



**BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI**

Original Application No.578/2018
(Earlier O.A. No. 26/2013(SZ) (THC)

WITH

Original Application No. 579/2018
(Earlier O.A. No. 27/2013 (SZ) (THC)

WITH

Original Application No. 580/2018
(Earlier O.A. No. 28/2013 (SZ) (THC)

WITH

Appeal No. 176/2018
(Earlier Appeal No. 51/2012 (SZ) (THC)

WITH

Appeal No. 86/2017 (SZ)

Janajagrithi Samithi		Applicant(s)
	Versus	
The Union of India & Ors.		Respondent(s)
	WITH	
CSI St. Luke's Church		Applicant(s)
	Versus	
The Union of India & Ors.		Respondent(s)
	WITH	
Ballibettu Alide Deasthana; Yellur & Ors.		Applicant(s)
	Versus	
The Union of India & Ors.		Respondent(s)
	WITH	
Janajagrithi Samithi		Appellant(s)
	Versus	
The Union of India & Ors.		Respondent(s)
	WITH	
Janajagrithi Samithi		Appellant(s)
	Versus	
The Union of India & Ors.		Respondent(s)

RESPONSE / OBJECTIONS ON BEHALF OF UDUPI POWER CORPORATION LIMITED TO THE ENVIRONMENTAL CARRYING CAPACITY REPORT, DECEMBER 2021, DATED 24.01.2022 SUBMITTED BY THE STATE OF KARNATAKA THROUGH ENVIRONMENTAL MANAGEMENT AND POLICY RESEARCH INSTITUTE

I, Santosh Kumar Singh, son of Mr. Bhuvaneshwar Singh, aged about 52 years, Authorized Representative of Udupi Power Corporation Limited having office at Adani Corporate House, Shantigram, S.G. Highway, PIN-382421, Ahmedabad, Gujarat do hereby solemnly affirm and state as under:





1. I am the Authorised Representative of Udupi Power Corporation Limited (hereinafter referred to as the "**Answering Respondent**" or "**UPCL**") and I am fully conversant with the facts and circumstances of the present cases and I am, as such, competent to swear and sign this present affidavit. I am duly authorised to file the present response / objection.

2. I state that pursuant to the Order dated 14.03.2019 read with order dated 14.10.2019 passed in the above cases, the State of Karnataka was directed to get a carrying capacity study of the area carried out. By a Government Order, bearing No. FEE 08 EAA 2019 dated 12.05.2020 entrusted the study on Environmental Carrying Capacity Report for expansion of 2x 600 MW Udupi Power Plant. At the outset, it is submitted that the carrying capacity ought to have been carried out for the entire Udupi district but it appears that in the report instead of carrying out a comprehensive study merely presents baseline scenario and is silent about the augmentation of future requirements (until 2035) and carrying capacity in the region with respect to environmental indicators like Population (residents)+ Migration rate, Tourist Inflow, Traffic volume Urban land, Water available: Ground water+ Surface water, Water use: For domestic purpose, industrial use, agricultural use and others, Solid waste, Sewage and Air Emission: Industrial Emissions, DG set emission, emission from coal based tandoors, construction activities, open burning, transport (commercial & local) Biomass burning, road dust, crematoria's, residential and incinerators.

3. I state that **Environmental Management and Policy Research Institute (EMPRI)** and **GLens Innovation Labs Pvt. Limited** are not accredited by Quality Council of India under **National Accreditation Board for Education and Training (NABET)** as Environmental Impact Assessment (EIA) consultant organizations to carry out impact assessment studies.

4. GLens Innovative Labs Private Limited has accreditation by NABL for testing Ambient air, water (Ground & surface), stack emissions & waste water and not for impact assessment study. It is not competent





to carryout emission dispersion modelling using AERMOD, as no declaration is available as to accreditation of the functional experts to carry out modeling studies.

5. I submit that when EMPRI is not even accredited to even conduct an Environment Impact Assessment study, entrusting the study on the environmental carrying capacity study of the area to such an institute is untenable and it is submitted that the Report therefore is unsustainable.

