CHAPTER - 5

SCENARIO ON NORTHERN RAILWAY

General

Indian Railways is the premier transport organisation of the country and is the largest rail network in Asia and the world's second largest under one management .Indian Railways is a multi-gauge, multi-traction system covering the following lengths (Table 5.1):

Table – 5.1 Railway Network

Track Kilometres	Broad Gauge (1676 mm)	Metre Gauge (1000 mm)	Metre Gauge (1000 mm)	Total
	86,526	18,529	3,651	108,706
Route Kilometres	Electrified	Total		
	16,001	63,028		

Vastness and importance of Indian Railways in India with its pan Indian presence is brought out from following facts Indian Railways runs around 11,000 trains everyday, of which 7,000 are passenger trains and owns following assets and more than 15 lac employees(Table 5.2)

Table – 5.2 Railway Assets

Locomotives 7566	Coaching Vehicles 37840	Freight wagons 2,22,147	Stations 6853
Yards 300	Good Sheds 2300	Repair Shops 700	Work Force 1.54 Million

Territorial presence of Indian Railways

In order to bring about greater efficiency in administration, speedy implementation of on-going projects, better customer care, etc., Indian Railways have with its ministerial H.Q. at Rail Bhawan New Delhi is organized in 16 zones covering entire India and all metropolitan towns (Fig 5.1 & Table 5.3).

