 1(Domestic Terminals 1A+ 1B),
2. Terminal 2 (New Integrated Terminal + Elevated Road + Chhatrapati Shivaji Smarak),
3. Corporate Aviation (CA) Terminal,
4. Cargo Terminal,
5. Sewage Treatment Plants (STP),
6. Airside Operations (Aircraft Landing / Takeoff Operations + CCR + Aircraft Ground movement)

*Bureau Veritas (India) Private Limited (Certification Business) has carried out the verification of the quantification of Greenhouse Gas emissions of the above organization as per ISO 14064-3:2006. The Greenhouse Gas emission quantification and reporting is found to be in accordance with the requirements of the standard detailed below*

*STANDARD*

**ISO 14064 - 1: 2006**

*SCOPE OF VERIFICATION*

**Greenhouse Gas emissions and removals:**

| | |
|---|---|
| Direct Emissions | : 4015.09 $tCO_2e$ |
| Energy Indirect Emissions | : 98129.46 $tCO_2e$ |
| Other Indirect Emissions | : 422515.40 $tCO_2e$ |
| GHG Sinks | : Nil |
| Emission due to Biomass Combustion | : Nil |

Reporting year: 1st April 2017 to 31st March 2018
Level of Assurance: REASONABLE

VERIFICATION REPORT REFERENCE: INDIA-VER/13.50/2018 rev. 1.2

*To check this certificate validity please call:* +91 22 6274 2000

*Further clarifications regarding the scope of this verification statement and the applicability of the ISO 14064-1:2006 requirements may be obtained by consulting the organization.*

*Certificate Number :* IND18.1071 *Date:* 14 June 2018

*Ramesh KOREGAVE*
*Director, CERTIFICATION*
*South Asia Region*

*Certification / Managing Office Address: Bureau Veritas (India) Private Limited (Certification Business) 72 Business Park, Marol Industrial Area, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India.*

ISO 14064-1 certificate | Rooftop solar installation at airport

DNV

MANAGEMENT SYSTEM CERTIFICATE

Certificate no.: 10000359950-MSC-RvA-IND | Initial certification date: 26 May 2015 | Valid: 26 May 2021 – 25 May 2024

This is to certify that the management system of
**Mumbai International Airport Limited**
Chhatrapati Shivaji Maharaj International Airport,Mumbai - 400 099, Maharashtra, India

has been found to conform to the Energy Management System standard:
**ISO 50001:2018**

This certificate is valid for the following scope:
**Operation, maintenance and security of terminals, operational areas & cargo complex at C.S.M.I. Airport, Mumbai.**

Place and date: Barendrecht, 29 June 2021

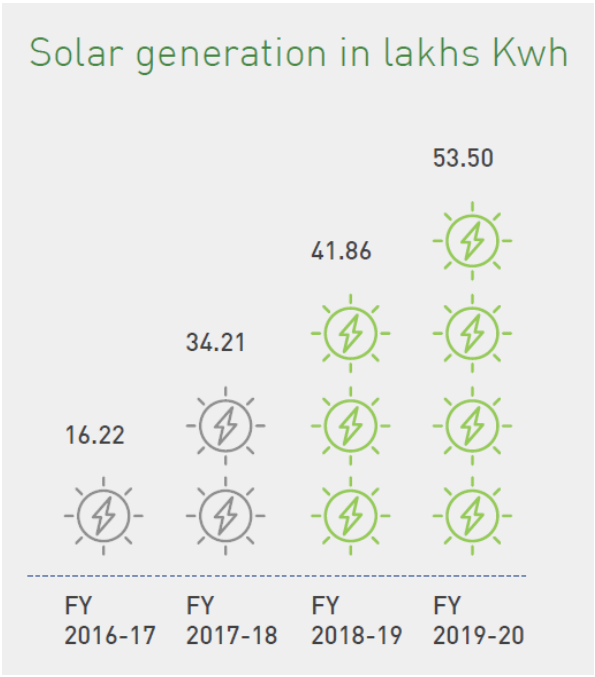
For the issuing office: DNV - Business Assurance, Zwolseweg 1, 2994 LB Barendrecht, Netherlands

MGMT. SYS. RvA C 014

IAF

Eric Kwak
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV Business Assurance B.V., Zwolseweg 1, 2994 LB, Barendrecht, Netherlands - TEL: +31(0)102922689 - www.dnv.com/assurance




ISO 50001 certification | Solar power generation

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

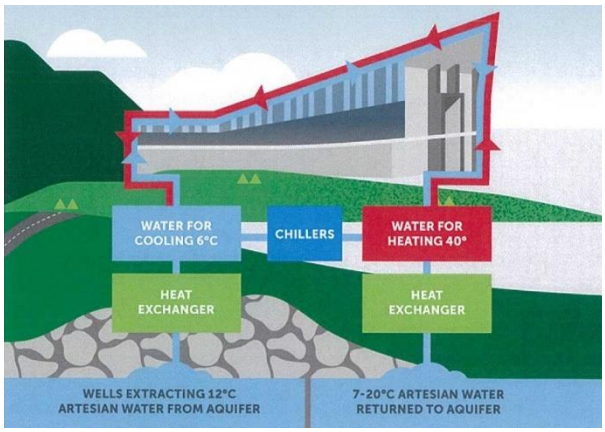
**Christchurch International Airport**
**Innovation and Aquifers**

At the heart of its sustainability strategy is the Maori concept of Kaitiakitanga – responsibility, care and guardianship for our natural environment and future generations. To guide the work, Christchurch International Airport developed a Green Transition Plan (GTP), benchmarked against global airport best practices, and driven by science-based reduction targets, aligned with ACA Level 4. The key GTP project involved the replacement of diesel boilers with a clean ground source heating and cooling system, resulting in 83% reduction in CO2e, and significant cost savings. Christchurch Airport pioneered the use innovative of ground source heat systems (GSHP) in New Zealand, which has subsequently been shared with others in the region to enhance the wider regions decarbonisation.

GSHP works by harnessing the artesian water flowing underneath Christchurch to both heat and cool Christchurch's entire terminal building. The artesian water has a consistent year-round temperature of 12°C, lending itself well to a heat pump-type system. Once extracted, the artesian water passes through heat exchangers that increase or decrease the water's temperature to extract or reject heat energy. Cooling the water provides heating to the building (by extracting heat energy), while heating the water provides cooling to the building (by rejecting heat energy). When conditions suit, this equipment can be bypassed to further enhance performance. The heat exchangers create a physical separation between the artesian water and the building's water supply to eliminate the risk of contamination of the artesian water. Afterwards, the water is returned in the same condition it was taken (with only the temperature altered).

