



Bengaluru
INTERNATIONAL
AIRPORT



Rating to BIAL:

Sharing of best practices

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Vice President (Engg)





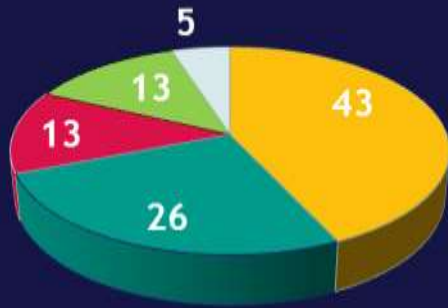
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Contents:

- **BIAL: Energy & Environmental Management**
- **Our **Greenco** journey**
- **Energy Management Excellence**
- **Water Management Excellence**
- **Waste Management Excellence**
- **Carbon Accounting & Reporting**
- **Internal Challenges**



About BIAL



■ GVK ■ Siemens ■ Gol ■ GoK ■ Zurich Airport

- ❖ Public limited company under Indian Companies Act
- ❖ Private Public Partnership
- ❖ BOOT project transferred after 60 years (30 + 30)
- ❖ Operated by BIAL according to international standards.

Vision

Bengaluru airport will excel in consistent, efficient and friendly delivery of airport services as the gateway to South India

March 17, 2014

Energy & Environment Management: Awards & Recognition

- Karnataka State Environmental Award 2012
- **Airport Carbon Accreditation : Became the first Airport in Asia- Pacific to achieve a Level-2 Accreditation**
- VESTIAN - FM ZONE India Leadership Award 2012 for “Best Initiative towards Renewable & Sustainability”
- **GreenCo certification by GBC of CII: First company in India to get GreenCo.**
- LEED Certification of Passenger Terminal Building: 1st ever terminal in world to get certified under EB category by USGBC.
- **Adoption of Bio-fuel: 1st Airport in India to adopt bio-fuel in its operations.**



Energy & Environment Management: Awards & Recognition

- CII Environment Best Practices Award 2012
 - Most innovative award (Top)
 - Most useful project award
- World Water Summit Award 2012
 - Outstanding water management award (Top)
- CII National Award for Water Management 2011
 - Excellent Water Efficient Unit Award (Top)
- International Conference on Green Technology and Environmental Conservation (GTEC 2011)
 - Best Paper award for BIAL Solid Waste Management
- Mysore Horticultural Association , Lalbagh annual awards 2011
 - Best Ornamental Garden Award
 - Best Maintained Garden Award



Certifications



ISO 14001:2004



ISO 9001:2008



OHSAS 18001:2007

Other Certifications:

- ISO 27001: 2005 Information Security System
- BS 25999-2:2007 : Business Continuity Management - second airport in the world after Glasgo airport.
- BIAL's Carbon Disclosure Project under GVK group of companies found its place among the top 10 Indian Companies with a score of 75. (Topmost in utilities sector)

Greenco Certification: BIAL's Journey.



- Greenco steering Committee meetings and commitment from BIAL - Nov 2010
- Launch of GreenCo by GBC at New Delhi - 10th Feb 2011
- Registration with GBC, CII - 2nd June 2011
- Kickoff Meeting & Training done by GBC, CII - 18th and 19th July'2011.
- BIAL visit to CII for discussions/clarifications - 24th & 25th Aug 2011
- Internal review and assessment of the filled-in questionnaire and supporting data for the Greenco Rating - end Aug,2011
- Submission of parameter wise data for assessment - Sept,2011.
- Preliminary review & Report seeking additional data/info by CII - Oct,2011.
- Submission of additional data/info for review - Dec,2011
- Visit and discussions with CII on further clarifications - 9th & 10th Feb 2012
- Verification, Review & Site Assessment by CII - 23rd and 24th Feb 2012.
- BIAL received Greenco Silver rating on 08th March'2012.

GREENCO Training byCII



BIAL GREENCO TEAM



GREENCO Final Assessment at BIAL





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Energy Management Excellence

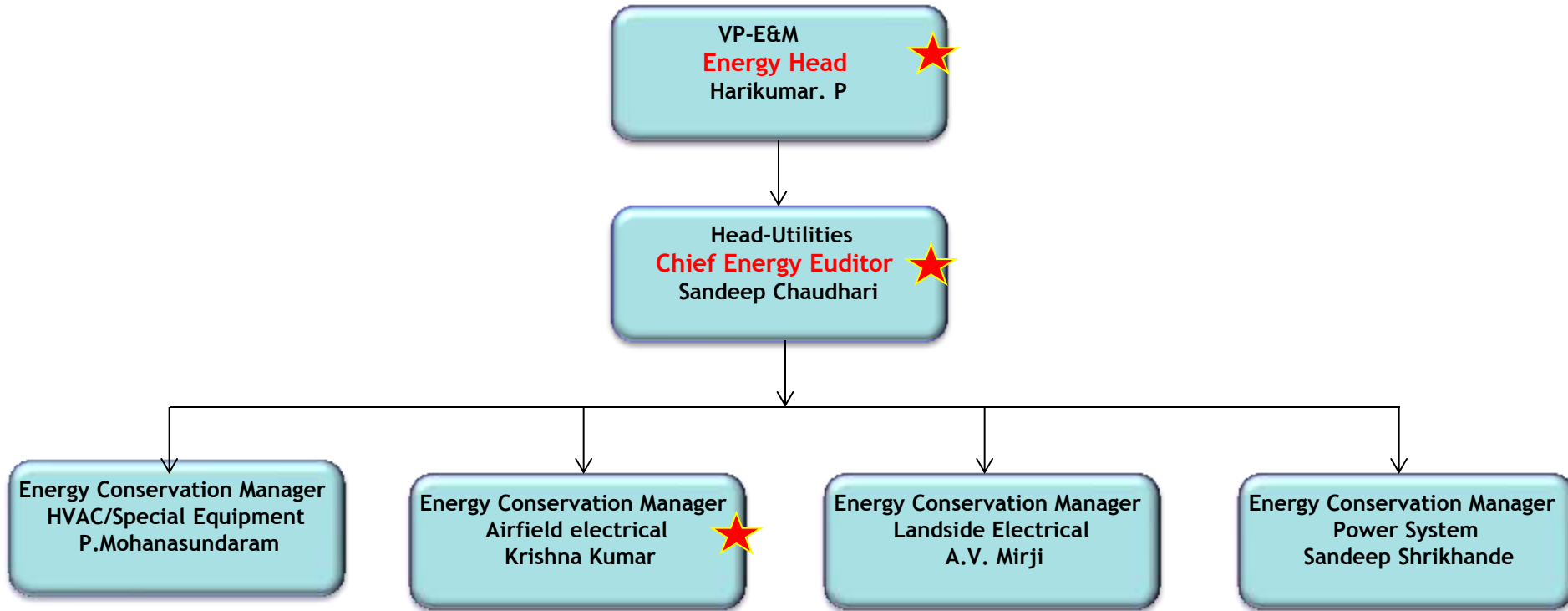


Seven Pronged Sword



Energy Management Cell

1. Energy Management Structure



★ denotes-Certified Energy Auditor by BEE, Ministry of power, Govt.of India

Energy Efficient Equipments

2. Energy Efficient Equipments

- Fuel Efficient DG sets with electronic fuel injection system
- UPS with IGBT technology for better efficiency at full load and part load conditions
- High efficiency chillers - IPLV and NPLV
- Timers and occupancy sensors for lighting
- CFL Lamps with high efficiency electronic ballasts
- Photo electric sensors to control operation of lights in peripheral areas
- Variable Speed Drives for all the Motors for optimum part load operation
- Aerofoil design backward curved blowers provided for the Air Handling Units
- BMS integrated Energy meters/ BTU Meters to control and monitor all the motors & A/c load effectively and towards energy conservation.

