



BEST PRACTICES IN WASTE MANAGEMENT @ KEMPEGOWDA INTERNATIONAL AIRPORT BENGALURU

BANGALORE INTERNATIONAL AIRPORT LIMITED

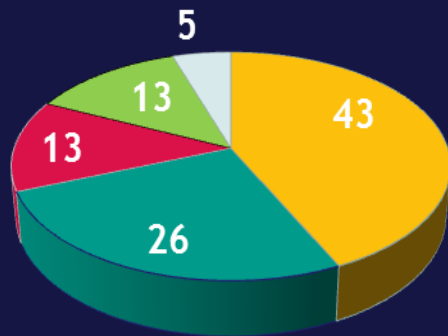
December 4, 2015

Company Profile

Bangalore International Airport Limited (BIAL)



GreenCo Best Practices Award 2015



■ GVK ■ Siemens ■ Gol ■ GoK ■ Zurich Airport

Vision

Kempegowda International Airport will excel in consistent efficient & friendly delivery of airport services as gate way to South India



- ❖ 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.

- ISO 14001 (EMS), OHSAS18001, ISO 9001 (QMS), ISO 50001 (ENERGY) & ISO 27001 (ISMS)
- ISO 22301: Business Continuity Management
- Airport Carbon Accreditation Level 3
- Existing Terminal rated LEED SILVER by USGBC
- Terminal Expansion certified as LEED Gold by IGBC
- First company in country certified as GreenCo under Silver category

Started operation: May 23rd 2008

No. Of Employees: 838

GreenCo Best Practices Award 2015

Preliminary Assessment & Site Visit @ KIA



Bangalore International Airport Limited (BIAL) was amongst first companies to be certified as GreenCo Silver rating.

The objective of the rating system is to assess the present level of environmental performance employing holistic approach covering various areas - energy efficiency, water conservation & management, renewable energy, greenhouse gas mitigation, waste management, material conservation & recyclability, green supply chain, and other miscellaneous areas like ventilation, landscape, site & Innovation. There are 5 levels of rating system, starting with 'Certified' level and platinum being the highest.



Registration	May 11	Submission of Document	Oct 2011	Site visit (Assessors)	Feb 2012	Award	Mar 12
↓		↓		↓			
Handholding & Training	July 11	Pre assessment	Dec 2011	Submission of Report	Feb 2012	Rating	Silver
↓		↓		↓			

Service

DOMESTIC CONNECTIVITY



Description	Existing
Total Area	4009 Acres
Terminal	1 (T1+T1A)
Runway	1 (4000 Mtr long & 45 M wide)
Operating Hrs	24 Hrs /365 days
Passenger 2014 - 15 (app)	15.4 Million
Floor space	1.6 Million Sq. feet
Aircraft movement/day	400 App.
Destination	56
Aerobridges	17
Boarding Gates	26
Countries connected	18
Retail Concepts	28
F&B Concepts	17
Car Parking capacity	2000
Number of employees	8100 (Direct & Indirect)

- Aviation Fuel
- Cargo Facilities
- Ground Handling
- Flight Catering
- Food and Beverage
- Business Hotel
- Retail/Duty Free
- Advertising

Logos of service providers:

- Skytanking, IndianOil
- Menzies, AIR-INDIA, sats
- GlobeGround
- ASG Sky Chefs, TAJ SATS AIR CATERING
- HMS HOST, Cafe COFFEE DAY
- LARSEN & TOUBRO LIMITED, Divya Hotels & Resorts
- KHOPPER STOP LIMITED, the Nuance group
- JCDecaux

37	Airline Operating
9	Domestic Passenger Airlines
1	Domestic Cargo Airlines
28	International Airlines
7	International Cargo Airlines
56	Destination Served

AIRPORT SERVICE



KIA Waste Management @ 3R principle: policy and guidance documents



WASTE MANAGEMENT POLICY

As the operator of India's prime Greenfield airport, Bangalore International Airport Limited (BIAL) is committed to excellence in operation & maintenance and safe practices towards minimization of waste as per the operational requirements & international standards. The management and staff of BIAL believe in safe and healthy work habits and work environment. And BIAL is committed to achieving excellence in Waste Management through measures designed to

- 1. Reduce waste generation from its source.
- 2. Segregate the accumulated waste as:
 - Hazardous waste and non-hazardous waste
 - Recyclable waste and disposable waste
- 3. Implement innovative measures to reuse the generated waste.
- 4. Recycle the recyclable waste and utilize the recycled product.
- 5. Dispose the waste through scientific process with minimum damage to the environment.
- 6. Comply with the currently applicable legal and regulatory requirements.
- 7. Involve employees of all levels in the Waste Management efforts.
- 8. Reciprocate & reward the employees for giving innovative ideas in Waste Management.
- 9. Impart training & awareness about Waste Management techniques to all the employees & vendors.
- 10. Communicate to all the persons working under the control of BIAL their individual waste obligations.

