Green Airports
KLIA and klia2

ICAO International Aviation and Environment Seminar

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28th to 29th October 2014, Kuala Lumpur Concorde
Agenda for the Day

1. Global Industry Targets
2. Our National Indicators
3. Malaysia Airports Commitment
4. KLIA Going Green Since 1998
5. Now klia2 A Green Building
6. Our Environmental Plans Moving Forward
GLOBAL INDUSTRY TARGETS

<table>
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<tr>
<th>2010</th>
<th>2020</th>
<th>2050</th>
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<td>1.5% improvement in fuel efficiency</td>
<td>Cap emissions from 2020 for carbon neutral growth</td>
<td>50% reduction in net CO2 emissions over 2005 levels</td>
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<td>Working towards carbon neutral growth</td>
<td>Implementation of Global Sectoral approach</td>
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“Under ICAO’s leadership, aviation has produced the first, and to date, only globally-harmonized agreement designed to address climate change on a global basis from a specific sector and ICAO is in the best position to effectively and systematically address the impact of international aircraft emissions on climate change.”

ICAO President Roberto Kobeh González
17th December 2009 – Copenhagen, Denmark
“I would also like to announce here in Copenhagen that Malaysia is adopting an indicator of a voluntary reduction of up to 40% in terms of emission intensity of GDP by the year 2020 compared to 2005 levels. This indicator is conditional on receiving the transfer of technology and finance of adequate and effective levels from our Annex I partners…”
MALAYSIA AIRPORTS COMMITMENT

LOW CARBON GROWTH BY 2015
KUL, PEN, LGK, KCH, BKI

CARBON NEUTRAL GROWTH BY 2020
KUL, PEN, LGK, KCH, BKI
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6. OUR ENVIRONMENTAL PLANS MOVING FORWARD
Natural lighting in KLIA terminal building reducing the need for lighting during the day.
KLIA GOING GREEN SINCE 1998

MORE ENERGY INITIATIVES...

Switching off lightings and air-conditioners when not in use

ENERGY SAVINGS DEVICE (ESD)
- Average 39% monthly savings in consumption at installed locations
- Average reduction of 500 CER equivalent per month

Sensors in lighting, air-conditioner and walkalators
KLIA GOING GREEN SINCE 1998

WASTE MANAGEMENT INITIATIVES

Recycling bins at KLIA

Paperless travel with introduction of self-service kiosk and mobile check-in
KLIA GOING GREEN SINCE 1998

WATER MANAGEMENT INITIATIVES

Introduction of mandatory use of biodegradable detergent and cleaning material

Collection of rain water at 2 balancing ponds to allow sediments to settle before being channeled to nearby rivers
KLIA GOING GREEN SINCE 1998

2009 KLIA Carbon Footprint study

KLIA’S DIRECT EMISSIONS 2008/2009: 96,437 metric tonnes CO2-equivalent per year

Methodology: Green House Gas (GHG) Protocol

Verified by: PE International, 2010
KLIA GOING GREEN SINCE 1998

“Airport in a Forest, Forest in an Airport”

BIODIVERSITY AT THE HEART OF OUR BUSINESS

Late 2009, THE KLIA JUNGLE BOARDWALK was developed to offer passengers a refreshing experience of walking through a mini natural forest reserve.
KLIA GOING GREEN SINCE 1998

Launching of Malaysia Airports Sustainability Policy
KLIA GOING GREEN SINCE 1998

Annual GREEN DAY since 2011
Making HEADLINES

KLIA GOING GREEN SINCE 1998

Environment

W ith the Japanese architect Mikiya Kasahara won the bid to design Kuala Lumpur International Airport (KLIA) in 1998. It was also a wish to make Malaysia's national airport as integral part of the airport's very structure - to relate the building to its environment.

A founder of the "Metabolism Movement", an architectural school devoted to the idea that there is a symbiotic relationship between nature and architecture, Kasahara planned to integrate lush vegetation into the halls and terminal buildings of the new international airport.

KLIA was constructed on 1750 kilometers of watered land under the slogan "The airport in the forest" and a foundation on airport itself half a million trees were transplanted to the site and planted around the main terminal building.

At the newly established building complex, the "Satellite Forest" - complete with a waterfall - ensures that one of the first things that greets passengers as a soothing element of nature.

"A lot of thought has been put into the design of KLIA to incorporate as much of the environment as possible. This helps to harmonize nature, technology and human interaction," says Tan Sri Bashir Ahmad, managing director and CEO of Malaysia Airlines.

"A tree, for example, the roof of the airport's main terminal building. The roof is technologically designed to be flexible enough to withstand earthquakes, but when you gaze at it from inside it resembles the leaves of a palm tree," he says.

KLIA has won numerous awards for its environmental initiatives, including the Green Star Gold rating in 2004, which is the highest rating possible. The Green Star rating is based on the "Clean Air Program" principles of sustainable development agreed by the United Nations. The project was also given the "Best of the Best" award at the "Green Building" competition.

