

6. Physical Infrastructure

6.1 WATER SUPPLY

6.1.1 Present Water Supply Schemes

6.1.1.1 Gonda (Kanke Reservoir) Water Supply Scheme

Kanke reservoir with basin area of 19.30 sq. km is located about 5.2 kms from Town-hall at Gonda village in Ranchi and has an elevation of 611 m above MSL. This scheme was designed for the supply of 4.3 million gallons of water per day (19.50 MLD) by constructing a dam on the Karam Nala. The scheme was sanctioned at an estimated cost of Rs. 81.65 lakhs and the works were completed in two phases – the first phase in 1955 and the second phase in 1960, when 19.50 MLD, which is ultimate capacity of water supply, was made available to Ranchi and Doranda including Hinoo and Kanke. In addition water is supplied to various Government institutions, offices i.e. Rajendra Medical College, Agriculture College, Veterinary college, Government house, Nepal Kothi etc to the tune of about 4.92 MLD. The maximum catchment of this source is covered by residential areas.

6.1.1.2 Hatia Water Supply Scheme

The Hatia dam water supply scheme with catchment area of 47.94 sq. km was taken up at Dhurwa village to cope with the increased demand of water supply of developed areas of Doranda and the residential-cum-industrial complex of H.E.C. as separate water supply scheme. This scheme was executed in the year 1963 with a rated capacity of 12.5 MGD (56.83 MLD). A water reservoir has been constructed by providing a dam on Subarnrekha River at Hatia. This scheme was designed to meet the requirement of H.E.C. of approximately 11 million gallons (50.1 MLD) of water per day, but afterwards H.E.C. revised its requirement which

increased to 18.4 MGD (83.65 MLD). Thus, it became insufficient to meet the entire water requirement. Presently water is drawn only on alternate day due to scarcity.



6.1.1.3 Getalsud (Rukka) Water Supply Scheme

The Rukka (Getalsud) dam has been constructed on Subarnarekha River near a village Getalsud about 12.5 km away from the city for dual purpose i.e. for supply of water to Ranchi city and for generation of hydropower. This reservoir is built for a storage capacity of 288.63 million cum. The government of Jharkhand has reserved 340.96 MLD of water in this reservoir for the use of Ranchi city. After this scheme was implemented, the existing Kanke and Hatia systems were connected with Rukka system to provide flexibility to transfer water from one reservoir to another and thus to different parts of the city. The total capacity of Rukka dam to supply water is about 170.50 MLD. The dam is at lower altitude compared to city and the drainage pattern is such that the wastewater from domestic areas of Ranchi joins the reservoir at on upstream side and hence treatment at the Rukka water works requires additional attention.

The details of the present sources of water supply from all the three water supply schemes namely Gonda Water Supply Scheme, Hatia Water Supply Scheme and Subarnrekha Water Supply Scheme and the areas served are detailed in **Table No. 6.1**

Table No. 6-1: Existing Water Supply Schemes in Ranchi

S. No.	Source	Design Capacity (MLD)	Uses
1	Kanke Dam (Gonda)	19.50	<ul style="list-style-type: none"> Domestic and Fire fighting uses Minor industrial use Garden and parks
2	Hatia Reservoir	56.83	<ul style="list-style-type: none"> 25.0 MLD for H.E.C industrial use 20.46 MLD for domestic use at H.E.C. township 0.91 MLD for Hatia Railway establishment 1.36 MLD for H.S.L. domestic use 0.45 MLD for colony of A.C. office 2.05 MLD for Tupudana industrial units and domestic use 0.91 MLD for Argora and Harmu colonies domestic use 5.68 MLD is used by the H.E.C for the purpose other than mentioned above
3	*Subernrekha (Rukka) Scheme	170.48	<ul style="list-style-type: none"> 18.18 MLD for H.E.C. domestic fire fighting, industrial use, hospital use etc 2.27 MLD for Ranchi Railway Station 22.73 MLD for domestic use of Ranchi 13.64 MLD for Army establishment 72.74 MLD out of H.E.C. area (a) Domestic use (b) Ancillary Industries use (c) Parks and Garden (d) Defence establishment and Railways 40.91 MLD for H.E.C. areas (for domestic, Factory and Garden uses)
Total		246.85	-
Note: Water Storage capacity of Rukka Dam is 340.96 MLD			

Source: Drinking Water & Sanitation Department, Govt. of Jharkhand, 2011

Refer **Map No. 6.1** for location of Existing WTPs in the Planning Area

Presently only 65-70 % of the Ranchi city area is covered under piped water supply. The total capacity of potable water generation of the planning area is around 417.29 MLD considering the capacities of the treatment plants at Kanke, Hatia and Subernarekha although the total water produced at present is 246.85 MLD. The present domestic requirement of water (@ 70 lpcd) for the 10,73,440 population would be 75.15 MLD.