Energy Efficiency



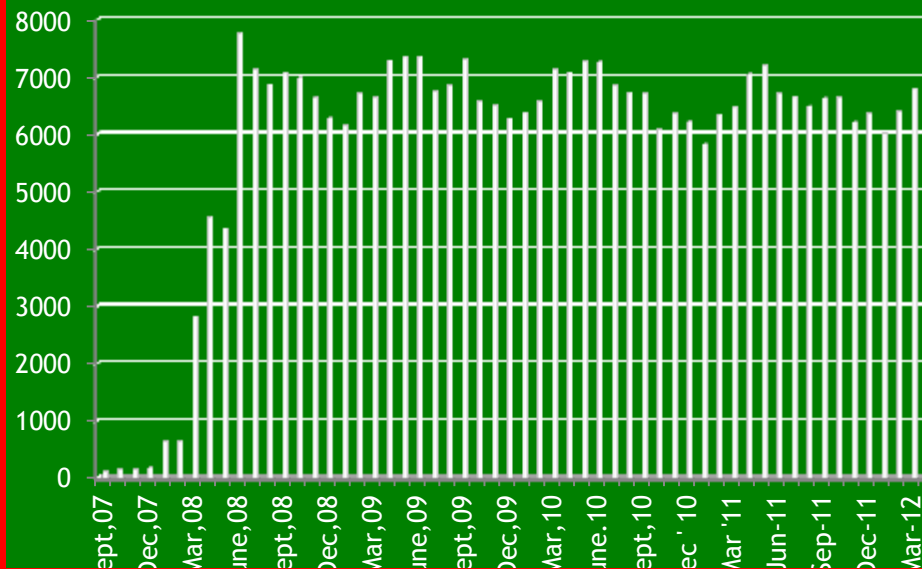
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PERFORMANCE PARAMETERS - 66 KV

