Chapter 2 ⇨ Prevention and Control of Pollution

Pollution is the introduction of contaminants into a natural environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms. It can take the form of chemical substances or energy, such as noise, heat or light.

The growing concerns regarding the adverse impact of pollution have led India to pass a number of legislations to protect the environment. This includes laws to control and prevent air, noise and water pollution besides other statutes passed by the legislature to protect the environment.

IR which is the single largest carrier of freight and passengers in the country and by the very nature of its operations, generates an immense challenge to the overall management of the environment in the country; hence, it has a clear responsibility towards conservation of the environment. Its approach to pollution control is significant for tackling environmental challenges to the country.

Our audit objective was to obtain reasonable assurance to the compliance with the pollution laws/directions of the Pollution Control Boards and existence of effective environment management system in IR. This chapter highlights the approach of IR in dealing with and eliminating or minimizing different forms of pollution.

2.1 Policies and Guidelines

In IR, environmental problems arise mainly while transporting passengers and in handling and transporting pollution intensive commodities such as coal, iron ore, cement, fertilizers, petroleum etc. RB is yet to issue any comprehensive guidelines specifically for sidings, handling and transport of these commodities.

So far no standard instructions regarding packing and transporting of different kinds of goods have been detailed by the Railways in their codes and manuals[12].

[12] Indian Railways Code for Traffic Department, Indian Railways Commercial Manuals Vol.II ,and Red Tariff detailing rules and conditions for carriage of dangerous and explosive goods.

The instructions included in these manuals which date as far back as 1939, have been periodically revised. These instructions cover various aspects of transportation of different types of commodities. Environmental aspects involved in carriage of goods were not specifically and adequately addressed in these rules. For instance, there are separate detailed instructions for carriage of commodities like coal, iron ore, cement, POL, fertilizer etc. These instructions focus on the type of wagon to be used and packing conditions for transportation of these commodities. These were prima-facie, guided by both technical and commercial considerations[13]. Subsequent revisions also have not adequately focused these issues, despite the growing incident of environment pollution. For instance, coal is still generally carried in uncovered wagons despite directions to the contrary of some SPCBs.

Thus, no specific criteria have been laid by the RB to enable itself to assess the performance of each zonal railway in minimizing environmental pollution. Absence of clear criteria has been a limiting factor in our audit. We observed that the CPCB also neither issued any specific guidelines for the transport of pollution intensive commodities by rail. However, SPCB of West Bengal, Jharkhand and Odisha have issued detailed guidelines regarding handling of goods at sidings and their transportation.

2.2 Organizational Structure

There is no separate directorate or cell either at the RB level or at the Zonal level to co-ordinate various environmental issues involved in the operations of IR. At the RB level, the policy issues and guidelines regarding core operations are addressed through a number of Directorates in the RB. The responsibility for implementation of various environmental measures relating to stations, trains and tracks is dispersed over a number of directorates in the RB viz. Mechanical, Civil Engineering, Commercial and Electrical Directorates. While Mechanical Directorate is responsible for formulating policies, issuing guidelines and implementation of measures in locomotives and coaches, such responsibility regarding sidings and goods sheds rests with Commercial and Civil Engineering Directorate. The Electrical Directorate plays a significant role in electrification of tracks which helps in prevention of air pollution due to emission from diesel exhaust.

Our examination of the charter of duties and range of issues handled by various directorates revealed that environmental aspects such as the prevention and

[13] Minimization of loss in transit and consequent claim by the consignors/consignees.

control of air, water and noise pollution are only incidental to the core area of operation of each directorate.

At the zonal level, the heads of the respective departments are similarly responsible for environmental issues which are handled in a manner similar to that in the RB. Hence, such issues are dealt with in a manner that is only tangential to their core activities.

2.3 Air Pollution

The Air (Prevention and Control of Pollution) Act, 1981 has defined "air pollutant" as any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be injurious to human beings or other living creatures or plants or property or environment. Thus the presence of 'particulate matter', sulphur-dioxide, nitrogen-dioxide, carbon-monoxide, hydrocarbons, lead, etc., in the atmosphere in high enough concentrations and for a duration long enough to cause undesirable effects can be called air pollution. It could have an adverse impact on human health, of other living entities, man-made heritage, and life-support systems, such as global climate.

In this section, we examined the approach of IR towards air pollution and measures taken both at the Board level and at the operational level to mitigate this problem.

2.3.1 Air Pollution at Stations, Sidings and Goods Sheds

An Indian Railway station is typically over crowded with large number of visitors, coolies and vendors. The pollution profile of a railway station is likely to follow that of the neighborhood as no major pollution source exists at a railway station. Pollution issues arise mainly while handling and transporting freight such as coal, iron ore, cement, fertilizers, etc. These commodities are mainly handled at Railway/Private sidings[14] and Good sheds. These materials create serious air pollution when carried by rail in open wagons and during loading/unloading operation. Further, fugitive emission[15] is also caused by these commodities. Such dust, when deposited on the track, impedes drains as it fills the interstices within the track ballast.

[14] A siding is a place which is used to receive, temporarily store and load/unload materials in the rakes and dispatch materials.