The installation of our GSHP system has allowed the airport to decommission the terminal diesel boilers. During the 12 months since its installation in November 2019, the airport has seen a reduction of 982 tCO2e, this equates to 83% reduction in our Scope 1 emissions.

## Project Graphic




Ground source heat pump diagram

Ground source heat pump in our International Terminal Building


Christchurch Airport living wall


Christchurch Airport Senior Project Manager Mike Parker, and General Manager for Sustainability and Planning Nick Flack

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

**Darwin International Airport**
**Aerobridge and Apron Upgrades**

As early adopters of large scale solar in 2011, and with ongoing investment in ground-based and rooftop solar projects, NT Airports' renewable energy generation has achieved significant cost savings and emissions reductions. NT Airports is leveraging value from its renewable energy investments through seizing emerging market opportunities brought about by stakeholders wishing to reduce emissions and energy costs. For NT Airports, the emerging shared challenges of climate change have brought stakeholders together and been a driver for strengthening strategic partnerships with government and business.

The installation of electric ground power units (eGPU) and pre-conditioned air (PCA) units was undertaken as a new project when replacing an apron and aerobridge, with three more bays with PCA and eGSE to follow on from these works. This new infrastructure is powered predominantly from solar energy which has grown recently in capacity through the investment in five commercial scale rooftop solar projects across DIA, totalling 5.8MW.

A science-based emissions tool is used to track the emissions reductions of the solar projects and manage the progress of NT Airport's emissions reduction target of net zero scope 1 and 2 emissions by 2030.

## Project Graphic


Article in Northern Territory Business Magazine

Completion of Bay 2 apron, aerobridge and Pre-conditioned Air December2021

Solar system on cold store Facility 2021

Recently installed preconditioned air unit Bay 2 – November 2021

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

**Hawke's Bay Airport**

**Hawkes Bay Airport's 100% Renewable Carbon Zero Electricity**

In 2020, Hawkes Bay Airport's switched its electricity supply to Ecotricity, New Zealand's only provider of 100% renewable and carbon zero certified electricity. Ecotricity sources renewable energy from three hydro dams, the Flat Hill Wind Farm and its solar customers who export electricity to the grid. All greenhouse gases associated with the full lifecycle of these generation sources are measured in accordance with the United Nations Product Protocols. Any remaining emissions that can't be avoided are offset by purchasing verified carbon credits, using only New Zealand Native Bush Carbon Credits, making Ecotricity not only carbon neutral but supporting New Zealand's biodiversity.

This procurement decision has achieved a 99% reduction in HBAL's Scope 1 and 2 carbon emissions, using a market-based approach. It has also contributed a 40% reduction in Scope 3 carbon emissions, by supplying green electricity to its tenants and stakeholders across the airport site.

Having a 100% renewable electricity supply has enabled HBAL to decarbonise and electrify its operations including:

- Electric airline ground support equipment
- Electric and hybrid airside operations vehicles
- Electricity providing ground power to aircraft
- Electric cooking appliances in cafés, kitchens and airline lounge
- Heating and air conditioning in the new terminal via efficient electric heat pump technology
- All hot water for bathrooms and kitchens is generated via electric hot water cylinders

Our new terminal opened in August 2021 and is proudly 100% fossil fuel free.

HBAL also recognises that simply switching to a green electricity supplier doesn't mean we can use as much electricity as we like. Energy efficiency and avoiding non-essential energy are key areas of focus, as we continue to reduce our absolute carbon emissions in line with our company commitment to reach net zero carbon emissions by 2030.

## Project Graphic

Electric ground power units

Electric ground support equipment


Ecotricity's wind farm generation


Hybrid electric airside vehicles

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

**Kempegowda International Airport**
**ZERO Scope 2 Emissions at BIAL**

Kempegowda International Airport, Bengaluru (KIAB) is one of the fastest-growing airports in the world with an annual footfall of over 33 million passengers (2019-20, pre-COVID) but has also built a reputation for its sustainability initiatives.

KIAB's Sustainability Vision: Touch lives by nurturing a sustainable future through initiatives that drive economic, social and environmental transformation.

KIAB's sustainability roadmap 2030 is built on six key pillars, which include Net Zero Carbon Emission by 2030. Through our actions, the airport has demonstrated their responsibility towards climate action and goals while adhering to industry standards. This includes ensuring meticulous monitoring of all our operations and energy utilised by our community members.

KIAB had completed the project in November 2020. From December 2020, through:

- Onsite Power Purchase Agreement Model Solar installation
- Offsite Solar electricity generation
- Offsite Wind electricity generation

KIAB is consuming 100% renewable electricity for the airport operations, ensuring the elimination of > 50000 MT of Carbon Emissions per annum (Only exception – A few days our offsite facility did not produce electricity due to floods caused by unprecedented rains)

Management Vision for the Sustainable Future had propelled the airport to conceptualise this project. The application of the project and the integrated multipronged approach makes it unique. KIAB had faced the following challenges and the team successfully navigated the headwinds, crosswinds in accomplishing the project:

- Statutory approvals with regard to aviation – Director General of Civil Aviation (DGCA) / Airport Authority of India (AAI)
- Daily work approval from the airport environment

- Glare Analysis to evaluate aircraft as well ATC safety requirements
- Availability of adequate offsite projects to meet the electricity demand
- Rooftop Onsite work without operation interruptions
- Statutory regulations of the Electricity distribution and government authorities

Post achieving Zero Scope 2 emissions through a 100% renewable electricity consumption route, now KIAB has publicly committed and working towards achieving Net Zero Carbon Emissions by 2030.

## Project Graphic

Onsite solar installation (airport office)

Offsite wind power

Onsite solar installation (airside ground mounted)

Offsite solar installation

## ONSITE GENERATION OR PURCHASE AGREEMENT OF RENEWABLE ENERGY

### Kuala Lumpur International Airport

### Embracing Green Energy of Ground Power Unit (GPU) for Sustainable Carbon Management

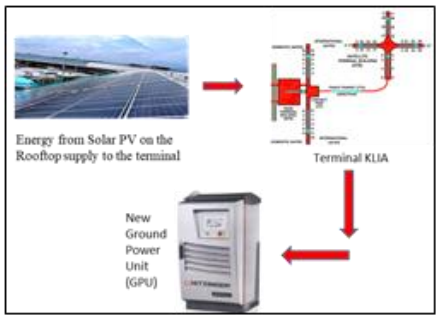
Malaysia Airports Holdings Berhad (MAHB) is committed to upholding our vision and strongly supports carbon emission reduction and climate change initiatives at airports. Energy and environmental policies have been established with the main objective of reducing energy and carbon emissions. The Environmental Strategy Roadmap (ESR) 2016-2020 focused on the execution plan to reduce carbon emissions with a 9% carbon reduction target by 2020 with 2016 as the baseline. MAHB has achieved a total cumulative of 23% carbon reduction in 2020 through the initiatives implemented at the airports. The purpose of this project is to reduce carbon emissions and dependency on diesel fuel while supporting the MAHB's Energy and Environmental Policy in line with the National target of 45% carbon reduction by 2030 and commitment to becoming a carbon-neutral nation by 2050.