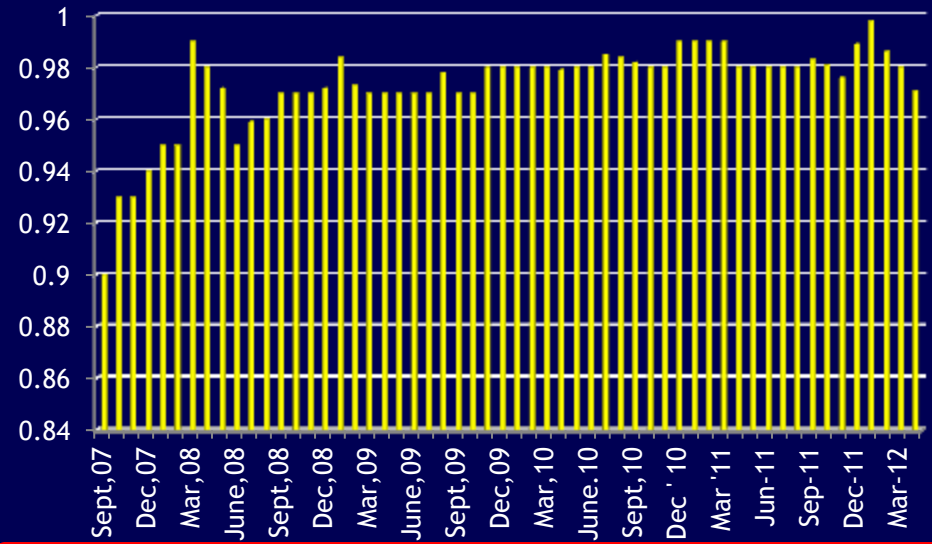


3. Bench Marking

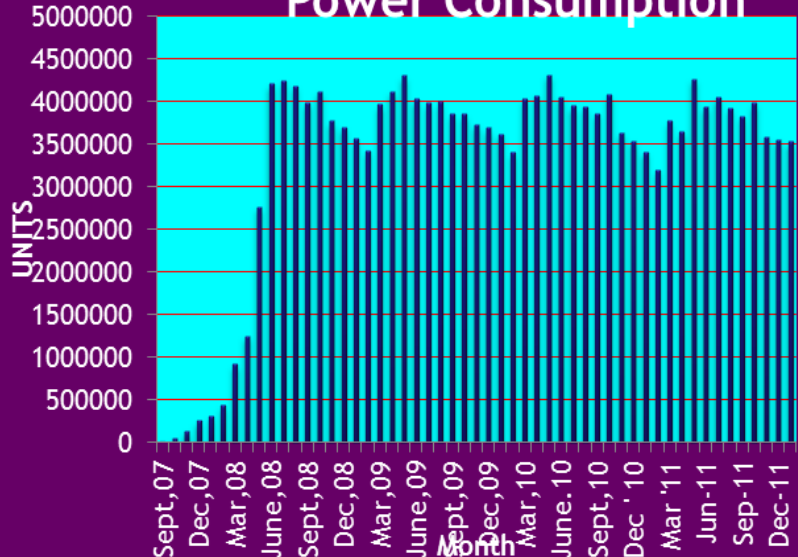
Maximum Demand in KVA



Power Factor



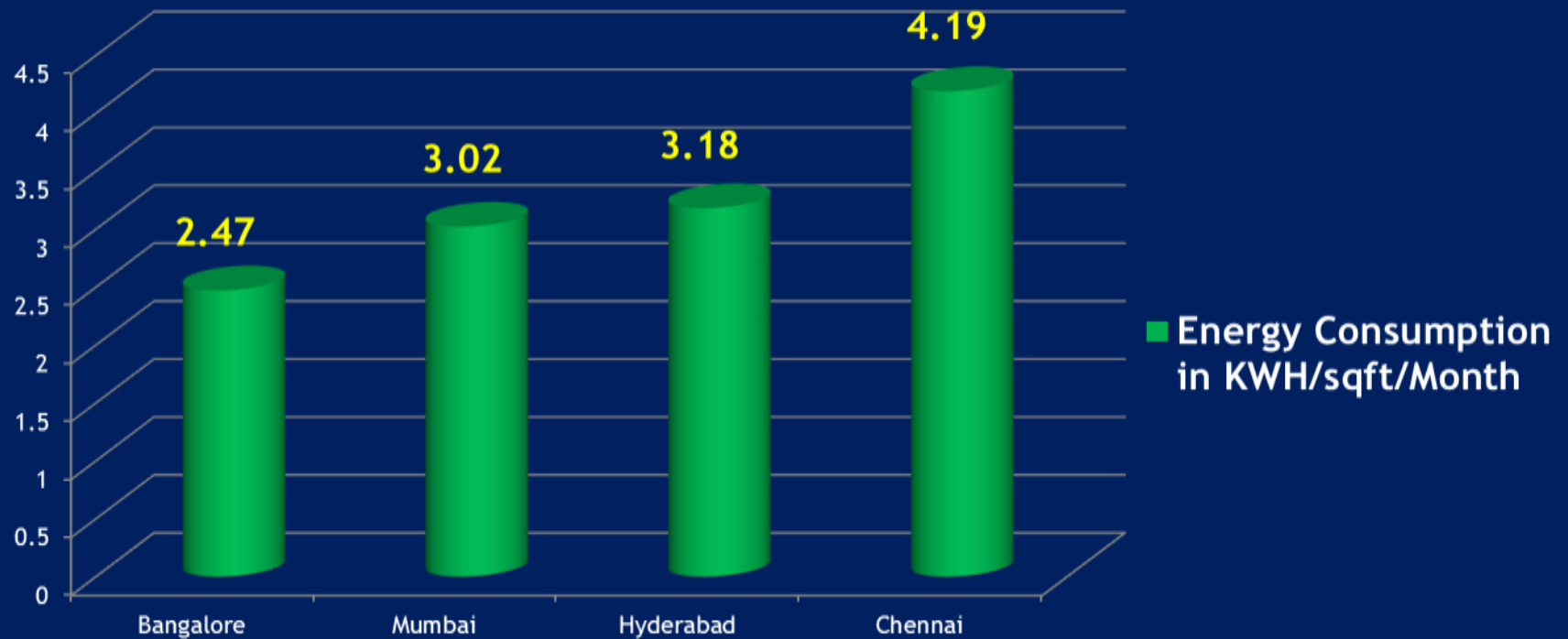
Power Consumption



Specific Energy Consumption of BIAL in KWH/Pax



Energy Consumption of Terminal building in KWH/Sq.ft/Month

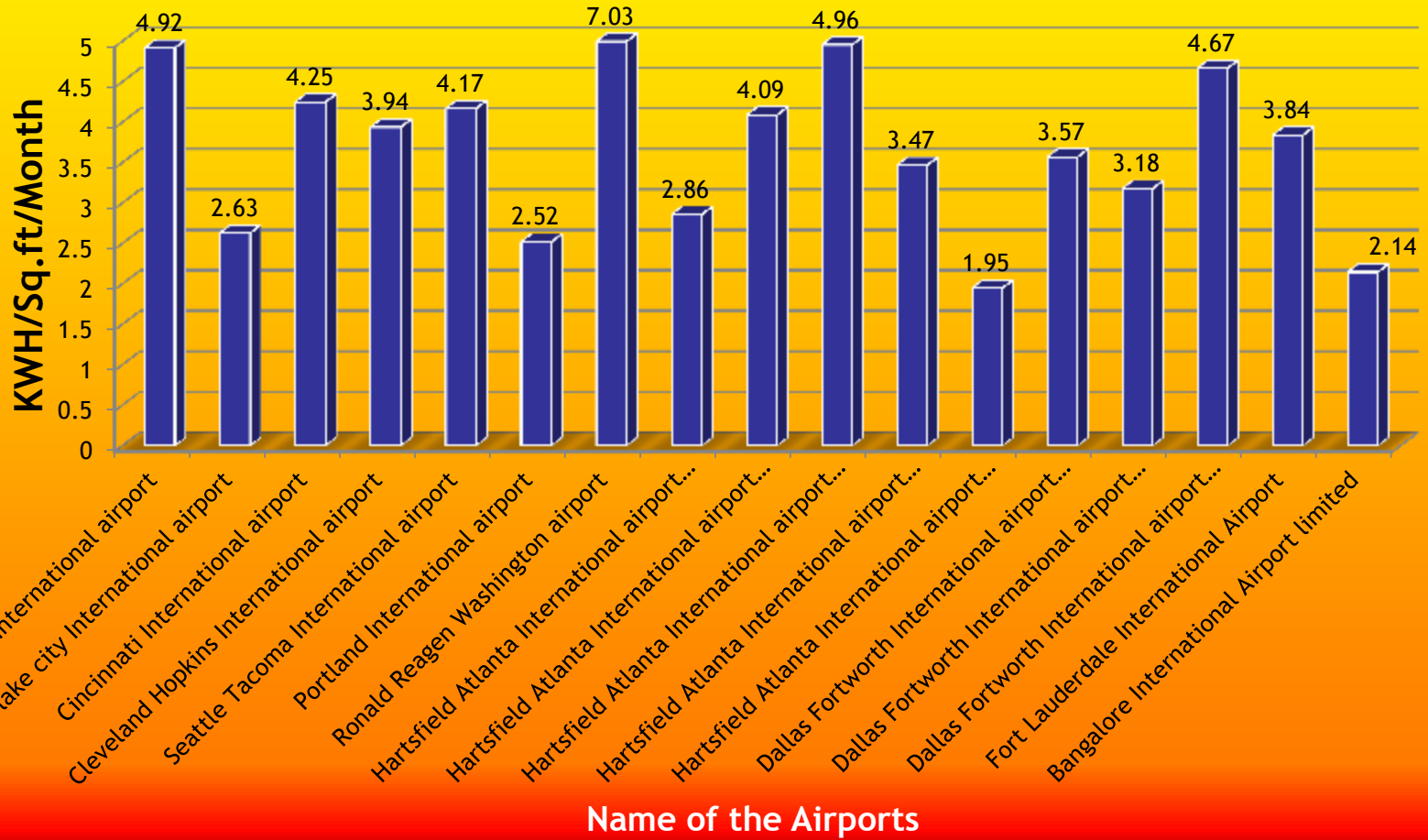


International benchmarking

3. Bench Marking



Specific Energy Consumption -Terminal Building



Courtesy: cleanairports.com

Monitoring & Control

4. Monitoring and review systems

- SCADA for control and monitor power supply.
- Centralized IBMS system for auto operation to schedule, control and monitor all the services such as internal & external lighting, HVAC, Fire fighting system, Water supply pumps, STP etc.
- BMS integrated Energy meters to control and monitor all the motors & A/c load effectively and towards energy conservation



- **Total Energy Audits conducted annually.**
- **Annual Efficiency measurement of energy intensive equipment, review and trend analysis.**
- **Monthly review and analysis of energy balance reports.**
- **Proposals, Viability analysis and pay-back for energy conservation.**
- **Focused and time bound implementation of energy audit findings.**

- **BIAL is getting Power from KPTCL 220 KV Substation from Begur.**
- **BIAL is responsible for providing the Power to all the concessionaires.**
- **Depending on the requirement of energy the contract demand set with BESCO in advance.**
- **For future expansion ,the energy requirement planning is done in advance.**
- **Use/ substitution of more renewable energy is under process**
- **Energy conservation measures are identified, budgeted and planned for short time and long time implementation.**

Awareness Programs - Internal

7. Total Employee Involvement



Energy Conservation - Internal Awareness Posters & Award process

QC initiatives

Six sigma

R&R programs

Trainings

- Encouraging Employees for innovative ideas on Energy conservation and rewarding them through R&R.
- Encouraging Employees to make a positive change to the Conservation initiatives taken by BIAL