6. I state that the State of Karnataka through EMPRI has taken almost 2 years to complete the study. However, the study as is evident from the report itself is still incomplete.

7. I submit that EMPRI is not only incompetent to carry out the Environmental Carrying Capacity Study (CCR) but also that the study carried out by it is not in accordance with the Central Pollution Control Board (CPCB) methodology. CPCB, in compliance with the Hon'ble National Green Tribunal (NGT), Principal Bench, order dated 24.04.2019 in O.A. No. 606/2018, has prepared and submitted "Methodology for assessment of environment carrying capacity of central pollution control board (CPCB) in the matter of O.A. No. 606/2018 (in compliance of Municipal Solid Waste Management Rules, 2016), a copy of which is herewith produced and marked as **Annexure-R1**.

8. I state that on going through the CCR submitted by EMPRI, it is found that the same is not in accordance with the CPCB methodology. The following Table would indicate how the CCR of EMPRI is not in accordance with the CPCB methodology.





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
1	Goal and Scope – Aim of the study and scope comprising of system boundary functional unit and environmental indicator shall be defined	Goal & scope is discussed in Chapter 2 of Carrying Capacity Report (Page Nos. 7 – 9)	It is observed that study area defined as 10 km around UPCL TPP. However, report considered secondary data of Udupi district for some parameters.
	<p>Macro-level assessment of major resource and waste flows within the system boundary. The region will be assessed for the direct resource use and waste flows. Environmental indicators will be identified in terms of specific resources and waste flows. Most common Environmental Indicators under study are land use, water use, solid waste, wastewater and air emissions.</p> <p>Status of environmental indicators for current year and projection until year 2035 should be evaluated.</p>	<p>The study area defined as 10 kms radius around the UPCL plant.</p> <p>Scope defined to cover the Macro-level assessment of major resource and waste flows within the system boundary. The region was only assessed for the direct resource use and waste flows.</p>	<p>CCR doesn't address environmental indicators projection until year 2035.</p> <p>CCR reflected literature / text mentioned in the methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
2	Field inspection, information review – Information concerning the system will be obtained through field inspection, survey, literature review etc.	Information concerning the system will be obtained through field inspection, survey, literature review etc.	Information concerning the system will be obtained through field inspection, survey, literature review etc.
	Field Inspection to collect the relevant information about area under study. In this, field inspection includes survey of industries, commercial areas, residential areas, dumpsites, landfill sites, sewage treatment plants, water treatment plants, discussion with government officials, discussion with local residents, migrants and tourists etc. to get real scenario of the region.	<p>Field inspection, information review discussed in Chapter 3 (Pg. No. 10 – 15)</p> <p>The field visit was limited to</p> <ul style="list-style-type: none"> • Meeting the Udupi Power Corporation Ltd officials and collection of Data • Interviewing the local people in the 36 villages to know their perception of the projects and to record the socio-economic wellbeing – based on their opinion. • Collection and analysis of the Surface & Groundwater samples • Collection and analysis of the Sea Water samples 	There is no discussion on real scenario of other industries, commercial areas, dumpsites, landfill sites, sewage treatment plants, water treatment plants, discussion with government officials, and tourists etc.





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
3	Inventory – Systematic accounting of major resource, material, activity and waste flows within the regions system boundary will be performed	Inventory discussed in Chapter 4 of CCR (Pg. No. 16 – 53) Proper inventory of different resources as per the CPCB methodology not carried out As Methodology need to discuss about	
	To illustrate the major resource flows from within and outside the boundary region to various activities, and waste flows from activity to various waste management systems. Inventory for the system is to be developed based on information provided in development plan, discussion with authorities, literature values and field inspection.	<p>In CCR the following data is discussed based on secondary information w.r.t Udupi district</p> <ul style="list-style-type: none"> • Population • Air emission • Water resources • Water consumption • Land resources • Land-use and Land-cover (LULC) [carried out 10 km radius around UPCL] • Soil • Critical Ecosystem & Biodiversity Hot spots in the region • Traffic volume survey • Industries 	<ul style="list-style-type: none"> • Population • Tourist Inflow • Water resources • Land resources • Domestic establishment & public services Commercial establishments
	Population: Population of the region is to be evaluated by data extrapolation using the census data. Changes in population are influenced	Census data is used for addressing Population of region, data of Udupi district were addressed in general decadal rate	The other aspects of population migration number and labor supply rate is not addressed.