[15] emissions of gases or vapors from pressurized equipment due to leaks and various other unintended or irregular releases of gases

In absence of uniform guidelines issued by the RB, CPCB and SPCBs, we were constrained to assess the level of compliance with the statutory regulations[16] and guidelines issued by some SPCBs related to handling and transportation of commodities at sidings and goods sheds.

2.3.1.1 Non-compliance with Statutory Regulations

As per section 21[17] of the ***Air (Prevention and Control of Pollution) Act, 1981*****,** all sidings and Railway Good sheds require Consent for Operation (CFO) from the concerned SPCB. RB had stipulated (June 2009) that before issue of Railway Receipt for booking of freight (iron ore, steel and cement) Railway Administration should ensure one time submission of CFO to the Senior Divisional Commercial Manager of the Division in which the loading takes place.

Test check of 34 sidings over 16 zones[18] handling pollution intensive commodities like coal, coal dust, iron ore, cement, fertilizers, petroleum etc. revealed that CFO was obtained only for nineteen (55 per cent) out of the 34 sidings test checked.[19] 10 out of the remaining 15 sidings (SR-3, ECR-2, SECR-2,SCR-1 and ECoR-2) had not obtained CFO on the ground of absence of specific instructions from the RB/ Pollution Control Boards. No action was taken against the sidings for non adherence to either the instructions of the RB or the statutory provisions. No action was also forthcoming from the concerned pollution control board for ensuring compliance with the statutory guidelines.

In fact, the RBs instructions of June 2009 were interpreted by a couple of the Railway Administrations[20] (SECR, NWR and NCR) as though obtaining of CFO was not required for sidings with only unloading facilities.

2.3.1.2 Non-compliance with SPCB Guidelines

The SPCBs of West Bengal, Jharkhand and Odisha issued detailed guidelines regarding handling of goods at sidings and their transportation. These guidelines, inter-alia, provided for covering of open wagons carrying pollution intensive

[16] Air (Prevention and Control of Pollution) Act, 1981,
[17] Section 21 provides that no person shall, without the previous consent of State Pollution Control Board, establish or operate any industrial plant in an air pollution control area. Railway sidings/goods sheds are covered under the provision of this section.
[18] Metro Railways excluded as there was no siding
[19] Sidings are dealing in coal and petroleum oil/petroleum products
[20] Railway Administration refers to the Zonal Railway Administration

commodities. The guidelines[21] issued by Pollution Control Boards of West Bengal, Jharkhand and Odisha between August 2010 and June 2011 provide for installation of water sprinkling system, plantation, construction of boundary wall, drainage and proper approach roads, covering of all minerals when not in use etc. On verification of the status of implementation of prescribed guidelines in six sidings and six goods sheds test checked[22] in the three zones (SER, ER and ECoR) falling within the jurisdiction of the Pollution Control Boards of West Bengal, Jharkhand and Odisha, we observed that except ECoR, the guidelines were not completely followed in the remaining two zones as mentioned below:

i. In SER, despite instructions (June 2011) from Jharkhand State Pollution Control Board (JSPCB) to Noamundi Iron Ore Mines of M/s Tata Steel Limited in Jharkhand, minerals like coal, coal dust, iron ores etc. were not covered with tarpaulin when not in use. The siding authority also failed to comply with instructions of JSPCB for construction of boundary wall, drainage, plantation and water sprinkling. Besides, CFO granted by the JSPCB expired in June 2011 and the application for renewal was pending before JSCPB as of March 2012. The operation of the siding is however, still continuing (March 2012). A test check of another two goods sheds[23] handling coal and coal dust; it was observed that water sprinklers were either out of order (Bhojudi Coal Washery) or not provided (Nimpura Goods shed).

Iron ore partially covered at Noamundi (TISCO) siding in Jharkhand, SER

ii. In ER, on the basis of complaints lodged in 2008 by the residents of surrounding area of Chitpur Yard, WBPCB[24] issued directives (February 2011) for taking remedial measures. This included undertaking feasibility study for using a mopping machine on the wharf as a substitute to sprinkling and for growing creepers on top of the wall fencing. These have not been taken up (March 2012). Regarding the New Alipore Coaching

[21] Guidelines of Odisha (OSPCB), West Bengal WBSPCB) and Jharkhand Pollution Control Boards (JSPCB) were issued in August 2010, February 2011 and June 2011 respectively.
[22] Two sidings and two goods sheds test checked in each zone
[23] Bhojudi Coal Washery and Nimpura Goods shed
[24] West Bengal Pollution Control Board

Complex, it was seen that the Station Manager informed (November 2010) the divisional authorities regarding accumulation of huge cement dust due to offloading of cement from rakes. This frequently led to a storm of cement which often engulfed not only the station area but also the adjoining areas. Railway Administration did not take any remedial measures in this regard (March 2012).