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Water Management Excellence



Potable Water Supply Network At BIAL

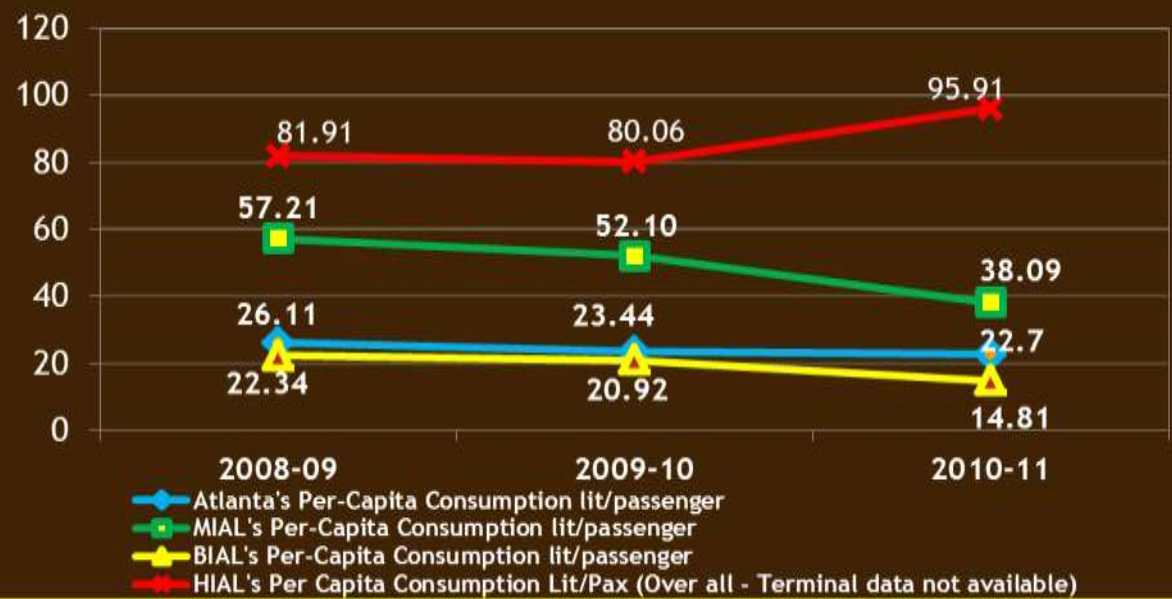


- ✓ VARIABLE FREQUENCY DRIVE (VFD) & HYDRO PNEUMATIC SYSTEM TO ENSURE BEST EFFICIENCY
- ✓ AUTOMATIC OPERATION AND CONSTANT MONITORING THROUGH SCADA.
- ✓ SAP- PM MODULE FOR EFFECTIVE MAINTENANCE

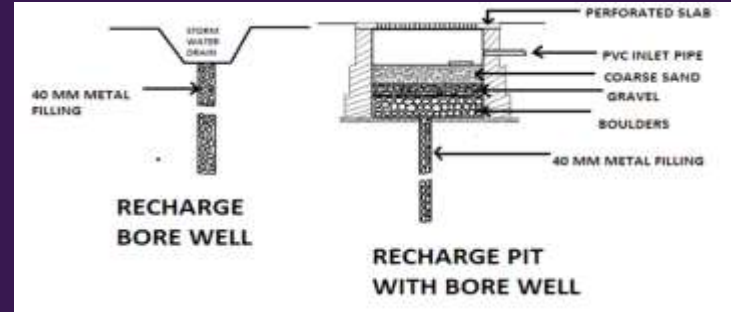


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SWC Benchmarking - National/International



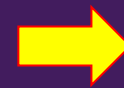
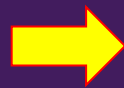
Groundwater Enhancement by Constructing 315 Rain Water Recharge Pits



Open type rain water harvesting ponds



Capacity enhancement of roof top rain water harvesting to 1710 KL.



Renovation and reuse of abandoned open wells as alternate water supply. No bore wells are used in BIAL.



Drip irrigation system at Heritage Boulevard & Garden Boulevard Covering 1,22,500 Sq.m area.



WATER TREATMENT SYSTEM: Zero discharge



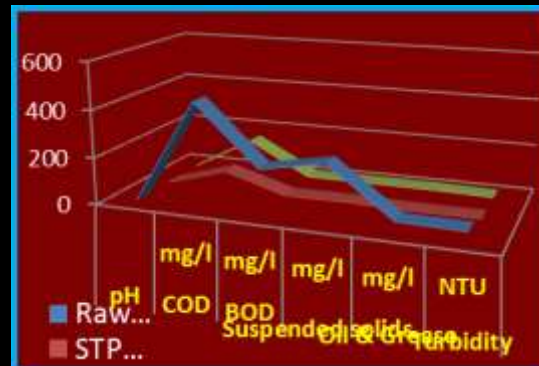
STP TREATED WATER: It is used for irrigation, air-conditioning and fire fighting works.



SLUDGE DRYING: BIAL also uses the sludge drying beds to generate manure for it's greeneries spread over 360 acres of land.



WITHIN THE FENCE



WATER TESTING LAB: KSPCB's Approved Water Testing Laboratory.



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Waste Management Excellence



Initial Challenges

COULD BE BETTER
Sir, I was slightly worried
... to the BIA. But

'We need a world-class civic attitude'

ಅಂ.ರಾ.ವಿಮಾನ ನಿಲ್ದಾಣಕ್ಕೆ
ಸ್ಮಾರ್ತ್ ಮಾರ್ಗ ಅಸಾಧ್ಯ

Service needs to be improved
I was waiting to...

ವಿರ್ ಪೋರ್ಟ್ ಹೈವೇ ಅಸಾಧ್ಯ
ಪ್ರಾಧಿಕಾರದಿಂದ ಪರದಿ: ಹೈಕೋರ್ಟ್‌ಗೆ ಸರ್ಕಾರ ಮಾಹಿತಿ

A commercially oriented machine, without heart or soul

Dirty toilets
Toilets are another story. There was no water in the tank and the flush wasn't working.

BIA's teething problems?
The painting and marking for queues at various counters are not proper



'No FOD' Campaign

Mechanized Sweepers



Best Practices.....

1	Blue	Offices and non-toilet areas	Office cleaning staff Other non-toilet area staff	
2	Yellow	Toilet areas: Vanity & washbasin counters	Toilet cleaning staff	
3	Red	Toilet cubicles and Urinal areas	Toilet cleaning staff	
4	Green	Glass and frames cleaner	Glass cleaning staff	

Color Coded Cleaning System as per CCP Codes

Integrated Waste Management Color Coded Bins

Structure

- Stainless Steel
- 3 Compartments
- Top openings with flap

Dimensions

- H: 100 cm
- W: 135 cm
- D: 59 cm

Volume

- 680 Liters each compartment



Overview




Bins Relining

Liner Holding Frame

- Square Frame to spread the liner.
- Second frame to hold the liner sturdy
- Railing channel to accommodate the frame with Liner



Advantages:

- Easy to replace
- Better Appearance as no hangings
- Clearance and relining is easy

Liners

Color Liners

- Yellow: Cans
- Black: General Waste
- Blue: Bottles



Advantages:

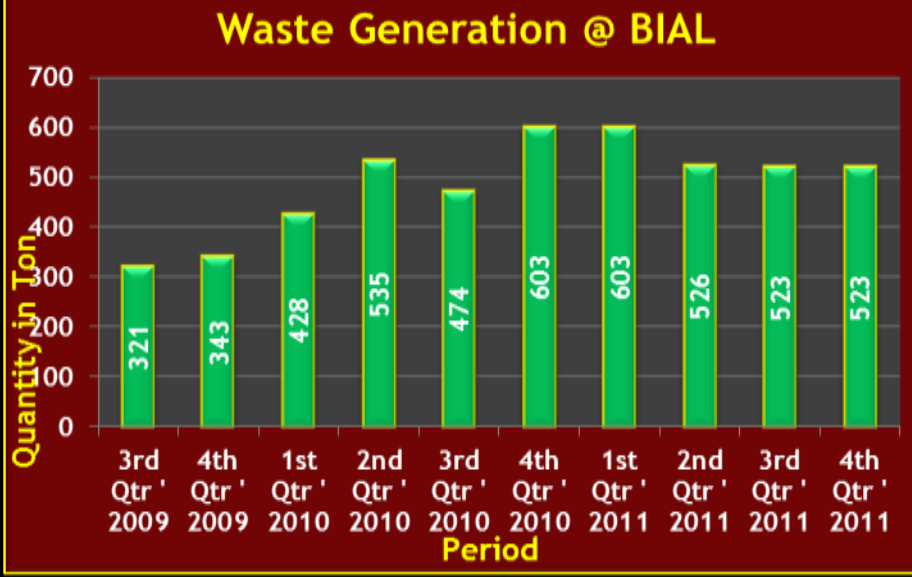
- Segregated Accumulation
- Safe Disposal