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	by three factors: birth rate, death rate and population. Migration numbers (Qin et al. 2011). Birth rate and death rate can be deduced from historical information and empirical data. Population migration rate will be predicted based on the analysis of labor supply and demand balance, namely the difference between the local labor force and labor demand.	from 1981 – 1991, 1991 – 2001 Reference Page No 16 of CCR	
	Tourist Inflow: Tourist Inflow is to be calculated by data extrapolation of peak tourist inflow of peak season.		Tourist inflow not discussed in CCR
	Water Resource a) Identify the source of water supply i.e. Ground water or surface water. b) Quantify the Total water supply to residents and industries and other commercial zone. c) Calculate the water balance of the region under study.	CCR assumed the source of water for Udupi district. CCR discussed about the climatic conditions and scenario about the rainy season. (ref: Page 16 & 17)	There is no data for quantifying about total water supply to residents, industries, and other commercial zones Water balance and available per capita of the region is not calculated.



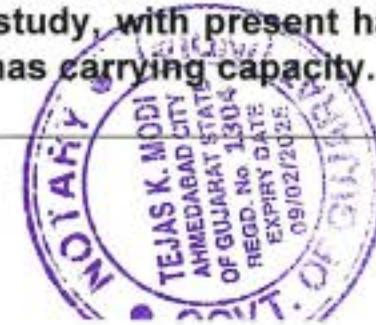


Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>Water supply for region is to be collected for calculating the total water available per capita to civil population, commercial activities and Industrial area.</p>	<p>Water availability, water demand, water balance for Udupi, Karkala, Kundap blocks discussed in Page No 118, Chapter 6 <i>(Source of data: Department of Major and Minor Irrigation, Mines and geology and other)</i></p>	
	<p>Land Resource: Land use classifications mainly based on Non developable area (ANo) and Area for infrastructure development (AIF)</p> <ul style="list-style-type: none"> • Non developable area (ANo) consists of forests, agriculture, waste lands and nallahs • Area for infrastructure development (ATF) consists of area required for commercial, industrial, public, governmental and transportation activities and organized open spaces 	<p>Land resources is addressed by using Land use/Land cover (LULC) satellite imagery, The Land Use/Land Cover study analyses the changes for the years 2002 and 2019.</p> <p>LULC classification detection analysis carried out for quantifying the difference for Built up area, Agricultural land, Forest, Grassland & Grazing Land, waste lands & water bodies Change between 2002 & 2019 is shown in Page no 63.</p>	





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
For Domestic Establishments and Public services			
	<p>Water consumption: Calculate the amount of water consumption in the region. As per MOHUA, average requirement of water is 135L/day/person (MOUD, 2012) and 180L/day/person (MOUD, 1999) for tourists</p>	<p>Water availability, water demand, water balance for Udupi, Karkala, Kundapura blocks discussed in Page No 118, Chapter 6</p> <p>The data shows that even with the projected demand for water of 0.74594 the district will have water balance of 15.95642 BCM</p> <p>In this study area WRCC is more than 3, hence WRCC is safe</p> <p><i>(Source of data: Department of Major and Minor Irrigation, Mines and geology and other)</i></p>	<p>Water consumption calculations for region not addressed in CCR</p>
	<p>Solid waste generation: Calculate the amount of solid waste generation in the region. Municipal solid waste generated in the range 0.2 - 0.6kg/day/person, MOUD, 2016.</p>	<p>Solid waste generation for region not calculated as per the CPCB protocol.</p> <p>However, as per available data Udupi district Environment Plan,</p>	<p>Waste calculation is based upon secondary data. Udupi district Environment Plan does not consider the industrial waste which should have been done for this study, with present handling capacity, the district has carrying capacity.</p>