2.3.1.3 Pollution scenario in zones not covered by any guidelines

The SPCBs are yet to issue any guidelines for handling and transportation of pollution intensive commodities in respect of 13 zones[25]. We examined the impact on environmental pollution due to operations of sidings/goods sheds and efforts of the Railway Administration to minimise pollution. Deficiencies in adopting measures for controlling air pollution in sidings/goods sheds noticed in respect of the 13 zones where the SPCBs had not issued any guidelines are discussed below:

i. The transport of commodities like coal and iron ore was examined in all zones. A test check of 34 sidings covering 16 zones revealed that in 13 zones (except NER, NEFR and ECoR) commodities like coal and iron ores were being carried in open wagons without covering with tarpaulin sheets. Handling of these loose commodities at sidings and their transportation without covering posed health hazards to the neighbouring residents and also for the line staff and passengers of adjacent platforms. There was no system in place to measure the extent of pollution due to open carriage of polluting commodities.

Coal carried in open wagon without cover

ii. The Railway Administration (NWR) failed to control fugitive emission at the time of unloading of coal at Merta Road Goods Shed resulting in public complaints. In fact, on one occasion, the court imposed penalty of ₹ 5 lakh against the Railway Administration and ₹ 25 lakh against the consignor. On being pointed out by Audit, Railway Administration stated (March 2012) that they had issued instructions for adoption of some remedial measures like provision of water sprinkler, plantation and

[25]Excluding ER, SER and ECoR

construction of boundary walls. It was, however, observed that the remedial measures are yet to be implemented (August 2012).

Cement dust at Salt Cotaurs Goods shed, Chennai

iii. In SCR, SPCB carried out ambient air quality monitoring (May 2009) at the Jaggiahpet siding. They found that the value of Total Suspended Particulate Matter was 2179 micro gram per cum as against the norm of 500 micro gram per cum. Consequently, SPCB issued directives (June 2009) to make provisions of permanent water sprinkling system, erection of permanent wind breaking barriers along with geo-net screens, covering of trucks loaded with coal with tarpaulin etc. During subsequent inspection (May 2010), SPCB observed that the Railway Administration had not complied with its guidelines issued in June 2009 and therefore, issued a show-cause notice to stop loading / unloading activities. Even after a lapse of two years, the Railway Administration had not fully complied with the directives of SPCB in respect of provision of geo net screen for wind braking barriers, plantation, development of concrete approach road, repair of permanent water sprinkler etc. On being pointed out in Audit, Railway Administration stated (April 2012) that the activities of the sidings had almost been stopped.

iv. In two Goods Sheds (Salt Cotaurs and Bunder goods shed, Mangalore) of SR handling commodities such as cement, soda ash and fertilizers etc. large quantities of cement dust were found strewn all over the area. Though there were no public complaints against these two sheds, the accumulated cement dust was a health hazard to the public as well as the staff posted there.

v. In two Railway goods shed at Moga and Jagraon over NR handling food grain (outward traffic) and fertiliser (inward traffic), it was observed that no water sprinkling system had been installed. Metal roads provided in the goods shed were found in damaged condition causing dust (air) pollution along the track.

vi. In CR, no remedial action was taken on three public complaints received from passengers in 2008 and 2009 in connection with the increase in air pollution because of coal dust in the Wani station area emanating from the

coal loading point at Wani Goods Shed, near Wani station. Dust spread at Wani Station was also noticed during Audit Inspection (November 2011).

vii. In Kankaria and Jogeshwari A.T. goods shed of WR, no action was taken by the Railway Administration to assess the air quality standard due to loading/unloading of cement and fertilizer. Measures like plantation around unloading areas to prevent fugitive dust, provision of wind barriers, covered sheds, water sprinkling, etc were not taken up by the Railway Administration to check the environmental pollution.

Thus, the Railway Administrations failed to adhere to the statutory provisions i.e. obtaining CFO from the SPCBs in nearly fifty per cent of the sidings test checked. In response to a reference from WR regarding the necessity of covering open wagons, RB stated that the issue of covering of open wagons may be dealt with at Zonal Railway level and that the covering should be done by the consignor/rail-user. Adequate measures were also not taken by the Railway Administration to follow the guidelines issued by the SPCBs in respect of sidings/goods sheds. Despite widespread pollution intensive activities and receipt of numerous complaints, IR is yet to frame comprehensive guidelines relating to handling and transportation of pollution intensive commodities.

While agreeing to the audit observations regarding carriage of dusty cargo in open wagons, Ministry of Railways (MR) replied (October 2012) that the Railway Administration had already advised the customer to arrange for measures like provision of sprinklers for water sprays, dust screens/green cover to avoid coal dust pollution.MR also stated that petroleum products and chemicals were being transported in tanks and special type of covered wagons and therefore, there was no issue of pollution involved.

The contention of MR is not tenable as instructions issued are merely an ad-hoc reaction to the audit observations. No attempt has been made by the MR to address the issue holistically and to issue consolidated instructions at the RB level in consultation with CPCB. Several instances, as highlighted in the preceding sub-paras, were noticed where remedial measures for reduction of pollution were not taken up.

2.3.2 Study Report of Central Pollution Control Board

At the instance of Audit, CPCB had carried out a study in March 2012 for assessment of ambient air quality at 14 major stations over 12 zones of IR.

Monitoring was done for 2 days. On the first day samples were collected on 24 hour basis and on the second day, samples were collected on eight hour basis.

