



INDIAN RAILWAYS

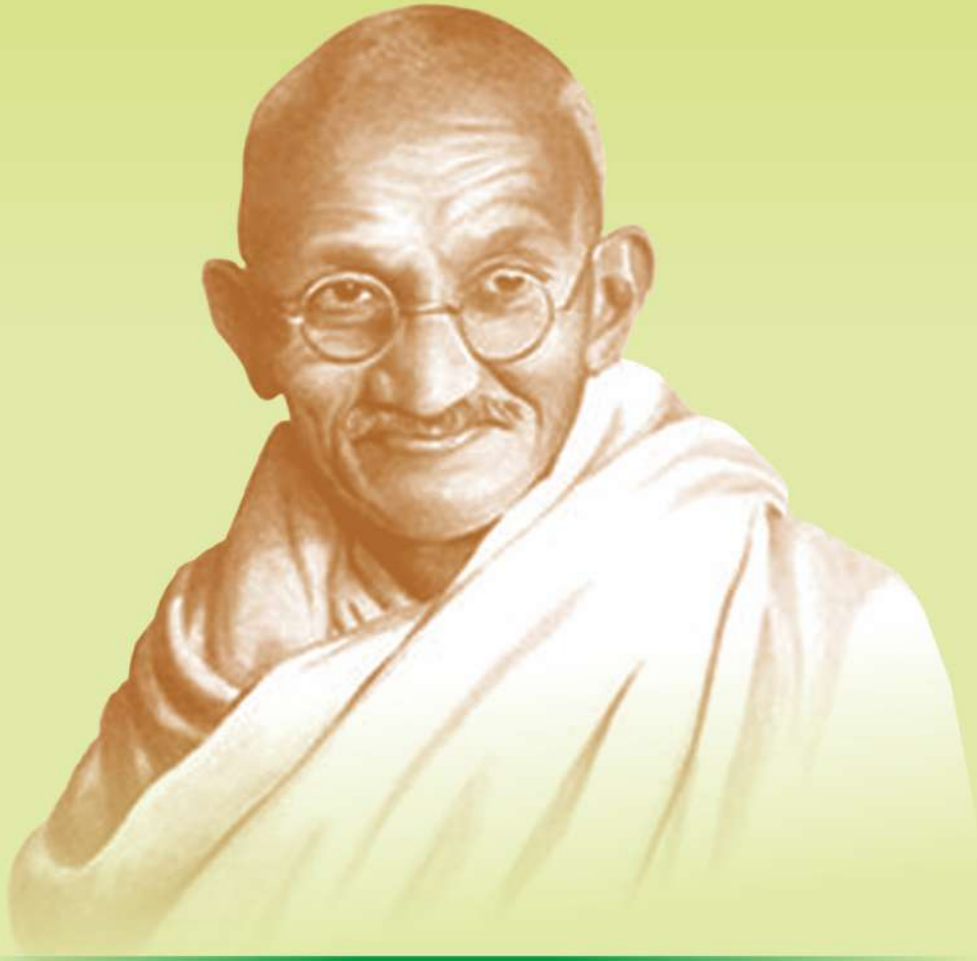
***Towards a Low Carbon
Mass Transportation System***

**Environmental Sustainability
Annual Report 2016-17**



INDIAN RAILWAYS
Green
Initiatives





*“Be the change
that you want to
see in the world”*

- Mahatma Gandhi



INDIAN RAILWAYS ENVIRONMENT MANAGEMENT

VISION

- To promote Green environment and clean energy while making the Indian Railways a global leader in sustainable mass transport solutions.

MISSION

- To promote energy conservation measures.
- To maximize the use of alternate forms of clean energy, thereby minimizing the carbon footprint of Railways.
- To provide clean and hygienic environment to customers.
- To promote conservation of water and other natural resources.
 - To march towards Zero waste discharge from the major Railway units.
- To promote Green built-up spaces and expand tree-cover.
 - Building in house capacity to set up an effective Environment Management System.
 - Noise reduction in Railway operations.



Shri Suresh Prabhakar Prabhu
Minister of Railways,
Govt. of India

On the occasion of World Environment Day–2017, I congratulate all Railwaymen for taking initiatives for making Indian Railways (IR) eco-friendly and greener mode of transport system.

As a single organization, we are the largest consumer of energy and water. This warrants IR to take leadership role in shouldering India's responsibility towards the climate change goals to promote Green Environment and Clean Energy while making the Indian Railways a global leader in sustainable mass transport solutions.

To have an unrelenting focus on the subject, IR has established a directorate dedicated to the affairs of Environment, Cleanliness and waste management. It is the only Ministry, under the Government of India, to do so.

I appreciate the efforts done by Environment and Housekeeping Management Directorate to keep “Towards Low Carbon Mass Transportation System” as the theme in celebration of World Environment Day all over the Indian Railway network. Discussions and workshops are being conducted in all Zonal Railways to spread awareness and action taken by Indian Railways for mitigating climate change.

Indian Railway has planned for various initiatives to meet its commitment on sustainability. Some of them are enhancing intermodal share of freight traffic, taking up plantation in Railway land, fitting of Bio-toilets in trains. IR also have an ambitious plan to turn its buildings into “Green Buildings”. Revival of water bodies is done on priority basis so as to reduce the pressure on local water table.

For the Indian Railways, sustainability leadership is a responsibility that reflects its new approach in protecting the environment, advancing social equity and achieving long-term economic prosperity. IR takes this responsibility seriously so that all Indians will benefit from it.

I am happy to unveil this Annual Report - 2016-2017.

(Suresh Prabhu)

भारतीय रेल पर्यावरण प्रबंधन

विज़न

- भारतीय रेलवे को व्यावहारिक द्रुत परिवहन समाधान के क्षेत्र में ग्लोबल लीडर बनाते समय हरित पर्यावरण तथा स्वच्छ ऊर्जा को बढ़ावा देना।

मिशन

- ऊर्जा संरक्षण उपायों को बढ़ावा देना।
- स्वच्छ ऊर्जा के वैकल्पिक स्वरूपों का अधिकतम उपयोग करना, जिसके परिणामस्वरूप रेलवे में कार्बन फुटप्रिंट को न्यूनतम करना।
 - ग्राहकों को स्वच्छ एवं स्वास्थ्यपरक पर्यावरण उपलब्ध कराना।
 - जल और अन्य प्राकृतिक संसाधनों के संरक्षण को बढ़ावा देना।
 - प्रमुख रेलवे इकाइयों से कचरे का उत्सर्जन न होने देने का प्रयास।
 - हरित निर्माण तथा छायादार वृक्ष-क्षेत्र को बढ़ावा देना।
- प्रभावी पर्यावरण प्रबंधन प्रणाली स्थापित करने के लिए संगठन के भीतर क्षमता विकसित करना।
- रेलवे परिचालन में ध्वनि प्रदूषण को कम करना।



Shri Manoj Sinha
Hon'ble Minister of State for Railways,
Govt. of India

Indian Railways, the lifeline of the country, is the largest passenger carrying system in the world. It is not only the single largest consumer of natural resources, but also a major contributor to green environment due to reduced GHG emissions. IR has been taking a number of steps to become a greener mode of transport.