6.1.1.4 Ground Water

30-35 % of the city population is depending for water on ground water source. The yield from the bore-wells is not significant within the entire area of the city and during the summer seasons. Possibilities of extracting ground water in considerable quantity to satisfy the water demand of the city are not recommended.

6.1.2 Norms for Water Supply

Per capita water supply for designing of various schemes as suggested in "Manual on Water Supply and Treatment" of the Central Public Health Engineering Organisation, Government of India is as follows:

- 70 lpcd for Towns provided with piped water supply but without sewerage system;
- 135 lpcd for Cities provided with piped water supply where sewerage system is existing/contemplated;
- 150 lpcd for Metropolitan and Mega Cities provided with piped water supply where sewerage system is existing/contemplated.

Ranchi, being the capital of city of Jharkhand state of India. Commercial activities and populations are increasing rapidly and standards of living of local population are increasing. In view of this condition, the criteria used for fixing the water supply norms include:

- 100 % houses will be supplied with piped filtered water by the year 2037;
- 100 % houses will be connected to Municipal Sewerage System requiring flushing of toilets;
- Adequate water for fire fighting will be stored for entire Planning Area;
- Per capita gross domestic water requirement inclusive of general light industrial, commercial, institutional, fire fighting, and floating population, works out to 155 lpcd (including 15% transmission losses) for Urban Area;
- Water demand for proposed industrial areas should be estimated as 45,000 litres/hectare/day

However, this does not include the major industries like H.E.C., Tupudana auxiliary industrial units, proposed industrial estates etc for which additional bulk water supply is needed.

6.1.3 Projected Water Demand in different Planning Units

The water demand for each planning unit is based on projected population for the year 2037. The calculation is based on the water demand norm of 155 lpcd for urban area. The total domestic water demand in RPA as in 2037 is 489.43 MLD.

Table No. 6-2: Domestic Water Demand in RPA-2037

Planning Unit	Places Covered	Population 2037	Domestic Water Demand (in MLD)
PU-1	Ward 14, 15, 25, 26, 27, 28 and 29, 47, 48 and 50	2,68,400	41.60
PU-2	Ward 16, 17, 18, 19, 22, 23, 24, 30 and 31	1,59,804	24.77
PU-3	Ward 1, Jaipur (189), Garu (153), Kadma (155), Ratu (79), Tendar (77), Kamre (144), Jhiri (145), Sundil (147), Dhamaisoso (147), Chatakpur (148), Naudsoso (150), Kamta (152) and Konje	2,38,825	37.02

Planning Unit	Places Covered	Population 2037	Domestic Water Demand (in MLD)
	(151)		
PU-4	Ward 2 and 3, Kanke (156), Arsande (159), Boreya (185), Sangrampur (160), Partial Village Patraru (161), Hochar (158), Banhura (49) and Dubhiya (48)	2,42,210	37.54
PU-5	Ward 4, 6, 8, 9, 10, 20 and 21	2,10,775	32.67
PU-6	Ward 5, Lem (162), Partial Ward 5, Kadal (165), Renro (163), Partial Village Patraru (161), Chuttu (164), Chandwe (47), Oyana (46), Partial Village Getlatu (168), Neyuri (45), Kollari (28) and Irba (27)	2,02,225	31.34
PU-7	Ward 7, 11, 12, 13, Petrol (172) and Khatanga (179)	2,75,050	42.63
PU-8	Lalganj (171), Dumardaga (181), Sugnu (170), Jamunari (17), Partial Village Getlatu (166), Hawbai (167), Mesra (169), Rudiya (168), Rukka (31), Hutup (29), Karma (30), Turup (16) and Salhan (15)	94,940	14.72
PU-9	Partial Village Hesal (19), Masu (18), Tati (173), Partial Village Silwai (174), Haratu (175), Partial Village Chatra (31), Mahilong (176)	2,45,370	38.03
PU-10	Ward 49, Ara (178), Bargawon (216), Baram (177), Kewali (217), Sidraul (218), Kutiatu (330), Sahera (329), Village Tetri (325), Arma (333), Malti (332), Palandu (331), Village Ganrke (335), Village Ulatu (339), Berwari (20), Partial Village Hesal (19), Partial Village Silwai (174), Partial Village Chatra (31), Chene (337), Rampur (336), Sarwal (334), Jordag (324)	2,28,840	35.47
PU-11	Ward 45, 46, 51, 52, 53, 54, Khijri (219), Tumbagutu (301)	2,32,390	36.02
PU-12	Kutetoli (299), Oberiya (297), Mariyatu (303), Chandaghasi (300), Ithe (304), Dungri (294), Tanko (295), Garhkhatanga (296), Lolkhatanga	2,66,475	41.30