CPCB observed that none of the stations covered in the study had applied for consents under Air (Prevention and control of Pollution) Act and Water (Prevention and control of Pollution) Act and also authorization[26] for handling hazardous waste. Further, the values of various gaseous pollutants exceeded the national ambient air quality standards prescribed[27] by the CPCB (November 2009) at a number of stations.

The observations of CPCB on the individual stations as a result of study are detailed below:

Stations/Zone	Observations
Bilaspur/SECR	RSPM[28] and SPM exceeded the prescribed limit[29] at most of the monitoring places. However, SO_2 and NO_x values were observed to be within the limits.
Jabalpur /WCR	The value of RSPM was higher than the prescribed limit.
Jaipur / NWR	Air quality monitored at three locations around the station revealed that the values of gaseous pollutant were well within the prescribed limit of CPCB.
Howrah & Sealdah / ER	The ambient air quality exceeded the prescribed limits for RSPM & NO_x while SOx was within the prescribed limit.
Khurda & Bhubeneswar (ECoR)	The ambient air quality for RSPM, NO_x and SOx was within the prescribed limit.
Patna (ECR)	RSPM values was in excess of the prescribed limit.
Vadodara(WR)	SPM & RSPM value were found to exceed the prescribed limits.
Ahmadabad(WR)	RSPM value was in excess of the prescribed limit and the values of NOx and SOx were found well within the prescribed limit.

[26] Rule 5 of Hazardous Waste(Management, Handling and Transboundary) Rules,2008 requires that every occupier handling hazardous wastes shall make an application for grant of authorization for handling hazardous wastes

[27] The National Ambient Air Quality Standard (24 hours average) for RSPM for industrial and residential area is 100 micro gm per cubic metre and 80 micro gm per cubic metre respectively.For oxides of Sulpher (SOx) and Nitrogen (NO_x), prescribed limit is 80 micro gm per cubic metre while for PM_{10} , the limit is 100 micro gm per cubic metre

[28] RSPM refers to Respirable Suspended Particulate Matter

[29] Prescribed limit refers to National Ambient Air Quality Standard

Secunderabad /SCR	The values of PM_{10} exceeded the prescribed limit.
Hubli /SWR	Ambient air quality monitoring revealed that the values of PM_{10} [30] exceeded the prescribed limit.
Guwahati / NEFR	The value of PM_{10} exceeded the prescribed limit of 100 micro gram /cum by 64 per cent. CPCB also observed that the high amount of NO_x was due to burning of diesel as fuel.
Chennai/SR	The values of PM_{10}, NO_x and SOx were found within the prescribed limit.

From the above observations of CPCB, it is seen that the ambient air quality in respect suspended particulate matter (SPM/RSPM/ PM_{10}) at most of the railway stations was above the national ambient air quality standards. It was also observed in Audit that there was no system of monitoring pollution level at stations.

2.3.3 Pollution from Trains

The trains on IR are powered mainly by diesel and electricity. IR has been emphasizing increased electrification of its tracks which is an eco-friendly option for the consumer. The use of diesel, on the other hand leads to substantial emissions in the form of unburnt hydro carbons, carbon monoxide and particulate matters etc. which add to air pollution. Air conditioning in trains also adds to air pollution. As per Montreal Protocol, the deadline for phasing out CFC refrigerant R-12 was 2010 and that of HCFC refrigerant R-22 is 2040.The initiative of IR in phasing out of CFC R12 refrigerant was appreciable towards green environment.

Air conditioning in trains

The release of Chlorofluorocarbons (CFC) damages the earth's ozone layer. In IR, AC coaches with R12 CFC refrigerant and R22 HCFC refrigerant are being used. Till March 2011, 76 per cent under slung AC coaches had been converted to eco-friendly R134a refrigerant and the balance RMPU AC coaches were fitted with HCFC R22 refrigerant. The CFC refrigerant R-12 had been phased out completely in all zones.

[30] PM_{10} refers to particulate matter(size less than 10 micro gram)

2.3.3.1 Emission from Diesel Locomotives

Diesel is used to power traction in about 70 per cent of the track on IR. Scrutiny in audit revealed that IR had neither initiated any measure to fix standards for emissions from the use of diesel for traction purposes nor any system had been set up to monitor the emissions from diesel locos and assess or compare the extent of emission with the international standard. South Central Railway Administration stated that there were no instructions for regular monitoring of emission levels and there was no such monitoring anywhere in IR.

Research & Design

- For control of harmful emission from locomotives, RDSO has undertaken two projects-Use of fuel catalyst and catalytic convertor and Procurement of emission test car & reduction of emission of ALCO engine with target of completion by September 2012 and March 2013 respectively.
- Initiatives of RDSO resulted in reduction of noise level of power car and compressor for AC EMUs/MEMUs from 140db to 75-80 db and less than 66db respectively.