G V Sarathy Reddy
Managing Director
Bangalore International Airport Limited

Date: December 2011

- ❖ Continuous monitoring on waste generation.
- ❖ Minimize waste generation.
- ❖ Scientific method adoption in segregation and recycling of waste generated.
- ❖ Involving employees in the waste generation reduction efforts.
- ❖ 100% legal and regulatory compliance.
- ❖ Develop & maintain own standards.
- ❖ Trainings and awareness programs.
- ❖ Optimum efforts to ensure lowest landfill among all industrial sector.

AERODROME MAINTENANCE MANUAL

Annex-15
Water Supply System

AERODROME MAINTENANCE MANUAL

Annex-6
Airfield Drainage System

TS 6

TECHNICAL SPECIFICATIONS
WATER & WASTEWATER

- ✓ **BIAL Maintenance Manuals:**
 - Annex-06: Airfield Drainage System
 - Annex-15: Water supply system
 - Annex-16: Sewage Treatment System
 - ✓ **TS-6: Technical specifications for Water and Waste Water**
 - ✓ **47 Standard Operating Procedures (SOPs) and Emergency Operating Procedure (EOPs)**
- GreenCo Best Practices Award 2015

Sl. No.	Activity/Item	Frequency	Responsible Person
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BIAL EXCELLENCE :



BIAL received prestigious SKYTRAX award for Best Regional Connectivity in Central Asia, 2015. The results are based on passenger satisfaction survey which is the most prestigious amongst all the surveys measuring airport services.



Out of 12 QC projects, 8 QC teams are awarded under the “Gold” category and 4 QC teams are awarded under the “Silver” category in the “23rd Chapter Convention on Quality Circles – CCQC 2014” at T. John Institute of Technology, Bengaluru on 7th September’2014.



“Energy Efficient Unit’ and ‘Most Useful Presentation Award on Energy Management’ at National Energy Award for Excellence in Energy Management by CII, August 2013



Most Innovative” and “Most Useful Project” at CII- Environmental Best Practices Award – 2013 organized by CII- Sohrabji Godrej Green Business Centre

- It takes up valuable and expensive land close to towns and cities
- It devalues nearby land properties
- Pollutes groundwater, air and produces pungent odor
- The proper waste management & disposal process justifies natural resources

Airport Scenario:

- Airports generate enormous volume of solid & Liquid waste along with small quantity of hazardous waste from its operations.
- Proper segregation at source.
- Proper disposal of Solid Waste and scientific processing
- Bird Management
- Storm Water & Wastewater Management.





Waste Generation & Processing At BIAL



Waste Collection:


All the waste generated at various waste generation points in airport like Terminal building, Admin building, Maintenance buildings, Aircrafts and Concessionaires are provided with different color code waste collection bins. All bins nomenclature is provided to ease the user to drop the waste into suitable bins. The filled bins are collected in scientific manner and transferred to solid waste collection center for further segregation and packing in UV sterilized bags after weighing.

Best Practices At BIAL

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



Transparent Roof Top



Wind Operated Ventilators

UNIQUENESS OF WASTE CENTRE

The waste collection center is constructed to handle the waste generated in airport by means of scientific method of segregation and recycling. The waste collection center is constructed in environment friendly manner as listed,

Natural Sunlight helps in Solid Waste management

- Removing the moisture
- Prevent from further decaying
- Prevent from foul smell
- Save the electricity in day lighting.

Wind Ventilators ensures energy saving for exhaust.

The platform of the waste collection center is raised by 10 ft. from ground level in order to avoid any rain water entry or animals.