New: Color Coded Bins for segregation at source

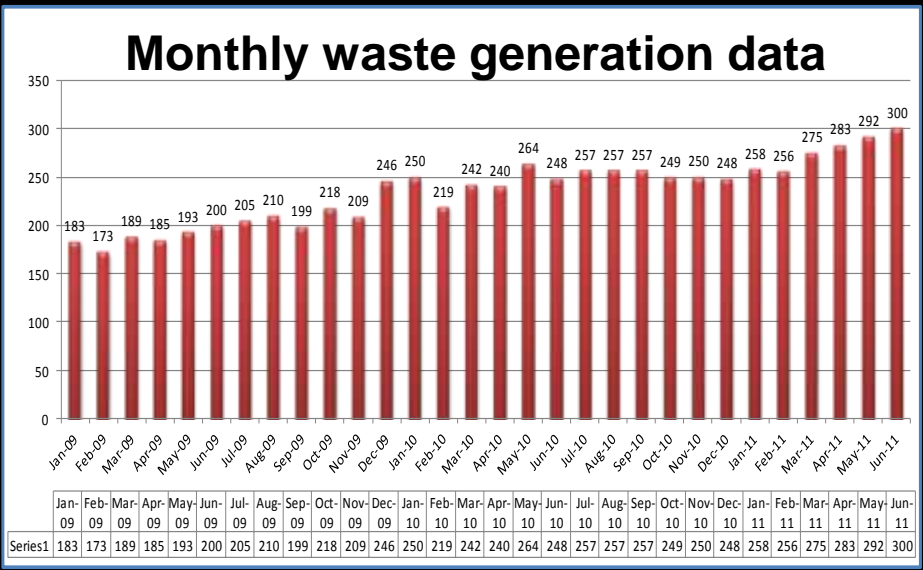
Waste Generation & Processing At BIAL



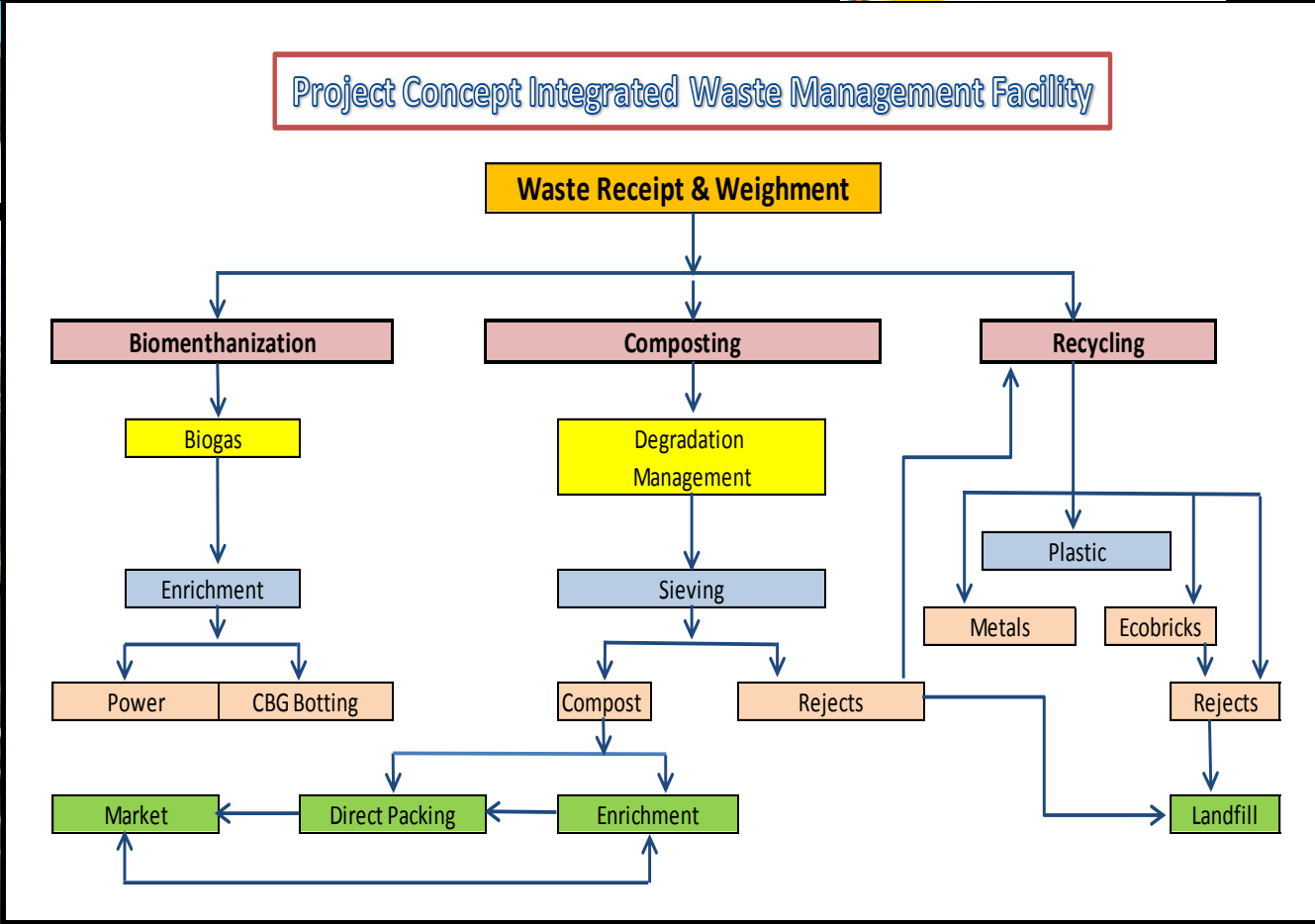
Quarterly waste weighing survey and data analysis



