Carbon Neutral Approach of Delhi Airport

21st June, 2017

GreenCo Platinum Certified Company

GMR

↗ DIAL is a joint venture consortium of GMR Group, Airports Authority of India (AAI), Fraport to operate, maintain and develop the Indira Gandhi International Airport (IGIA)

↗ **Key activities -**

- ✓ **Airport Operations:** to ensure safe, seamless passage of Aircraft, Passengers and Cargo
- ✓ **Aero & Non Development**
- ✓ **Commercial Property Development**
- ✓ Infrastructure **Maintenance** & **Utility Services**

Fraport **10%**

DIAL

26%

64%

GMR
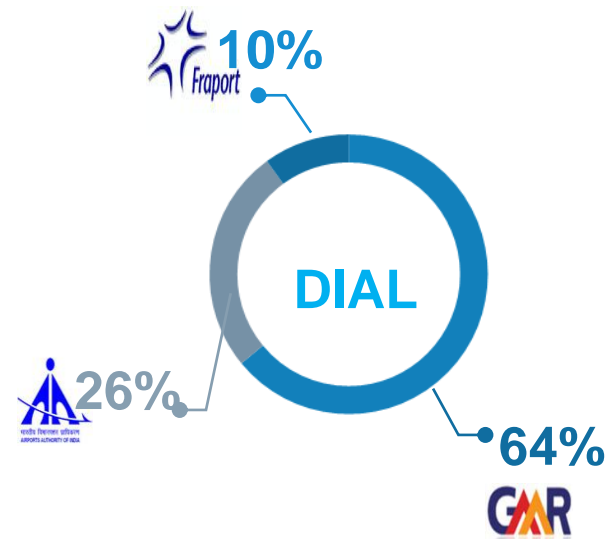
Delhi Airport

- ACI – ASQ Awards for 2016 : 2nd Best Airport by Size – over 40 million passengers per annum & currently it Operates to 57.7 million passengers per annum

- SKYTRAX World Airport Awards 2017 : Best Airport in India and Central Asia

Humility | Entrepreneurship | Teamwork and Relationships | Deliver the Promise | Learning | Social Responsibility | Respect for Individual

3

 # DIAL's Mission

"To be amongst the world's Top 3 airports by providing superior customer experience through deployment of technology and innovation, while sustaining profitability with **care for environment** and being a great place to work"
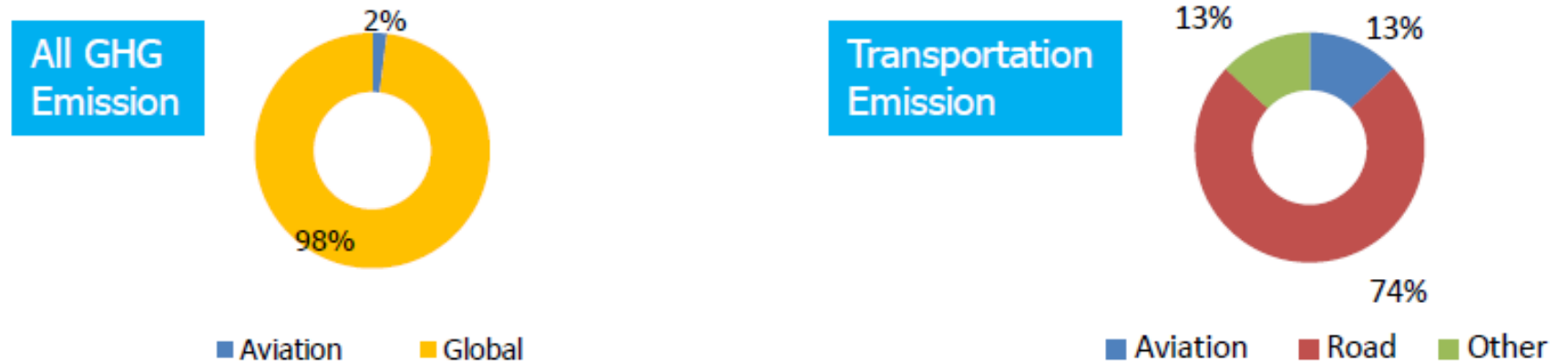

Optimization of Consumption & Efficiency Improvements

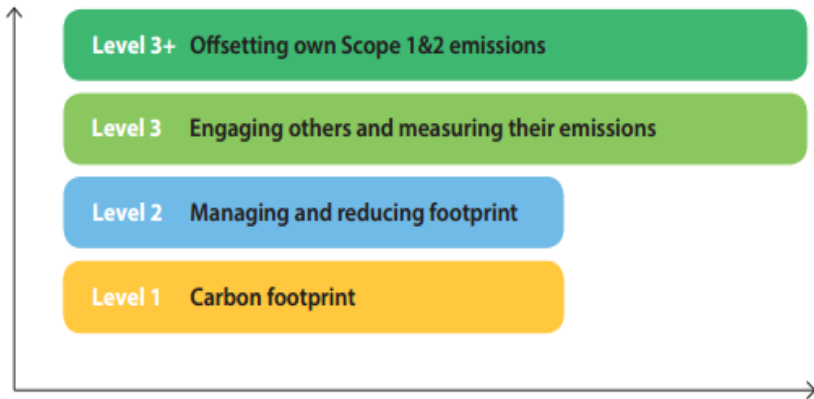Stakeholders Energy Conservation (meritorious accounting of power distribution to concessionaires)