Planning Unit	Places Covered	Population 2037	Domestic Water Demand (in MLD)
	(305), Gundu (268) and Kochbang (306), Lodhma (302), Churu (327), Pindarkom (328) and Kharsidag (326)		
PU-13	Ward 38, 39, 40, 41, 42, 43, 44, 55, Labeled (233), Hotwasi (232), Balalong (236), Harser (235), Nachiatu (241), Bhandratoli (240), Semba (239), Baridih (237), Singhpur (238), Chete (256), Sithiyo (255), Pindarkom (254), Balsiring (253), Sukurhutu (269), Ghuthia (265), Sohdag (257), Jamgain (264), Hulhundu (266) and Jujusiring (252), Daladili (133), Meral (134), Gutuwa (138), Saparom (137), Tundul (231), Pundag (228) and Kudlum (124)	2,78,225	43.12
PU-14	Ward 32, 33, 34, 35, 36, 37, Partial Village Pandra, Pirra (93), Dandaiphuthat (95), Tiltta (94), Simliya (139) and Dahisota (143)	2,14,106	33.19
Total		31,57,636	489.43

Source: Estimates of the Consultant

6.1.4 Water Requirement for Major Industries/Railways/Airports/IT

At present the major industry area like Heavy Engineering Corporation (H.E.C.) and Railways, Airports and defence establishment are collecting and treating their water requirement by themselves without depending on Municipal Water Supplies. Their main sources of raw water are the Hatia Reservoir and Subarnarekha River Scheme.

It is proposed that in future, all the major industries will arrange their water need depending on their requirements. The treatment and disposal of wastewater is also to be undertaken by these agencies. Municipal Corporation of Ranchi may not take this responsibility, as special treatment is required by each industry.

Table No. 6-3: Industrial and Institutional Water Demand within Planning Area

S. No.	Landuse	Water Demand (@45000 litres/HA/Day)
1	Existing HEC Area, Institutions, Dairy etc	*81.84
2	Proposed IT (865 ha)	38.925
3	Proposed Industrial Area (1119 ha)	50.355
4	Proposed Transport Nagar (218 ha)	9.81
5	Proposed Truck Terminal and Warehouse/Godowns (260 ha)	11.7
6	Proposed Institutional Area (794 ha)	35.73
Total		228.36

Note: *As projected in Final DPR of Water Supply, Drinking Water and Sanitation Department, Ranchi

Table No. 6-4: District Wise Water Demand in RPA-2037

District	Planning Unit	Population, 2037	Gross Water Demand (MLD) - 2037		
			Domestic	Industrial & Institutional	Total
A	1, 2	428204	66.37	7.56	73.93
B	3, 4	481035	74.56	47.87	122.43
C	5, 6	413000	64.02	22.62	86.64
D	7, 8	369990	57.35	38.32	95.67
E	9, 10	474210	73.50	57.51	131.01
F	11, 12	498865	77.32	3.31	80.63
G	13, 14	492332	76.31	51.17	127.48
Total		31,57,636	489.43	228.36	717.79

Source: Estimates of the Consultant

6.1.5 Water Supply and Demand and Available Water Sources

The total water available from the existing available sources in the Ranchi is only 417.02 MLD and total water demand for the Planning Area by horizon year 2037 will be 717.79 MLD. There will be a shortage of 300.77 MLD during the year 2037. Thus, there is a high need to identify the new sources for the Ranchi Planning Area to satisfy the water demand for the horizon year 2037. The

available possible sources in the vicinity of the Ranchi Planning area are detailed as below.