IR has taken the initiative for using bio diesel to minimise air pollution and related public health risks as it reduces green house gas emission. After examining the potential applicability of bio diesel as a fuel for locomotives and conducting trials, RDSO[31] concluded (December 2003) that bio-diesel could be used without engine modification and could attain full operating power. It was also concluded that a blend of 20 per cent biodiesel was compatible with the locomotives operating on IR and India's climate condition. The action plan of Mechanical Directorate of RB for Vision 2020 envisaged setting in motion the initiative of IR for achieving 10 per cent blending of bio diesel.

We observed that out of 16 zones[32], bio-diesel was used only in five zones (SER, SECR, ER SR and NR). During the period 2006-11, the production of bio-diesel over these five zones was only 155.123.Kl besides procurement of 47.46 Kl from outside agencies. The usage of bio-diesel was very insignificant (0.01 per cent) when compared with the total consumption of 109.30 lakh kilo litres of HSD oil. The percentage of blend during the period of review varied between 5 to 10 per cent in locos.

From the reply of the Zonal Railway Administration, it revealed that the factors limiting the usage of bio-diesel were:

[31] Research, Design & Standard Organisation
[32] Excluding metro railways where no diesel engine is used

i. Absence of specific instructions for adopting 20 percent blends for bio-diesel (NWR).

ii. The trials conducted for bio-diesel were not encouraging (CR).

iii. There was no production and utilization of bio-diesel as the plantation of Jatropha had not been successful due to high mortality rate (ECR).

iv. Poor yield of bio-diesel due to poor quality of Jatropha seeds (SER).

Thus, the negligible use of bio-diesel clearly corroborates veracity of the contention of the Railway Administrations. The Railways had taken a number of initiatives for encouraging the use of bio-diesel—like setting up of Jhatropha plantations and setting up of esterification plants. However, the main reason for the limited and declining usage of bio-diesel was not addressed i.e. no instructions were issued to the field offices from the RB for using blended biodiesel. In addition, no system was set in place for monitoring emissions from diesel locomotives.

Initiatives of IR for production of bio-diesel as an alternative fuel and the constraints in production of bio-diesel are discussed in sub-para-3.6.

2.3.3.2 Electrification of Track

Electric traction is environmentally friendly, pollution-free and energy efficient and offers an excellent alternative to fossil fuels as a source of energy. Its use as a motive power is eco friendly for the consumer. As compared to diesel, electric traction is capital intensive and requires higher investment in terms of locomotives, overhead equipment, electric loco sheds, and other equipment.

IR has progressively electrified 19607 Route Km (RKM) out of 64,460 RKMs till March 2011. During the XI Five Year Plan period (2007-12), IR targeted to achieve electrification of 3500 RKMs at the rate of 700 RKMs per year. During the period 2007-11, 3391 RKMs were electrified.

We observed that electrification was being carried out selectively for sections of a route instead of electrifying the whole route. Patch wise electrification of routes resulted in hauling of diesel engines on electrified route leading to avoidable pollution due to emission from diesel besides higher operational costs on account of higher line haul cost under diesel traction.

CR Administration stated that Diesel locomotives over electrified routes were being used for operational requirements to avoid intermediate detention of trains due to change in traction. Contention of the Railway Administration side testify to the fact that situation could have been avoided had the Railway Administration had resorted to strategy of route wise electrification.

The movement of diesel locos under electrified route led to continued dependence on diesel locos resulting in increased environmental pollution.

2.3.3.3 Ventilation of Tunnel

The essential requirements of a ventilation system of tunnels are to ensure sufficient air flow to prevent locomotives from over-heating and to keep thermal effects within desirable limits. The ventilation system should ensure sufficient airflow relative to moving train to keep the concentration of pollutant gases[33] inside the tunnel within permissible limits. Monitoring of air quality and temperature inside the tunnel was, therefore, important to assess the need and adequacy of ventilation of tunnels. As per Para 1007 B of Indian Railway Bridge Manual, ventilation of the tunnel is one of the important aspects relating to passenger and crew comfort during movement of train inside the tunnel.

During test check of provision of ventilation in 181 tunnels out of 479 tunnels over 16 zones, we observed that neither air quality nor temperature monitoring was carried out in the tunnels to verify whether:-

- The pollutants inside the tunnels were within threshold levels and
- The temperature was limited to 50 degree centigrade to prevent overheating and to keep thermal effects within the permissible limits.

We also examined the status of functioning of ventilation provided in tunnels and observed that the artificial ventilation provided at a cost of ₹ 5.33 crore in two tunnels[34] in ECoR could not be commissioned till March 2012 due to non-availability of power. Records of the Railway Administration revealed that the absence of ventilation had caused suffocation to maintenance staff after passing of trains.

SCR administration stated that in longer tunnels, artificial ventilation was being provided depending upon the requirement and as such, there was no necessity of monitoring of air quality and temperature in tunnel. They further stated that monitoring of air quality /temperature was not being done anywhere in IR.

[33] Oxides of carbon,nitrogen,sulpher and hydrocarbons
[34] Tunnel No. 23 (1.6 Km) and 25 (1.5 Km) in Koraput-Raygada section

Contention of the Railway Administration was not tenable as the requirement or adequacy of ventilation could be judged only on the basis of monitoring of air quality/temperature in the tunnel.