Due diligence studies showed that the Diesel Mobile Ground Power Unit (GPU) consumes diesel fuel which emits high carbon emissions when generating electricity power for aircraft at an apron. Several discussions and awareness were conducted with airlines such as Malaysia Airlines and Malindo on the commitment to migrate from Diesel Mobile GPU to the new installation of GPU systems at airports.

Management has approved the 81 units of the GPU Frequency Converter to be installed with the 2 phases of implementation. The first phase, 19 units were installed from 2017 to May 2018, which contributed to a 788 tCO2 reduction. The second phase, with 62 units planned to be installed in 2024 that will contribute to a 2,443tCO2 reduction. Through this initiative, KLIA also can reduce the spillage of diesel from mobile GPU that would damage the apron surface, land, and water contamination to the environment.

In total 1,970tCO2 reduction from 2018 till 2020 is equivalent to 4% of the total 23% of the ESR roadmap achievement.

## Project Graphic





| Integration terminal green energy source (Solar PV) and new GPU | Installation of new GPU |
|---|---|


| GPU utilisation by aircraft and reduction of APU operation | Discussion with airlines and operation team |
|---|---|

## BASKET OF MEASURES

### Indira Gandhi International Airport
### Clean Energy Program (CEP) to Achieve Net Zero Carbon Emission Target - Delhi Airport

Climate change is a global challenge requiring an urgent global response. Countries are working towards climate change mitigation by adopting Net Zero commitments. Government of India has also committed to achieving net zero by 2070. Key Aviation stakeholders with ACI made a long-term goal as "ACI member airports at a global level commit to reach net zero emissions by 2050 and urge governments to provide the necessary support in this endeavour" in 2021.

To support this, Delhi International Airport Limited (DIAL) has adopted Carbon Management System in line with UNFCCC objectives in 2010. DIAL also adopted Airport Carbon Accreditation Programme in 2012 and currently is at Level 4+ "Transition", (highest level). In 2021, DIAL committed to becoming Net Zero Carbon Emission Airport (NZCEA) by 2030, with initiatives such as Energy Efficiency, Green Infrastructures, Clean Energy Programmes, Operational Excellence, Airlines Programmes, Green Transportation Programmes and Carbon Sink Actions.

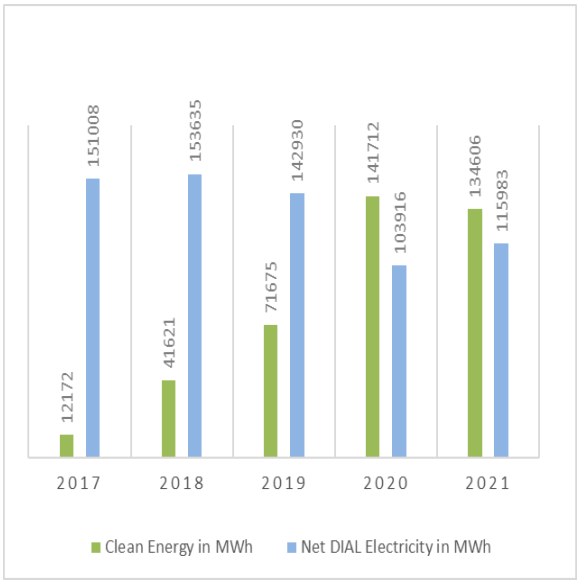
At IGIA, Scope 1 and Scope 2 contribution is ~3% and ~97% respectively, excluding scope 3 emission, one of the key initiatives in the NZCEA is the early adoption of the "Clean Energy Programme" (CEP) and reducing the scope 2 emission to zero. To execute this, a Cross Functional Team (CFT) with members from Engineering, Finance, Legal and Environment was formed.

As the capacity of the onsite solar plant could not be increased beyond 7.84 MW, the CFT explored other opportunities to increase the share of clean energy. The team reviewed policy opportunities, technical and infrastructure feasibility, cost economics and finalised procurement of renewable energy (RE) through the Open Access Mechanism in 2017. DIAL also incurred about ₹ 8 million for infrastructural upgrades.

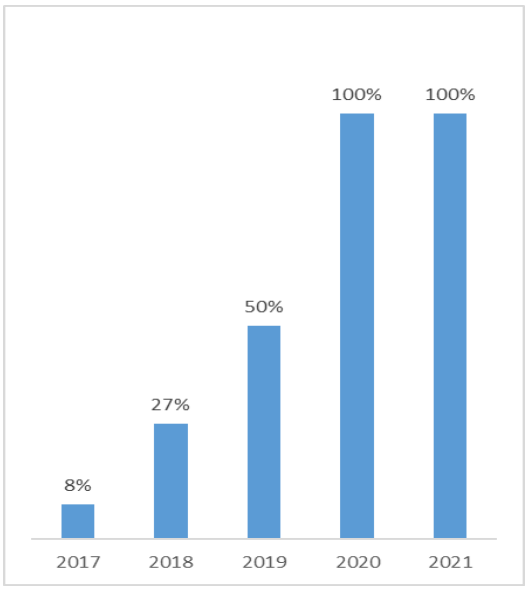
DIAL has procured 401787MWh of clean energy and reduced scope 2 emissions by 329465tCO2 between August2017 to November 2021. In CY2020

net electricity consumption of the airport was met through CEP and the scope 2 emission was zero.