IR is a lead signatory to India's INDC by committing to reduce 20% of fresh water consumption. IR have a great potential of conserving water. Some of the initiatives taken by IR in the sphere of water conservation are:-

- The current installed capacity of over 1.2 crore litres per day is being enhanced to 3.5 crore litres per day during 2017-18 itself.
- Indian Railways has issued a water policy which covers all aspects of water use, recycling, conservation and recharge of ground water. Recycling Plants, Rain Water Harvesting Plants, Sewage Treatment Plants and Effluent treatment Plants on Railway Land.
- Encouraging participation of private players for recycling water for non-potable usage on BOOT basis.
- To improve the ground water table, Rain water harvesting system has been provided at around 1150 locations in 2016-17.
- Water audit has been completed at 129 locations resulting in saving of water consumption up to 15-20%.
- Water Recycling plants are proposed to be set up at a number of locations in different zonal railways to cut down on fresh water consumption.

The initiatives taken by the Indian Railways in the past one year have been compiled in this Annual Report. It is a useful document encompassing achievements in the area, the way forward and policy perspective at a glance in the field of environment in Indian Railway.

I commend the efforts of Environment and Housekeeping Directorate of Ministry of Railways in this regard, and extend my best wishes to all Railwaymen on this occasion.

(Manoj Sinha)





Shri Rajen Gohain
Hon'ble Minister of State for Railways,
Govt. of India

Indian Railways is the most energy efficient mode of transport and therefore the most environmentally sustainable among all including road, air and water.

Cleanliness is an essential part of healthy environment. Indian Railway is firmly committed towards Sustainable Environmental practices and also to provide a cleaner travelling experience to the users. In the recently conducted survey by Quality Council of India (QCI), 3 Zonal Railways and 3 stations each in A1 and A category have been ranked at 1st, 2nd and 3rd position. Further, it is proposed that the survey will be conducted in 200 trains to measure the standard of cleanliness.

A dedicated SWACHH RAIL PORTAL has also been developed to showcase rankings of stations and trains, methodology adopted for rankings and stations/trains specific dashboards. This web portal will also be leveraged to seek passenger feedback on cleanliness on a continual basis.

Environment friendly disposal of Solid Waste from our stations and maintenance depots is an essential ingredient of Swachh efforts. Plants handling 5 TPD and 15 TPD of solid waste are coming up at Jaipur and New Delhi. This shall be followed up with 8 plants processing a total of 105 TPD. All these plants include a component of "Waste to Energy".

Indian Railways is also committed to afforestation alongside railway track and mass plantation on vacant pieces of Railway land on a major scale by entering into agreements with State Forest Departments. In 2016-17, Indian Railways has planted 1.25 crores of plants.

My best wishes to all on World Environment Day 2017.

(Rajen Gohain)



FOREWORD

Growing economies require massive movement of men and materials and equally massive amounts of energy to enable and fuel growth. Growth for the present and future generations is, therefore, totally dependent on finding sustainable methods that improve the environment. Role of transport is crucial in this task and sustainable transport is the key to sustainable growth.

Worldwide, transport accounts for around a quarter of the CO₂ emission and its share has been continuously increasing since 2010. Fortunately, rail transport is uniquely positioned to carry large volumes of passengers and goods without imposing an unacceptable environmental cost. International Union of Railways (UIC) has estimated that in 2013, railway transport accounted for 8% of the passengers and cargo carried, but contributed to just 2% of the energy use and 3.5% of the transport sector's CO₂ emission.

Indian Railways has been alive to the need to improve energy efficiency and increase use of renewable sources of energy like solar and wind power. It has set itself a goal of reducing CO₂ emission by 32% by 2030 vis-à-vis the baseline of 2005. A number of steps have been taken in this respect. Railway land along the track is also being used for afforestation. Plantation of five crore trees in the next three years has been targeted.

Other notable initiatives include gradual and complete switchover to bio-toilets on trains, environmentally responsible disposal of solid waste and waste-to-energy plants at select stations. A comprehensive “Swach Rail” programme has been launched as a part of Swach Bharat.

Railways have taken a number of initiatives in water conservation and management too. Rain Water Harvesting has been made mandatory in all the projects. Water audit is being undertaken at major water consumption centres in programmed manner. Waste water recycling plants have been planned at major consumption centres to reduce the demand of fresh water.

The Annual report of “Environmental sustainability – Role of Indian Railways” brought out by the Environment and House Keeping Management Directorate is compendium of the efforts put in by Railways and way forward. I am sure that the report will prove very useful to the railway men and fellow citizens alike.

As the world celebrates World Environment Day, we, in the Indian Railways re-dedicate ourselves to do our best and contribute to a green sustainable future for the country and the world at large.



(A.K. Mital)
Chairman, Railway Board



Solar Plant at Rail Bhawan



PREFACE

Indian Railways in its long history of 160 years has served as the lifeline of the country's transport. IR's role in enhancing sustainable construction and operations has become more critical considering that India has committed itself to certain INDCs which are legally enforceable by United Nations Framework Convention on Climate.

Among the various environment friendly measures adopted by Railways is Green Co Rating System, which is the first of its kind framework in the world, aimed at catalyzing green practices in Indian industry. The objective is to define and assess "How Green is a company" and facilitate the way forward for further improvement and promote world class competitiveness through Green strategies. The framework adopts life-cycle approach while evaluating the activities of a unit/facility on green front.

DLW (GreenCo Silver), Varanasi and Perambur Carriage Workshop (GreenCo Bronze), Southern Railway have been certified by CII GBC as identified in the MOU. In addition Lallaguda Carriage Workshop (GreenCo Silver) have credibly achieved certification on their own. The new Administrative building of Indian Railway Institute of Civil Engineering at Pune has been certified as the first Platinum rated green building by world's certification agency LEED.

On the occasion of World Environment Day 2017, I congratulate for the initiative taken by EnHM directorate for organizing a programme on the theme "Towards a low-carbon Mass Transportation System".

Railway Board has advised Zonal Railways and Production Units to organize 'World Environment Day-2017' in a befitting manner on the theme "Towards a low-carbon Mass Transportation System". On this occasion Indian Railways is recognizing the efforts of Railway men who have made significant contribution towards Environment Protection and Water Conservation by distributing awards to outstanding contributors on Environmental management.

The Annual Report 2016-17 on "Environmental Sustainability in Indian Railways" which is being released showcases the achievement of Indian Railways on Environment and will prove to be beneficial to all the stakeholders. The contribution of Environment and House Keeping directorate in bringing out this Annual Report 2016-17 is appreciated.

Happy World Environment Day 2017 !!!



(Ravindra Gupta)

Member Rolling Stock
Railway Board



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CHAPTER - 1

1.0 Towards a Low Carbon Mass Transportation System

Indian Railways (IR) is one of the world's largest rail networks, spread over 66,000 route Kms. IR is the lifeline of the country carrying 23 million passengers every day making it the largest passenger carrying system in the world. It is also the 4th largest freight transporter in the world moving 1,050 million tonnes of freight, as it traverses the length and breadth of the country.