GOVT. OF GUJARAT
NOTARY
TEJAS K. MODI
D. CITY
AHMEDABAD
STATE
OF GUJARAT
REGD. N. 1304
EXPIRY AVE
09/02/2026

TEJAS K. MODI
D. CITY
AHMEDABAD
STATE
OF GUJARAT
REGD. N. 1304
EXPIRY AVE
09/02/2026

GOVT. OF GUJARAT
NOTARY

Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
		the total solid waste generation is 107 T/D is considered for calculating solid waste carrying capacity. Discussed in Page no 126 & 127	
	Waste water generation: Calculate the amount of waste water generation in the region Approx.. 80% of total water use is assumed for wastewater generation rate.		Calculations of Wastewater generation for region not addressed in CCR
	Traffic volume: Survey is to be carried out during weekends and weekdays a) Assess the mode wise traffic composition at hotspot area of the region. b) Estimate the number of vehicles manually and with videography if feasible. c) Origin and Destination Survey is to be carried out in the area to estimate the extent of traffic	Traffic volume data addressed in Chapter 5 Page No 58 & 59. Vehicle movement data collected from NHA from Jan 19 to May 21 within the study area.	However, there is no clarity if the traffic volume is for entire Udupi district or 10 Km radius of UPCL. No classification of data available for survey carried out during weekends & weekdays The report does not indicate that this study has been done as per CPCB methodology





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>demand from zone to other.</p> <p>d) Fuel Station Survey is to be carried in the study area road network to identify the type of fuel, fuel saving, quantity and frequency of fuel filling and their mileage, type of engine, age profile and the composition of fuel types (petrol, diesel, (CNG) in total fleets.</p> <p>e) Meteorological survey, Calculate the number of vehicle inflow and number of local vehicles.</p> <p>f) Calculate the average vehicle trip lengths for different vehicle categories (truck, car, and two-wheeler) by mapping the distance for general probable stops covered by the vehicles.</p> <p>g) Types of vehicles</p> <p>h) Type of fuel consumption,</p> <p>i) Travel time data</p>		
	Air Emission: Inventorization of air emission sources like biomass burning, open waste burning, stubble	Ambient air quality monitoring carried out in 08 location in 10 kms radius around UPCL plant.	Emission inventory sources like biomass burning, open waste burning, stubble burning and construction activities is not carried out as per



NOTARY
TEJAS K. MODI
AMHERST ROAD CITY
OF GUJARAT STATE
REG. NO. 1304
EXPIRY DATE
01/01/2025
GOVT. OF GUJARAT

TEJAS K. MODI
AMHERST ROAD CITY
OF GUJARAT STATE
REG. NO. 1304
EXPIRY DATE
01/01/2025
GOVT. OF GUJARAT

GOVT

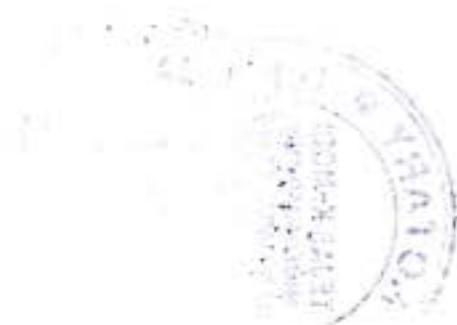
Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	burning and construction activities	Discussed in Chapter 6 Page No 75 to 83.	CPCB methodology. The report does not indicate that this study has been done as per CPCB methodology
	For Commercial Establishments (Include Text)		
	Industries: Inventorization of legal and illegal industries and type of industries	Type of industries available in study area is addressed as per source district at glance 2016. (Refer page no 62)	Inventorization of legal and illegal industries and type of industries is not available. The report does not indicate that this study has been done as per CPCB methodology
	Transport: Calculate the number of commercial vehicles, type of vehicles, fuel used and average trip length.	Traffic volume data addressed in Chapter 5 Page No 58 & 59. Vehicle movement data collected from NHA from Jan 19 to May 21 within the study area.	There is no classification of data presented between commercial vehicles, type of vehicles, fuel used and average trip length The report does not indicate that this study has been done as per CPCB methodology
	Water consumption: Find out the source of water consumption, Calculate the water consumption per establishment.		No data regarding water consumption per establishment. The report does not indicate that this study has been done as per CPCB methodology