Thus, the failure of the Railway Administration in monitoring of air quality/temperature in tunnel and commissioning of ventilation was indicative of the lack of concern of IR to protect its passengers and crew against potential health hazards.

2.3.3.4 Dust level in passenger coaches

At the instance of Commissioner of Railway Safety (CRS), RDSO conducted trials between March and June 2010 for measurement of dust ingress in coaches. On the basis of the trials, it was observed that in IR the average dust concentration in non-AC coaches was almost double the limits[35] prescribed by the CPCB as the speed increases from 80 to 100 kmph. The value of Particulate Matter (PM_{10}) was also found three times of CPCB prescribed limit and also higher than the standard for PM_{10} (150 micrograms per cubic meter) prescribed in other international rail systems. Based on the findings, CRS instructed (November 2010) RDSO to evolve standards to be maintained for dust particles inside non-AC coaches and develop dust mitigating measures to reduce the total dust values. However, no standards have been developed till now (March 2012).

Passenger surveys of 3217 Non-AC passengers and 1322 AC passengers conducted by Audit between August 2011 and March 2012 over 17 zones revealed that 39 per cent of Non- AC passengers and 35 per cent AC passengers felt that the quality of the air inside the coaches 'Requires improvement'.

Response of the passengers was indicative of the deficiency in initiatives of IR in minimizing dust level in coaches.

2.4 Noise pollution

As per Rules 3(1) and 4(1) of the Noise Pollution (Regulation and Controls) Rules 2000, different ambient air quality standards in respect of noise levels have been prescribed for different areas such as industrial, commercial, residential and silent zones. The noise levels in those areas should not exceed the standards

[35]The National Ambient Air Quality Standard (24 hours average) for RSPM for industrial and residential area is 100 micro gm per cubic metre and 80 micro gm per cubic metre respectively.For oxides of Sulpher (SOx) and Nitrogen (NO_x), prescribed limit is 80 micro gm per cubic metre while for PM_{10} , the limit is 100 micro gm per cubic metre

prescribed[36]. The principal contributors to ambient sound pressure levels at stations are the movement of trains, blowing of horns by trains and announcements.

2.4.1 Noise Pollution at Stations

An independent study by Annamalai University during September 2002 at three important stations-Chennai Central, Tiruchirappalli and Villupuram over Southern Railway revealed that the average sound level at platforms, driver's rest room, etc., were in the upper limits of the prescribed levels as applicable to commercial areas[37].

During March 2012, CPCB conducted noise monitoring at different locations of 14 major stations over 12 zones at different points of time in a day. Study revealed that noise levels were in excess of the prescribed limit at all stations and there was no system of monitoring the noise level.

In absence of any monitoring mechanism of the sound level at stations, audit conducted a survey[38] of 2439 passengers at 34 Railway Stations across 17 zones. The survey revealed that 31 percent of the passengers were of the view that the noise level at stations was unbearable.

2.4.2 Noise level in passenger coaches

During the course of trials in two trains between March and June 2010 for measurement of noise in coaches, RDSO observed that the noise level increased from 76.8dB to 80.3 dB as the speed increased from 80 to 110 Kmph and at an identical speed, the noise level in AC coaches increased from 71 to 72 dB. The above noise levels were well above the UIC (Union Internationale des Chemins de Fer/International Union of Railways) prescribed levels of 68 dB for interiors of second class passenger coaches.

In response to our survey questionnaire to 3352 Non AC passengers and 1295 AC passengers in 80 trains as per sample selection, on an average 26 per cent and 10 per cent of Non AC and AC passengers respectively were of the view that the noise level inside the coaches was unbearable.

[36]As per Noise pollution Act, the ambient air quality standards in respect of noise for industrial area should be 75db(A) Leq during the day time and 70db(A) Leq during the night time.
[37] The ambient air quality standard in respect of noise for commercial area is 65 and 55 db(A) Leq for day time and night time respectively
[38] Collection of opinions of passengers through questionnaire

In the absence of any specific instructions either from Pollution Control Boards or from RB, the zones did not initiate any remedial measures to reduce noise pollution.

2.4.3 Noise control measures near habitation/silence zones

CPCB code of practice for controlling noise from sources other than industries and automobiles suggests erection of acoustic barriers, reduction of speed and avoiding whistling within and along the Municipal limits and habitation zones for Railway operations.

Scrutiny of records revealed that no instructions had been issued at the level of RB regarding noise control measures near habitation/silence zones.

2.5 Water Pollution

Water pollution is the contamination of water bodies namely lakes, rivers, oceans, and groundwater. Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. Besides being a crucial resource, maintenance of its quality is also a major concern.

As per Sections 24, 25 and 26 of The Water (Prevention and Control of Pollution) Act, 1974, no person shall knowingly cause or permit flow of any poisonous, noxious or polluting matter into any stream or well or sewer or land without treating it.

Sewage is an excellent medium for the development of bacteria, some of which may be pathogenic. Raw sewage is harmful, as it consists of pathogen bacteria, which are capable of causing diseases such as typhoid fever, dysentery, diarrhea and cholera.

IR is a major user of water for cleaning of trains and stations. IR also generates a large quantity of sewage both on trains and stations.