Rail-based transport is the most environment friendly mass transport system due to the inherent gains it provides in terms of energy efficiency and resource optimisation. Railways are about 12 times more efficient in freight traffic and 3 times more efficient in passenger traffic as compared to road transport. As the Indian economy transitions, with economic growth and sustainable development as twin goals, mobility will play a key role. It has been estimated that for the sustainable development of Indian Economy, the inter-modal share of freight traffic by rail should go up from the current share of 36% to 45% by 2030. Accordingly, Indian Railways is gearing up for a massive growth to achieve such increase in inter-modal share by augmentation of its network and rolling stock fleet along with increase in productivity.

For IR to become a low carbon mass transport system an integrated approach, which includes resource efficiency at its core, will be critical.

As the country's lifeline, the national transporter, in January 2015, set up the Environment Directorate in the Railway Board, to coordinate all environment management initiatives across the Indian Railways. Since then, the Railways has taken steps to streamline its initiatives with regards to environmental management, with some notable initiatives including Energy Efficiency, Renewable and Alternate sources of Energy, Water Conservation, Afforestation, Waste Management and Green Certifications.



CHAPTER - 2

2.0 Reducing Global Carbon Footprints

India has a population of about 1.26 billion people spread over a vast geography. Mobility will play key role with urbanisation and the growth of cities. The transport sector is and will continue to remain a critical enabler of development and would also have to grow in a sustained manner for the country to meet its developmental objectives.

Transport accounts for more than half of India's total petroleum consumption and more than 25% of the overall energy needs. It accounts for about 13% of the total emissions. Given the relative advantage of the efficiency of rail-based transport, increasing the share of rail for both passenger movement (regional, sub-urban and urban) and freight movement is vital for increasing the energy efficiency of the transport sector thereby, reducing the GHG emissions of the country.

2.1 INDC

The Government of India, as part of its Nationally Determined Contributions (NDCs), has set a target of 33% emissions intensity reduction, with the transport sector being one of the key sectors with substantial mitigation potential.

TERI was engaged with the Ministry of Railways for assisting in developing the strategies for emissions reduction for the Ministry with a horizon period of 2030. IR strategies on operational and technical energy efficiency measures, along with efforts to move greater share of traffic to electric traction, were modelled, and resulting numbers for the same were estimated. The strategies, duly approved by the Board, were thereafter shared with MoEFCC for their consideration in the INDC document.

The INDC document submitted by India in October 2015, was widely discussed at the 21st Conference of Parties (CoP 21) organized by the UNFCCC in Paris, in November 2015. TERI also supported the Ministry of Railways, the nodal ministry for India's transport sector dialogue, to set up the Government of India's official transport sector event at COP21.

The INDC was ratified by India the following year, and India now had an officially mandated target of activities for meeting its INDC commitments for 2030.

One of the most vital transportation emissions mitigation strategies agreed to by the Government of India was increasing the share of Indian Railways in the movement of freight from the current ~35-36% to 45% by 2030.

As a follow-up of achieving this target, MoEFCC has again approached the Ministry of Railways to convene a working group to help in meeting this target of the Government of India. With representation from all the other concerned ministries, this group would therefore have to come up with workable solutions to be able to meet the mode share targets for India.

2.2 IR's Role in India's INDC for combating Climate Change

- IR should aim to enhance the share of the Railways in the overall land based freight transport from the present 36% to 45% by the year 2030.
- IR should target setting up of Dedicated Freight Corridors (DFCs) across the country. The first two corridors are already under construction and likely to be completed by 2019. This first phase of the project alone is estimated to reduce emissions by about 457 million ton CO₂ over a 30 year period.
- Increase the share of renewable energy in its energy mix.
- Railways to further improve its energy efficiency for both diesel and electric traction thereby facilitating the reduction of GHG emissions for the country.
- PAT Scheme to be implemented in railway sector.
- Use of 5% blending of biofuels in traction diesel fuel.
- Improve water use efficiency by 20% up to 2030.
- Tree Plantation to increase Carbon Sink.
- Waste Management and Pollution Control.
- Adopting the good practices on Green Buildings, Industrial Units and other establishments for the management of resources and infrastructure to achieve Environmental Sustainability in growth of IR.
- Role in 'Swachh Bharat Mission'.



CHAPTER - 3

3.0 Conference of the Parties to the UN Convention on Climate Change (UNFCCC)

3.1 Indian Transport Sector Showcase Event at COP21, Paris



Shri Hemant Kumar, the then Member Mech. Rly. Board, Chairing the Panel discussion at India Pavilion

- The Campaign on Transport sector of Govt. of India was coordinated and organized by MoR at COP-21/Paris, involving all transport sector ministries viz. MoRTH, MoCA, MoSHP, MoUD etc.
- Ministry of Railways were designated as Nodal Ministry by MoEF&CC for holding event on 'Transport Sector GHG Emissions' at 'Indian Pavilion' as part of COP-21 at Paris, France. The event was attended by officials of all transport sector

ministries of Govt. of India, Expert Bodies as well as International Agencies.

3.2 Indian Railways at CoP-22, Marrakech

- Ministry of Railways has participated in COP-22 held at Marrakech in Nov., 2016.
- A session on Sustainable Transport Solutions was organised at India Pavilion.
- Strategies for Mitigation of Transport Sector Emissions and implementing Sustainable Transport Solutions were discussed.



Shri Abhay Bakre, ED, Rly. Board in Sustainable Transport Solutions session

CHAPTER - 4

4.0 Energy Efficiency in Mass Transportation System

4.1 Improvement in Specific Energy Consumption in Electric Traction

Adoption of 3 phase IGBT Technology for EMUs in Mumbai Suburban area is expected to reduce emission of 600 tonnes of CO₂ per annum per train due to regenerative braking features.

Introduction of latest energy efficient Locomotive technology is expected to reduce 500 tonnes of CO₂ annually due to regenerative braking features of new 6000 HP locomotives.

Other Technological improvements in electric locos

- Fitment of 1000 KVA hotel Load converter to supply to the utilities in trains.
- Provision of Energy-cum-speed monitoring system (ESMON) on all electric locomotives to monitor the driver performance leading to energy conservation.

4.2 Improvement in Fuel efficiency in Diesel Traction

Following measures are undertaken / planned to improve Specific Fuel Consumption (SFC) and fuel savings:

- Provision of Auxiliary Power Units (APU) on all diesel locos.
- Common Rail Electronic Direct Injection (CREDI) / Electronic Fuel Injection (EFI) system.
- Guidance for Optimized Locomotive Driving (GOLD).
- Multi Genset locomotives.
- Miller Cycle Turbocharger.
- Smart Multiple Units.
- Hotel load on diesel locomotives to reduce power car fuel consumption.