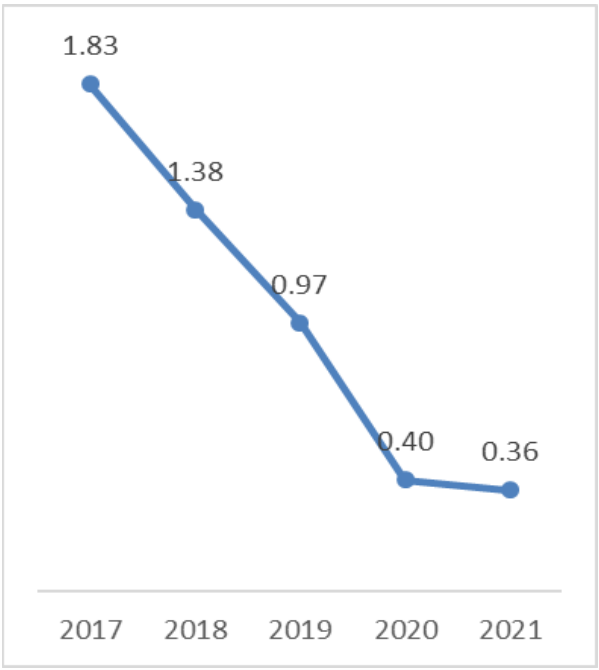
## Project Graphic



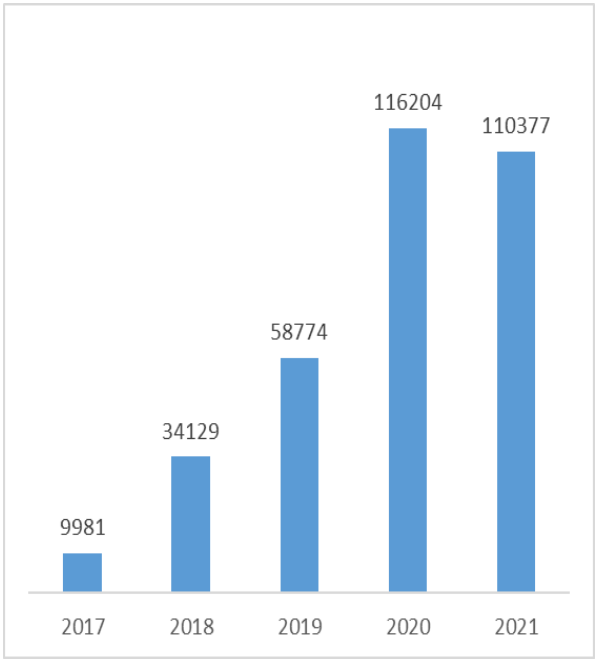

Net electricity (MWh) of DIAL and clean energy (MWh)




Share of Clean Energy as a % in net electricity consumption of DIAL




Specific GHG emission of IGIA (Scope 1 +2) (kgCO2/Pax)




Emission reduction achieved through clean energy (tCO2)

## BASKET OF MEASURES

### Kaohsiung International Airport
### Airport Full Scope Carbon Reduction

Kaohsiung International Airport (KHH) had set a long-term energy reduction goal to contribute to carbon emission control since 2014, which is reducing the quantity of electricity used by 1% every year.

In line with the energy reduction goal, KHH further launched its Airport Full Scope Carbon Reduction Project to enhance its overall carbon management in 2017. The project was executed in two different operating boundaries below:

The first boundary is within KHH itself, which is targeting its Scope 1 and Scope 2 emission. Strategies for the first boundary include:

- Yearly ISO 14064 and ACA Level 3 verification – KHH performed yearly GHG emission accounting to ensure continuously monitoring, reporting and enhancement of GHG emission management.
- Energy Efficient Facility – KHH had gradually replaced old equipment or retrofitted new equipment with energy saving products, such as the addition of an electric vehicle charging station and changing lightbulb and air conditioning systems into an energy saving model.
- Fuel Saving Facility – KHH provides the addition of 50 bicycle parking space and execute the public transfer commuting every third week of the month policy.

Overall, the first boundary has reduced a total of 1,413 tons of CO2e emission/year from 2017 to 2019.

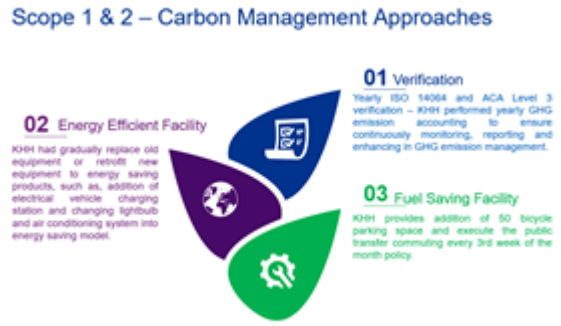
The second boundary is outside of the KHH operation, which is targeting its Scope 3 emission. Strategies for the second boundary include:

- In 2018, KHH approaches all companies in their value chain. Together with KHH, 27 companies made a carbon reduction commitment to further enhance KHH's carbon reduction project's scope. These companies not only have to align their operation with KHH's first boundary strategies but also reduce the APU usage if they are airline providers.

Overall, the second boundary has reduced a total of 30,807 tons of CO2e emission/year from 2018 to 2019.

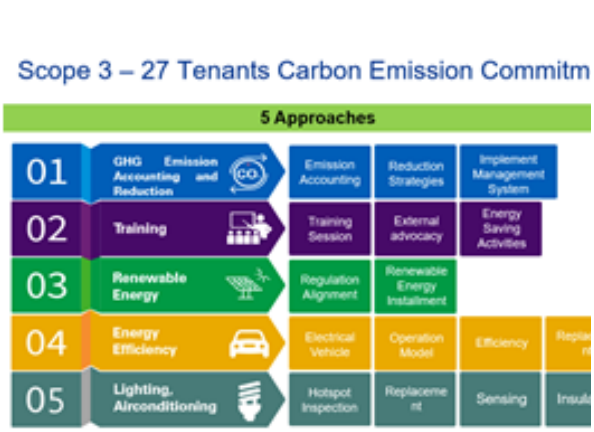
(The year 2020 is not included because due to COVID energy usage has dramatically decreased.)

## Project Graphic





| Scope 1 & 2 carbon management | GHG emission accounting verification |
|---|---|





| Scope 3 commitments | Promoting Carbon Management |
|---|---|

## BASKET OF MEASURES

### Rajiv Gandhi International Airport
### Sustainable Airport Operations for Efficient Carbon Management and Effective Reduction

Global industrialisation has enhanced human life, but extensive burning of fossil fuels caused emissions of carbon enormously. Consequently, there is a change in the composition of atmospheric gases and this phenomenon causes an increase in the earth's surface temperature and leads to climate change. In these circumstances, there is a risk to the existence of humans including other life on the mother earth, if climate action is not initiated immediately.

At Rajiv Gandhi International Airport (RGIA), GMR Hyderabad International Airport Limited (GHIAL) along with its stakeholders, has been adopting environmental protection as its core operating principle through sustainable airport operations.