S. No.	Source	Distance by Road from Ranchi (kms)	Storage Capacity (Mcum)
1	Konar Maithan Dam	140.0	337.0
2	Tenughat Dam	96.90	476.0
3	Tilaiya Dam	158.0	394.7
4	Govind Ballabh Pant Sagar Dam (located at Madhya Pradesh)	368.0	10625.0

Refer **Map No. 6.2** for location of new water sources for Ranchi Planning Area

The water allocation of these sources and water that could be available for the Ranchi needs to be studied in detail. Hence, it is recommended to undertake water source identification study for availability of the water.

6.1.6 Water Intake, Treatment and Distribution

The water supply system of the city is maintained by three agencies viz. Drinking Water & Sanitation Department (DWSD)-Govt. of Jharkhand, Ranchi Municipal Corporation (RMC) and Public Health Engineering Department (PHED) through their existing system. Beside heavy industrial area like H.E.C. also have their own independent supply system for their areas, which has their own future plans.

6.1.6.1 Water Intake

The main sources of water for the city are the three reservoirs constructed on river Subarnarekha at different locations. The water stored in these reservoirs is draw by intake pumps and treated in water treatment plants before supply to the users. The water level of the river Subarnarekha varies drastically during monsoon and summer seasons. The river is almost dry during the summer period and during monsoon period; the water level of the river sometimes goes higher than ground level of the city at some locations and stays so for many days. Thus,

storage of river water during the peak rainfall period and augmentation of the reservoirs capacity are the appropriate options to meet the increasing demand of water.

6.1.6.2 Water Treatment

Based on the geographical barriers, population distribution and ease in operation and maintenance, the entire Ranchi Planning Area is required to be divided into 38-service Zones including 11-RMC water supply zones.

The 38-service zones are served by three water supply zones with one intake arrangement for drawing raw water from their respective reservoir on River Subarnarekha. The raw water will be pumped to the treatment plant through raw water pumping mains. The location of water intake, water treatment plant and area to be served would be as in **Table No. 6.5**.

Table No. 6-5: Location of WTPs & Capacity for Domestic Water Supply (in MLD)

S. No	Water Intake	Treatment Plant location	Capacity of Existing WTP (MLD)	Proposed Capacity of WTP (MLD)	Remarks
1	Kanke Reservoir	Near Rock Garden	19.50	19.50	-
2	Hatia Reservoir	HEC Township	56.80	56.80	-
3	Getalsud Reservoir	Rukka	284.50	340.96	It is proposed to augment the existing capacity of WTP by 72.17 MLD. The water shortage may be met from identification of new water sources
Total			360.80	417.26	-

Note: It is proposed that in future, all the major industries will arrange their water need depending on their water requirements.

6.1.6.3 Water Distribution

It is recommended that a comprehensive distribution system starting from major W.T.Ps in each service district be designed and the present pipeline system and

W.T.P.s already available to be integrated with the proposed system. The design recommended should consider a minimum terminal head pressure of 7 m at peripheral locations.

6.1.7 Transmission Water Pumping Main and Service Reservoirs

It is proposed to provide a separate clear water service reservoir for each of planning unit, which will supply water through distribution mains located at corresponding unit. Treated water for planning unit will be supplied through distribution mains directly from the service reservoir of planning unit.

6.1.7.1 Service Reservoirs (SR)/Elevated Service Reservoirs (ESR)

A service reservoir/elevated services reservoir is proposed for each of the individual planning unit, which would store the quantity requirement for the respective planning unit. The SR/ESR would receive the quantity of water through the clear water pumping mains from the treatment plants. The capacity of various SR/ESRs for each unit is as under:

Table No. 6-6: Distribution of Service Reservoirs in Planning Units

Planning Unit / Zone	Existing Capacity of SR (ML), 2011	Additional Capacity of SR (ML), 2037	Total Capacity of SR (ML)-2037
1	3.17	5.31	8.48
2	2.72	2.11	4.83
3	0.0	5.11	5.11
4	1.36	9.90	11.26
5	8.86	0.94	9.80
6	0.0	9.40	9.40
7	0.68	12.11	12.79
8	0.0	4.41	4.41
9	0.68	10.73	11.41
10	0.0	10.64	10.64
11	3.0	2.81	5.81
12	0.0	5.14	5.14
13	21.17	0.00	21.17
14	26.57	0.00	26.57
Total	68.21	78.62	146.83

Refer **Map No. 6.3** for location of Existing and Proposed UGR/SR in Planning Area

6.2 SEWERAGE SYSTEM

6.2.1 Existing Sewerage System

Presently, the Ranchi Planning Area (RPA) does not have any integrated sewerage system except for certain pockets such as H.E.C. Colony and MECON Colony having their own independent system. There are generally septic tanks in Ranchi. The effluent is released untreated into the nearby drains and low-lying areas. Similar is the case of industrial wastewater. In case of septic tanks, the soak pits are becoming non-functional in many areas because of high sub-soil water table within a short span of time. The city also has public toilets facilities located at public places i.e. bus terminals, Firayalal commercial area, near DC office, slum areas etc.