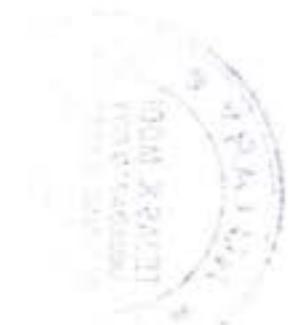
Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	Waste Water Generation: Calculate the waste water generation, evaluate the capacity for treatment of waste water		<p>No data on the waste water generation, evaluate the capacity for treatment of waste water.</p> <p>The report does not indicate that this study has been done as per CPCB methodology.</p>
	Solid waste generation: Calculate the amount of solid waste generation from the commercial establishments	As per available data Udupi district Environment Plan, the total solid waste generation is 107 T/D is considered for calculating solid waste carrying capacity. Discussed in Page No 126 & 127	<p>Solid waste generation for study area not calculated as per the CPCB protocol.</p> <p>Waste calculation is based upon secondary data from Udupi district. Environment Plan does not consider the industrial waste which should have been done for this study, with present handling capacity.</p>
	Air emission sources: a) Inventorization of coal based tandoors are being used in the hotels, restaurants and dhabas and other specific area. b) Inventorization of type of fuel being used in the industries in the boilers and for heating purpose. c) Inventorization of Municipal Waste Incinerators, Biomedical	The AAQ monitoring carried out in 8 location around UPCL TPP within 10km radius.	<p>The report doesn't disclose the sources of air emission within the study area and projected pollution load.</p> <p>No data available on air emission sources as per CPCB protocol.</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	Incinerators and Hazardous waste incinerators and evaluate their efficiency. d) Inventorization of Construction activities in the region. e) Inventorization of Road dust and unpaved road.		
4	Environmental Indicators – specified indicators will be evaluated		
	Specified indicators will be evaluated	Inventory indicators discussed in chapter No 5 Page No 54 to 59	
	1. Population (residents)+ Migration rate	Census data used for addressing Population of region, data of Udupi district were addressed in general decadal rate from 1981 – 1991, 1991 – 2001 Reference Page No 16 of CCR	The other aspects like population migration number and labor supply rate are not addressed. The report does not indicate that this study has been done as per CPCB methodology
	Tourist Inflow	Not discussed	The report does not indicate that this study has been done as per CPCB methodology
	Traffic volume	Traffic volume data addressed in Chapter 5, Page No 58 & 59.	Inventory of traffic volume is not carried out The report does not indicate that this study has





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
		Vehicle movement data collected from NHA1 from January 19 to May 21 within the study area.	been done as per CPCB methodology
	Urban land	Not discussed. Discussed regarding land degradation	
	Water available: Ground water+ Surface water	Generalized statement regarding water availability is stated.	
	Water use: For domestic purpose, industrial use, agricultural use & others	Not discussed	Water use for domestic and industrial use, agriculture & other are not discussed
	Solid waste	Discussed in Chapter 5 in page 59	There is no inventorisation of solid waste
	Sewage	Not discussed	Not discussed The report does not indicate that this study has been done as per CPCB methodology
	Air Emission: Industrial Emissions, DG set emission, emission from coal based tandoors, construction activities, open burning, transport (commercial & local) Biomass burning, road dust, crematoria's, residential and incinerators	In CCR Industrial Emissions with respect to UPCL is discussed in Chapter 6 Assessment of carrying capacity Page No 84 to 94	DG set emission, emission from coal based tandoors, construction activities, open burning, transport (commercial & local) Biomass burning, road dust, crematoria's, residential and incinerators are not identified.