To contribute to the ICAO's environmental goal of "limit or reduce the Impact of Aviation Greenhouse Gas Emissions (GHG) on the Global Climate", RGIA has implemented the following:

- Green buildings
- Eco-friendly refrigerants use and fuel conservation
- Renewable energy use
- Energy conservation
- Fuel-efficient aircraft and ground support operations
- Green belt development – carbon sinking
- GHG emissions management and carbon neutrality

These practices reduced carbon emissions during 2017-2021 despite of pax growth:

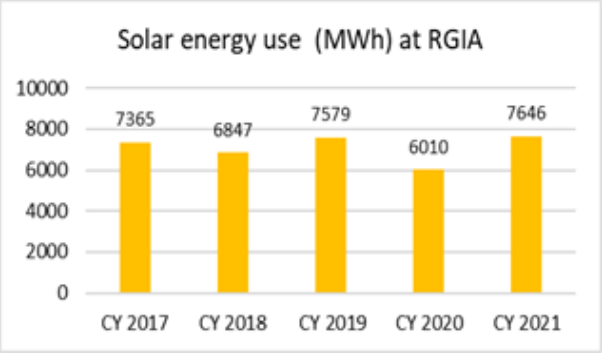
- Scope 1: Fuel, fire drills, and refrigerant source emissions reduced 461 tCO2e.
- Scope 2: solar energy saved 28999 tCO2e and energy-efficient operations reduced 6905tCO2e (tonnes CO2 equivalent).
- Scope 3: Aircraft single-engine taxing, FEGP use & solar GSE reduced 69983 tCO2e.

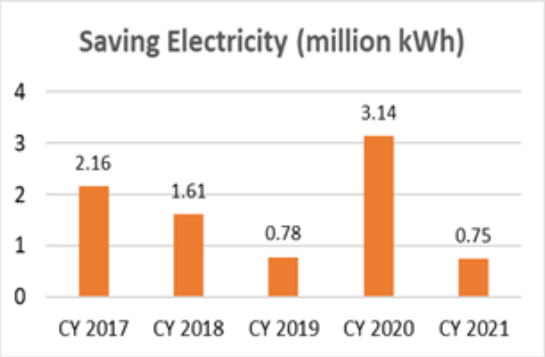
- Carbon sink: the vegetation absorbed 3408 tCO2e.

RGIA's Carbon Management is aligned with the United Nations Sustainable Development Goal 13: Climate action – Take Urgent action to combat climate change and its impacts.

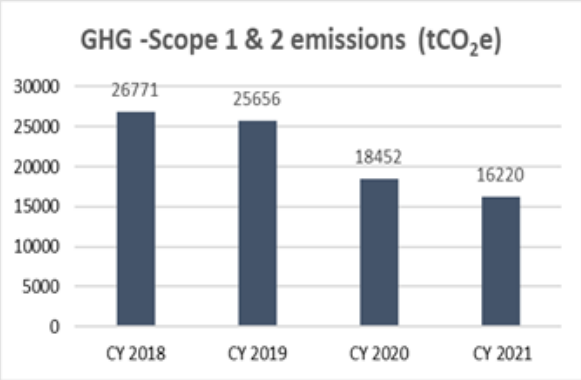
GHIAL, along with stakeholders, jointly initiated a strategy to become a carbon neutral airport. Subsequently, RGIA has adopted the ACI's "Airport Carbon Accreditation" programme = to become carbon neutral and the Level3+ which is renewed until 2023. In this journey, RGIA is aiming to achieve Level 4+ and to become a "Net Zero Carbon Emission Airport" by 2050.

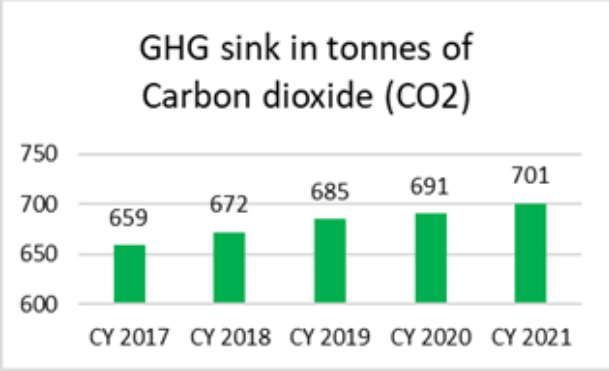
## Project Graphic




| Solar power plant (10 MWp) at RGI Airport | Energy conservation results |
|---|---|




| Carbon emission trend chart | GHG sink through green cover at RGIA |
|---|---|

## BASKET OF MEASURES

桃園國際機場股份有限公司
Taoyuan International Airport Corporation Ltd.

### Taoyuan International Airport
### Lean Power Consumption and Carbon Reduction Project

The COVID-19 pandemic has affected airport operations in recent while. However, Taoyuan International Airport has not slowed down its commitment on carbon reduction. The Lean Power Consumption and Carbon Reduction Project", which contains three action plans as follows, was proposed during the COVID-19 pandemic help further evaluate carbon reduction traces in anticipation of zero emissions by 2050.

1. Adjustment of operational strategies:
    - In response to the drastic reduction in passenger traffic, Taoyuan International Airport aggressively adjusted airport operational strategies and implemented the following measures: terminal entrances were reduced from 70 to 26, 15 lounges were closed and business service facilities were reduced by up to 50%.
    - To cooperate with the preceding service scale reduction, the operational strategies regarding lighting, air conditioning, automatic doors and elevators in closed and low-intensity use areas were flexibly adjusted.
2. Replacement of significant energy consumption equipment:
    - Indoor and outdoor lighting systems in the airport were fully replaced by LED power-saving lamps; a total of 24,800 lamps were replaced.
    - Chillers and AHUs were replaced with highly efficient equipment. Furthermore, the equipment monitoring system was updated to precisely measure energy efficiency and operations, as well as dynamically adjust the demand and supply of air conditioning.
    - A smart inverter and sensing control system was added to 28 escalators to reduce power consumption during off-peak periods. Meanwhile, 12 oil hydraulic elevators were replaced by energy-efficient elevators.
3. Renewable energy
    - Solar photovoltaic energy system was installed on the roof of terminal 2 and the area leased by business partners, with a total capacity of 450kW.

- Established a green port-related industrial team with the government, focusing on vehicle electrification, energy storage technology, offshore wind power, etc., to formulate national low-carbon strategies and measures.