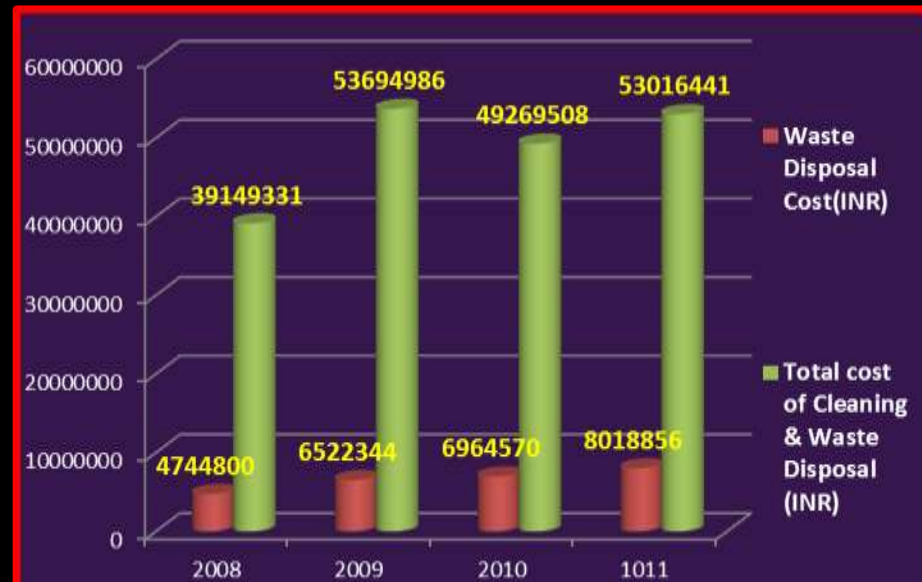
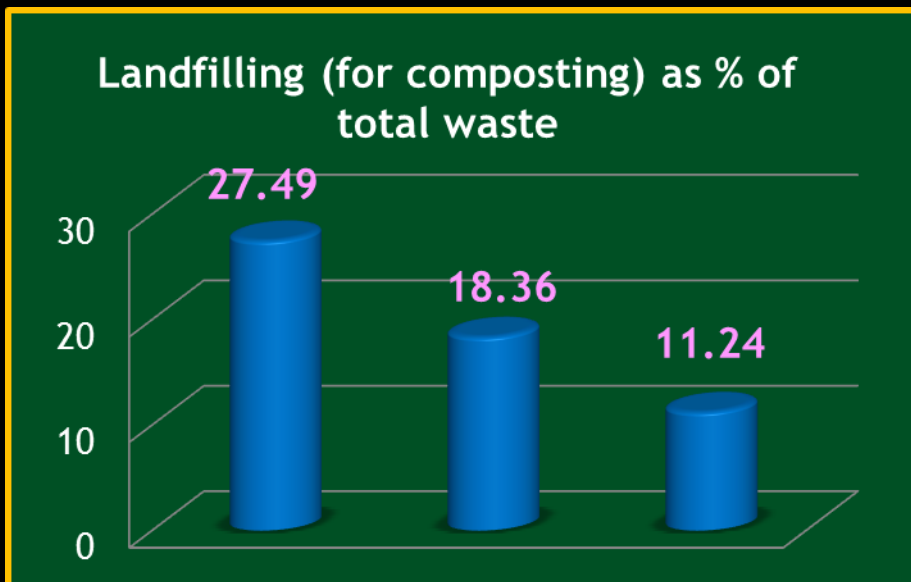
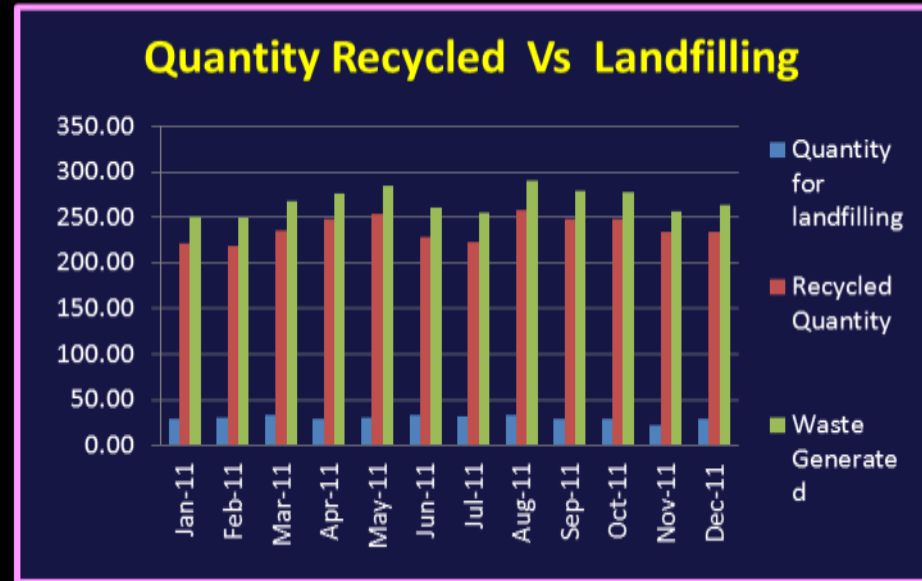
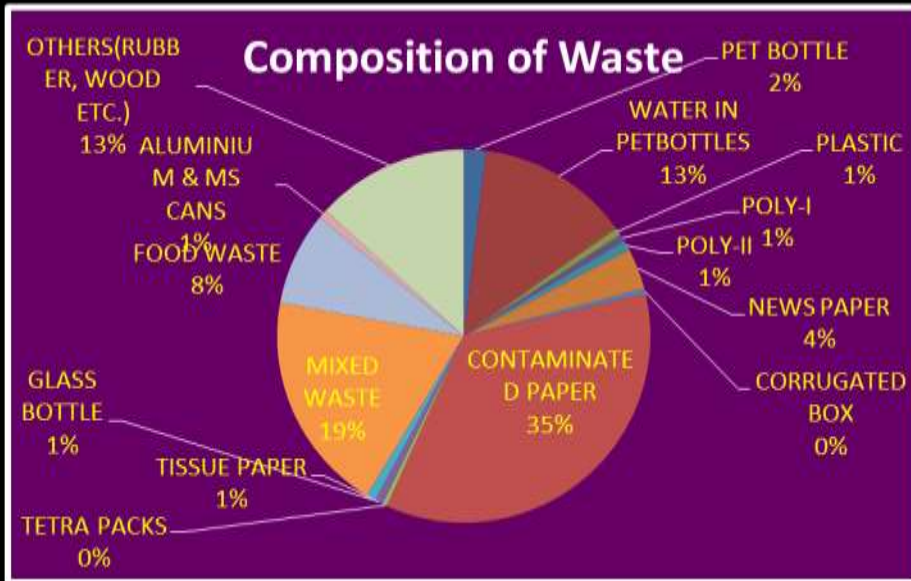
■ Recyclable
 ■ Organic
 ■ Hazardous



Waste processing and disposal



ECONOMICS OF SOLID WASTE MANAGEMENT





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Carbon accounting & Reporting