A Sewerage Treatment Plant (STP) of 4-MLD capacities is located near Kanke dam to prevent water contamination of the Kanke reservoir.

6.2.2 Estimated Domestic Wastewater Generation

Considering the various factors, the per capita wastewater generation would be 80% of the water supply. Planning unit wise discharge of the wastewater is given in the **Table No. 6.7**.

The planning units are combined into 6-sewerage zones considering the criteria of slope, topographical features, water bodies and local disposal points for better collection and treatment of wastewater.

Table No. 6-7: Domestic Wastewater Load in Ranchi Planning Area (RPA)

Sewerage Zone	Planning Unit / Area Covered	Projected Population (Year – 2037)	Generated wastewater in MLD (Year 2037)
1	PU-3(100%), PU-4(98%), PU-5(50%), PU-6(90%), PU-8(70%), PU-9(2%), PU-14(50%)	9,41,999	116.81

Sewerage Zone	Planning Unit / Area Covered	Projected Population (Year – 2037)	Generated wastewater in MLD (Year 2037)
2	PU-1(90%), PU-2(50%), PU-6(5%), PU-11(20%), PU-13(20%), PU-14(50%)	5,41,757	67.18
3	PU-1(10%), PU-2(50%), PU-4(2%), PU-5(50%), PU-6(5%), PU-7(70%)	4,19,620	52.03
4	PU-7(30%), PU-8(30%), PU-9(98%)	3,51,460	43.58
5	PU-10(100%), PU-11(20%), PU-12(90%)	5,10,106	63.25
6	PU-11(60%), PU-12(10%), PU-13(80%)	3,92,694	48.69
Total		31,57,636	391.55

Source: Estimates of the Consultant

Refer **Map No 6.4** for Sewerage Zones within the Planning Area

6.2.3 Disposal of Industrial Effluent

A number of medium and small size industries i.e. H.E.C., Tataisilwai, Swarnarekha watch factory, M/s Rare Maintenance & Chemicals, Tupudana are located in Ranchi Planning Area (RPA). These industries discharge their industrial effluent into natural drain, which ultimately merges into River Subarnarekha, which pollutes the water. Therefore, it is proposed that all large and medium industries should have their own effluent treatment plants while industrial estates should have Common Effluent Treatment Plant (CETP) to meet the standard for discharge of treated industrial effluent.

6.2.4 Proposed Domestic Sewage Disposal System

Considering various factors for Sewerage Treatment Plant (STP) siting, like availability of adequate land, convenience of disposal/transfer of sludge/effluent, natural topography, slope seven locations has been selected for STP locations. Refer **Map No. 6.4 A**.

Table No. 6-8: Location of Proposed STPs within Planning Area, 2037

Sewerage Zone	Location	Design Capacity of STP (including Infiltration (MLD))	Land Area (Hectare)
I	PU-8	122.65	22
II	PU-14	70.54	13
III	PU-7	54.63	10
IV	PU-9	45.76	8
V	PU-12	66.42	12
VI	PU-11	51.13	9
Total	-	411.12	74

Source: Estimates of the Consultant

6.2.5 Sewage Treatment Technology

After thorough investigation of several methods i.e. activated sludge, extended aeration and oxidation pond method of sewage treatment for wastewater, the activated sludge system has been found suitable for treatment of sewage at different sewage treatment plants.

6.3 DRAINAGE

6.3.1 Present Drainage Situation

With the exception of small pockets i.e. H.E.C., MECON etc of the city nowhere within the Ranchi Planning area any planned drainage system is in existence. The Ranchi Municipal Corporation area has some roadside small drains, which are not efficient enough to provide relief to the locality during the rainy seasons.

With the encroachments alongside drains, inadequate section of the outfall channels, over-flooding of the local drains, de-silting of hills, inadequate section of the outfall channel, existence of low-lying ditches within the local drains pattern having inadequate banks result in frequent over-flooding of the adjoining areas due to inefficient carrying capacity. This endangers the health and property of the area. This is more so within the corporation area where density of

population is high and areas where buildings are constructed in low-lying areas blocking the natural drainage courses.