Renewable Energy Development & Emission Reduction

Employee Engagement: Awareness Training & Capacity Building

↗ **Climate change** is perhaps the biggest threat to be faced by Humanity

↗ Aviation is a small but important contributor to climate change, **2% of Global GHG emission**, out of which international aviation is responsible for approximately 1.3 %.

↗ Global demand for air travel is estimated to increase significantly in the future. it is likely to be accompanied by an increase in aviation-related **environmental impacts.**
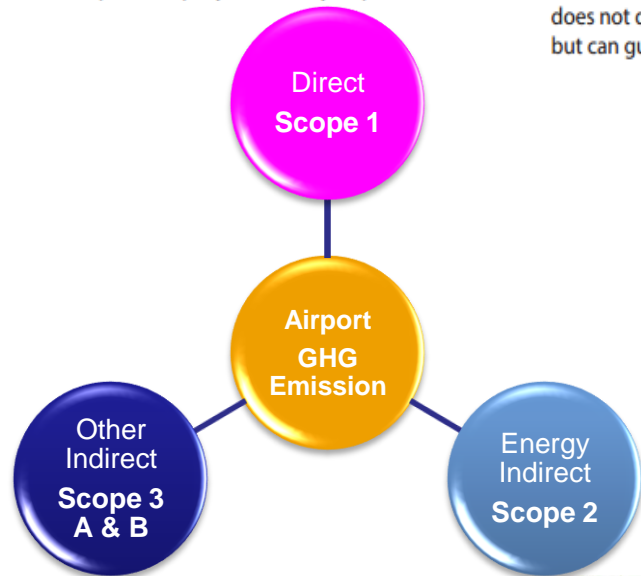
All GHG Emission

2%

98%

■ Aviation   ■ Global

Transportation Emission

13%   13%

74%

■ Aviation   ■ Road   ■ Other

ACI Airport Carbon Inventory System

Level 3+ Offsetting own Scope 1&2 emissions

Level 3 Engaging others and measuring their emissions

Level 2 Managing and reducing footprint

Level 1 Carbon footprint

Scope 1 & 2 - Emissions from activities which the airport company are directly responsible for

Scope 3 - Emissions from activities which the airport does not directly manage but can guide and influence

Direct **Scope 1**

Airport **GHG Emission**

Other Indirect **Scope 3 A & B**

Energy Indirect **Scope 2**

Level 1	Level 2	Level 3	Level 3+
• Scope 1 & 2 Carbon Footprint • Externally verify footprint • Publicly available policy indicating commitment to energy/carbon reduction	• Scope 1 & 2 Carbon Footprint • Externally verify footprint • Publicly available policy indicating commitment to energy/carbon reduction	• Scope 1 & 2 Carbon Footprint • Externally verify footprint • Publicly available policy indicating commitment to energy/carbon reduction	• Scope 1 & 2 Carbon Footprint • Externally verify footprint • Publicly available policy indicating commitment to energy/carbon reduction
	• Develop and submit verified carbon management plan covering Scope 1 & 2 emissions • Set target for reduction • Demonstrate improvement against chosen emissions metric	• Develop and submit verified carbon management plan covering Scope 1 & 2 emissions • Set target for reduction • Demonstrate improvement against chosen emissions metric	• Develop and submit verified carbon management plan covering Scope 1 & 2 emissions • Set target for reduction • Demonstrate improvement against chosen emissions metric
		• Include minimum required Scope 3 emissions in verified footprint • Provide verified evidence of stakeholder engagement plan	• Include minimum required Scope 3 emissions in verified footprint • Provide verified evidence of stakeholder engagement plan
			• Provide evidence that residual Scope 1 & 2 emissions have been offset