3R PRINCIPLE - WASTE MANAGEMENT BIAL



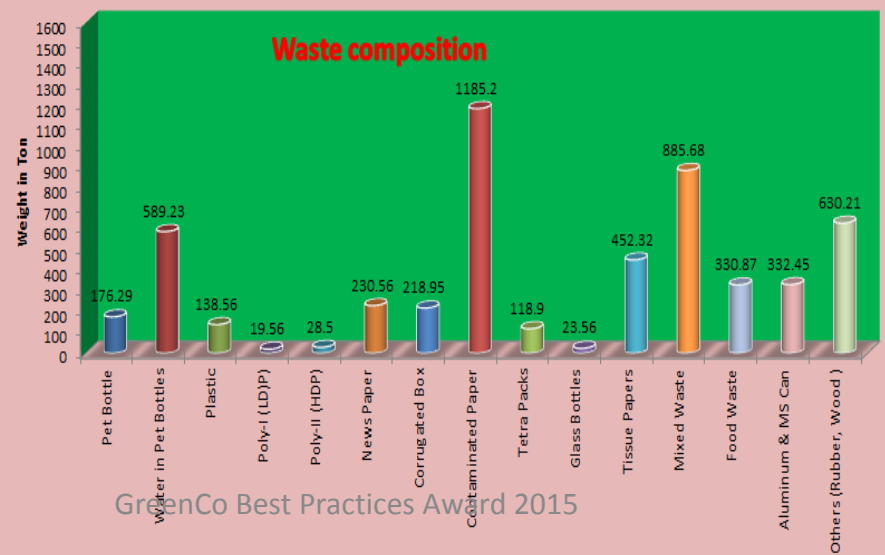
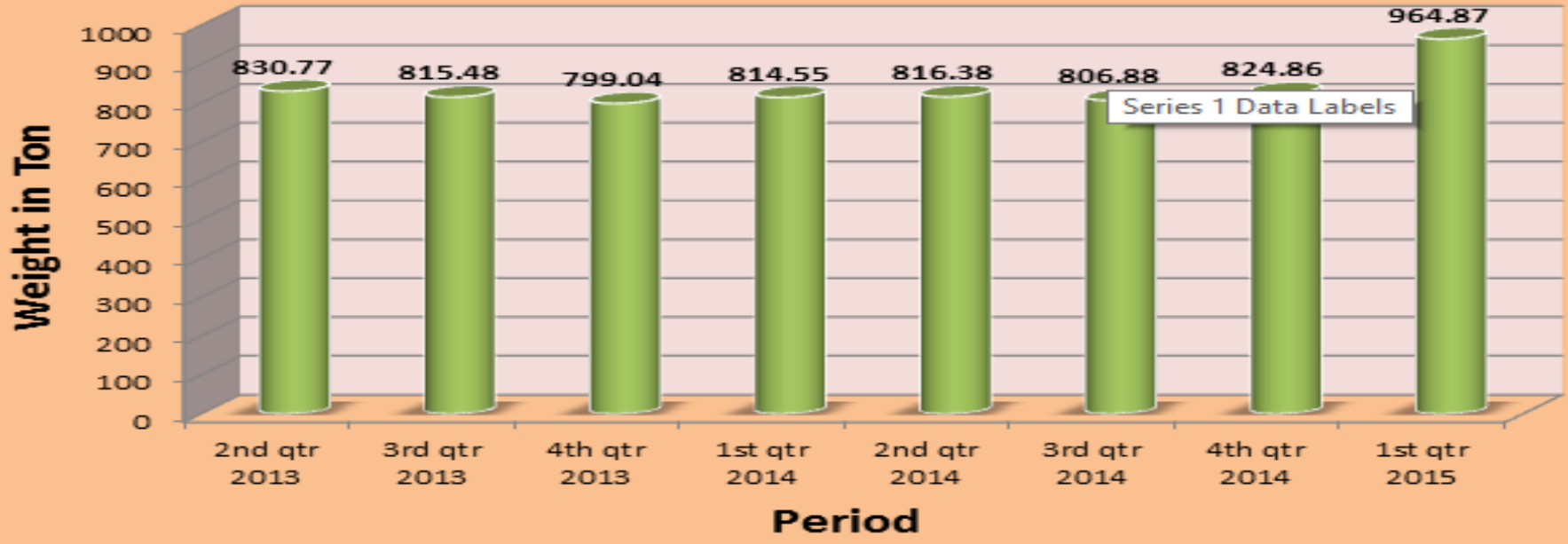
REDUCE, REUSE & RECYCLE

- A. Reduction in consumption of tissue paper rolls by installing electric hand driers at all points wherever applicable to reduce the waste generation.
- B. Use of ceramic cups for Tea/coffee/Water instead of paper cup, each paper cup consume 5 liters of water for production which ensures water conservation and waste production reduction
- C. Created awareness among all the employees to use one side used paper for rough print and other rough works
- D. The awareness programmes are conducted and posters are displayed to educate the customers and people involved in airport operation to reduce the waste generation.
- E. The quantity of waste generated by passengers, concessionaires and employees are surveyed and quantified on regular basis. The waste generation per passenger is derived and monitored
- F. Regular training for the employees regarding waste management and importance of waste management
- G. Regular Audit conducted regarding waste management and loop holes if any identified and implementation towards correction activities carried out
- H. Reduction in usage of bottled water by providing RO units at various locations.