4.3 Improving Energy efficiency on account of trailing Rolling Stock

- Pay load to tare ratio will be increased to 4.0 for ARI Gondola wagons and 4.21 for BOXN25 Design.
- Commodity specific wagons are also being developed. These measures will enable higher throughput and result in reduced GHG emissions for the same freight traffic.
- Improved design Stainless Steel Coaches also provide higher carrying capacity. With increasing share of such coaches, PKM to GTKM ratio will improve resulting in reduced GHG emissions for carrying the same passenger traffic.



CHAPTER - 5

5.0 Energy Conservation and Energy Efficiency

Given the massive scale of its operation, it is not surprising that the Indian Railways has a growing appetite for the consumption of electricity. In 2015-2016, Indian Railways consumed about 18.22 billion kWh of electricity, comprising around 1.8% per cent of the country's total power generation. With rail traffic projected to register an increasing growth in the coming years, it is estimated that the demand for electricity by the Indian Railways will go up manifold over the next decade.

Indian Railways has taken a series of measures to cut down its energy consumption & rationalise its energy procurement process by implementing several energy conservation measures, procurement of power under Open Access and harnessing Renewable Energy.

Energy Conservation initiatives:

- 5.1 Indian Railways have been very conscious about saving energy, as energy saved is energy generated. It began the energy conservation journey much earlier and at every stage, took benefit from the best available technology, whether it was replacement of T-8 fittings by energy efficient T-5 & CFL fittings, or provision of LED lights, energy efficient ceiling fans, occupancy sensors, use of star rated equipments etc.
- 5.2 These steps have reduced its specific electricity consumption by about 2-3% on a yearly basis. In non-traction areas, due to various initiatives taken in the last two years, energy savings have grown to above 5% in 2016-17 as against the previous year. Some of the initiatives include:
 - a. Railway Board has issued directives to Zonal Railways to utilize LED tube light fittings and cover all stations with 100% LED fittings. At all A1, A & C category station complexes, a policy has been issued on ESCO model for replacing all lights, fans, ACs etc with energy efficient equipments. Till date, 1592 stations have been converted into 100% LED stations and balance stations shall be covered in this financial year itself i.e. 2017-18.
 - b. Carried out energy audits of 643 facilities. IR has also signed MOUs with Ministry of Power and BEE for co-operation to improve Energy Conservation in IR in the presence of Shri Suresh Prabhakar Prabhu, Hon'ble Minister of Railways and Shri Piyush Goyal, Hon'ble Minister of State (Independent Charge) for Power, Coal and New & Renewable Energy and Mines.
 - c. As part of capacity building of railway staff and to emphasize on energy management system in Zonal railways, Centre for Railway Information Systems (CRIS) has

developed www.railsaver.gov.in portal, online platform for capturing energy data from various divisions, which will help in strategizing energy conservation, energy management for IR. Similarly, www.irgreenri.gov.in portal has been developed to disseminate the green initiatives adopted across railways. The energy consumption has almost been constant since last five years despite increase in connected load. This is due to various energy conservation initiatives taken by IR.

5.3 These efforts have been regularly recognized at national level and several prestigious awards were given to IR. In the year 2016, Indian Railways have bagged 27 no. of National Energy Conservation Awards by Bureau of Energy Efficiency on 14.12.2016 at Vigyan Bhawan, New Delhi which is the highest number of National Energy Conservation Awards received by Indian Railways during last decade.



Pipe Cool Day Light system at MCF RBL



CST, Mumbai

CHAPTER - 6

6.0 Increasing share of Renewable Energy

6.1 Solar Power

As part of the Indian Railway's Solar mission and to reduce dependence on fossil fuels, keeping in line with Budget (2015-16) announcement of Hon'ble MR and directions of PMO, IR has planned to set up 1000 MW of solar power through developers with PPA.

- 500 MW solar plants on roof top of Railway buildings, for meeting non- traction power loads.



2 MW Solar PV plant at MCF RBL

- 500 MW solar plants on land based systems, for meeting traction as well as non-traction loads.

Railways till date have set up about 16 MW solar power plants at administrative buildings, stations & hospitals including 1 MW solar power plant at Katra Railway station, 500 kW at Secunderabad, Jaipur, Varanasi, and Bhusawal & 400 kW at Kolkata Metro. Further, work is in final stages for 4 MW.

Zonal Railways have been asked to set up solar power plant of 50 MWp on rooftop of Railway buildings. Railways have already finalized tenders for about 28 MW capacities. Additionally, for 100 MW Solar Photovoltaic plant on Railway building's rooftop (Phase-II), tender has been finalized for 48 MW by REMCL. For balance roof-top of about 350 MW capacity, M/s Central Electronics Limited (CEL) has been asked to carry out detailed study & finalize the project reports, based on which tenders will be invited.

Railways have also tied up 50 MW from the Rewa Ultra Mega Solar Power Plant for meeting its traction power requirement in Madhya Pradesh. Railways are working with Solar Energy Corporation of India (SECI) to set up 150 MW solar power plants. Further, 50 MW of land-based solar has been planned in Chhattisgarh, under the ownership of REMCL for which policy shall be issued by Board for leasing of railway land. Accordingly, till date, Railways have finalised/ tied up about 250 MW of land based solar plants.



PV Modules on PF-1 (Udhampur End) Katra Railway Station

6.2 Wind Power

Indian Railways has planned to set up 200 MW of wind mill power plants. Out of this 10.5 MW capacity wind mill plant has already been set up in Integral Coach Factory (ICF), Chennai & 26 MW windmill power plant has also been commissioned by Railway Energy Management Company Limited (REMCL) at Jaisalmer in Rajasthan. Further REMCL issued tenders for harnessing 35 MW wind plants in the States of Tamil Nadu, Andhra Pradesh, Madhya Pradesh and Maharashtra. Another work for 10.5 MW Wind plants in the state of T.N. at the PB cost of SR has been transferred to REMCL. For setting up additional capacities, Railway Energy Management Company Ltd. (REMCL) is working out modalities.



Wind Mill ICF Chennai

CHAPTER - 7

7.0 Alternate Fuel and other Clean Energy initiatives - IROAF

Search for viable alternatives to fossil fuels has been spurred by need for conservation of natural resources, economic reasons and for preventing and reversing global warming. Indian Railways Organisation for Alternate Fuel (IROAF) was established to explore possibilities in proliferating new sources of Environment friendly Fuels / Energy in Indian Railways.

7.1 Energy Options with lesser Carbon Foot Print

Bio based fuels produced from renewable bio-mass and other products of nature present a win-win situation with complete carbon neutrality as CO₂ generated by burning these fuels is fixed again by trees and plants, thus creating nil adverse environmental impact. Also, the traditional pollutants created by fossil fuel burning arising from sulphur and other harmful elements contained in fossil fuel are absent in Bio-fuel which results in much lower emissions. Substituting HSD with bio diesel results in reduction of 44% Hydrocarbon (HC), 89.3% reduction of Carbon Monoxide (CO) and no Sulphur content in exhaust.

7.2 Bio-Diesel blending on Indian Railways

IR started 5% Bio-Diesel blending with HSD on 5th June 2015. 7097 KL of bio- diesel was blended @ 5% with HSD in 2016-17 against 5149 KL in 2015-16. 5.3% of total HSD used in 2016-17 was blended with bio-diesel against 3.6% in 2015-16.