2.5.1 Effluent Treatment

Train servicing and maintenance processes generate effluents such as oil, antifreeze and cleaning chemicals which can pollute the environment, if not carefully controlled. IR, therefore, needs to ensure that the effluent from Railway stations/sidings is discharged after proper treatment into the municipal sewers. RB instructed (June 2009) installation of Effluent Treatment Plants (ETP) at all major

stations for treatment of effluents before being discharged into sewers/water bodies.

In SECR, petroleum products were found deposited alongside the track. These were deposited during unloading at the POL Siding at Bhilai. Oil spillages were also noticed during loading activities at GR siding, Bajwa (WR). It was noticed that there were no specific instructions from the RB regarding treatment of oil spillages at sidings. In WR, it was observed that the spilled oil along with other wastes was being treated through the effluent treatment plant.

Discharge of waste water from Kharagpur Station (SER)

Scrutiny revealed that no records regarding quantity of water treated and chemical used were maintained in SCR. During joint inspection by Audit along with the railway officials, it was observed that in absence of any ETP in SER, effluents were being discharged from the major stations[39] to the nearby low lying areas /water bodies and municipal drainage system resulting in contamination of surrounding surface and ground water.

While applying for CFO, the siding owners are required to furnish details of sources of water pollution, types of pollutants generated, method of treatment and disposal to control pollution etc. In this regard, PCBs of Odisha and West Bengal directed that in case the waste water contains any substance which is harmful to the environment, the same should be treated to remove the substance so as to meet the prescribed norms. Test check of two sidings[40] in ER, revealed that guidelines were not followed in both these sidings.

Scrutiny in audit revealed that no assessment was made by the RB regarding the requirement of ETPs. Out of 17 ETPs sanctioned over five zones (SCR, SECR, WR, NWR and ER), 14 ETPs were installed in three zones (SCR, WR and ER) till March 2012. The sanction of only 17 ETPs at an all India level barely averages one ETP per zone and leaves most of the major stations (A1, A & B category) like Bilaspur / SECR, Jabalpur /WCR, Ahmadabad (WR) & Vadodara

[39] Chakradharpur, Panskura, Tatanagar and kharagpur Stations
[40] Budge Budge and Sodepur siding

(WR), Hubli/SWR, Chennai /SR, Guwahati / NEFR etc. without an ETP. There was little initiative for making provision of ETPs in the remaining 12 zones.

MR stated that the railways drainage systems are connected with the drains of the local municipal authorities in major cities and such plants have been set up by local authorities. They further added that ETPs were being sanctioned as per the recommendations of the Railway Administration. Contention of the MR was not tenable as no attempt was made to assess the actual requirement of ETPs at major stations taking into account the capacity constraints of the municipal authorities. Further, in a number of stations, the effluents from the station premises were being drained directly into nearby water bodies /low lying areas polluting the ground water.

2.5.2 Study Report of Central Pollution Control Board

CPCB carried out a study (March 2012) of method of treatment and mode of discharge of waste water generated at station. Study in 14 major stations over 12 zones of IR revealed that the waste water /effluents were being discharged to public sewer. There was no system for monitoring quality and quantum of waste water generated at stations. The results of study were as follows:

Stations/Zone	Observations
Bilaspur / SECR	• Effluents were being discharged directly in the nallah passing through Titli Chowk without any treatment that finally joins River Arpa. • Examination of the waste water quality at the point of generation revealed that the oil and grease concentration was found higher than the standards.
Jabalpur /WCR	• Wastewater from only one side is being treated. However, waste water from Itarsi side was collected through pipelines and discharged in to nallah without any treatment. • The analysis of waste water at station premises revealed that the parameters like COD, BOD, TSS etc. exceeded the prescribed limits.
Jaipur / NWR	Waste water let out into municipal drains.
Ahmadabad(WR) & Vadodara (WR)	• No system of quantification of waste water generation. • The waste water from all operations at station is being discharged directly into the municipal sewerage system without any treatment.

Secunderabad /SCR	• Only part of the waster coming from aprons and coach yard was treated through water recycling plant and the remaining was being discharged into the municipal sewer. • The treated waste water was being used for apron cleaning, coach exterior washing and gardening. • No data available in respect of waste water treated and recycled.
Hubli/SWR	• No system of quantification of waste water generation • The waste water is being discharged directly into the municipal sewerage system as there was no waste water treatment facilities.
Chennai /SR	No water treatment facility. Water is pumped into municipal sewer.
Guwahati / NEFR	• Liquid waste let into municipal drain without any treatment and the municipal drains finally let drain to nearby wetlands. • Acid of the lead acid batteries are directly discharged to municipal drains without any treatment, violating the provisions[41] contained in Batteries (Management & Handling) Rules 2001 for disposal of batteries.

Note: Study of mode of discharge of waste water was not carried out at Patna (ECR), Bhubeneshwar (ECoR),Khurda(ECoR),Howrah(ER),Sealdah(ER)

The results of the study of CPCB were indicative of lack of awareness of the IR towards its environment. The study supports our contention in the above para that installation of ETPs is important for the control of water pollution. The study also emphasizes the need for treatment of water before it is discharged into the municipal drains.