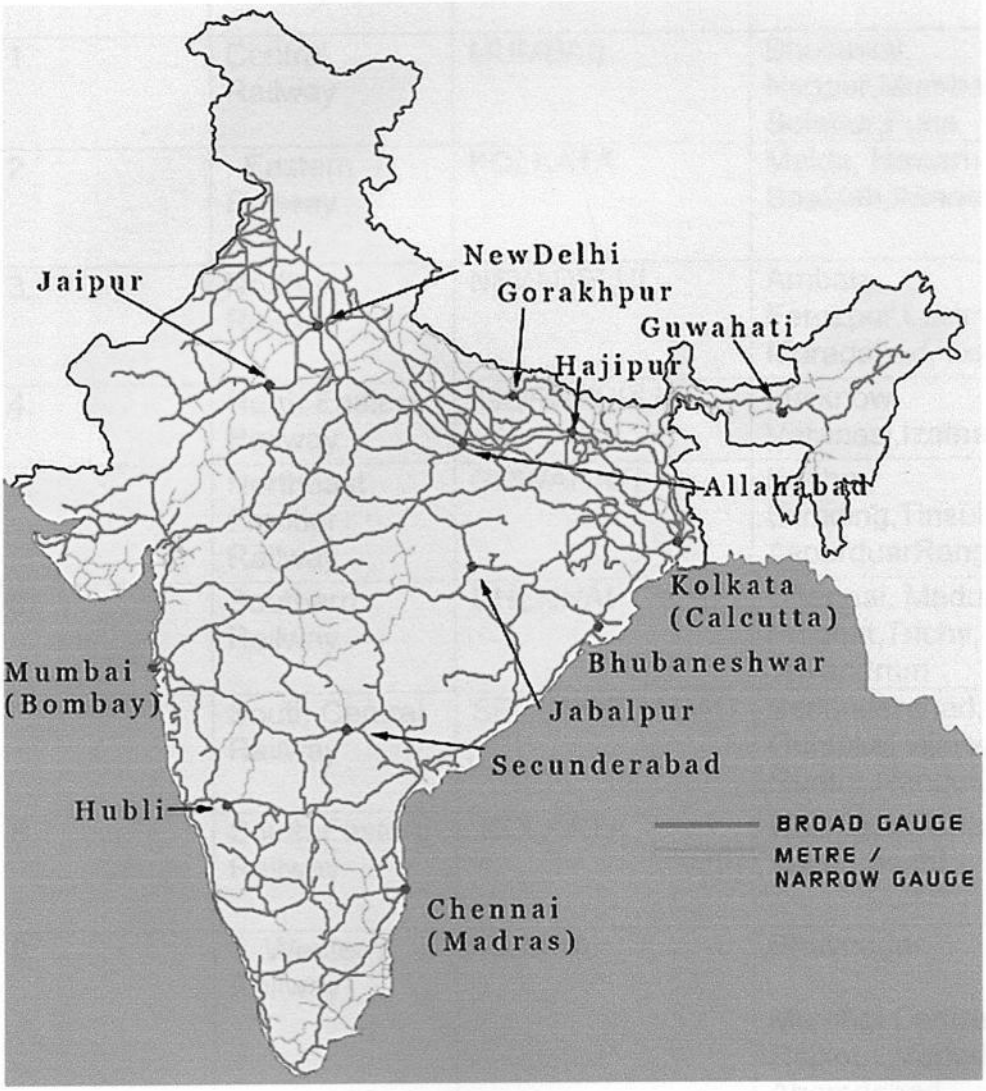

Fig- 5.1 Schematic map of Indian Railway Net-Work

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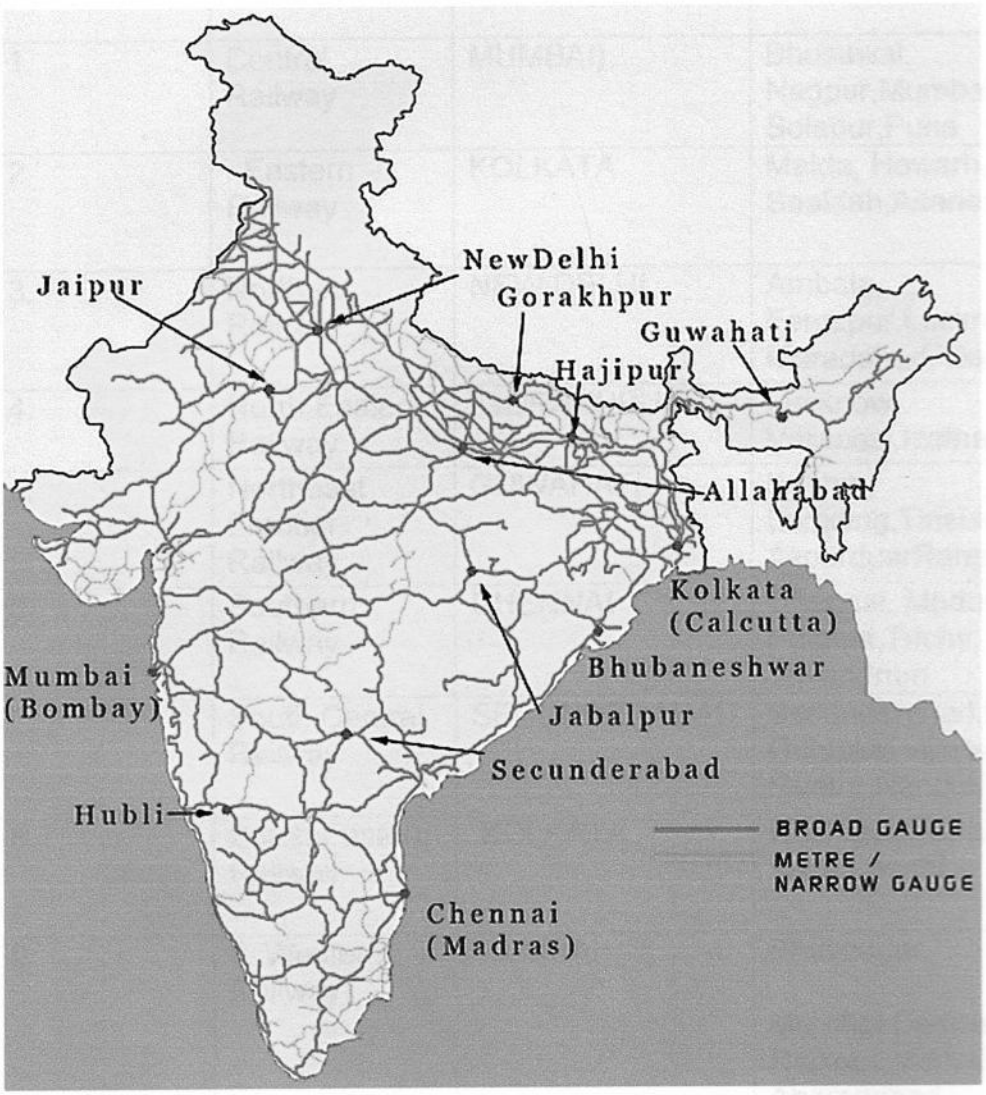