6.3.2 Drainage Basins / Zones

Ranchi city has a flat to gently undulating topography with occasional ridges. The Ranchi plateau gradually slopes down towards south east into the hilly and undulating region of Singhbhum. The Subarnarekha River is passing through the city with its tributaries like Nati Nadi, Hinoo Nadi, Harua Nadi, and Harmu Nadi. In addition, there are numbers of nallah out falling into these tributaries. The storm run-off from the city thus finds its way to various nallah and tributaries of Subarnarekha River through roadside drains.

Considering the topographical features, the whole Ranchi Planning Area (RPA) area is divided into 7 (seven) numbers of drainage basins, which are ultimately drained into the river Subarnarekha either directly or through various drainage channels. These seven catchment basins are detailed in **Table No. 6.9**.

Table No. 6-9: Details of Catchment Zones of the Planning Area

S. No.	Catchment Zone	Catchment Area (HA)	Flow Direction in catchment	Major Drainage Channel in Catchment
1	I	3982.3	North to South-Eastern side	Sapali Nadi, Doma Nadi and their tributaries
2	II	14901.5	West to Eastern side	Potpoto River and Jumar River and their tributaries
3	III	8032.7	West to Eastern side	Harmu River, Argora Nalla and their tributaries
4	IV	4306.2	West to North-Eastern side	Tributaries of Subarnarekha River
5	V	5753.8	West to Eastern side	Raru Nadi and its tributaries
6	VI	12076.3	South to Northern side	Sapahi Nadi and its tributaries
7	VII	16167.4	West to North-East direction	Subarnarekha River and its tributaries
Total		65220.20	-	-

Refer **Map No. 6.5** for Drainage / Catchment Zones within the Ranchi Planning Area

The drainage problem of Ranchi Planning Area (RPA) is to tackle 'Basin wise or Drainage Zone Wise', if required storm water is to be diverted to another basin, if the capacity of one basin is found inadequate. The planning area needs a new comprehensive study and action programme for drainage system and network also considering the developments upto 2037 as suggested in this plan.

6.3.3 Recommendations and Action

- The encroachments on natural drainage system, which is the main reason for the blockage, should be stopped;
- Existing manholes where available on drains are inadequate; more manholes and inlet are required for the quick disposal of silt and stagnated water. The size of the inlet holes and their position need to be redesigned;
- Pits for Silt trap of proper size should be constructed in suitable areas and provision of periodical cleaning the silt pit should be done to avoid blockage in the drainage system;
- An effective garbage collection system (including domestic and other type of garbage) to be in place so that this does not block the drainage channels. This is subject to detailed feasibility study;
- Preparation of Detailed Drainage System Plan for entire Planning Area

6.4 SOLID WASTE MANAGEMENT

6.4.1 Introduction

Presently important sources of solid waste generation are (i) Residential areas including slum habitations (ii) Fruit and vegetable market (iii) Hotels & restaurants (iv) Hospitals (v) Drains de-silting (vi) Commercial & Industrial wastes from these areas.

A comprehensive picture of solid waste generation per capita based on an international 2010 study is detailed in **Table No. 6.10**

Table No. 6-10: Relation between GDP and expected generation of MSW

Country	Urban Population (% in total)			GDP per Capita (%)			MSW generation per capita (kg/day)		
	2007	2010	2030	2007	2010	2030	2007	2010	2030
India	12.28	17.35	32.43	5.3	6.0	7.0	0.75	0.79	0.97
Nepal	15.25	21.87	38.65	2.0	3.0	4.2	0.32	0.35	0.44
Pakistan	17.93	25.10	45.00	4.2	4.8	5.2	0.39	0.44	0.59
Bangladesh	18.03	25.37	44.45	4.7	4.8	5.0	0.67	0.73	0.98
Sri Lanka	12.27	17.35	32.43	4.7	4.9	5.3	0.56	0.59	0.73

Source: "What a Waste", Solid Waste Management in Asia, Urban Development Sector Unit, East and Pacific Region, 2010

From the **Table No. 6.9**, it can be concluded that with the economic development and the increase in growth of per capita GDP, the per capita generation of solid waste generation increases. There is an approximately increase of 0.01 kg /capita/day per annum in India. It is estimated that, per capita solid generation for Ranchi for the year 2037 would be of the order of 0.51 kg per capita per day.