KLIA's environmental efforts have been recognized both nationally and internationally, with the airport being awarded the "Best Airport in Asia" by the Asian Airports Association in 2008.

The airport's environmental initiatives continue to evolve, with plans to install solar panels and wind turbines in the near future. KLIA is committed to reducing its carbon footprint and becoming the greenest airport in the world.
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klia2 GREEN BUILDING

LEED Classification
RATING POINTS

Platinum 80 and above
Gold 60-79
Silver 50-59
Certified 40-49

GBI Classification
RATING POINTS

Platinum 86 and above
Gold 76–85
SILVER 66–75
Certified 50–65

- It is beyond collecting points
- It’s a commitment of all parties, operator, stakeholders, commercial, towards being sustainable
- It is an overall holistic integration of many aspects
- It is a continuous and persistent effort to reach sustainable goals and work together
klia2 GREEN BUILDING

klia2 Airport Main Terminal Building
• Designed and planned as 30 percent more efficient than international standards, 50 percent more efficient than local standards

klia2 Retail Mall and Integrated Complex
• Designed as 15 percent more efficient than International standards, 25 percent more efficient than local standards
klia2 GREEN BUILDING

- Solid Waste Management Policy
- Recyclable waste storage facilities
- Recycle & Recyclable Building materials Certified Wood
- Rainwater harvesting for landscape irrigation
- Lighting Efficiency 25% more efficient than AHSRAE 90.1 Occupancy Sensors & Controls
- Roof Insulation and heat reflective materials
- Car park daylight sensor in perimeter zone
- Klia2 Main Terminal Building
- Klia2 Integrated Complex
- CO₂ ventilation strategy
- Low VOC Materials
- Efficient BMS to monitor breakdown of energy use
- Water-saving fixtures reduce use by more than 40%
- Heat recovery for all AHUs
- High Performance Low-e glass curtain wall
klia2 GREEN BUILDING

Energy Efficient Design Strategies (Active)

- Variable speed drives for all AHUs
- Lighting efficiency * 25 percent more efficient
- Lighting equipped with sensors switch off with available daylight
- Demand control ventilation with CO2 sensors
- Variable air volume for office working areas and S3
- Airport BMS system able to monitor in detail the breakdown of energy use throughout the year in order to save energy during operations of airport

* ASHRAE 90.1 max standards
Energy Efficient Strategies And Features (Passive & Active Design)

- High performance façade systems
- Roof using reflective material
- Roof insulation
- Heat recovery for all AHUs
- Energy efficient lighting *20 percent more efficient
- Demand control ventilation with CO2 sensors
- Carpark efficient lighting with daylight sensors in perimeter zones

* International baseline standards
BUILDING MANAGEMENT SYSTEM

• Building management systems in the terminal programmed to automatically turn off equipment when not in use and turn off lights in unoccupied areas or where natural light is bright enough by itself.

• They also control temperature and constantly monitor energy consumption so that efficient performance can be measured and maintained.
Rainwater Harvesting

klia2 roof collects all rainwater for non-potable water usages such as landscape water demands and toilet flushing requirements thus reducing processed potable water demands and used for landscape and flushing. Rainwater collection will at the same time reduce storm water runoffs.
District Cooling System

- **Thermal Energy Storage (TES)** The TES, acting like a large thermal flywheel, will shift cooling load on the chillers to off-peak times by charging the water in the tank. The tank volume will be cooled at night by the chillers hence the use of less-expensive off-peak electricity rates, and reduces the need for additional chillers' capacity.

- No CFC based refrigerant used in the district cooling plant and TB01 system
- Equipment leakage rate, type of refrigerant are specified to reduce ozone depletion and reduce global warming potential (GWP)
- Selection based on low global warming potential and low ozone depletion which minimize emission of harmful compound to the environment.
Green with tenants

**Energy & Atmosphere**
- CFC (Chlorofluorocarbons) Reduction
- Optimize Lighting
- Optimize Lighting Controls
- Energy Efficient Equipment & Appliances
- Energy Accountability

**Indoor Environmental Quality**
- Thermal Comfort
- Day lighting
- Views
- Use low emitting materials (VOC)
- Carpeting
- Sealants
- Wall coverings
- Paints

**Materials & Resources**
- Recycle
- Long term lease
- Minimize demolition
- Divert construction waste
- Re-use/refurbish furniture
- Use regional Materials
Designated parking lots for hybrid car users

Carpark designed to allow maximum daylight usage

Recycling bins
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Sustain Our Environment and Community

- Sustain Our Environment and Community
- Effectively & efficiently manage our resources and waste
- Support and achieve national and industry stated goals on carbon reduction
- Contribute to community development in education, welfare & job creation

Energy (Electricity)

Carbon

Waste

Water
THANK YOU