Fig- 5.1 Schematic map of Indian Railway Net-Work

Table- 5.3

INDIAN RAILWAY'S ZONE'S & THEIR DIVISIONS WITH HEAQUARTERS

S.No.	Name of the Zone	Head Quarter	Divisions
1.	Central Railway	MUMBAI)	Bhusawal, Nagpur,Mumbai(CST), Solapur,Pune
2	. Eastern Railway	KOLKATA	Malda, Howarh, Sealdah,Asansol
3.	Northern Railway	NEW DELHI	Ambala, Ferozpur,Lucknow, Moradabad, Delhi
4.	North Eastern Railway	.GORAKHPUR	Lucknow, Varanasi,Izatnagar
5.	Northeast Frontier Railway	GUWAHATI	Katihar, Lumding,Tinsukhia, AlipurduarRangiya
6.	Southern Railway	CHENNAI	Chennai, Madurai, Palghat,Trichy, Trivandrum
7.	South Central Railway	SECUNDERABAD	Secunderabad,Hyderabad, Guntakal,vijaywada, Guntur,Nanded
8.	South Eastern Railway	.KOLKATA	Kharagpur,Chakradharpur, Adra,Ranchi
9	9. Western Railway	MUMBAI	Bhavnagar, Mumbai Central, Ratlam, Rajkot, Vadodara, Ahemdabad
10.	East Central Railway	HAJIPUR	Danapur, Dhanbad, Sonepur, Mughalsarai, Samastipur
11.	East Coast Railway	BHUBANESWAR	Khurda Road, Waltair,

			Sambalpur
12.	North Central Railway	ALLAHABAD	Allahabad, Jhansi, Agra
13.	North Western Railway	JAIPUR	Bikaner, Jodhpur, Jaipur, Ajmer
14	South East Central Railway	BILASPUR	. Nagpur, Bilaspur, Raipur
15.	South Western Railway	HUBLI	Bangalore, Mysore, Hubli
16	. West Central Railway	JABALPUR	Jabalpur, Bhopal, Kota

Two more divisions are to be created at Bhagalpur & Thane as announced in interim budget of Railways for year 2009-2010.

From above map and table it can be appreciated that Indian Railways has its main infrastructure and large no of employees and their colonies almost in every major city of India thus competing and facing same problems specially of water availability as being faced by that city and town. Though railways being large organization has its independent infrastructure and colonies and makes its own arrangements for water supply and sanitation in addition to getting these augmented from city services as possible as such plays an important and independent role in conservation and loading such resources in mega cites of Delhi ,Mumbai ,Chennai ,Kolkata, Ahemdabad ,Nagpur ,Hycerabad etc.

Rly colonies also face such shortages and their serious ness can be appreciated that even these problems have been brought to notice of Minister of Railways as Upset with power and water problems, a group of women stopped

Railways Minister special train at Barauni in Bihar on 12 june 2005 as reported in papers also.

Ministry of railways however is looking after the policy part only and actual field implementation of various schemes in any area is done by Zonal Railways in their respective jurisdictions accordingly in line with national policies on water management .Rly .Bd. has written to all zonal railways enclosing copy of secretary, ministry of water resources regarding problem of ground water decline being faced and has directed Railways to adopt concept of rain water harvesting vide Bd's letter no 2000/lmb/9/8 dtd 4/6/2001. This aspect has been given highest importance is brought out by facts that this was being monitored by Chairman Railway Board as emphasized vide Bd's letter no 2002/adv.(L&A)/Rain Harvesting dtd 6/6/2002.