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
5	Assessment of Carrying capacity – Carrying capacity of the region will be evaluated for urban land, water resource, atmospheric assimilation and waste carrying capacity of the region.		
	<p>Urban Land Carrying Capacity (ULCC) ULCC may be evaluated based on methodology presented in Urban Carrying Capacity Report by IIT Guwahati (IIT Guwahati, 2012).</p> $AR=[A_U-(A_{ND}+A_{IF})]*FAR/S$ <p>Where, A_R = area for residential requirements A_U = total urban area A_{ND} = non developable area A_{IF} = area for infrastructure development FAR= Floor Area Ratio S = Floor area requirement per head</p> <p>Non developable area (A_{ND}) consists of forests, agriculture, waste lands and nallahs. Area for infrastructure development (A_{IF}) consists of area required for commercial, industrial,</p>	<p>Urban Land Carrying Capacity (ULCC) is discussed by considering Land Use Land Cover (LULC) classification detection analysis carried out for quantifying the difference for Built up area, Agricultural land, Forest, Grassland & Grazing Land, waste lands & waterbodies Change between 2002 & 2019 (ref: page 62 & 71)</p>	<p>However, ULCC is not calculated as per the urban carrying capacity reported by IIT Guwahati $AR=[A_U-(A_{ND}+A_{IF})]*FAR/S$</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>



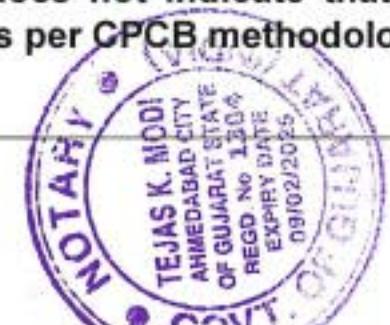


Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>public, governmental and transportation activities and organized open spaces.</p> <p>As per IIT Guwahati 2012 report,</p> <p>FAR need to be determined by considering various aspects like, provision of intended free space, safe bearing capacity of soil, economy of people for affording earthquake resilient structures, drainage and transportation requirement and so on. While the proposed "SAFE" method itself will determine an acceptable FAR, one need to provide an initial value of FAR. This value can be given from guidelines provided by different organization including ULB. In absence of any such guidelines, a value of 1.5 can be used for initial trial value. This value is suggested based on the general trend observed so far in Indian condition.</p>		





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p><i>Floor area requirement per head:</i> Based on analysis of socio- economic status of the present population and considering future possible matrix of different classes, an average logical area requirement is to be calculated</p>		
	<p>Water Resource Carrying Capacity (WRCC)</p>		
	<p>Amount of available water resources (AWR), and the amount of surface water withdrawal (SWW) These can be estimated by the following equations: AWR = AGWR + ASWR + OAWR</p> <ul style="list-style-type: none"> • AGWR is the available ground water resource, • ASWR is the available surface water resource, • OAWR is other available water resources, mainly wastewater reuse and collection of rainwater. 	<p>Water resources carrying capacity (WRCC) is discussed in Chapter 6 Page No 116 to 125</p> <p>Amount of available water resources (AWR) is addressed in Page No 124.</p> <p>Available water resource (AWR) is 606.80 MCM for Udupi District</p>	<p>Amount of surface water withdrawal (SWW) is not calculated</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p style="text-align: center;">SWW = TWS - GWS – OSWS</p> <ul style="list-style-type: none"> • TWS is total water supply, • GWS is ground water supply, • OSWS is other sources of water. 		
	<p>Water Demand: Gross water amount consumed by all types of water users. The gross amount of water demand includes the conveyance loss of water, domestic water demand, industrial water demand, agricultural water demand, and "other" water demand</p> <ul style="list-style-type: none"> • Domestic water demand includes urban domestic water demand, made up of the residential use of water and the public use of water (including the water use by tertiary industry and the construction industry), 	<p>WRCC is addressed based on the taluka wise (water availability, Water demand, water balance) data available with department of Major and Minor irrigation, Mines and Geology and others.</p> <p>The data shows that even with the projected demand for water of 0.74594, the district will have water balance of 15.95642 BCM</p> <p>In this study area, WRCC is more than 3. Hence WRCC is safe</p>	<p>No data collection and estimation is done w.r.t WRCC.</p>