First 30TPD Bio-Diesel Plant of Indian Railways at Tondiarpet, Chennai

IR is setting up two 30 TPD capacity Bio-Diesel plants at Tondiarpet (Chennai) and Raipur (Chhattisgarh) during 2017-18. These two plants will meet 15-20% of IR's total requirement of bio-diesel for 5%

blending.

7.3 CNG/LNG based Dual Fuel Diesel Engines for DEMU Trains

Natural Gas usage emits less GHG than liquid fuels due to fewer Carbon atoms in its molecular structure.

Indian Railways have the distinction of being the only railway in the world to have been using CNG run locomotives for passenger transportation. IROAF is pioneering implementation of CNG based dual fuel fumigation Technology on CNG DEMUs DPCs of 1400 hp to achieve up to 20% substitution



of Diesel. 17 Diesel Power Cars of DEMUs have been converted into CNG based dual fuel engine. 08 more DPCs are under conversion during the year 2017-18.

IROAF is now moving towards the next level of HSD substitution by 40% for which Bids have been invited for 30 DEMUs DPCs.



Environment friendly CNG in Dual Fuel Mode for Traction

7.4 Solar Energy based solutions for Passenger Services

First rake of 1600 HP DEMU has been provided with Solar PV system. Provision of Solar Energy System on roof top of DEMUs shall provide cleaner environment.



As an advancement to develop latest technology, IROAF has also taken initiative for provision of Flexi Solar Panels on DEMUs.

7.5 Freight Services

IROAF has successfully tested solar generation based Guard comfort system on 6 BVZi wagons used on freight trains for guards. A 400 W Solar PV system

with batteries has been provided on guard van to give round the clock facility of a fan, light and a charging point to the guards who have until now worked without these facilities. 44 more wagons are being fitted at present.



Renewable Solar Energy based Guard Comfort Kit in BVZi wagons

7.6 CNG as Cutting Gas

CNG is an environment friendly alternate fuel for metal cutting as compared to Dissolved Acetylene (DA) or Bharat Metal Cutting Gas (BMCG) of BPCL. It also has higher thermal efficiency. Matunga Workshop of CR and Kota Workshop of WCR have switched over to the use of CNG for metal cutting, thereby not only improving sustainability but also savings of about Rs. 1 crore per annum.

7.7 Development of Bio-Fuels

IROAF has tied up with Indian Institute of Petroleum (IIP), Dehradun and National Institute of Solar Energy (NISE) to develop Solar Assisted Biomass Pyrolysis Technology for production of Methanol and other Bio-Fuels as a next generation of fuel resources for cutting edge commercial application.

CHAPTER - 8

8.0 Water Policy

Government of India in its Intended Nationally Determined Contribution (INDC) submitted to UN Framework Convention on Climate Change (UNFCCC) in October 2015 has committed to improve the water use efficiency by 20%.

Accordingly, Indian Railways, being a major consumer of water, ought to take adequate and effective measures to improve the management of demand as well as supply of water to be a part of the environmental objective as well as avoid water scarcity coming in the way of operation & maintenance of



Hon'ble MR releasing IR Water Policy

Railways. Policy instructions on water management on IR, to facilitate clarity on this subject and to ensure systematic approach in Water Management, were issued on World Water Day on 22.03.2017.

Salient Features

8.1 Each Division/ Workshop of Zonal Railways and PUs shall prepare a water management plan with smallest unit being a railway station, major staff colony, hospital, workshop, sheds/depots etc. This plan shall also include targets of water use efficiency, plan for audit of functioning of few existing Rain Water Harvesting Systems (RWHs), Targets for providing new recharge structures, undertaking water audits and setting up Water Recycling Plants (WRPs)/ Effluent Treatment Plants (ETPs)/Sewage Treatment Plants (STPs), Use/Proliferation plan of water efficient fixtures, installation of water meters etc. Each Zonal Railway/ PU shall endeavour to make at least one unit (colony, workshop/ shed, station etc.) every year to become water positive which implies that recycled water plus water harvested is more than water extracted & consumed.

8.2 Introduction of Automatic Valves:

All the valves which are manually operated till now shall be changed to automatic valves with a built in actuating mechanism.

8.3 Use of SCADA (supervisory control and data acquisition) based control systems:

SCADA systems, by monitoring the technological parameters in the water distribution stations, allow the optimum functioning of the pumping system and safety in the

equipments and installations. It obtains efficient energy usage and optimum administration of the drinkable water.

8.4 Mandatory Provision of Solar water heaters

Normally solar water heaters are retro fitted as an afterthought with the aim of conserving energy. This leads to unplanned and unsightly piping installations which become a blemish on aesthetically designed structures. No housing or building plan shall be approved without a solar water heating arrangement, where ever water heating is envisaged. Provision of electric water heaters shall be an exception, at locations where solar water heaters are not practicable.

8.5 Measurement and Accountal of Water Consumption

Water meters shall be installed in major service buildings, workshops, depots/sheds, stations, major utility buildings covering supply point(s) and major distribution/end-use points. Smart meters may be provided which will be useful for measurement, accountal and monitoring of water consumption. This database shall be used for planning appropriate water conservation and water supply augmentation works.

8.6 Water Audit

The objective of water audit is to measure and assess the extent of fresh water use, water losses in the system and wastewater generated in order to find ways to optimize the use of the scarce resource, as well as reduce, reuse and recycle of wastewater. Water audit shall be carried out in all establishments (station, sheds/depots, colonies and Workshops/ PUs etc.) where (a) water consumption is more than 5 lakh litres per day and/ or (b) water supply is from ground water source and Ground Water Block falls in 'Semi-Critical', 'Critical' or 'Over-exploited' category as per Central Ground Water Board categorization and/ or (c) where railway is purchasing substantial quantity of water from Municipality.

8.7 Rain Water Harvesting (RWH)

systems shall be provided in all existing establishments (station buildings, service buildings, residential quarter and other units) having roof top area of more than 200 sqm subject to techno-economic feasibility. RWH may also be done by reviving old water bodies on railway land and creating new water bodies wherever feasible.



Rain Water Harvesting Plant at Rail Soudha, Gadag Road, Hubballi

8.8 Mandatory adoption of small vegetated infiltration basins for storm water management

Considering the excessive runoff during rainy season causing seasonal floods in

urban areas, it is necessary that progressive and creative storm water management practices are adopted as is the norm in developed countries. STPs/ ETPs/ WRPs have to be provided at railway stations, colonies, workshops/ sheds, hospitals etc., including other units as per the CGWA's guidelines and/or as per the recommendations of Water Audit report.

8.9 Coaching depots are generally provided with manual coach washing system which consumes huge quantity of water. Water Recycling Plants along with the automatic coaching washing plants shall be provided at all major coaching depots to reduce fresh water consumption. All coaching depots washing 200 coaches and above in a day shall be taken up for such provision in first phase.