Other important area of reducing the water demand for toilets and controlling pollution specially in Yards and track (Fig 5.2) has also got attention of Rly. Rly has taken decision and action to replace present toilets requiring large quantities of water for flushing with chemical based toilets (bio-toilets)

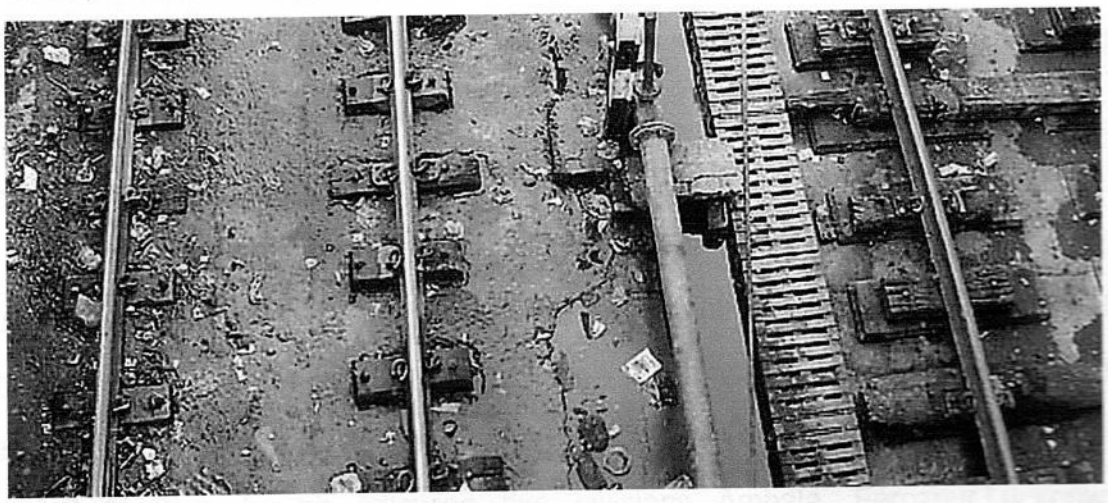

Fig – 5.2 (view of a typ. Yard with present toilet system)

Bio-toilets are part of an experiment to try out different types of eco-friendly toilets in trains. The Indian Railways plans to install eco-friendly toilets in all its 9,000 trains by 2011-13. And it is about time the railways changed tracks from open to 'biological' toilets, for an estimated two million passengers use its toilets daily, wasting a huge amount of water and creating hygiene problems Rly. Plans "discharge–free green toilets" in all 36,000 coaches in the eleventh plan period. This toilet uses less than 5 litres of water per flush against uncontrolled use of water in open toilets. it will save water.

It is not the only eco-friendly toilet the railways is experimenting with. IIT Kanpur has developed a cheaper "zero-discharge" toilet that will separate 90 per cent of the liquid from the waste and reuse it for flushing.

Northern Railway

Northern Railway is one of biggest and most important zones on Indian Most of establishment is based in Delhi NCT area including infrastructural requirements of Rly Bd. And many PSUs and is thus faced with similar water problems as being faced by other big cities specially the NCT region.

Reach of Northern Railway

Spreading across the states of Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh, Uttaranchal, Uttar Pradesh, Delhi and the Union Territory of Chandigarh, Northern Railway seems to have the vantage point of standing atop the peninsula and transposing its work rhythms to the rest of the country. With its hq at New Delhi it is having following five divisions Ambala, Ferozpur,Lucknow, Moradabad, & Delhi.

Jammu, Amritsar,Ludhiana ,Chandigarh ,Shimla ,Dehradun, Pathankot and Haridwar are other important towns. It also has following major establishments: Locomotive Workshop, Charbagh Lucknow Carriage & Wagon Workshop, Alambagh Lucknow. ,Jagadhari , Kalka. Bridge Workshop, Jalandhar Cantt., Lucknow. Engineering workshop, Jalandhar. And Signal & Telecom Workshop, Ghaziabad.