Carbon Accounting, Monitoring & Reporting

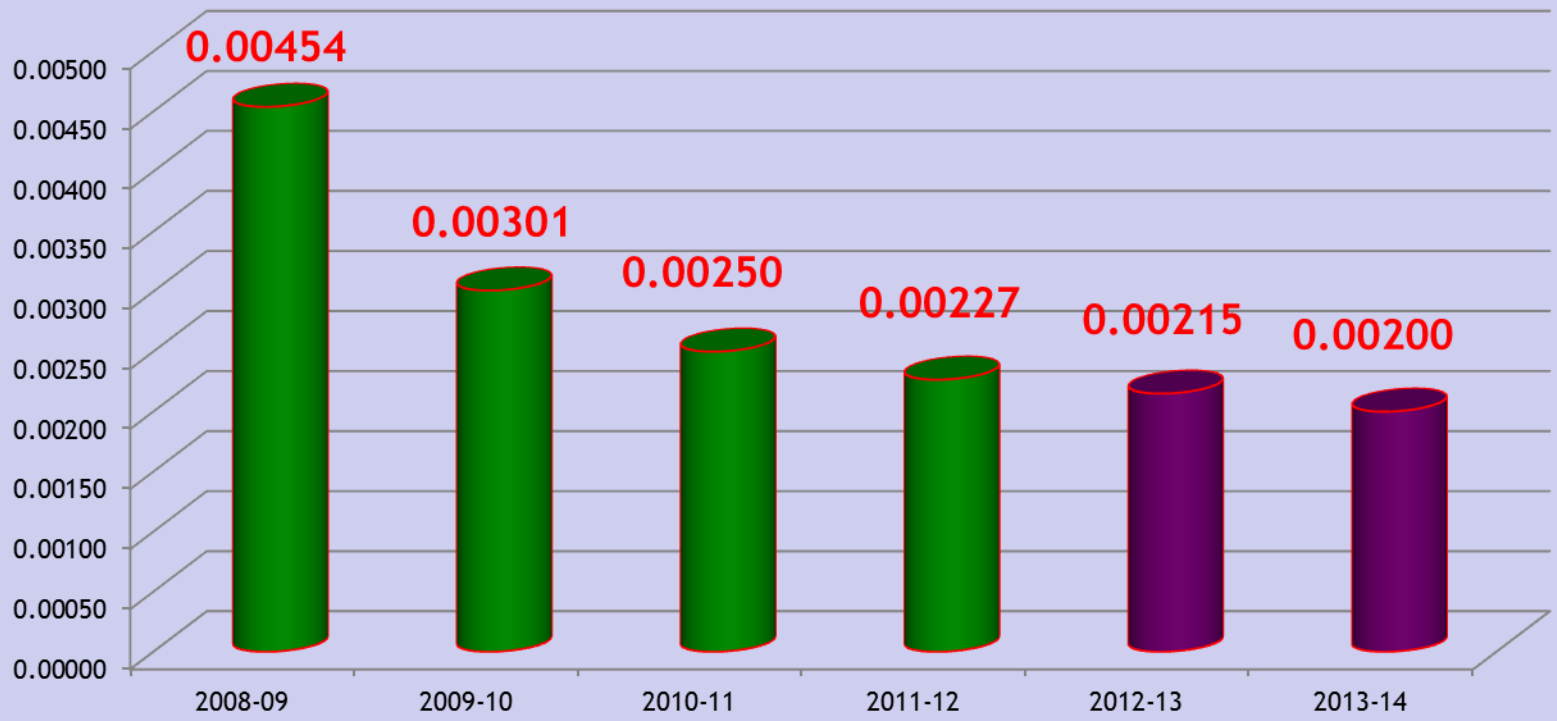


- Standard GHG Sources Identification & Data Collection Format for accounting.
- Guidelines of ISO14064 and “Corporate GHG Accounting and Management Protocol” are followed.
- Developed by WRI3 and WBCSD4. IPCC5 Assessment reports are used as references.

- Group of companies of GVKPIL which includes BIAL has reported their carbon emission to Carbon Disclosure Project for year 2010-11.
- Ranked among the top ten companies on “Carbon Disclosure Leadership Index” (CDLI) in India by *CDP India 200 Report 2011*.
- CDLI score of 75 achieved. Topped in the Utilities sector

Reduction in Emission in MT of CO2 (MT of CO2/Pax)

Carbon Emission/Pax
(MT of CO2)



Airport Carbon Accreditation

- ACI Europe and ACI Asia-Pacific have joined hands to assist their member airports to assess and reduce their carbon footprint through this accreditation program. Airport Carbon Accreditation enables airports to implement carbon management process and gain public recognition of their achievements through the attainment of accreditation at different levels of participation.
- The programme utilizes the GHG Protocol published by the World Business Council for Sustainable Development; concept of scope 1, 2 and 3 for defining emission sources.
- There are four levels of Airport Carbon Accreditation
 - **Level -1 : Mapping Level**
 - **Level -2 : Reduction Level**
 - **Level -3 : Optimization Level**
 - **Level- 4 : Neutrality Level**
- All the three years data of energy and fuel are verified by independent Verifier as per guideline.
- BIAL got Carbon accreditation in Level -2 i.e. Reduction Level by ACI, becoming the first Asia-Pacific Airport to achieve Level-2.

Airport Carbon Emission Data

Carbon Emission in Tons of CO2 Equivalent

Year	Nos of Passenger(in Numbers)	Scope-1	Scope-2	Total Emission (tCO2)	Total Emission/Pax tCO2/Pax
2008-09	7007286	403.18	31403.9	31807.08	0.004539144
2009-10	9920969	487.85	29362.74	29850.59	0.003008838
2010-11	11634035	656.11	28424.68	29080.79	0.002499631
2011-12	12710481	880.34	27926.72	28807.06	0.002266402

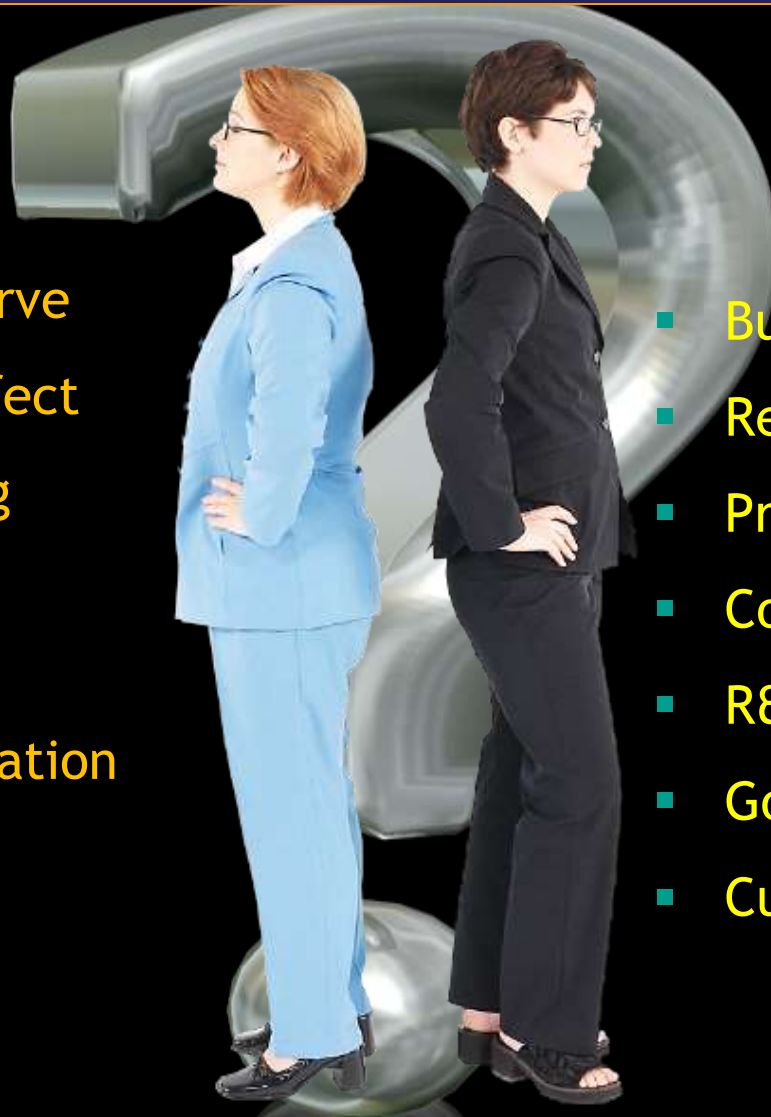


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Energy & Environment Management: Internal challenges



Social & Environmental responsibilities VS Organization interests



- Fossil fuel reserve
- Greenhouse effect
- Global warming
- Environment preservation
- Energy conservation
- Sustainability

- Business expansion
- Revenue growth
- Profitability
- Competition
- R&D
- Goodwill and market value
- Customer satisfaction