airport carbon accredited MAPPING

airport carbon accredited REDUCTION

airport carbon accredited OPTIMISATION

airport carbon accredited NEUTRALITY

✓ Leadership & Strategy: Create **Team Focus** & Commitment

✓ Promote **Energy Conservation and Efficiency**

✓ Promote **Green Building** Concepts

✓ Adopt **Renewable** Energy Program

✓ Adopt Efficient Systems, Technology & **Less Emission Intensive Process**

✓ Adopt **GHG Management System**: Map, Quantify & Reduce

✓ GHG **Supply Chain** Initiatives
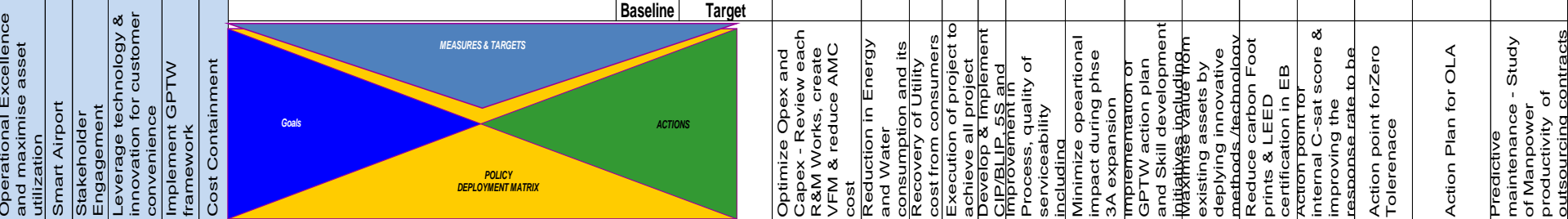
✓ Adopt Collaborative Environment Management Program

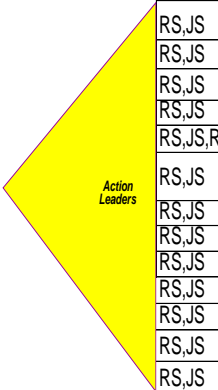✓ **Employee Engagement**: Awareness Training & Capacity Building.

PDM - CPEO (17-18)

#	Measure	Baseline	Target
14	% Zero Tolerance Achievement	80%	100%
13	BE Score (Overall / Customer Focus)	576 / 51.25 / 49.50	585 / 52 / 49.50
12	ASQ Score (Overall) / Skytrax	4.986	4.995 (Top 25)
11	% variance of ASQ score from target score (Check-in, Ambience, Baggage Delivery)	3.85%	2.50%
10	Stakeholder Engagement Score	3.90	4.00
9	Succession Planning (CXO-1,CXO-2 & CXO-3)	80%	100%
8	GPTW Score (Culture Audit / Perception Survey)	Base Score	Base Score +10%
7	Process Improvement through deployment of technology	NA	4
6	DIAL Carbon footprint (Scope 1+2) (kg/pax)	1.88	1.78
5	Percentage savings in cost post award of project	5%	5%
4	% variance in approved time & cost for Capex Projects	<5%	<5%
3	R&M Cost / Pax (INR)	23	22
2	Utility Cost/ Pax (INR)	28	26
1	Total Operating Expense (INR Cr)	260	249.6

Goals (left axis):
- Operational Excellence and maximise asset utilization
- Smart Airport
- Stakeholder Engagement
- Leverage technology & innovation for customer convenience
- Implement GPTW framework
- Cost Containment

MEASURES & TARGETS / POLICY DEPLOYMENT MATRIX / ACTIONS

Actions (right columns):
- Optimize Opex and Capex - Review each R&M Works, create VFM & reduce AMC cost
- Reduction in Energy and Water consumption and its Recovery of Utility cost from consumers
- Execution of project to achieve all project
- Develop & Implement CIP/BLIP, 5S and improvement in
- Process, quality of serviceability including
- Minimize opeartional impact during phse 3A expansion
- Implementation of GPTW action plan and Skill development
- Maximise value from initiatives including existing assets by deplying innovative methods /technology
- Reduce carbon Foot prints & LEED certification in EB
- Action point for internal C-sat score & improving the response rate to be
- Action point forZero Tolerenace
- Action Plan for OLA
- Predictive maintenance - Study of Manpower productivity of outsourcing contracts

Action Leaders:
RS,JS
RS,JS
RS,JS
RS,JS
RS,JS,RD
RS,JS
RS,JS
RS,JS
RS,JS
RS,JS
RS,JS
RS,JS
RS,JS

RS - Roy Sebastian
JS - Jagmal Singh
RD - Rajani Dimri

Leadership & Strategy-COO PDM (FY 2017-18)

PDM- COO FY 17-18

#	Measure	Baseline	Target
15	Zero Tolerance Acheivement %	100%	100%
14	BE Score / Operation Focus	576 / 59.5 / 72	585 / 59 / 72
13	ASQ Score (Overall) / Skytrax	4.986	4.995 (Top 3)
12	Composite stakeholders C-SAT Score (HK, Airlines & Service Providers)	4.42	4.50
11	GPTW Score	Baseline	Baseline +10%
10	Succession Planning (CXO-1 & CXO-2)	100%	100%
9	Carbon Footprint (Scope 3)	13.79	13.10
8	Arrival CDM/A-TFM		Aug'17
7	Automated ROT capturing	N/A	Aug'17
6	CUSS Usage of total departing passengers	NA	15%
5	Peak Hour ATM - Runway scheduling capacity	62+5	73
4	OTP (Overall)	77%	83%
3	Slot adherence from airlines	NA	80%
2	Baggage Delivery OMDA compliance	92.40%	95%
1	Safety Incident rate per 10000 movements	0.14	0.10