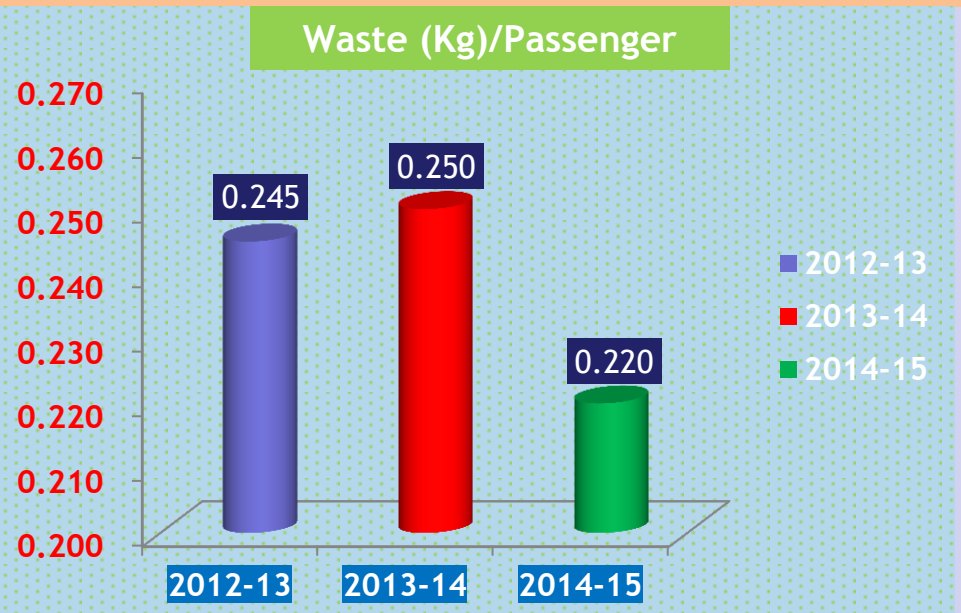
Waste Weighing Survey and Data Analysis



Waste generation at BIAL



GreenCo Best Practices Award 2015



Waste To Processing Site



Weighed Solid Waste Collected in the UV sterilized bags are dumped in solid waste dump yard to load into the vehicle for transportation to BIAL partner m/s. Terra Firma Bio Technologies (TFBL) for scientific processing.