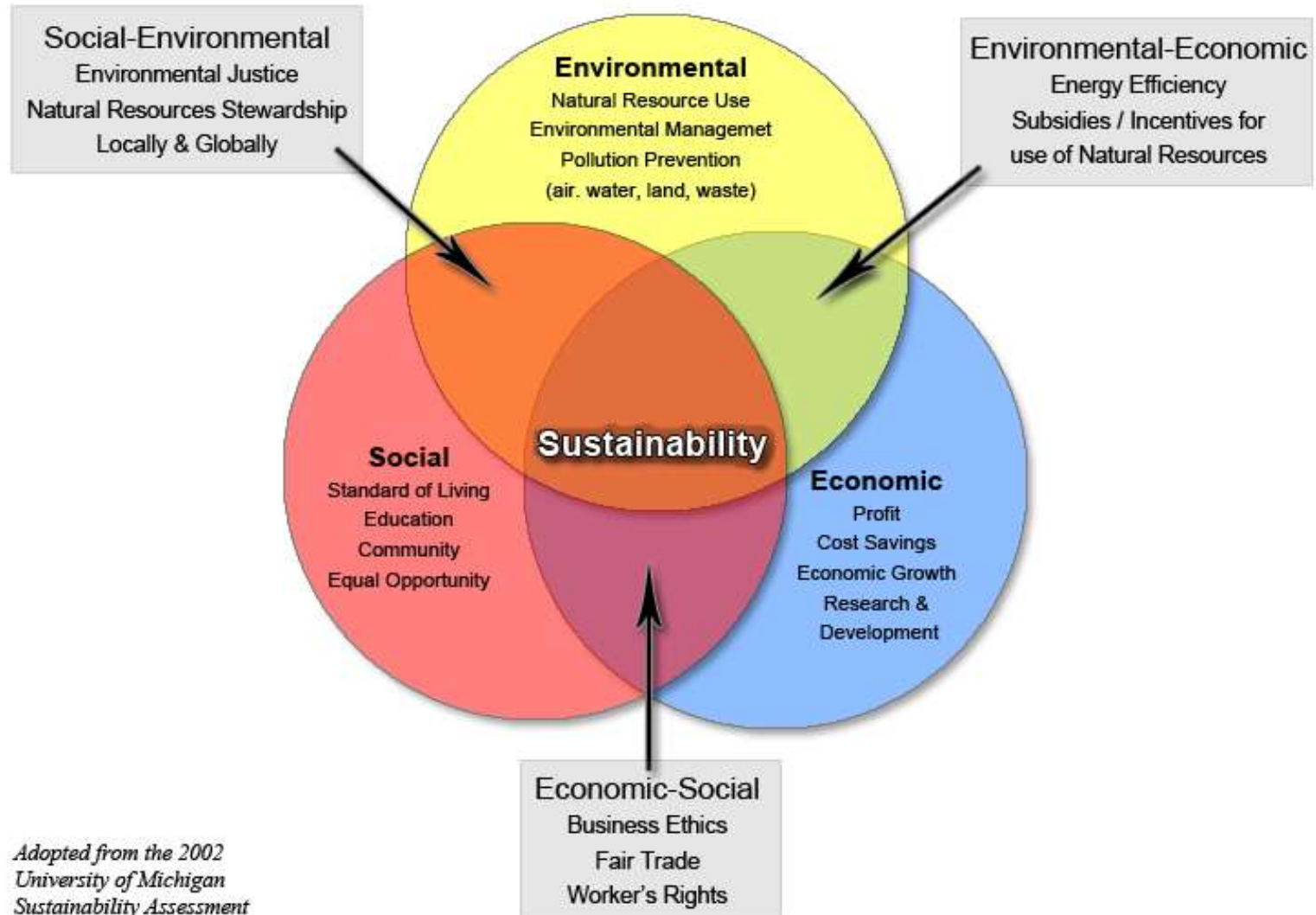
Market options VS Internal challenges (Need Vs Constraints)



- Energy audit firms
- Solution providers
- Energy efficient products
- Renewable energy
- Retrofitting
- Certifications
- Energy efficient designs

- Budget
- Payback
- ROI/NPV
- Investment viability
- Lifetime costing
- Operation & Maintenance expenses
- After sale services

The Three Spheres of Sustainability



*Adopted from the 2002
University of Michigan
Sustainability Assessment*

ENERGY MANAGEMENT POLICY



In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Energy Management through measures designed to:

1. Continuously supply energy to all facilities in an efficient manner.
2. Minimize power, steam and related energy consumption in a cost-effective manner.
3. Optimize energy production and consumption in Energy Management.
4. Maximize the quality of energy production of energy in the required services.
5. Reduce the impact of all risks to the energy management system.
6. Comply with the current regulatory and legal requirements.
7. Develop and use cost-effective energy conservation and energy saving technologies.
8. Communicate to all employees working in the context of BIAL, their individual energy obligations.
9. Reduce the carbon emissions/footprint in a greenfield through a variety of technologies.

G.V.K. Reddy
Managing Director
Bangalore International Airport Limited

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WASTE MANAGEMENT POLICY



In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Waste Management through measures designed to:

1. Reduce waste generation wherever possible.
2. Re-use and recycle wherever possible.
3. Recycle and reuse waste.
4. Re-use and recycle wherever possible.
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19. Re-use and recycle wherever possible.
20. Re-use and recycle wherever possible.

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WATER MANAGEMENT POLICY



In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Water Management through measures designed to:

1. Continuously supply water to all facilities in an efficient manner.
2. Minimize water consumption in a cost-effective manner.
3. Optimize water production and consumption in Water Management.
4. Maximize the quality of water production of water in the required services.
5. Reduce the impact of all risks to the water management system.
6. Comply with the current regulatory and legal requirements.
7. Develop and use cost-effective water conservation and water saving technologies.
8. Communicate to all employees working in the context of BIAL, their individual water obligations.
9. Reduce the carbon emissions/footprint in a greenfield through a variety of technologies.

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GREEN PROCUREMENT POLICY



In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Green Procurement through measures designed to:

1. Minimize the use of non-renewable resources which are environmentally efficient.
2. Minimize the use of non-renewable resources which are environmentally efficient.
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20. Minimize the use of non-renewable resources which are environmentally efficient.

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ISO - 9001:2008

Quality Policy

In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Quality Management through measures designed to:

1. Identify and understand customer requirements and expectations.
2. Plan and implement processes to meet customer requirements and expectations.
3. Monitor and measure process performance and customer satisfaction.
4. Analyze and identify areas for improvement.
5. Implement and maintain a Quality Management System.
6. Review and improve the Quality Management System.

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Managing Director



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OHSAS-18001:2007

Occupational Health & Safety Policy

In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Occupational Health & Safety Management through measures designed to:

1. Identify and understand occupational health and safety hazards and risks.
2. Plan and implement measures to control occupational health and safety hazards and risks.
3. Monitor and measure occupational health and safety performance.
4. Analyze and identify areas for improvement.
5. Implement and maintain an Occupational Health & Safety Management System.
6. Review and improve the Occupational Health & Safety Management System.

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Managing Director



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ISO - 14001:2004

Environmental Policy

In the spirit of India's greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and will practice towards supply the necessary and supporting staff and their teams to per the operational requirements and associated activities. The management of BIAL, is committed to achieving excellence in Environmental Management through measures designed to:

1. Identify and understand environmental aspects and impacts.
2. Plan and implement measures to control environmental aspects and impacts.
3. Monitor and measure environmental performance.
4. Analyze and identify areas for improvement.
5. Implement and maintain an Environmental Management System.
6. Review and improve the Environmental Management System.

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Managing Director



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Q&A

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Thank You