GOALS (rows, left): Operational Excellence; Smart Airport; Stakeholder Engagement; Deliver Superior Customer Experience; Be a Great Place to work; Cost Containment & profitability

MEASURES & TARGETS — **GOALS** — **ACTIONS** — **POLICY DEPLOYMENT MATRIX**

ACTIONS (columns, right):
- Implement technology & enhance use of implemented technology
- Implementation of GPTW action plan
- Implementation of comprehensive stakeholder engagement plan
- Implementation of NATS recommendations for increased runway capacity
- Enhance Carbon neutral initiatives through effective stakeholder collaboration
- Support in phase 3A Expansion Plan
- Reduction in waiting time, security check in and immigration, I to I
- Identify and execute Kaizen / CIP / BLIP opportunities
- Maximize value from existing assets
- 100% adherence to OLA compliance
- Safety culture in IGI community and Business Continuity measures

Action Leaders:
- AK= Ashwani Khanna
- AB= Arun Behal
- VK=Vineet Kumar
- MK= Muthukrishnan
- TK= Tariq Kamal
- JT=Jaideep Thakur
- PP=PP Singh

Action Leaders (per action): AK, AB, TK; ALL HODs; ALL HODs; AB; MK; ALL HODs; AK,TK; ALL HODs; AK, AB, TK, JT, VK; ALL HODs; PP,AB,TK,AK

Legend: ○ ● ▾

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Humility | Entrepreneurship | Teamwork and Relationships | Deliver the Promise | Learning | Social Responsibility | Respect for Individual   9

Energy Management

Certification

The Energy Management System at DIAL is certified under ISO 50001:2011

First Airport
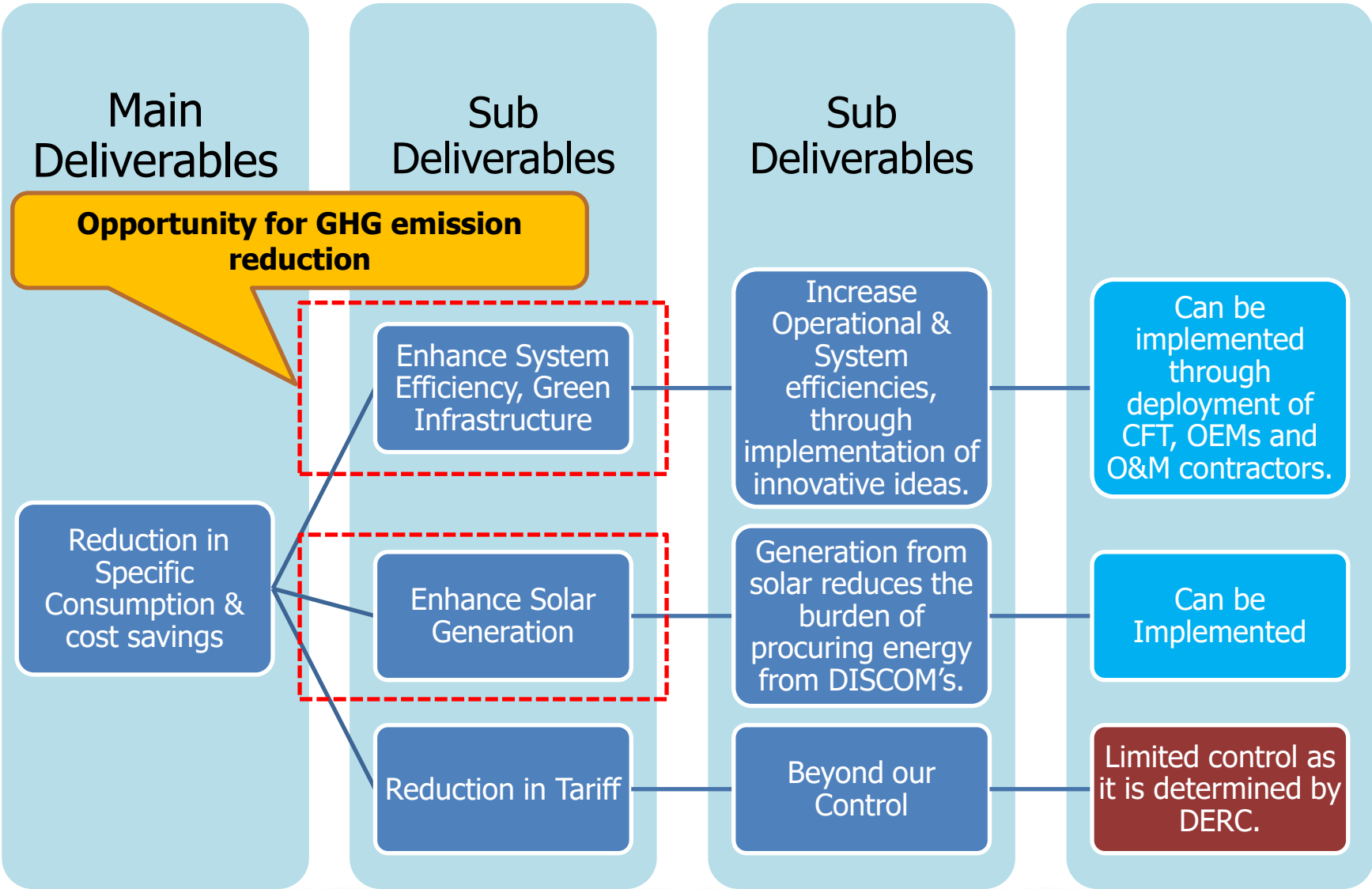
IGIA is the "FIRST Airport in the World" to be certified under ISO 50001:2011