## Project Graphic


| Smart sensor power saving escalators | LED lamps |
|---|---|


| Trophy of the 20th Public Construction Golden Quality Award | Carbon reduction performance |
|---|---|

## BASKET OF MEASURES

HANEDA Tokyo International Airport

### Tokyo (Haneda) International Airport
### CO2 Reduction Programme for Haneda Airport Passenger Terminal

As part of its efforts to address environmental issues, Tokyo (Haneda) International Airport has been working to reduce CO2 emissions from the passenger terminal buildings by setting specific numerical targets, and they have achieved these targets in the past years. For these coming years, the airport will promote plans to reduce CO2 emission by 46% by 2030 (compared to 2013), which is the government's target, and carbon neutrality by 2050.

At the same time, the Tokyo Metropolitan Government has already achieved the amount of emission reductions required under the "Total Greenhouse Gas Emission Reduction Obligation" imposed on large business establishments in the past planning periods, and is working to achieve this goal in 2030, the final year of the plan.

Furthermore, Haneda Airport has been selected by the Ministry of Land, Infrastructure, Transport and Tourism as one of the priority study airports to promote specific studies for the decarbonisation of airports. The Tokyo International Airport Eco Airport Council, which consists of members of Haneda Airport's aviation-related companies, is planning to compile these results in the future, and Japan Airport Terminal Co., Ltd. as a member of this council, are striving to realise carbon neutrality by 2050.

The project was delivered with 4 main initiatives:

- The first initiative was changing the lighting within the terminal building to LED lights. The floor lighting was converted to LED lighting when maintenance works were held before new tenants moved into the rental office space. Some of the lighting for signage and information signs were converted to LED lighting.
- The second initiative was installing inverters. Inverters were installed in the current air conditioning unit.
- The third initiative was implementing functions, which correspond to electricity reduction, in the newly constructed areas. Functions installed were controlling lighting by installing motion sensors and daylight sensors, implementing Low-E glasses, and cool-bit hats.

- Another initiative was applying shading film on glass windows to shield less sunlight.

As a result of the initiatives, a reduction of 26% of electricity consumption was witnessed. The average electricity usage 146,000,000kWh , from 2005 to 2007, has decreased to 108,000,000 kWh in an average from 2015 to 2019.

## Project Graphic

Converting lightings to LED at arrival lobby

Controlling lighting by installing lightings with motion sensors


Signs converted to LED lightings

Installing air conditioning unit

## OTHERS

### Cairns Airport
### Source Separated Organic Waste

Better waste management infrastructure processes were incorporated into Cairns Airport's domestic terminal redevelopment project, to achieve environmental and social outcomes including the reduction of greenhouse gas emissions.

Cairns Airport was one of the first Australian airports to purchase and install an industrial food waste macerator, custom-built food waste separation bins, and compostable coffee cup repurposing. Retail tenancy agreements, community partnerships and terminal advertising enabled the separation of food waste at the source, keeping it out of the landfill. Instead of being an emissions source, the food waste is used by the community as a resource to grow more food.

Despite challenges presented by the COVID-19 passenger downturn, revenue loss and community grouping restrictions, this programme has been successful. Now that the infrastructure and processes are in place, a high portion of organic waste generated in the airport's administration building and the domestic terminal is being diverted from landfills for community composting. The volume of compostable waste generated each week varies with operational fluctuations. An average of 240kg of coffee grounds, 1000kg of food waste, and 100 compostable coffee cups were diverted from landfills each week throughout 2021, reducing the airport's overall contribution to landfills and scope 3 greenhouse gas emissions. The project has also resulted in a waste disposal cost saving of $2354.00 since it commenced.

This programme is ongoing now that the infrastructure and processes are in place.

## Project Graphic


Community garden composting facility. Coffee grounds and macerated food waste pulp

Fresh produce grown at community gardens with the use of food waste generated by the programme


Custom made waste collection bins in the domestic terminal, including food waste for composting

Food waste macerator installed in the domestic terminal waste room and example of the food waste pulp that is produced by the machine

## OTHERS

### Kansai International Airport
### Setting a Long-term Target for Zero Greenhouse Gas Emissions

The Kansai Airport Group has been engaged in various activities to reduce the environment's burden at three airports in the Kansai region (Kansai International Airport, Osaka International Airport, and Kobe Airport). Considering the need to plan medium to long-term measures to achieve net-zero CO2 emissions by further reducing energy consumption and using renewable energy, Kansai Airport Group set a long-term target of net-zero greenhouse gas emissions by 2050, and announced it in March 2021.

Japan's global warming emission reduction targets at the beginning of 2020 were 28% in 2030 and 80% in 2050. Unfortunately, the effects of climate change have become more prominent year by year. According to IPCC Special Report 1.5° C, reducing the emission in 2030 by 45% compared to the 2010 level and net-zero in 2050 is necessary to keep the temperature rise within 1.5° C.

That is why Kansai Airport Group believes that the reduction target of the KAP Group must be net-zero by 2050, and has decided to work toward the formation of an internal consensus. Since 90% or more of the CO2 emission sources of Scope 1 and 2 of the KAP Group are from energy consumption, Kansai Airport Group chose to build its efforts based on the introduction of renewable energy and energy conservation strategies.

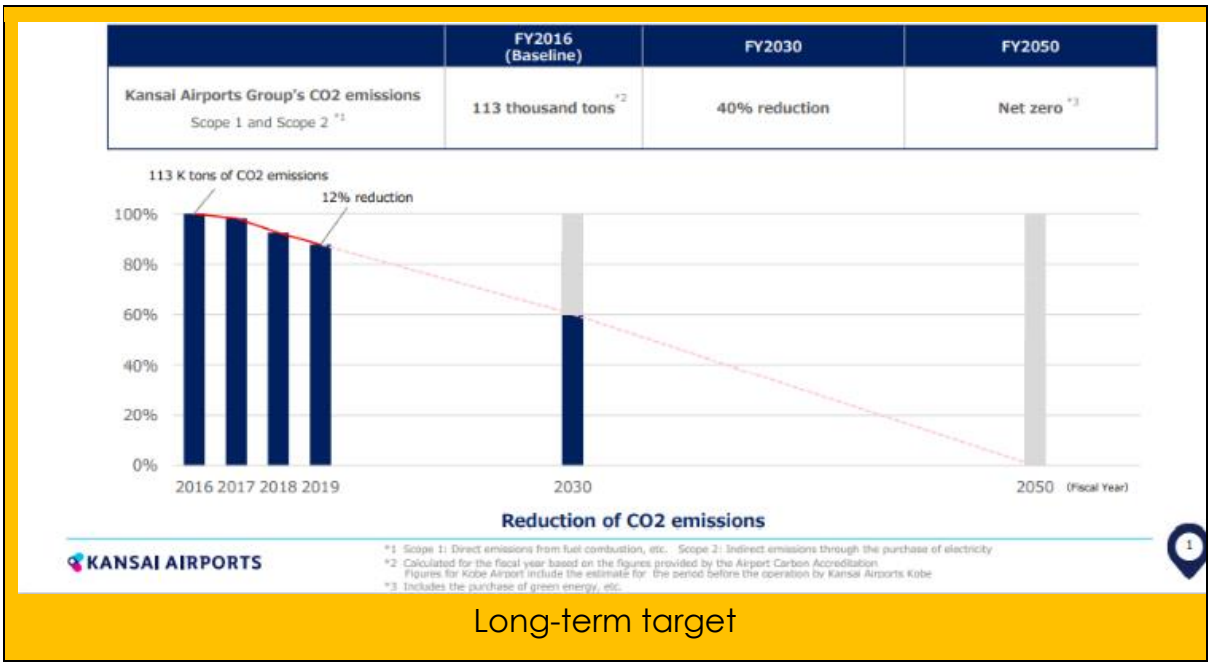
Our airports have been highly regarded as environment-conscious airports by other countries and companies, not only within Japan, as all three have received Level 4 (Transformation) certifications under the Airport Carbon Accreditation programme. The Kansai Airport Group is confident that it is now ready to reduce greenhouse gas emissions further.