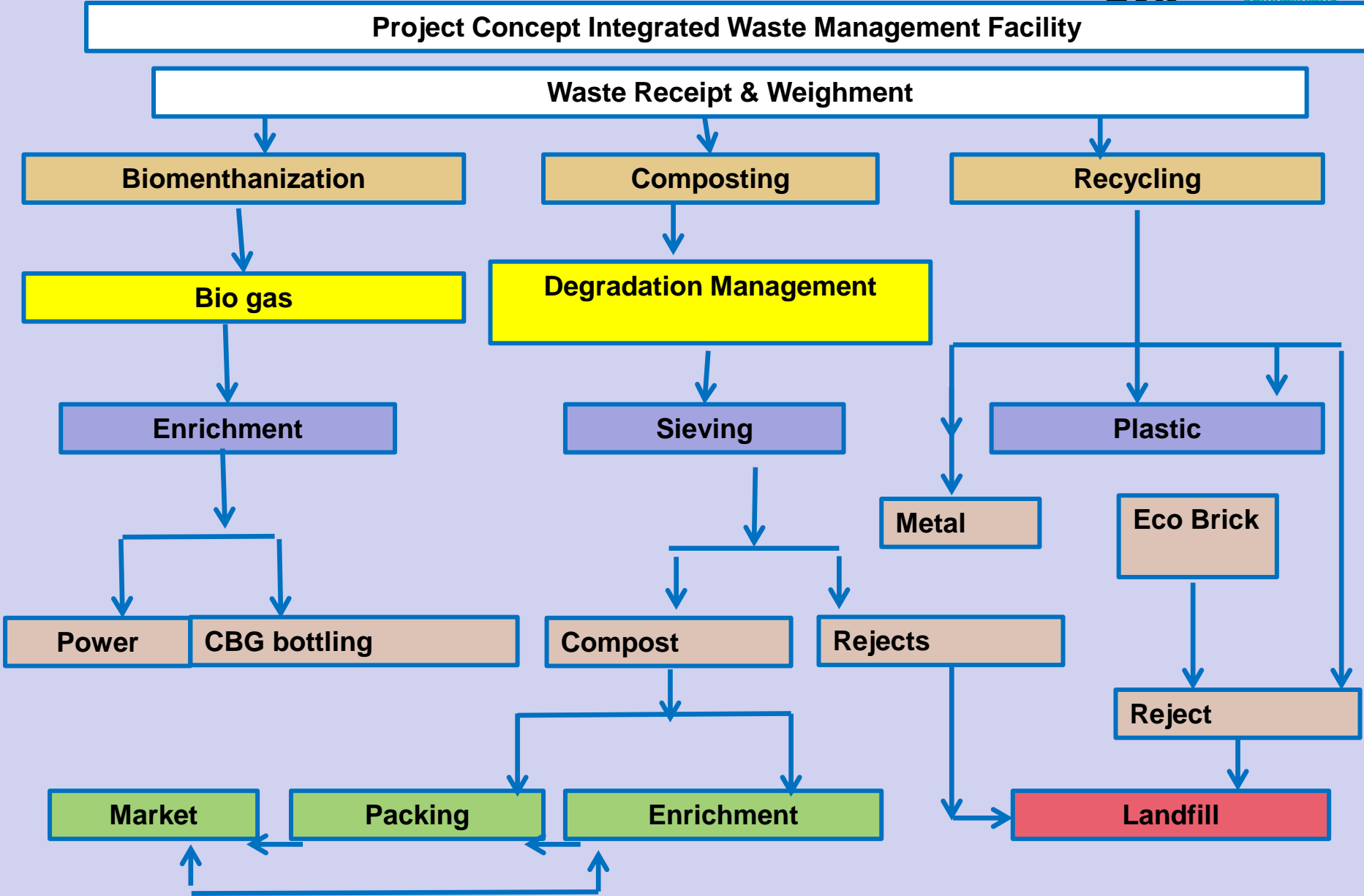


TFBL Processing Site



TFBL Lab

Waste Processing & Disposal





City Compost



Raw Material



Pre Segregation



Simple Sieving



Bagging



Enrichment



Sieved Compost

Plastic Processing



Raw Material



De-Duster



Pre wash



Shredder



Shredder



Post Wash

Bio Gas Generation



Biogas Digester



Biogas Digester



Biogas Engine



Purification

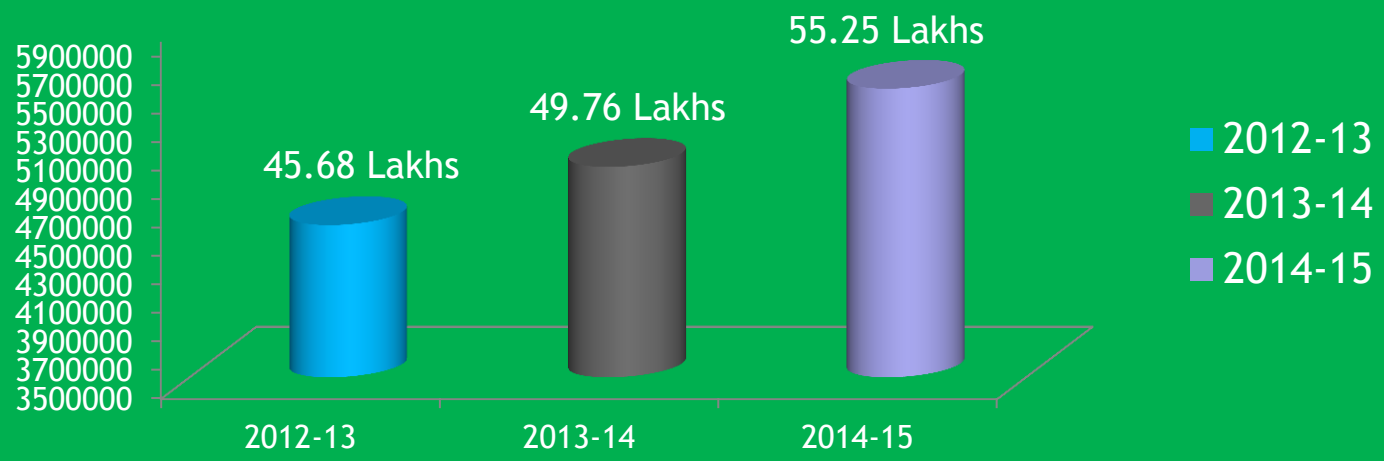
Bricks Manufacturing



Economics & % Reduction in landfilling

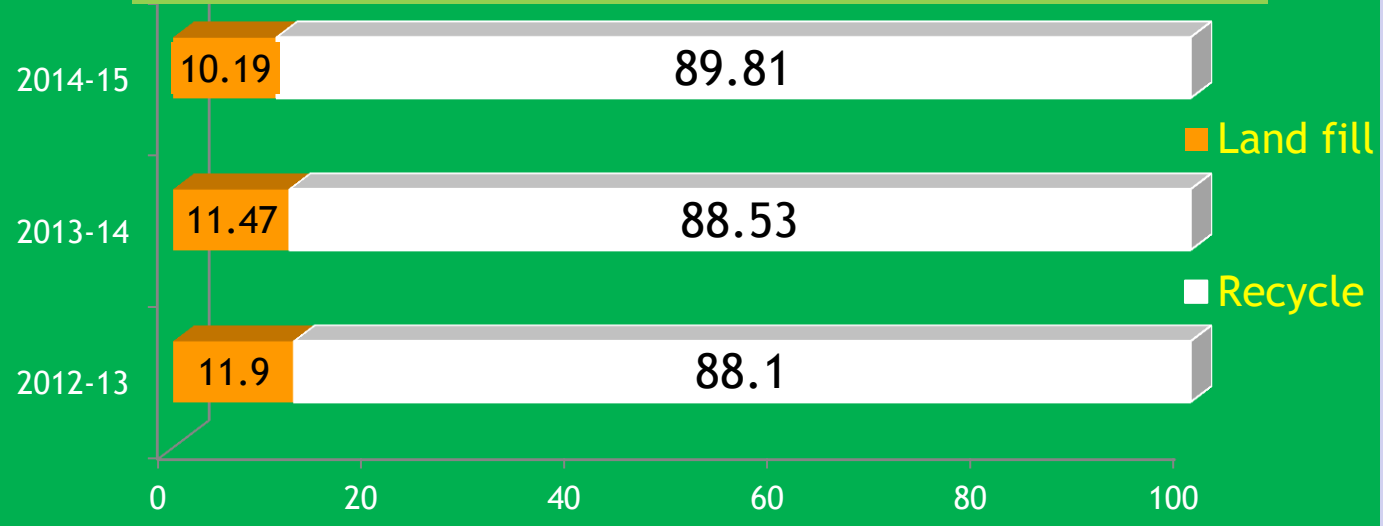


Yearwise Expenditure SWM @ KIA



BIAL spent around 55 Lakhs in the financial year 2014-15 towards SWM & Scientifically processed around 3250 MT of solid waste

Specific Reduction in Landfill Qty. (%)