Identification of Problem : Tree diagram

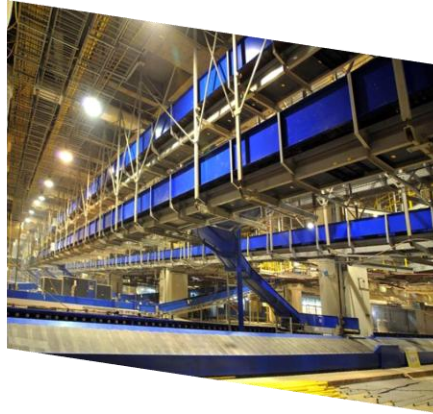| Main Deliverables	Sub Deliverables	Sub Deliverables	

Opportunity for GHG emission reduction

Reduction in Specific Consumption & cost savings

- **Enhance System Efficiency, Green Infrastructure** → Increase Operational & System efficiencies, through implementation of innovative ideas. → Can be implemented through deployment of CFT, OEMs and O&M contractors.

- **Enhance Solar Generation** → Generation from solar reduces the burden of procuring energy from DISCOM's. → Can be Implemented

- **Reduction in Tariff** → Beyond our Control → Limited control as it is determined by DERC.

Energy Efficiency & Conservation

Lights

BHS

HVAC

Major Emission Saving Initiatives

Energy Efficiency CDM Project

Energy Efficiency Measures implemented in Terminal 3 has been registered with UNFCCC (United Nations Framework Convention on Climate Change) as Clean Development Mechanism (CDM), with effect from 26 July 2013.

The FIRST AIRPORT to have successful registered with UNFCCC on this account.

Total estimated savings- 16,413 metric tonnes CO_2 equivalent per annum.

- Energy efficient chiller

- VFD's in Secondary Pumps and CT Fans

- Tempered Cooling system

- Low U- Value Building Envelope and Roof
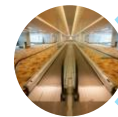
- VVFD and Radar sensor based Travellators & Escalators

Major Emission Saving Initiatives

30% energy saving achieved

More than 40% conservation achieved

Effective waste management plan

IGBC recommended human comfort parameters with optimum energy utilization.

Innovation in water, renewable energy generation, trained manpower etc.

**"ARC" Adopted in Delhi Airport**

https://app.arconline.io/app/project/1000098896/score/total

**First Solar project in the airside of airports in India with 7.84 MW of Capacity**

↗ Technical Information:
  – Location : South of Runway 11/29 beyond drain
  – Orientation : Towards South
  – Usage : Internal usage

  – Back up : No batteries. Power Generated and used during day time
  – Make: Canadian Solar
  – Type of solar panel : Crystalline PV panels.

▪ **Reduces 10, 600 tons of CO_2 annually**

2.14 MW (2% of net energy consumption)

2014

2016

2.14 MW+ 5.71 MW
(9% of net energy consumption)

2017-18

Location identified for 10 MW capacity

2020

20 MW of Solar PV
More than 25% of net energy consumption

Multimodal Connectivity

Fixed Ground Power Unit (FGPU) and Conditioned air supply facility at T3 Terminal.

Dedicated CNG filling station inside the airport
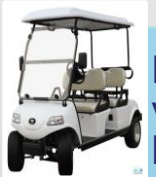
Battery operated vehicles for Terminal buildings

Regular air quality monitoring around airport

Regular vehicles pollution check

Carpool network website for employees

Fuel Hydrant systems

Greenhouse Gas (GHG) Inventory

Stakeholder Engagement: Delhi A-CDM

- ✓ Save cost
- ✓ Reduce emission
- ✓ Enhanced Airport capacity
- ✓ Improved operational efficiency
- ✓ Enhance trust and understanding with partners

↗ The concept focuses on improving air traffic flow & capacity management at airports by reducing delays, improving the predictability of events & optimizing the utilization of resources.

↗ It involves airport operators, airlines, ground handlers & ATC collaborating and sharing data to increase overall airport efficiency.

↗ First Airport in the country to have implemented A-CDM.