NOTARY PUBLIC
TEJAS K. MODI
DALLAS COUNTY
REG. NO. 2504
EXPIRY DATE
09/02/2025

NOTARY PUBLIC
TEJAS K. MODI
DALLAS COUNTY
REG. NO. 2504
EXPIRY DATE
09/02/2025

NOTARY PUBLIC
TEJAS K. MODI
DALLAS COUNTY
REG. NO. 2504
EXPIRY DATE
09/02/2025

Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<ul style="list-style-type: none"> • Industrial water demand consists of the demand for fresh water, excluding water recycling within enterprises. • Agricultural water demand is made up of irrigation water demand water recharge. • Other water demand consists mainly of the demand for sanitation water in the urban area and the water restoration requirements of rivers, lakes and wetlands. <p>Water resource carrying capacity (WRCC) depends on the water availability and water demand, and is given as,</p> <p style="text-align: center;">WRCC=WNWD</p> <p>Where, WA= water availability WD = water demand Widodo et al., 2015 stated that for</p>		





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	WRCC < 1 capacity is overshoot, WRCC 1 - 3 capacity is conditionally safe and WRCC > 3 capacity is safe.		
	Water Environmental Carrying Capacity (WECC):		
	<p>Rivers:</p> <p>The water environmental capacity is the maximum pollutant loading that the water body can hold under a certain water environment quality target. The dominant water pollutant is Biological Oxygen Demand (BOD). The length and width of the computed river is relatively large, so we can ignore the horizontal changes of pollutant concentration, and only take into account changes of pollutant concentration along the river, so we select one-dimensional water quality model to calculate the Surface water environmental capacity. The water environment capacity can be calculated with following equation as per Qingchun Yang et al; 2019</p>		<p>Not calculated</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>Assuming stream and waste water discharge are at steady state and instantaneous full mixing of all flows.</p> $W_R = \left[C_s - C_o \exp\left(\frac{-KL}{u}\right) \right] \times Q$ <p>W_R represents the river's pollutant carrying capacity, g/s; C_s represents the water quality target concentration at the downstream cross-section of the river, mg/L; C_o represents the actual water quality concentration at the upstream cross-section of the river, mg/L; K represents the pollutant degradation coefficient, d⁻¹ ; L represents the length of river, m; u represents the average flow velocity at the river's, cross section, m/s; Q represents the designed flow at the river's cross section, m³/s Note: As per Yingrong Wen et al; 2017, the reported range for laboratory-measured k values is from</p>		 



Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	0.3 to 0.5 day ⁻¹ at a temperature of 20 °C, which is considered representative of field conditions		
	<p>Lakes Pollutant carrying capacity of the lake: Considering, Lake is of small size with equilibrium of multi-year average in flowing water and outflowing water. It is desirable to adopt the uniform mixture model to calculate the pollutant carrying capacity. Based on the material balance equation, the pollutant carrying capacity</p> $W_L = (C_s - C_0) V + K C_s V + C_s q_{out}$ <p>In this equation</p> <p>W_L represents the pollutant carrying capacity of the lake, t/a; C_s represents the water quality target concentration, mg/L; C_0 represents the actual water quality concentration, mg/L;</p>		<p>Not calculated</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>



GOVT. OF GUJARAT
TEJAS K. MODI
AHMEDABAD CITY
OF GUJARAT STATE
REGD. No. 13004
EXPIRY DATE
09/02/2025

GOVT. OF GUJARAT
TEJAS K. MODI
AHMEDABAD CITY
OF GUJARAT STATE
REGD. No. 13004
EXPIRY DATE
09/02/2025

GOVT. OF GUJARAT
TEJAS K. MODI
AHMEDABAD CITY
OF GUJARAT STATE
REGD. No. 13004
EXPIRY DATE
09/02/2025

Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>V represents the average storage capacity of the lake in dry seasons, m³ ;</p> <p>q_{out} represents multi-year outflowing water of the lake in dry seasons, m³ /a;</p> <p>K represents the pollutant degradation coefficient, d⁻¹ mainly BOD parameters under consideration</p>		
	<p>Ground Water</p> <p>For estimating the level of groundwater pollution with low-hazard pollutants the following formula can be used as per Anna Belousova, 2006</p> $\frac{C_1}{MPC_1} + \frac{C_2}{MPC_2} + \dots + \frac{C_n}{MPC_n} = 1$ <p>Where C₁, C_n are concentration of separate pollutants, and MPC₁, MPC_n represent maximum permissible concentration.</p>		 