Northern Railway has been facing and is aware of water availability problem as being faced by other cities in its jurisdiction accordingly even before Ministry of Railways directed all zones to take suitable action in area of water harvesting as per guidelines issued by Ministry of Water Resources on 4/6/2001 NRly has already taken note of this serious problem and has written to all its divisions to get details of water harvesting in station areas ,colonies offices from CGWB and suggest measures to be implemented in their jurisdiction vide D.O. letter no. 897-w/0/rain water harvesting dtd 10-5-01. This subject has been followed regularly by HQ from time to time .The public notice issued by CGWB under section 15 of environment protection act 1986 issued in March 2001was also highlighted with instruction to take necessary action. Necessary booklet containing guidelines on subject was also circulated.

On Northern Railway this subject is looked after by water supply department headed by Chief Engineer (works) and supported by senior officers in JA and senior scale level and other junior officers and staff in HQ. Railways have been organizing Seminars, issuing detailed policy guidelines and monitoring the situation through periodic Review meetings. In addition other important aspects for increasing water availability like Water recycling have also been explored ,measures have been taken to have independent source of supplies so as to lighten the burden on already creaking water supply arrangements of NDMC and Jal Board, using new techniques

of collecting water horizontally rather than relying only on vertical exploration only .suitable guidelines and instructions are formulated and issued to reduce water pollution and ensure supply of potable water to Railway users and its employees and their families (Appendix A & Appendix B).

All the five divisions have taken up Rain Water harvesting schemes in planned manner and implementation is being executed systematically keeping in view the provisions on this subject .

Typically following detailed instructions have been issued by HQ to field officers for RAIN WATER HARVESTING.

Necessity:- Water is one of the most essential requirement for existence of living beings. Surface water and ground water are two major sources of water. Due to over population and higher usages levels of water in urban areas, water supply agencies are unable to cope up demand with surface sources like dams, reservoirs, rivers etc. This has led to digging of individual tubewells by house owners. Even water supply agencies have resorted to ground water sources by digging tubewells in order to augment the water supply. Replenishment of ground water is drastically reduced due to paving of open areas. Indiscriminate exploitation of ground water results in lowering of water rendering many bore-wells dry. To overcome this situation bore-wells are drilled to greater depths. This further lowers the water table and in same areas area leads to higher concentration of hazardous chemicals which are fluorides, nitrates & arsenic. In coastal areas like Chennai, over exploitation of ground water resulted in sea water intrusion thereby rendering ground water bodies saline. In rural areas also Government policies on subsidized power supply for agricultural pumps and piped water supply through bore wells are resulting in to decline in ground water level. The solution to these problems to replenish ground water bodies with rain water by man made means.

Basic types:- Following are three basic types:-

(a) Roof top rain water harvesting and storage in tanks.

(b) Roof top rain water harvesting and recharging subsurface aquifer.

(c) Surface run-off harvesting and recharging subsurface aquifer.

Legislation:- Under section 15 of Environment (Protection) Act 1986, Central ground Water Authority (Ministry of Water resources) has made it mandatory to adopt rain water harvesting system for certain types of building/institutions located in specified regions of National Capital territory.

In Chennai, rain water harvesting has been made compulsory. In Delhi, Building bye-laws have been modified making rain water harvesting mandatory for new buildings erected on plots of more than 100 sq. mtrs.

Ministry of Environment & Forest (Government of India) has circulated draft Gazette Notification regarding rain water harvesting in hilly area of entire country. It is likely to become a law very soon.

Delhi Government has come up with an incentive scheme to reimburse 50% cost of rain water harvesting structure (maximum Rs. 50,000/-) to certain colonies of buildings in Delhi area.

MODES AND TECHNIQUES

THROUGH RECHARGE PIT

This method is suitable where permeable starte in available at shallow depth. It is adopted for buildings having roof area up to 100 sq mts Recharge pit of any shape is constructed generally 1-2 mts wide and 2-3 mts deep. The pit is filled with boulders, gravel and sand for filtration of rain water. Water entering in to RWH structure should be silt free. Top layer of sand of filter should be cleaned periodically for better ingression of rain water in to the sub soil.