The following points are the achievements of the project, which are supported by the acquisition of Level 4 (Transformation) of the Airport Carbon Accreditation programme.

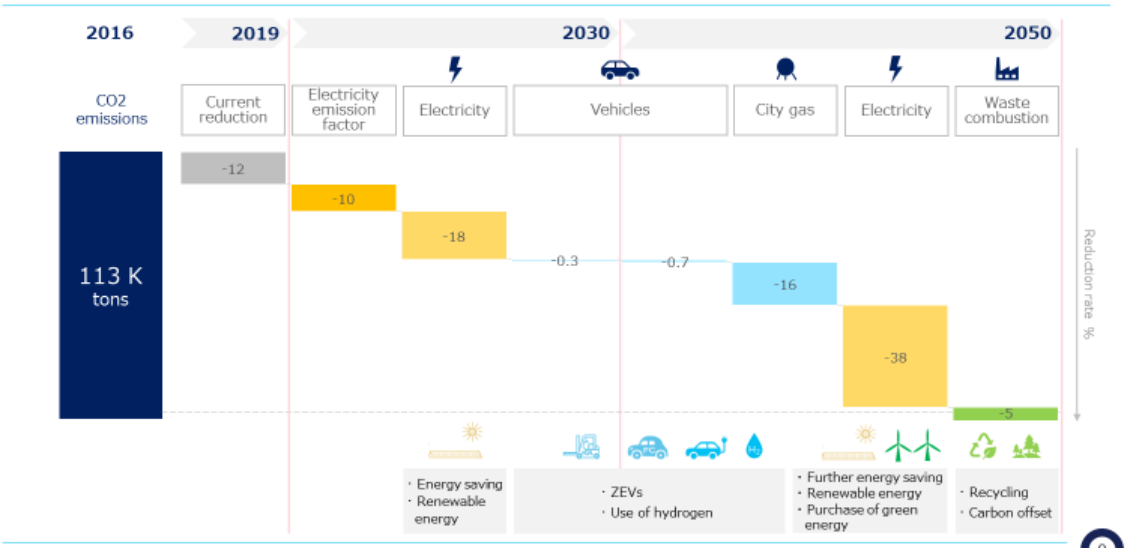
- The Group adopted the long-term target of net-zero greenhouse gas emissions not as a goal set by the Japanese government, but as a company policy in the form of our promise as the "Kansai Airport Environmental Declaration."

- To achieve the promise, we developed the project into an airport-wide initiative involving all airport-related business partners.

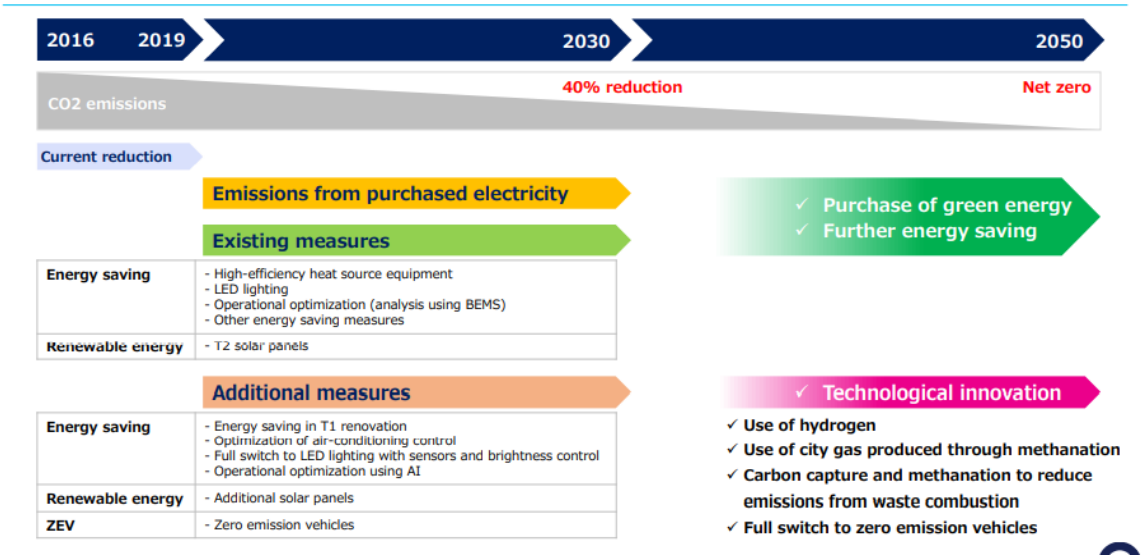
## Project Graphic




Long-term target




KAP Roadmap to net zero CO2 emissions




Roadmap to net zero CO2 emissions


Initiatives to date

## OTHERS

Muscat International Airport
Gateway To Beauty & Opportunity

### Muscat International Airport
### Establishment of Oman Airports Environmental Performance Committee (EPC) (Management Achievement)

As part of our Integrated Management System (IMS) 2.0 Road Map and the environmental initiatives, approved Energy Policy and the Environmental Integrated Management System, the airport has developed the terms of reference for the Environmental Performance Committee.