8.10 Use of water efficient fittings & fixtures

Water efficient fittings & fixtures play an important role in demand side management. Most of the water consumption by the end users is through valves, stop-cocks/faucets, flushing cistern, urinals etc., it is essential to choose such design of fittings and fixtures of sanitary fittings/fixtures which are efficient in water consumption.

8.11 Water Recycling Plants on BOOT basis

A paradigm shift in the policy on water recycling is being introduced with recognition of recycled water as a resource and installation of WRP's as revenue generating projects. When recycled water is used for non-potable purposes (replacing the presently used fresh water), it saves substantial money by reducing the water bill, in addition to savings on consumption of freshwater. Therefore, all ZR's shall attempt to enter into BOOT agreements with interested parties by calling tenders with suitable eligibility criteria to install waste water recycling plants (on railway land if available or otherwise) and enter into long term arrangement ranging from 15 to 30 years, for buying back recycled water from the successful bidder.



Water Recycling Plant, BBQ/SR

Water-Before and After Recycling

CHAPTER - 9

9.0 Water Conservation measures taken

9.1 Water Bodies

Railway have revived and made functional 1527 bodies out of 1560 existing water bodies. IR has revived 40 old water bodies in the process.

Revival of 200 year old Salarjung well at Hyderabad yielding average 2.5 lakhs litres water per day is example worth emulating. Apart from reviving old water bodies IR has also created five new water bodies in an area of over 6100 sq.m.

9.2 Water Recycling

Nine Water Recycling Plants were commissioned in 2016-17. Total 43 Water Recycling Plants are treating around 16 million litres of water per day. Work is under progress on 21 more WRPs.

9.3 Water Audit

129 Water Audits have been conducted in 2016-17 compared to 82 in 2015-16.

9.4 Rain Water Harvesting (RWH)

Railways have identified about 3539 buildings having rooftop area of more than 200 sqm, on which installation of RWH facilities are feasible. Nearly 3000 Rain Water Harvesting systems have already been provided including around 1150 done in last one year.



Salar Jung well, Hyderabad

CHAPTER - 10

10.0 Afforestation

- 10.1** In pursuance of Railways' commitment towards environmental improvement and sustainable development, Railway has planned to plant 5 crore sapling/ trees by 2019-20 as block plantation on railway land and boundary plantation along the railway tracks.
- 10.2** To achieve this, Railway has taken many strategic initiatives. Forest Departments of the States are being involved in plantation as well as maintenance and disposal of trees, thus bringing in the much needed expertise in afforestation. For this purpose, Ministry of Railways have finalised a model agreement in consultation with Ministry of Environment, Forest and Climate Change (MoEF&CC) in January 2016 to be entered between Zonal Railways and respective State Forest Department for plantation of trees on Railway land along the railway track and station yards without transferring the ownership of the land in favour of State Forest Department. As per this Agreement, plantation along the railway track on railway land boundary can be done by Forest Department without declaring such land as protected forest and can be re-used by Railways at any time without any hindrance to Railway works/ development projects, cost of the plantation including its protection and maintenance can be borne by State Forest Department or Railway Administration or can be shared by both. The agreement has already been finalised with State Forest Department of Haryana, Punjab, Assam and Karnataka.
- 10.3** The plantation work along the railway track has already been done under this agreement by State Forest Department of Punjab on about 73 km of land boundary by planting about 90000 saplings and State Forest Department of Haryana on about 13.71 km of land boundary by planting about 16500 saplings. Eastern Railway has also entered into an agreement with West Bengal Forest Department for undertaking plantation under Namami Gange Scheme, launched as a National Mission for Clean Ganga and offered 167.22 acres of land to West Bengal Forest Department for undertaking plantation.



Green & Clean DLW Varanasi

Konkan Railway Corporation Limited (KRCL) has tied up with Local Women Self Help Group for tree plantation as part of their afforestation effort.

10.4 Railway is also exploring the feasibility for leveraging 'Climate Fund', through various national/international mechanisms like, Green Climate Fund (GCF) and National Adaptation Fund (NAF) for plantation. Besides this, to generate additional resources in this regard, Railways have decided that the expenditure on plantation shall be met through by making 1% lump sum provision in the works estimates for Environmental works like plantation, etc and Corporate Social Responsibility (CSR) funds also to be mobilized from Corporates / Public Sector Undertakings (PSUs) for plantation. Zonal Railways have also been advised to involve Railway staff/ their families including Railway Protection Force (RPF) and contractors working for Railways for plantation through Shramdan.

10.5 A total of 1.25 crore trees were planted during 2016-17 on over 5566 Rkm as Boundary Plantation and 4562 Ha as Block Plantation.



CHAPTER - 11

11.0 Green Industrial Units



- 11.1** GreenCo rating developed by Confederation of Indian Industry (CII) offers significant value addition and direction to organizations in terms of resource conservation, waste reduction, climate change mitigation, greener supply chain and superior environmental performance. It has been acknowledged in India's Intended Nationally Determined Contribution (INDC) document, which was submitted to UNFCCC, as a proactive voluntary action undertaken by Indian private sector aimed towards combating climate change.
- 11.2** Diesel Locomotive Works (DLW) (GreenCo Silver) and Perambur Carriage Workshop (GreenCo Bronze) have been certified by CII GBC as identified in the MOU signed between Indian Railways & CII on 26.07.2016. In addition Lallaguda Carriage Workshop (GreenCo Silver) has credibly achieved certification on its own. The units were formally handed over these certificates by Hon'ble MR on the occasion of World Water Day on 22nd March 2017.
- 11.3** All Production Units and one Workshop in each Zonal Railway are proposed to be certified as Green Industrial Units by March, 2018.

DLW receiving “GreenCo Silver Plaque”



CHAPTER - 12

12.0 Green Buildings

The planet is home to more than 7 billion people and the population continues to grow resulting in need of more and more urbanization and demand for more construction activities.

Construction sector especially buildings pose a major challenge to the environment. Globally buildings are responsible for at least 40% of total energy use, 42% of water consumption and 50% of total raw material consumption. In addition the building activities contribute 50% of the world's air pollution, 42% of the green house gases, 50% of all water pollution, 48% of all solid waste and 50% of all CFCs to the environment.

Green Buildings are an effort to reduce the negative impact of buildings on the environment during its construction and use. The aim of green building is to minimize demand on non renewable resources, maximize the utilization efficiency of resources, and maximize the reuse, recycling and utilization of renewable resources. It is evolved through a design process that requires input from all concerned viz the architect, landscape designer, the air conditioning electrical, plumbing and energy consultants to work as a team to address all aspects of building and system planning, designing, construction and operation. They critically evaluate the impacts of each design decision and arrive at viable design solution to minimize negative impacts and enhance positive impacts on the environment.

12.1 Green Buildings Design Considerations

There are many green building rating systems in world and also in India. These all Green rating systems look of following aspects in an integrated way with variable weightages, site planning and building envelope design :-



Green Building IRICEN

- Building system Design (HVAC, Electrical etc).
- Integration of renewable energy source to generate energy on site.
- Water and waste management.
- Selection of ecologically sustainable materials (with high recycled content, rapidly renewable materials, low emission potential etc).
- Indoor environment quality (maintains indoor thermal and visual comfort and air quality).