Parameter	Values
Per Year Fuel Savings (30,000 Kg * 365 days)	10.95 Million Kg
Per year CO2 reduction through DA-CDM	**34.49 Million kg CO2**
Per year savings through DA-CDM [13.6875 Million Litres @ ₹ 47.6/ Litre]	**₹ 639 Million**

https://www.icao.int/APAC/Meetings/2014%20ATMSG2/AI4%20IP14%20New%20Delhi%20A-CDM%20Implementation%20(India).pdf

- ❑ Celebi Delhi Cargo Terminal has installed a 2MW Solar Power Plant.

- ❑ Celebi Plans to achieve 20% of overall power consumption through Solar Power.

- ❑ Capacity of Solar Plant - 2 MWp

- ❑ Roof top area - 15000 sq meter

- ❑ Expected Generation Per Year - 3 Million Unit

- ❑ Expected Emission Reduction- 2800 tCO2/year

- ❑ Annual Saving- ₹ 1,26,87,400/-

Water Management & Rainwater Harvesting

- Zero Discharge Plant of **16.5 MLD STP**

- Having advanced Ultra Filtration (UF) and Reverse Osmosis (RO) systems

- Water consumption per passenger used to be **61 lit/pax (2010-11)** now it is **26 lit/pax (2016-17)**

- More than **360 Rainwater Harvesting Structure**

- The recharging sustains the ground water in the region and has estimated 63% recharge potential of water demand

- Developing **new rainwater structure** in and around airport as per plan

Humility | Entrepreneurship | Teamwork and Relationships | Deliver the Promise | Learning | Social Responsibility | Respect for Individual

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**Green Cover and Efficient Irrigation**

- Landscaping covering more than **120 acres of land**

- More than **19,000 trees** around various water bodies in New Delhi has been planted.

- Entire landscaping is irrigated with **treated waste water** having **drip irrigation** and **automatic water efficient** water dispensing system

GHG Emission Trend: Scope 3

Reductions Since 2014 to 2016
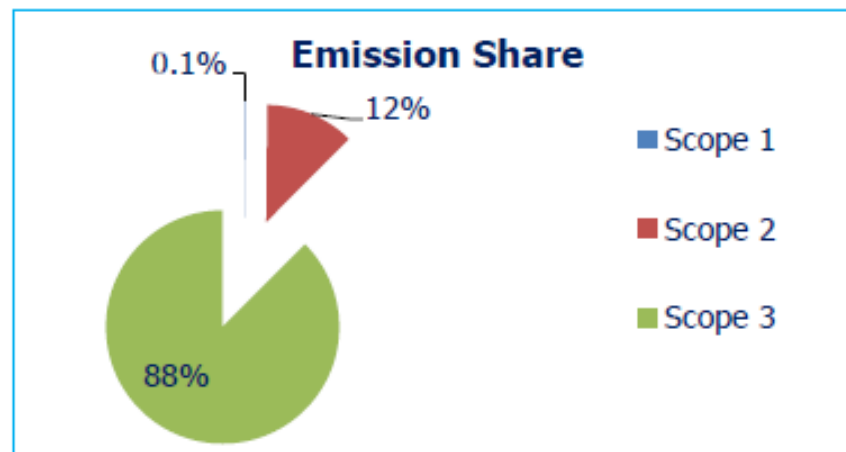
Specific emission

8%

Yearly Scope 3 Emission

kgCO2/Pax

- 2014: 14.42
- 2015: 13.77
- 2016: 13.33
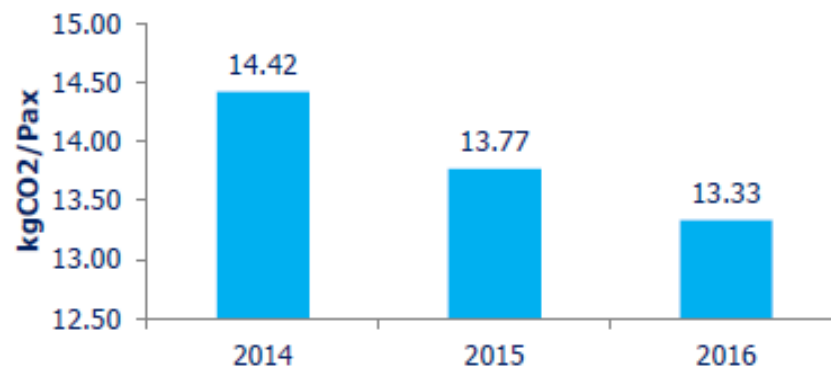
Scope 3 Emission Benchmarking