RECHARGE THROUGH ABANDONED HAND PUMP

In this, an abandoned hand pump is used for as recharge structure. It is suitable for building having roof top area up to 150 sq mts. Roof top rain water is fed to the hand pump through 100 mm dia pipe . Water fed in the Rain Water Harvesting structure should be silt free. Water from first rain should be diverted to drain through suitable arrangement. If water is not clear then filter should be provided.

RECHARGE THROUGH ABANDONED DUG WELL/OPEN WELL

In this method, a dry/ unused dug well can be used as a recharge structure. It is suitable for buildings having a roof top area more then 100 sq. mts. Recharge water is guided through a pipe of 100 mm to the bottom of the well. Dug well cleaning and destiling is imperative before using it. Recharge water guided should be silt free, otherwise filter should be provided . Well should be cleaned periodically and chlorinated to control bacteriological contamination.

THROUGH RECHARGE TRENCH

This method is used where permeable strata is available at shollow depth. It is suitable for buildings having roof top area between 200 to 300 sq. mts In this,trench of 0.5-1.0 mt wide, 1-1.5 mt deep and of adequate length depending upon roof top area and soil characteristics should be constructed and filled with boulders, gravel and sand Cleaning of filter media should be done periodically.

RECHARGE THROUGH SHAFTS

This method is suitable where shallow aquifer is located below clayey surface. It is used for buildings having roof top area between 2000-5000 sq. mts. Recharge shaft of diameter, 0.5-3 mts. and 10-15 mts deep is excavated mechanically. The shaft should end in impermeable strata. The shaft should be filled with boulders, gravel and sand for filtration of recharge water. Top sand layer should be cleaned periodically. Recharge shaft should be constructed 10-15 mts away from the buildings for the safety of the buildings.

RECHARGE TRENCH WITH BORE

This method is used where sub-soil is impervious and large quantity of roof water/ surface run off is available. In this, trench is made 1.5-3 mts wide and 10-30 mts length depending upon water availability. Wells of 150-300 mm. dia meter and 3-5 mts deep (below pervious layer) are constructed in the trench. No. of wells to be dug are decided in accordance to water availability and rate of ingression. Trench is filled with

filtration media. A suitable silt chamber is also inserted with grating for water diverting arrangements.

REFERENCES

For further help, Central Ground Water Board offices located in your area may be contacted which will provide technical guidance in this regard. A list of offices and their addresses was sent to CRB by Chairman, Central Ground Water Authority (Ministry of water resources, Government of India) and same was circulated to all the General Managers of Indian Railways vide Dy Director (Land and Amenities) letter No 2003/LMB/09/01 dated 12- 06- 03. However names of cities where these offices are located are given below:-

Lucknow, Guwahati, Hydrabad, Chandigarh, Calcutta, Bhubaneswar, New Delhi, Belgaon, Pune, Ahmedabad, Nagpur, Trivandrum, Bhopal, Jammu Tawi, Patna, Shilong, Agartalla, Raipur, Bangalore, Kangara, Dehradun, Jaipur, Chennai, Jodhpur, Vishakhapatnam. Manual on Rain Water Harvesting and conservation of consultancy services organization CPWD can also be referred for further details .

Implementation

Northern Railway was approached by undersigned to provide required details of status of water supply with special reference to measures taken for rain water harvesting projects vide my letter dated 17/09/2008 addressed to Chief Engineer (works) Baroda House New Delhi (Appendix C) and also visits and interaction with concerned officials. Northern Railway in turn has taken special interest and supplied relevant sample data for four divisions i.e. Ambala, Lucknow, Moradabad, and Delhi which to very large extent is considered the entire Northern Railway.