The **Table No. 6.11** shows the solid waste generation at 5-year intervals in the Ranchi Planning Area.

Table No. 6-11: Estimated Solid Waste Generation

Year	Actual/Projected Population	Estimated generation	
		Kg/day/person	MT/day
2012	1499461	0.26	389.86
2017	1737536	0.31	538.64
2022	2017780	0.36	726.40
2027	2344459	0.41	961.23
2032	2722508	0.46	1252.35
2037	3157636	0.51	1610.39

6.4.2 Solid Waste from Specific Specialized Areas

Vegetable & Fruit Market: A good quantity of solid waste will also be generated from vegetable & fruit markets. Solid Waste from vegetable markets is a large quantity of green waste that confirms the presence of commendable C/N ratio. However, no data on the specific generation of quantity is available so far. A study is suggested.

Hotels and Restaurant: Generally, hotels in cities generate @ 500 gms per bed per day. It is roughly worked out that each restaurant produces @ 200 gms of waste per visitor depending of volume of business.

Hospital Waste: As far as hospital waste is concerned, there is no separate disposal site in Ranchi. There is no functional incinerator, which is mandatory in government hospitals. Generally, there is generation @ 0.5 kg per bed per day of solid waste from hospital.

Table No. 6-12: No. of Hospital beds & projected solid waste generation

Planning District	Present No. of Beds as on (2011-12)	Projected No. of beds as on 2037	Solid waste generated per day in MT (2011-12)	Projected Solid Waste generated/day 2037 (MT)
A	1815	2141	907.50	1070.50
B	3369	2405	1684.50	1202.50
C	336	2065	168.00	1032.50
D	95	1850	47.50	925.00
E	63	2371	31.50	1185.50
F	241	2494	120.50	1247.00
G	214	2462	107.00	1231.00
Total	6133	15788	3066.50	7894.00

Source: Estimates of the Consultant

Commercial Waste from shops: Generally, each shop produces commercial waste in the form of paper, packages material & other waste varying from 0.5 kg to 5.0 kg per day depending on their business volume.

Other Sources: Besides the above sources, the solid waste is also generated from (1) Construction and Demolition Activities, (2) Motor Garages, (3) Industries, (4) Carcass Disposal, (5) Dairy and (6) Dhobi Ghat.

6.4.3 Quality of Solid Waste Generation

The characteristics of solid waste generation in Ranchi reveals that more than 61.35 % is organic including paper (refer to **Table No. 6.12**) and rest constitute of non-biodegradable like plastic, glass etc.

Table No. 6-13: Composition of garbage in Ranchi

S. No	Composition of garbage	Percentage
1	Organic Waste	51.49
2	Recyclable	9.86
3	Non Biodegradable	38.65
Chemical Composition/Energy		Value
4	C/N Ratio	20.23
5	HVC (Kcal/kg)	1060
6	Moisture Content (%)	49.0
Total		100.0

Source: Estimates of the Consultant

6.4.4 Landfill Area Requirement-2037

The Landfill area requirement based on methods of calculation as per Manual on Municipal Solid Waste Management (1st Edition) by Central Public Health and Environmental Engineering has been worked out as shown in **Table 6.13**.

Table No. 6-14: Land Requirement for Solid Waste Land Filling

S. No	Year	Estimated quantity of solid waste generated (in MT/day)	Total Area required (in Hectare)
1	2012	389.86	23
2	2017	538.64	31
3	2022	726.40	67
4	2027	961.23	53
5	2032	1252.35	68
6	2037	1610.39	85

6.4.5 Proposed Landfill Site

Presently, an area of 16.19 hectares of land is available for the purpose of landfill site at Jhiri Village. It is proposed to shift this site to new proposed landfill site. A land parcel of an area 85.0 hectares is proposed to development as a solid waste disposal site at Balsiring Village adjacent to the Ring Road. The landfill site for solid waste disposal should be equipped with the required facilities including fencing, weigh-bridges, proper access roads, proper drainage system, leachate collection system, gas handling equipments etc. Refer **Map No. 6.6**

6.4.6 Slaughter House

In order to cope with the unscientific way of slaughtering, the Ranchi Municipal Corporation has decided to establish a modern slaughter house. A land parcel measuring an area of 297.39 Ds (1.20 hectares) has been identified at village Arsande, Kanke Block. This project is still pending to materialize on land. Therefore, it is proposed to shift this site near to Ring Road at Village Sangrampur (Thana No. 160).