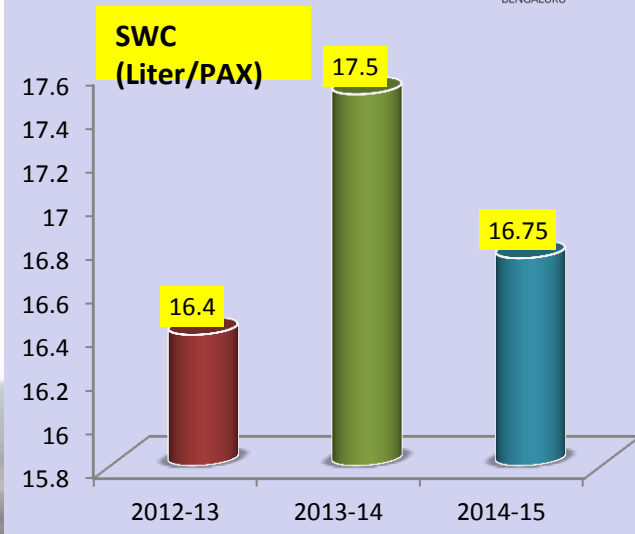


BIAL facilitated its own processing site map in TFBL and ensures continuous monitoring of processed waste and economic study hence continuously reducing the land fill

Best Practices - Wastewater Management



2.0 MLD STP



BIAL has water distribution concept through VFD driven Hydro-pneumatic system to ensure efficient water management

BIAL own 2.0 MLD sewage treatment plant to treat the sewage generated from airport activities. Adopted zero discharge policy. Voted best maintained STP in and around Bangalore by KSPCB. The treated water being completely utilized for secondary purpose. The sludge is de-composted in-house to generate manure and utilized for landscaping inside the airport. Also supplied the manure to the farmers in and around the airport for agricultural purpose.

Best Practises - Air Emissions

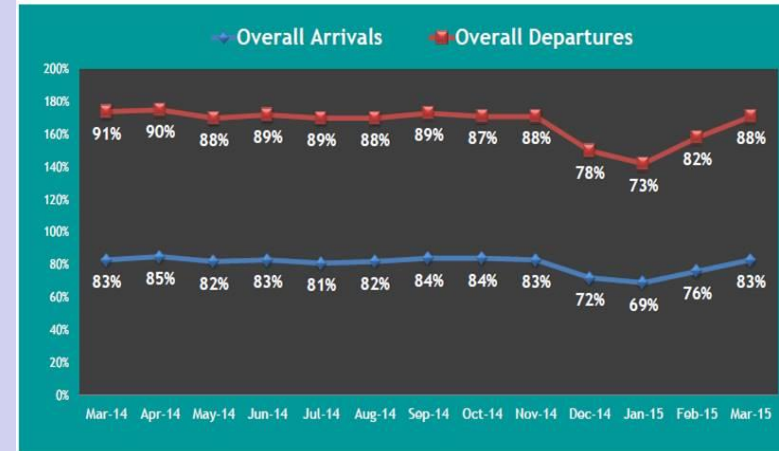


Carbon Emission in tonnes of CO2 Equivalent

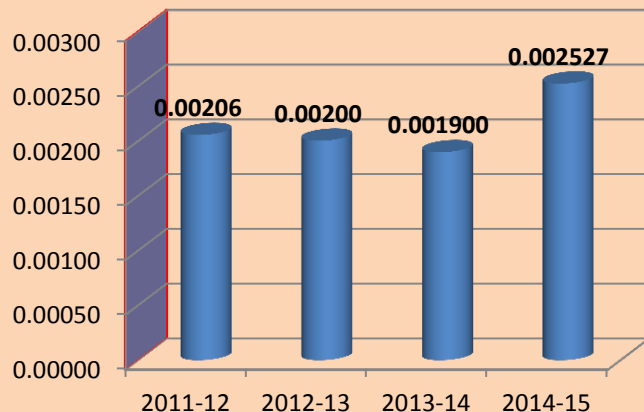
Year	Nos of Passenger (in Numbers)	Scope-1	Scope-2	Total Emission (tCO2)	Total Emission/Pax tCO2/Pax
2011-2012	12710481	880.34	25267.04	26147.38	0.002057151
2012-2013	11994743	856.6	23190.55	24047.15	0.002004807
2013-2014	12869678	764.22	23685.88	24450.1	0.001899822
2014-2015	15402931	754.39	38162.26	38916.65	0.002526574

OTP & 3 Lane change

OTP Monitor Overall - Trend



Carbon Emission/Pax (MT of CO2)



BIAL received Airport Carbon Accreditation at Level 3 i.e. Optimization Level by Airport Council International.