Chief Engineer (works) Baroda House New Delhi has furnished the data for recoded demand and supply from year 2001 onwards both for colonies and also for major station yards .details of rain water harvesting projects along with recorded water tables has also been furnished.(Tables 5.4 to 5.19)

Table 5.4

Delhi Division

Kisan Ganj Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table	
2001	3157	7	1871	2531	58	-	
2002	3157	8	1871	2619	59	-	
2003	3157	9	1871	2687	59	8.5	
2004	3162	9	1871	2687	40	-	
2005	3162	11	1871	2711	58	8.5	
2006	3162	11	1871	2711	42	8.5	
2007	3162	18	1871	3047	70	8.5	

Table 5.5

Delhi Division

S.P.Marg Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table	
2001	200	3	160	165	-	-	
2002	200	3	156	161	-	-	
2003	200	3	155	159	-	-	
2004	200	3	194	199	-	-	
2005	200	3	146	150	-	-	
2006	200	4	135	140	99	12	
2007	200	7	127	140	120	14	

Table 5.6

Delhi Division

P.K.Road Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	544	2	400	564	66	20
2002	544	2	400	564	-	-
2003	544	2	400	564	-	-
2004	544	2	400	564	-	-
2005	544	2	400	564	-	-
2006	544	2	400	564	-	-
2007	544	4	350	600	125	23

Table 5.7

Delhi Division

Chelms Ford Road Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	144	3	-	140	95	18
2002	144	3	-	140	95	18
2003	144	3	-	140	95	18
2004	144	3	-	140	95	18
2005	144	3	-	140	95	18
2006	144	3	-	140	95	18
2007	144	3	-	140	95	18

Table 5.8

Delhi Division

New Delhi Yard Qty in Klio Lts and Depth in Mts

Year	Washing demand	Watering demand	Drinking demand	Total Demand	No of Tube wells*	Water table
2001						
2002						
2003						
2004	5162	2588	4588	12318	8	
2005	5162	2588	4588	12318	6	
2006	5162	2835	4588	12585	4	
2007	5162	2835	4588	12585	4	

*** 80 lac Lit. from Ranney Well**

Table 5.9

Ambala Division

Ambala (E) Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	3454	5				
2002	3454	5				
2003	3325	5				
2004	3325	5				
2005	3279	5				
2006	3279	6			300	48
2007	3306	7			300	48

Table 5.10

Ambala Division

Ambala Yard Qty in Klio Lts and Depth in Mts

Year	Washing demand	Watering demand	Drinking demand	Total Demand	No of Tube wells	Water table
2001	117	243	306	667	6	
2002	117	243	306	667	6	
2003	117	243	306	667	6	
2004	117	243	306	667	6	
2005	117	243	306	667	6	
2006	117	243	306	667	6	
2007	117	243	306	667	6	

Table 5.11

Lucknow Division

Loco east Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	5120	6		2950		
2002	5120	6		2950		
2003	5120	7		3215		
2004	5120	7		3215	301/290	35/38
2005	5120	7		3215		
2006	5120	10		4770	345	36.6
2007	5120	10		4770	273	41.35

Table 5.12

Lucknow Division

Loco west Qty in Klio Lts and Depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	886	1		540		35.5
2002	886	1		486		36.2
2003	886	1		405		37
2004	886	1		324		37.5
2005	886	1		360		38.2
2006	886	1		288		39.5
2007	886	1		331		40.5

Table 5.13

Lucknow Division

CharBag Yard Qty in Klio Lts and Depth in Mts

Year	Washing demand	Watering demand	Drinking demand	Total Demand	No of Tube wells	Water table
2001	870	1385	2142	4398	7	30.5
2002	870	1395	2142	4408	7	37.7
2003	945	1250	2213	4408	7	38.1
2004	960	1407	2312	4680	9	38.7
2005	990	1368	2437	4797	9	39.3
2006	1004	1637	2543	5185	9	39.9
2007	1030	1616	2610	5257	9	40.6

Table 5.14

MoradaBad Division

Morada Bad Qty in Klio Lts and depth in Mts

Year	Total demand	No of Tube wells	Municipal supply	Total supply	Depth of tubewells	Water table
2001	1060	8	-			8.5
2002	1060	8	-			8.5
2003	1062	8	-			9.0
2004	1062	8	-			9.0
2005	1063	8	-			9.0
2006	1063	8	-			10
2007	1064	8	-			10