12.2 Benefits of Green Buildings

There are many tangible and non tangible benefits of Green Buildings.

- Green Buildings consume 10% to 40% less electrical energy as compared to conventional buildings.
- Green Buildings also attempt to generate on site energy generation through renewable energy utilization.
- Green Buildings consume 40% to 80% less water as compared to conventional building.
- Reduced Carbon footprint.
- Green Buildings generate less waste by employing waste management strategies on site. They may also employ waste to energy or waste to resource strategies on site.
- Green Buildings ensure proper safety, health and sanitation facilities for the labour (during construction) and occupants (while in use).



Green Building IRICEN



Green Building IRICEN

- Reduced absenteeism, reduction in respiratory diseases and reduced attrition rate amongst employees.
- Green Buildings offer higher image and marketability.

12.3 Green Rating of Existing Buildings

Though green rating systems were initially available for new construction only,

nowadays there is trend to get existing buildings retrofitted to make it a green building. The existing buildings are critically examined for the feasible green measures that can be taken without endangering the structural stability of the building. The retrofitment is done as per green building norms. It's a very fast growing field world over and very popular one. World's first skyscraper 'The Empire State Building' has been recently retrofitted to make it a Green Building. All rating systems in India like LEED, GRIHA, IGBC offer green rating for existing buildings as well.

12.4 Green Buildings on Indian Railways

Railways itself is energy efficient and green transport mode. with its vast expanse and pan India presence Indian Railways has a great potential to contribute to Green Building movement.

Nirman Nilayam (South Central Railway) :

The construction organization HQ at Secunderabad is the first Green rated Building on Indian Railways. It achieved GRIHA ' 3 Star 'rating.

IRICEN : Indian Railways Institute of Civil Engineering, Pune is one of the greenest Buildings of India. It has achieved the highest LEED 'Platinum' and GRIHA ' 5 Star ' rating.



Green Building IRICEN

Model of Green Building IRICEN



CHAPTER - 13

13.0 Environment friendly Bio – Toilets for Passenger Coaches

- 13.1 Indian Railways, in their commitment to provide hygienic environment to passengers and to keep station premises/tracks clean, have developed environment-friendly Bio-toilets for its passenger coaches. **The technology has been developed jointly by Indian Railways (IR) and Defence Research & Development Organization (DRDO). An MoU has been signed between IR & DRDO for development of bio-toilets.**

This environment friendly, low cost and robust technology, is the first of its kind in Railway Systems in the world. The efficacy of the bacteria used in this system has been tested by DRDO in extreme climates and conditions like those at Siachen Glacier. The anaerobic bacteria used in the bio-digester are



hardy enough to survive extreme cold & heat and also survive when subjected to commonly available disinfectants. As stationary application, the technology is being used by Indian Army deputed at high altitude in Himalaya region.

- 13.2 In these bio-toilets, the waste retention tanks are fitted below the coach floor underneath the lavatories and the human waste, discharged/collected into them, is acted upon by a colony of anaerobic bacteria that convert human waste mainly into water and bio-gases (mainly Methane CH₄ & Carbon Dioxide CO₂). The gases escape into the atmosphere and waste water is discharged after disinfection onto the track. **Raw human waste thus does not fall on the railway tracks and this keeps station premises/tracks clean.**
- 13.3 The first train, Gwalior-Varanasi Bundelkhand Express, fitted with IR-DRDO bio-toilets was introduced in service in January 2011. After receiving encouraging feedback, these bio-toilets were fitted in more coaches for in-service trials. At present, the pace of fitment of bio toilets has been increased substantially. Upto March 2017, more than 69,000 bio-toilets have been installed in about 19,000 coaches including 34,134 bio toilets fitted in 8788 coaches during 2016-17.

For the year 2017-18, it is targetted to install 40,000 bio-toilets in coaches. Further, IR has committed to **eliminate direct discharge toilet system from its entire coaching fleet by 2019 in line with 'Swachh Bharat Mission'**.

13.4 The technology adopted by IR to eliminate direct discharge system from passenger coaches is the best suited one as it is developed indigenously. However, it is sensitive to misuse by passengers habits of throwing of items like plastic bottles, paper cups, cloth rags, sanitary napkin, nappies, plastic/poly bags, Gutkha pouches etc. in toilets that causes choking of these toilets and makes the toilet non-functional. Here, the passengers' cooperation is of paramount importance for the success of these bio-toilets.

For this, awareness programme to educate the passengers on “How to use Bio-toilets - Dos & Donts” are regularly being conducted by Zonal Railways by means of providing stickers in coach toilets, playing audio/video clipping etc.

Bio-toilets fitted in Stainless Steel Bodied LHB Coaches



IR owned Inoculum (Bacteria) Generation Facility at Motibagh Workshop of SECR at Nagpur



13.5 Green Corridors

5 Sections Rameshwaram-Manamadurai, Okha-Kanalas, Porbandar-Wansjaliya, Madhupur-Giridih and Barmer- Munabao have been declared as Green Train Corridors which have no human waste discharge from trains, as all trains passing to these Sections are fitted with 100% Bio-toilets.

Other Green Initiatives

15.1 Shield on Environment Management

An MR's shield has been instituted to be given for best performing ZR/PU on Environment management. First shield awarded in April, 2016. Station Cleanliness and Train Cleanliness Shields have been merged with Environment Management Shield for the year 2016-17.

15.2 Railway Electrification

With a view to reduce dependence on imported HSD oil, thereby enhancing energy security of the country, and to reduce carbon footprint with eco-friendly mode of rail transport; Indian Railways has been progressively electrifying its routes. As on 1st April 2017, 30,012 Route Kilometres out of total 66,687 Route Kilometres of Indian Railways are electrified. This electrified network is 45% of total network of Indian Railways, and carries 65.10% of freight traffic and 54.30% of passenger traffic on electric traction. Electric Traction is environmental friendly green initiative without smoke resulting in cleaner and pollution free environment. The reduction in Green House Gas (GHG) emission is being done by more & more electrification of railway tracks.

Initiatives/Achievements:

- In the directions of PMO for Green Railways, Indian Railways have prepared an Action Plan for electrification of 24,400 route kilometre (Rkm) of BG network in five years (2016-17 to 2020-21). Accordingly, pace of electrification has been increased to 4,000 Rkm in 2017-18 in comparison to an average of 1700 Rkm from 2014-15 to 2016-17.
- To achieve, the target of 24,400 Rkm of electrification, three more agencies viz IRCON, RITES & PGCIL have been assigned electrification works of 1735 Rkm first time for fast track execution.



- 2013 route kilometre have been energised against the yearly target of 2000 route kilometre given by PMO for 2016-17. This is the best ever progress of Railway Electrification achieved in a single year in the history of Indian Railways.

15.3 Energy Efficiency Studies

Railway Board has signed a MOU with CII –GBC under which, CII is conducting Energy efficiency studies along with information sharing and capacity building exercise at 6 Production Units and 4 major Workshops of Indian Railways.