kgCO2/Pax — kg CO2/Pax Scope 3

- Heathrow (2013): 17.09
- Heathrow (2014): 16.93
- Incheon (2012): 27.66
- Incheon (2013): 26.62
- Incheon (2014): 24.73
- HIAL (2013): 14.93
- HIAL (2014): 16.60
- IGIA (2013): 13.59
- IGIA (2014): 14.42
- IGIA (2015): 13.77
- IGIA (2016): 13.33
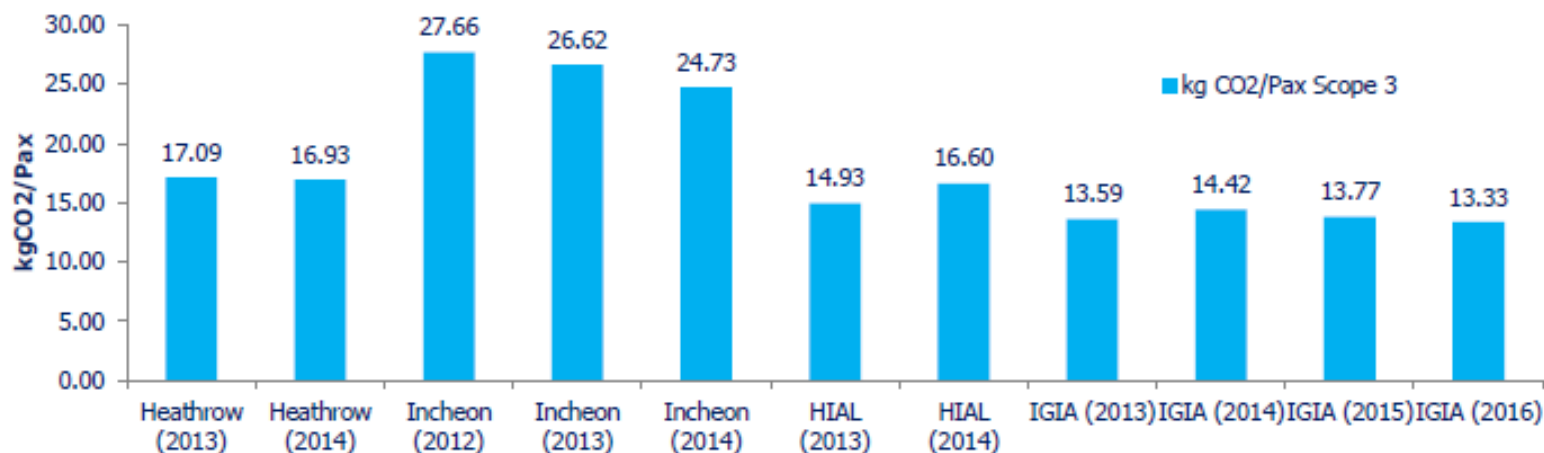
GHG Emission Share

Scope 1 emission	tCO2
DIAL Vehicles	839
Fire Drill	7
DG sets	202
Refrigerants	1
Fire extinguishers	0.2
Scope 2 emission	
IGIA Electricity Consumption	106197

Scope 3 Elements	tCO2
LTO Emission	532,957
Auxiliary Power Unit (APU)	17,037
Engine Test	1,804
Passenger airport access	112,267
Staff Business Travel -Air	107
Staff Business Travel - Fixed Vehicle	52
Staff Business Travel - Spot Booking	16
GSE	1747
Staff/Employee Travel - Land 3	825
CISF vehicle	249
Tenant (others) - Energy	74663

Emission Share

- 0.1%
- 12% Scope 1
- 88% Scope 2
- Scope 3

Scope 3

- 15.1%
- 10.1%
- 0.2%
- 74.6%
- Total LTO (LTO+APU+ET+GSE)
- Business Travel
- Tenant - Energy
- Airport Passenger
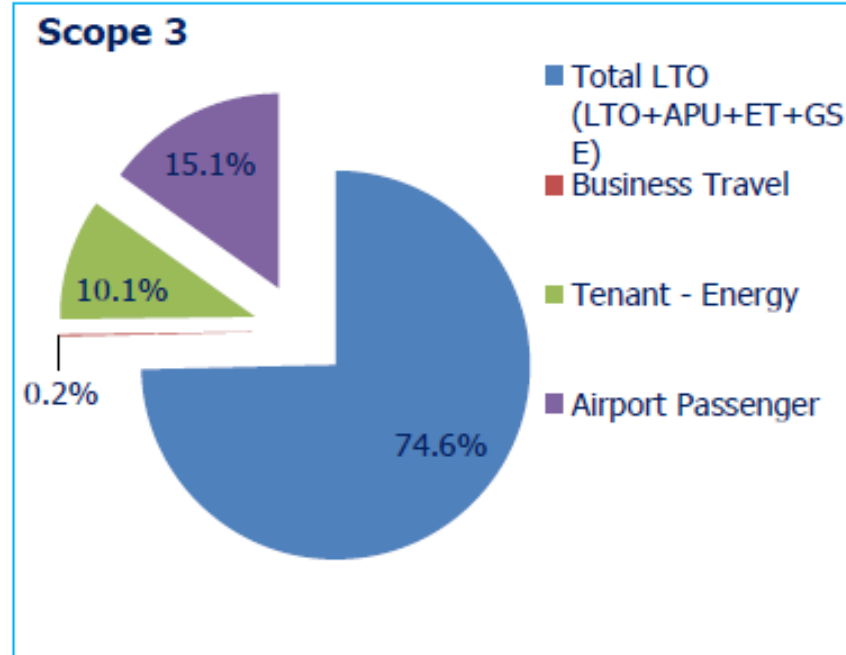
Key Performance Indicators (KPI)