2.5.3 Toilet discharge from running trains

IR transports about 14 million passengers on 9000 trains every day. It uses over 40000 coaches regularly for providing passenger services with each coach having four toilets. About 3980 MT of human waste is generated everyday by travelling passengers from 'Open discharge' module toilets of these coaches that directly goes onto the rail tracks polluting the stations and the areas through which the

[41] Rule 4(b) provides that it shall be the responsibility of consumers to return their used batteries only to the dealers or deliver at designated collection centers.

trains pass. In order to avoid open discharge of toilets on track, introduction of 'Green Toilets' has been under consideration of IR. Five models of toilets had so far been experimented with and none of these have proved satisfactory resulting in continued pollution of the environment. Details of the initiatives of IR in this regard and their performance have been discussed in sub-para 4.6.

In the existing scenario, the discharge from toilets falls directly into the water bodies or road running below the Road under Bridges (RUBs). The IRs Bridge Manual provides that rivers and road under bridges should be covered by suitable and approved means to prevent droppings, falling from passing trains on water bodies or roads.

We examined the initiative of IR in preventing contamination of water bodies and nuisance to road users due to open discharge of toilets from trains passing over bridges.

Study in 16 zones revealed that out of 1196, 20 per cent (243) of Road Under Bridges (RUBs) were not covered at the bottom to prevent toilet discharge from the passing trains falling on the road users. Further, out of 424 and 5437 steel girder bridges across water bodies under 'Important' and under 'Major' category respectively, 326 (76 per cent) and 3772 (69 per cent) number of bridges were not covered at the bottom leading to water pollution by toilet discharges falling from passing trains.

In response to a writ petition seeking a directive to IR for prevention of dumping of toilet waste from running trains into the open environment, a bench of High Court of Kerala directed (October 2011) the Railways and the Union Ministry of Environment and Forests to file an affidavit proposing a solution to the problem. The Division Bench observed that the problem was very acute in Kerala as the railway lines passed through thickly populated areas and over rivers which were the main source of drinking water.

The case though yet to be disposed off, clearly reflects the lack of sensitivity of the Railway towards a healthy environment and also lack of monitoring in implementing standard instructions issued by itself for prevention and control water pollution.

During the exit conference, SCR Administration opined that there was no need to cover the bottom of the bridges passing over water bodies as the pollution from toilet discharge was negligible compared to the volume of the stream. WCR Administration, on the other hand, stated that with the provision of green toilet covering of bridges would not be required.

The contentions of the Railway Administrations were not in conformity with the provisions contained in the IR Bridge Manual. IR is yet to finalise the design and specification of toilet even after experimenting on different models for about two decades. Non compliance of provisions contained in the IR Bridge Manual on the plea of implementation of green toilet was, detrimental to the aquatic environment.

2.6 Conclusion

Environment is a key survival issue and its challenges and significance has assumed greater importance in recent years. IR is the largest carrier of bulk commodities like coal, iron ore, cement, POL and fertilizer which are basically pollution intensive.

Despite the growing concerns over pollution and its increasingly adverse impact on the environment; RB failed to mainstream these issues. No substantive action was taken to integrate environmental concerns with operational policies. Even though, the RB is an established organization that is known for many best practices and social responsibility, it ought to have taken the lead; but was a laggard. Most internal instructions/directions did not have an environmental orientation and were guided by commercial/administrative considerations. No guidelines were framed by the RB to address the issue of pollution during transportation/handling of commodities at railway / private sidings or goods sheds/ yards.

In a majority of the cases the Railway Administration failed to comply with the existing guidelines of obtaining CFO from the concerned SPCB, were not taken before operating the sidings /goods sheds. In some of the cases, there was inconsistent and variable understanding of issues and their urgency. This led some of the Railway Administrations to presume that Consent to Operate was not required for all sidings/good sheds. Further, the Report of the CPCB, conducted at the behest of audit; highlighted that the standards prescribed for control of pollution –water, air and noise were not being followed at a large number of Railway stations indicating negligence on the part of IR in minimizing pollution level.

The CPCB also failed in framing guidelines for the transport of bulk commodities which are pollution intensive. Most of the SPCBs, also did not play an active role. Besides non issues of guidelines, SPCBs were indifferent to compliance even with the existing regulations.

Non-existence of higher directions from the RB, inconsistent and variable understanding of issues and their importance at the zonal level led to non-compliance with the existing pollution control laws. Even the existing guidelines issued by some of the SPCBs were not complied with.

2.7 Recommendations

- IR needs to formulate a comprehensive environmental policy. It also needs to bring out appropriate guidelines for controlling air and water pollution on its station, yard, work places or in operations in coordination with Central and various State Pollution Control Boards.

- A monitoring mechanism needs to be put in place at all levels within IR including the Railway Board for checking compliance with pollution control laws/ guidelines and implementation of its guidelines/instructions on environment.

- Environment management may be recognized, monitored and reckoned as a key result area for all Zonal and Divisional Railway Authorities and schemes devised to incentivize better performance in this regard.