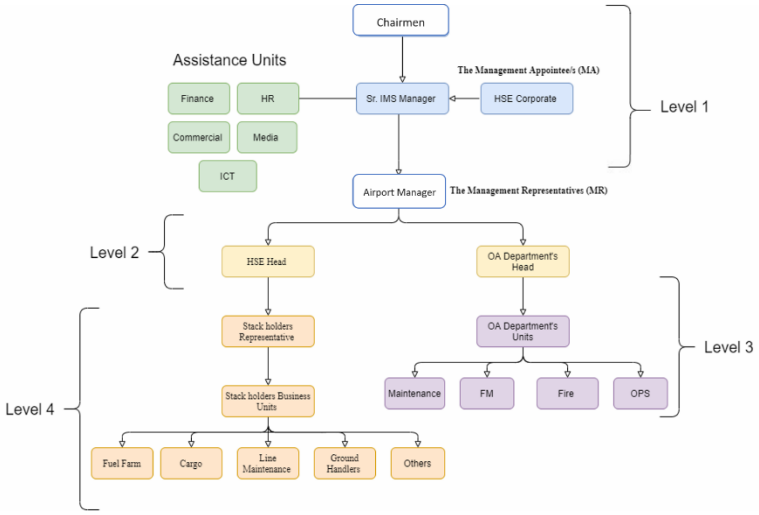
The IMS Department's main mandate is to develop and manage the Environmental and Energy Management systems requirements for all the activities/ operations that are associated with the Operations and Maintenance of the Oman Airports.

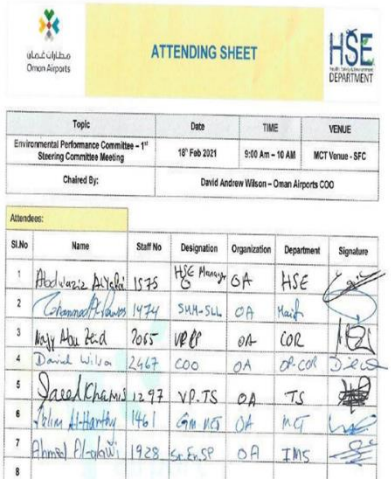
IMS Department is intended to operate and maintain an Environmental Integrated Management System (EIMS) confirming to ISO 14001: 2015, Energy Management System (EnMS) confirming to ISO 50001: 2011, Carbon Accreditation Program (ACA) confirming to Airport Council International (ACI), Waste Management Programme and others confirming to best international practice which all shall assist the organisation to achieve its strategic plan as for the environmental aspect.

In line with the above, and to ensure environmental compliance and centralisation and implementation of all environmental systems, projects and concerns and facilitating other environmental requirements and initiatives and fulfilment of all other legal requirements among all Oman Airports, OA established Oman Airports Environmental Performance Committee (EPC) which shall ensure integration of all environmental projects and initiatives in a systematic and integrated manner.

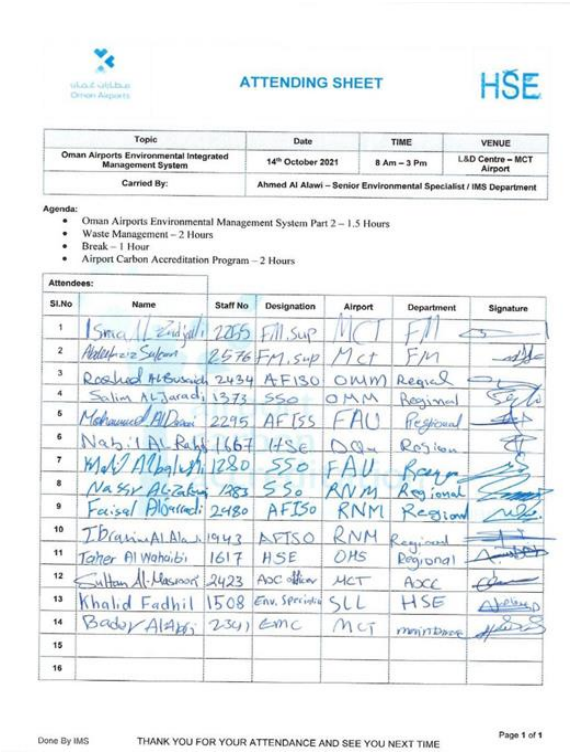
In order to fulfilment the structure of Oman Airports at all airports, the EPC has been designed to consist of 4 hierarchy levels structure, where each level has its own roles, responsibilities, and authorisations.

## Project Graphic




| EPC structure | Steering Committee MOM attendance sheet |
|---|---|


| Announcement of EPC internally by media | Attendance sheet of internal training and awareness programmes |
|---|---|

## OTHERS

**Siem Reap International Airport**
**The Trees Nursery**

Since 2000, Cambodia has committed to the United Nations Millennium Development Goals (MDGs).

In recent years, Cambodia has made considerable progress in many areas of human and social development, particularly due to its robust economic growth. However, the rapid expansion has put a strain on the national and local environments.

There is an increasing demand for timber, which is accompanied by unsustainable development that has a negative influence on the ecosystem and population. As a result, Cambodia has some of the world's highest rates of tropical deforestation.

This project is about combining the resources at the airport to grow trees so they can be distributed to our staff and planted at their property.

By establishing a nursery tree within the Airport compound, the following benefits have been assessed:

1. Environment civic engagement through raising awareness among airport employees and stakeholders about the environment, changing their environmental culture and impacting their own community.
2. Alternative source of social activity in relation to the environment with employees on the following objectives:
   - Improving knowledge,
   - Promotion and protection of natural assets and biodiversity,
   - Initiating and promoting a concrete action favouring the environment.
3. Corporate action for the environment.

By doing so, it will contribute to the airport's reputation by sharing the environmental concerns through this proactive activity.

Each beneficiary of the tree plants distribution will have to sign a moral agreement paper, within a leaflet format in which they will commit to taking

care of the donated trees and promoting environmental concerns in their community. There are about 30 different species of plants/trees and a year after we started the project there were already a hundred tree saplings available for distribution. The cost for maintenance is almost zero. There is no dedicated resource or staff to the tree nursery except for the initial setup of the space (fence, shade cover frame & net, garden hoses, seeds and some bags).

## Project Graphic

One of the airside gardens

Taking care of the tree nursery

The tree nursery, space for plants

Distribution of tree saplings on June 2021


**Airports Council International Asia-Pacific Region**

Unit 13, 2/F, HKIA Commercial Building,

Hong Kong International Airport, Hong Kong

ACI is a non-profit organisation whose prime purpose is to advance the interests of airports and to promote professional excellence in airport management and operations. As of January 2021, ACI serves 701 members operating 1933 airports in 183 countries. ACI Asia-Pacific has 131 members operating 617 airports in 49 countries and territories.