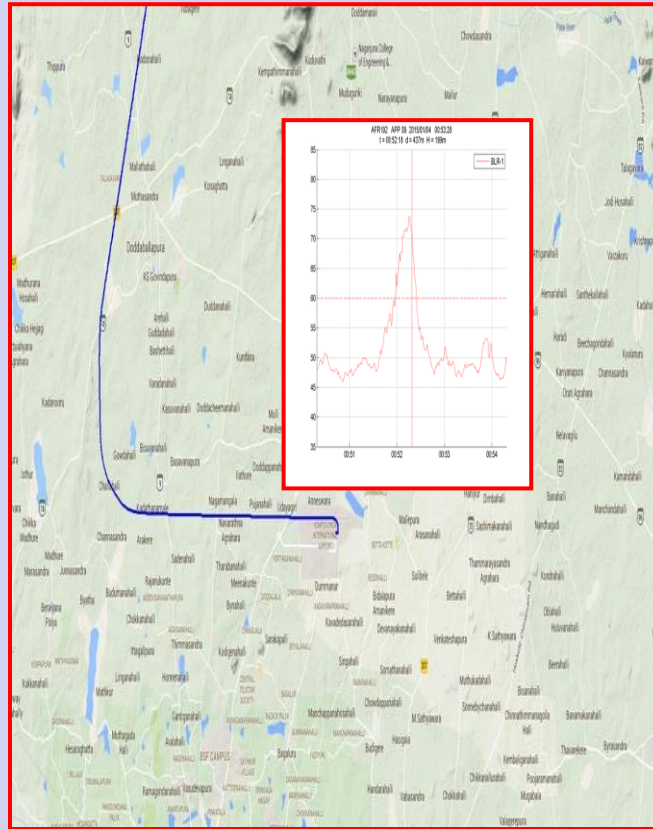




BIAL continuously monitor its air emissions and submit the report to KSPCB. BIAL installed Continuous Ambient Air Quality Monitoring Station with Online Display in its premises to monitor the Ambient air quality.

BIAL invested around INR 1.1 crore for this project and successfully completed in the year 2013.

Best Practises - Noise Monitoring



- BIAL also continuously monitor noise level generated due to aircraft movement.
- Installed two permanent Noise monitoring station outside the airport campus in two nearby villages exactly on the aircrafts approach path.
- Monitor the noise level up to 10 KM radius by mobile noise monitoring station.

BIAL spends around INR 50 Lakhs per annum for this and submits the report to DGCA. BIAL initiated this project in the year 2013 and started report generation from Jan 2015.

Best Practises @ KIA



WORLD of GOOD

GIAB RECYCLES ALMOST 100% OF ITS WASTE WATER.

GIAB recycles 100% of its wastewater

GVK Kempagowda



95% OF GIAB EMPLOYEES USE PUBLIC TRANSPORT

WORLD of GOOD

95% OF GIAB'S EMPLOYEES USE PUBLIC TRANSPORT.

GVK Kempagowda



WE PUT THE GARDEN BACK IN THE GARDEN CITY

WORLD of GOOD

WE PUT THE GARDEN BACK IN THE "GARDEN CITY".

GVK Kempagowda

Best Practises @ KIA

Sustainable Design Approach



Plastic-free terminal with all F&B and retail concessionaires offering cloth or paper bags.

CSR programmes to promote environmental safety and community development.



Continuous Adoption of Sustainable Practices



Swatch Bharat Campaign 2015



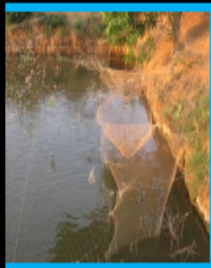
BIAL Top management committee involved in Swatch Bharat Campaign conducted in airport for employees and stake holders. Conducted four times and cleaned the premises

World Environment Day June 05 2015



BIAL Top management committee involved in planting of 1500 trees in airport premises on world environment day

Involving community



Solid waste management

- ❑ The AEMC is constituted under Chairman, BDA to handle the environmental issues concerning civil aerodromes. **(Frequency of meeting: Quarterly)**
- ❑ Sub-committees at airport level under CEO of District Panchayat and other local authorities as members to address the local issues around the airport. **(Frequency of meeting: Quarterly)**
- ❑ Direct coordination between BIAL personnel and local bodies: **Regular basis**
- ❑ Conducted many awareness program and poster campaign on Bird hazard and garbage discipline in the nearby village schools and panchayat meetings.