S. No	Particulars	2014-15		2015-16		2016-17	
		AOP	Actuals	AOP	Actuals	AOP	Actuals
1	Operating Cost (₹ Crores)	309.71	290.47	233	241.4	230	217.7
2	Electricity Consumption (Million Units)	221.20	219.79	219.79	224.10	216.60	220
3	Water Consumption (KL)	1,540,993	1,736,280	1,736,280	1,321,917	1,736,280	1,521,012
4	Utility Cost (₹) / Pax	31.0	26.1	29	28.36	28	17.42
5	R & M Cost (₹) / Pax	28.0	21.1	25	24.70	23	19.80
6	**Carbon Footprint (Kg/pax)**	**3.0**	**2.65**	**2.4**	**2.29**	**2.25**	**1.88**
7	C-sat Survey (Score out of 5)	4.3	4.2	4.2	4.23	4.3	4.2

Cost Benefit Analysis

Initiatives implemented in last 3 years (2014-15 to 2016-17)	Cost (₹ Million)	Emission Reduction	Pay Back (months)
Energy Saving Project	162.12	10, 702	93
Renewable Energy Project	350	11, 100	≈60
Emission Reduction Project with Stakeholder's	0	≈40, 000	NA
Offset Program	1.6	-	-

↗ **Net GHG emission is zero**.

↗ Significant cost savings related to operating expenses to the tune of INR 4.5 crore.

↗ Overall system and process efficiency improvement.

↗ Ease of GHG emission hotspot identification and actions to be implemented.

↗ DIAL has not only reduced its own GHG emission, but has reduced the overall GHG emission from the entire IGI Airport through rigorous stakeholder engagement program.

↗ Creating a leadership role and awareness on climate change and "carbon neutrality".

↗ Meeting the expectations of Government of India towards meeting its INDC commitments.

↗ Creating a sustainable airport operation model.

Going Forward – "Carbon Negative Airport"

- Development of solar energy
- Use of bioenergy – Waste to Energy
- Use of hydro power

Renewable Energy

- Energy audit
- Energy Monitoring
- Energy score card
- O&M activities

Energy Conservation

- Technology adoption and integration
- Adopt ECBC
- Passive Architecture
- Life cycle costing approach

Energy Efficiency

- Use of Cleaner fuels such as CNG
- More use of electrical vehicles in airside
- Use of alternative fuels (fuel cell, hydrogen vehicles)

Fuel Switch

- Increased tree cover
- Inclusion of offsite tree plantation

Increased Sink

- Any residual emission by acquiring credible carbon credits (CERs)

Sourcing of Carbon Credits

Bangalore International Airport Ltd

- Kempegowda International Airport

Delhi International Airport (P) Ltd

- Indira Gandhi International Airport

First Carbon Neutral Airport in Asia Pacific, followed by few more….

GMR Hyderabad International Airport Limited (GHIAL)

- Rajiv Gandhi International Airport

Mumbai International Airport Pvt Ltd

- Chhatrapati Shivaji International Airport

Sunshine Coast Regional Council

- Sunshine Coast Airport

GreenCo Scoreband - Delhi International Airport Limited

PARAMETERS	POINTS AWARDED (Service Sector)														
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150
Energy Efficiency															X
Water Conservation								X							
Renewable Energy					X			X							
GHG Emission								X							
Waste Management										X					
Material Conservation, Recycling & Recyclability							X								
Green Supply Chain						X		X							
Others									X						

Legends

- Orange = Points scored by DIAL
- X (Blue) = Maximum points scored in the service sector

CERTIFICATION (Service Sector)

LEVELS	POINTS AWARDED				
	350 - 449	450 - 549	550 - 649	650 - 749	≥ 750
Certified					
Bronze					
Silver					
Gold					
Platinum					X

	0 - 100	101-201	201-300	301-400	401-500	501-600	601-649	650- 699	700-749	750-799	800-899	900-1000
Total Score												

First Carbon Neutral Airport in Asia Pacific Region

First Airport in the world to adopt Green Building Performance Monitoring Platform - ARC

Indian Green Building Council (IGBC) Platinum Rating for Terminal 3

ACI Asia Pacific Green Airport Recognition- Gold Level

Skytrax World Airport Awards 2017

Network 18 & Honeywell Smart building Awards 2016
- Smartest Airport in India & Smartest Building In India

CII National Award for Excellence in Energy Management-2016

Green Company Platinum Level by CII-GBC

Humility | Entrepreneurship | Teamwork and Relationships | Deliver the Promise | Learning | Social Responsibility | Respect for Individual

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Thank you