15.4 Affordable potable drinking water

In order to provide potable drinking water on affordable rates to the railway passengers, Ministry of Railways has mandated IRCTC to install Water Vending Machines (WVM) on stations. Detailed policy guidelines have been issued in this regard vide CC No. 36/2015 dated 16/06/2015. This policy, inter alia, stipulates that the reject water (waste water after filtration) shall be used by Railway for platform washing, apron cleaning, toilets etc. i.e. conservation of a precious natural resource being water. Proliferation of Water Vending Machines not only achieves the purpose of provision of clean drinking water at affordable rates to passengers but is also a step in the direction of reducing the production and consumption of plastic bottles.

15.5 EMS / IMS Certification

8 Production Units and 40 major Workshops are certified to ISO 14001 : Environment Management System (EMS) / Integrated Management System (IMS). 23 Diesel Sheds, 7 major Coaching Depots and 3 Freight Depots have also been certified.

15.6 ISO : 50001- Energy Management System

Integral Coach Factory, Chennai was the first major establishment over IR to be certified with ISO: 50001, Energy Management System in August 2015. DLW / Varanasi, 5 Workshops of NR and 3 Workshops of SCR have also achieved ISO: 50001 certification.

15.7 Other Green Certifications

Railways have been advised to initiate process for Green Certification of Administrative buildings, Railway hospitals, Training Centres and Schools. Attempt to certify schools is unique as this will generate environmental awareness among next generation. Green rating system has also been developed for Railway Stations and pilot projects are currently on for New Delhi, Jaipur, Secunderabad, Varanasi, Chennai Central and Katra Stations.

15.8 Capacity Building

Capacity building programmes on Environment Management and Sustainability are organised at different Training Institutes. Courses were conducted at NAIR and IRIMEE during the year.

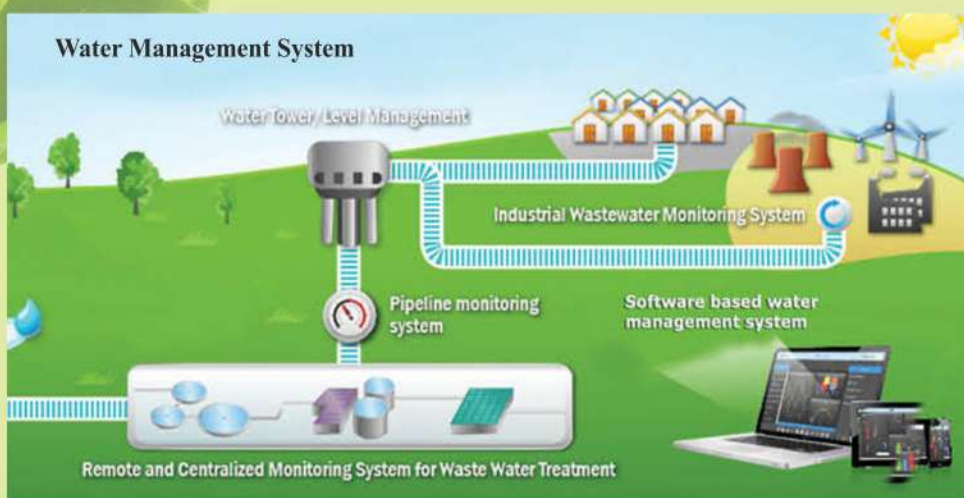
CHAPTER - 16

Policy Initiatives of IR towards Environmental Sustainability

With a pan-India network and linkages to various sectors of the economy, the Indian Railways has always considered environmental management as part of the core operating strategy. A renewed focus and thrust has been given in its activities to achieve a better environment with the launching of the new Environment and Housekeeping Management Directorate in the Railway Board. Some important policy initiatives taken in recent years are noted below :

16.1 Policy on Water Management

- Water Recycling plant to be provided at major water consumption centres subject to techno-economic viability.



- Rain water harvesting system to be provided.
- Water audit to be done at major water consumption colonies / installations / stations.
- Revival of water bodies
- Inclusion of Automatic Coach Washing Plant with Water Recycling

Plant in all green field coaching depots.

16.2 Policy on Energy Management

- Rate of track electrification increased to 2000 RKM/annum from 1300 RKM/annum, with a target of 10,000 RKM by 2020.
- 5% energy consumption to come from alternative sources.
- Use of 5% bio-diesel in traction fuel.
- 20% CNG substitution in DEMUs.
- Retrofitting with efficient lighting and other star-rated appliances.
- Production of only energy efficient 3 phase electric locos from 2016-17 onwards.





- Provision of LED lights in coaches during POH.
- IR has joined the Perform, Achieve and Trade (PAT) Programme of Bureau of Energy Efficiency (BEE) showing its commitment for improving energy efficiency.

16.3 Waste Management

- IR shall convert all existing coaches fitted with conventional toilets to those fitted with environment-friendly toilets by 2019.
- Pilot Plants for Solid Waste Management at major railway stations.
- Provision of dustbins in sleeper coaches also and more dustbins at stations.

16.4 Funding of Environmental Sustainability Works

- Policy frame work to earmark 1% lump sum provision in all works/project estimates towards environment related works has been issued.
- Policy frame work to undertake environmental sustainability works by Zonal Railways through CSR has been put in place.

16.5 Other Green policy initiatives

- Planting of trees on vacant railway land. MOUs being done with States.
- Use of plastics of less than 20 micron thickness in packaging is banned.
- EMS/IMS certification for all PUs, Workshops, Loco Sheds and major Coaching and Wagons Depots.
- Green Certification of Railway establishments.



New Design Coach with LED

Some Important Waste Management Rules Issued / Revised in 2016

•
**G.S.R. 320 (E) [18-03-2016] : Plastic Waste
Management Rules, 2016**

•
**G.S.R. 338 (E) [23-03-2016] : e-waste
(Management) Rules, 2016**

•
**G.S.R. 343(E). [28-03-2016] : Bio-Medical Waste
Management Rules, 2016**

•
**G.S.R. 317(E). [29-03-2016] : Construction and
Demolition Waste Management Rules, 2016**

•
**G.S.R No. 395 (E)[04-04-2016] : Hazardous and
Other Wastes (Management and Transboundary
Movement) Rules, 2016**

•
**S.O. 1357(E) [08-04-2016] : Solid Waste
Management Rules, 2016**

“Protection of the environment and conservation of water and forests are people’s responsibility.”

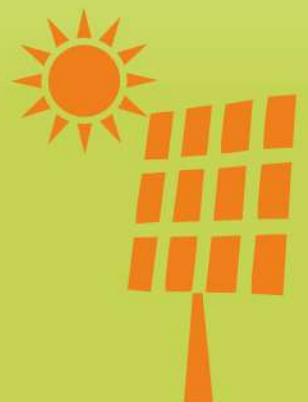
- Shri Narendra Modi
Prime Minister of India



GoldenPeacock Award “Environment Management” to RCF

“Indian Railway is committed to embed sustainability in its business and operational strategies.”

- Shri Suresh Prabhakar Prabhu
Minister of Railways,
Govt. of India



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