Awareness programs

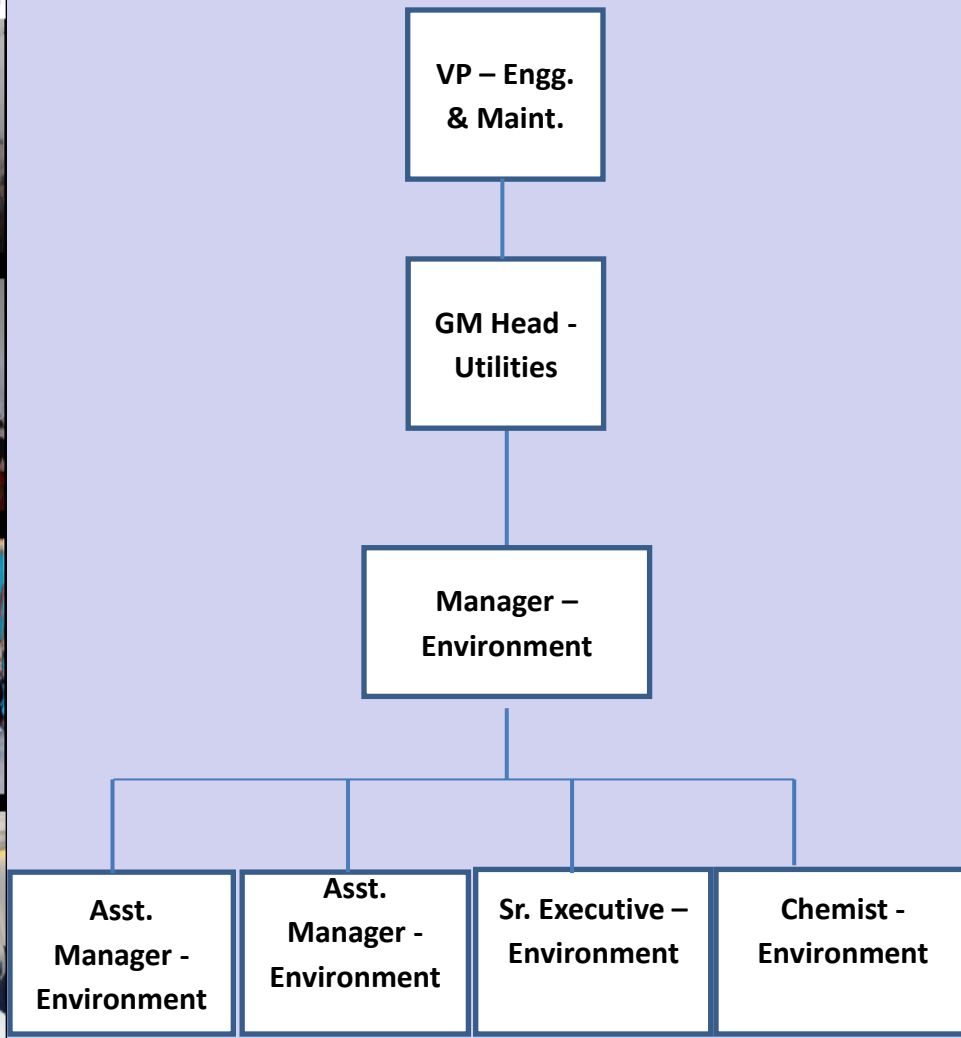


Painting competition at village school



100 years, 100 miles, 100 smiles.

Organogram for Waste Management Team



Uniqueness of the project



1. KIA is one of the airport which is scientifically processing solid waste with environmental values considering the nearby community health.
2. The waste collection center is totally environment friendly
3. The integrated waste management system is economical and one of the anti pollution drive mechanism
4. Ensured the cross contamination of surface run off water by installation of oil water separator.
5. Ensured the color coded bin concept for smart segregation at source
6. The manure produced from waste processing is being used for landscaping (560 acres) at Airport.
7. Ensured non use of chemical fertilizer for green belt development.
8. 100% utilization of treated water for irrigation ,firefighting and HVAC make up.
9. Use on eco-friendly chemical agent for house keeping activities.

REPLICATION POTENTIAL



Possible in all Indian airports,

CHALLENGES FACED

1. Collection of solid waste in the area of 4000 acres of land.
2. Identifying the proper vendor for solid waste processing in scientific way.
3. Discussing and mutual agreement towards integrated solid waste management between concessionaires and other stakeholders with in the airport premises
4. Bird attraction control system a big challenge faced during airport operation.
5. Identification of location and construction of covered waste center as per proper guidelines
7. Transportation without spillage, Public awareness

TANGIBLE BENEFITS



- 1. BIAL use the bio-fertilizer produced from its solid waste for its vast landscaped area (850 MT annually)**
- 2. The concrete blocks produced by waste are used for construction activities**
- 3. The raw bituminous produced from plastic waste is used for secondary road activities**
- 4. BIAL dispose the used oil extracted from oil water recovery mechanism to secondary market**

INTANGIBLE BENEFITS

- 1. All methods are major anti-pollution control drives which are towards safe guard of environment**
- 2. Ensures healthy environment.**
- 3. Steps are taken to control nearby water bodies get polluted due to discharge of pesticides, oil and other pollutants**
- 4. All bi products are economical and environment friendly**
- 5. Landfill quantity is majorly minimized to keep up the fertility of soil**
- 6. Safe guard the environment for future generation.**
- 7. Fulfilment of commitment of top management to have a eco friendly airport**

BIAL overcome the barriers of improper waste management in Indian airports as a result of its robust commitments from top management & adhering to legal compliances and its corporate social responsibilities.

BIAL has made capital investments to the tune of INR 150 Mio for this purpose and incurs an operational expenditure of over INR 55 Mio per annum to maintain a clean and waste free airport environment. It spends INR 6 Mio alone for the scientific disposal of solid waste.

The process adopted by BIAL in managing the solid waste has been recognized and appreciated by the regulating authorities and has already emerged as a benchmark for other Indian airports.



Thank you!

Sandeep Chaudhari
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