6.5 POWER

6.5.1 Existing Situation

The electric power for Ranchi agglomeration including some of the adjoining villages is supplied from the power generated by Patratu Thermal Power Station (110 MW) and Sikidiri Hydel Power Station (110 MW). The design capacities of both these power generation sources are 840 MW and 130 MW respectively.

The Ranchi city is getting power from two 132/33 KV Grid Sub Stations established at Hatia and Namkum. The total installed capacity of these GSS is 400 MVA (8 x 50 MVA). The present power supply in Ranchi city is 220 MVA, which is being catered through 26-Nos of 33/11 KV power sub-stations established in various part of the city. The present requirement of power in Ranchi city is 390 MVA. Thus, there is a gap of 170 MVA at present.

6.5.2 Future Requirement

By 2037, the city would need 909 MVA power and therefore additional power requirement for horizon year 2037 for the planning area will be 689 MVA.

It is proposed to build 2-additional Main Receiving Grid Stations (132/33 kV) of capacity 200 MVA each and 1-additional MRGS (132/33 kV) of capacity 150 MVA in the planning area. These GSS will be obtained power from Jharkhand State Electricity Board and different power plants of central sector. The tentative locations of grid stations have been detailed in **Table No. 6.15**

Table No. 6-15: Location of Proposed 132/33 kV Grid Stations in Planning Area

S. No	Location	Number	Capacity (MVA)	Remarks
1	Namkum	1	50 x 4 = 200 MVA	Existing
2	Hatia	1	50 x 4 = 200 MVA	Existing
3	Kolhea Kanadu (Thana No. 32) Village north of Ranchi	1	50 x 4 = 200 MVA	Proposed
4	Hardag (Thana No. 275) Village south of Ranchi	1	50 x 4 = 200 MVA	Proposed
5	Pheta (Thana No. 78) Village west of Ranchi	1	50 x 3 = 150 MVA	Proposed
Total		5	50 x 19 = 750 MVA	-

Power will further be transmitted to various sector substations (33/11 kV). The present total installed capacity of PSS (Power Sub Stations 33/11 KV) in Ranchi City is 352.5 MVA. Considering maximum capacity of each such substation as 20-MVA, 28-additional sub-stations (33/11 KV) are required to be built in or around the city to meet the power demand of the Planning Area by 2037.

Table No. 6-16: Proposed Electric 33/11 kV Sub-Stations in Planning Area

S. No	Location
1	Gonda Hill, Pithoria, Near Old Jail Compound, Morabadi Maidhan / Karam Toli Chowk, Boriya, Near RTC High School at Bariyatu, Moram Soram (Kathal More), Lawa Tung Pundag, Sirdol / Rampur, Singhmore, Hardag, Ormanji, JAP Compound (A.G. Colony Doranda, Agricultural Market at Pandra, Sadar Hospital, 2 ESS each in PU-1 to 14

Refer **Map No. 6.7** for location of Existing and Proposed GSS and ESS in Planning Area

6.5.3 Recommendations for Improvement in T & D of Power Supply

The following steps are recommended for improvement in Transmission & Distribution (T&D) of Power Supply in the long term, short term as well as in present condition.

- Power at 33 kV to be taken using overhead transmission line;
- Power at 11 kV shall also be taken using overhead transmission line or through underground cables depending upon the condition/necessity/importance and town development planning;
- To ensure minimum interruption of Power Supply, 11 kV underground distribution system can be connected in Ring Main. It will ensure alternate source of power supply for all substations connected to the Ring Main;
- It is proposed to take LT power supply using underground cables in the town area. It will ease the distribution of Power Supply in the densely populated area of the city;
- Wherever it is necessary to use overhead transmission (Outside city limit), LT Aerial Bunch cables can be used to check power theft;

- 11/0.433 kV substations can be indoor or outdoor type;
- Whenever there is any space constraint in congested areas, Modern compact packaged outdoor substations can be used. This type of modern outdoor substation contains transformer, RMU, capacitor and all the switchgear arrangement in a single compartment. Space required for this substation is 5m x 5m x 4m;
- The main receiving stations should have the SCADA (Supervisory Control & Data Acquisition) facility to ensure on line monitoring & control of power supply. All substations & distribution stations will be interconnected with controlling stations by using modern methods e.g. Fibre optics. Radio communication may be used for voice communication.