Table 5.15

MoradaBad Division

MoradaBad Yard Qty in Klio Lts and Depth in Mts

Year	Washing demand	Watering demand	Drinking demand	Total Demand	No of Tube wells	Water table
2001	82	1684	603	2370	3	8.5
2002	82	1976	628	2687	3	8.5
2003	82	2289	654	3026	3	9.0
2004	82	2505	727	3315	3	9.0
2005	82	2721	799	3603	5	9.8
2006	82	2937	869	3890	5	11
2007	82	3153	944	4180	5	11.6

Table 5.16

Delhi Division

S.P.Marg Colony (RWH) Area in Sq M and Depth in M

Year	Type	Roof Area	Surface Area	Total Area	Depth of Water table
2001					
2002					
2003	Recharge pit with Bore	12730	35000	47730	12.25
2004					
2005					
2006					
2007					

Table 5.17

Ambala Division

AmbalaColony (RWH) Area in Sq M and Depth in M

Year	Type	Roof Area	Surface Area	Total Area	Depth of Water table
2001					
2002					
2003					
2004					
2005	deep tubewell	117		117	48
2006					
2007					

Table 5.18

Lucknow Division

Loco east Colony(RWH) Area in Sq M and Depth in M

Year	Type	Roof Area	Surface Area	Total Area	Depth of Water table
2001	Deep tubewell	1060	12150	13210	34.8
2002					34.5
2003					34
2004					33.5
2005					33.4
2006					32.8
2007					32.7

Table 5.19

Moradabad Division

Moradabad Colony (RWH) Area in Sq M and Depth in M

Year	Type	Roof Area	Surface Area	Total Area	Depth of Water table
2001					
2002					
2003					
2004					
2005	Catchment area	32oo		3200	
2006					
2007					

Results

From the data made available it is noted that in Railways the work of rain water harvesting has been stared in 2001-2002 and till march 2005, 26 works were completed, however till year 2007-2008 ,180 no. works have been completed on NRly.

From the data perused it is established that there is problem of water availability in almost all divisions as water table recorded has plummeted from 2 to 10 Ms in different places except for Chalmsford & KisanGanj colony area in Delhi which may be a local phenomenon.

Rain water harvesting works have been completed and all policy guidelines on this subject are being followed on northern Railways and even areas not specifically covered for mandatory rain water harvesting works till now by CGWB have also been covered and provided with harvesting facilities.

Rain ware harvesting works have in general shown recorded improvement in availability of water as is reflected by recorded rise in water tables of that area. In one location the water table still keeps on declining which can be attributed to local factors.

As per discussions with officials generally recharge pit technique has been followed but in Lucknow ,old wells have been used for recharging. and in MoradaBad catchment area method has been used.

Few of good RWH works completed by NRly are shown bellow:

Fig 5.3 RWH by Pit method at Rail Bhawan

Fig 5.4 RWH by Trench method at Baroda House

Fig 5.5 RWH by Pit method at San martin Flats, Chanakyapuri

Fig 5.6 RWH by Trench with Bore method at S.P. Marg Officers Colony

In addition to adopting Rain Water Harvesting techniques N.Rly has also explored other areas of using Ranney well for augmenting its water supply rather than only deep collection of water.

Railways have also seen merit in Recycling and re use of waste water specially the washing water in major yards[30] a pilot project study for reuse of waste water arising out of train washing about 2.0 mld in new delhi station was carried out by teri. The project was found to be feasible and setting up of 2 water treatment plants was recommended .it is revealed during meeting with Rly Officials that further action in this regard could not be taken primarily because there are major changes planned in near future in new delhi station as a result of planned conversion of this station to a world class station.

During various discussions with officials of Railways it came out that though there is potential of reducing water requirements of train washing but no concrete action has been initiated to look in to this aspect.

Railways are also serious about water pollution and have well laid down procedures to ensure potable water supply to its consumers. The testing procedures treatment to be done have been prescribed by way of guideline circulars. Strict watch is kept on results of testing and necessary remedial measures are initiated.

[30] Executive summary designing a model for water cycle and reuse on "maintenance lines" for Indian Railways: A pilot project for New Delhi Railway Station by Northern Railway Sept.2005.