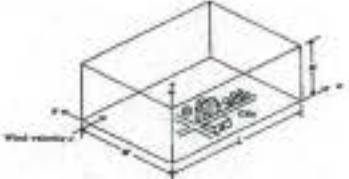




Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	If the sum of the concentration ratios is more than 1, then the groundwater is polluted. For all cases, pH must not be outside the limit 6.5-8.5.		
	<p>Atmospheric Assimilation Capacity:</p> <p>Various approaches are described in the literature for estimating the atmospheric assimilative capacity of a region. (Goyal et al. (2006) propose two approaches, one based on a ventilation coefficient, the other through pollution potential. SEPA (2003) recommend an A-P value method and multi-source simulation model to estimate atmospheric assimilative capacity in China.</p> <p>Here we are discussing the atmospheric assimilative capacity using simple Box Model: A simple box model based on mass</p>	<p>For Atmospheric Assimilation Capacity:</p> <p>Ambient Air Monitoring was carried out in the following Locations:</p> <p>AAQMS No 1: Top of the fire Station AAQMS No 2: Mudarangadi Village AAQMS No 3: R&R Colony, Adamar Village AAQMS No 4: UPCL Seawater pump house (Tenka – Yermal Village) AAQMS No 5: Hejamady village AAQMS No 6: Inna Village AAQMS No 7: Nandikoor Village</p>	<p>As per observations of AAQ monitoring all the concentrations of ambient air is well within the limits of National Ambient Air Quality Standards.</p> <p>Stack Monitoring & Air modeling using AERMOD</p> <ul style="list-style-type: none"> • 275 m stack with natural drift and ID Fan the velocity of flue gas cannot be less than 15 m/s, • It is assumed during monitoring velocity of gas is measured on outer periphery of stack or position of pitot tube position not placed properly, where least velocity was observed • There is an ambiguity in flue gas temperature in table No 6.20 & 6.21 mentioned as 401 & 339 K respectively. However, in Page No 84 & 85 of CCR, undersection 6.14.1 Stack emission results of both boilers mentioned as 25°C. <p>Modelling carried out with wrong plume height (Delta h) considered as 3 m (assumed) ($H = h +$</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	 <p>balance and assuming that all pollutants in the box are uniformly mixed (Figure 2) is used for preliminary estimates for step (ii) in Fig I (a). It is a simple model and has several limitations; however, for the purpose of demonstrating the framework and preliminary analysis, the model may provide broad estimates of carrying capacity. Mathematically, the model can be described as below</p> <p>Mathematically</p> $V \frac{dc}{dt} = qC_{in} - qC_{out} + S - K_{dd} CLW - K_{cr} C_{out}V$ <p>where, q = volumetric flow rate (m³/sec)</p>	<p>AAQMS No 8: Ullooru Village</p> <p>The following conclusive observations are drawn</p> <p>Sulphur dioxide as SO₂: Ranging from 6.7 to 13.2 µg/m³.</p> <p>Nitrogen dioxide as NO₂: Ranging from 9.5 to 15.5 µg/m³.</p> <p>Particulate Matter (PM₁₀): Ranging from 45.5 to 58.8 µg/m³.</p> <p>Particulate Matter (PM_{2.5}): Ranging from 16.4 to 26.4µg/m³.</p> <p>Stack Monitoring</p> <p>Thermal Boiler Unit-1: Emission of Particulate Matter concentration is 25.9 mg/Nm³ and is dispersed at the effective stack height of 275</p>	<p>Delta h) (Page No 84 & 85 of CCR)</p> <ul style="list-style-type: none"> • These readings were neither shared with nor accepted by UPCL at the time of taking readings. <p>No data available on atmospheric assimilative capacity using Simple Box Model based on mass balance and assuming all pollutants.</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p> C_{in} = influent concentration of a pollutant (g/m³) C_{out} = effluent concentration of a pollutant (g/m³) K_{dd} = dry deposition velocity (m /sec) K_{cr} = First order chemical reaction constant (l/sec) S =source emission rate(g/sec) $K_{dd}.C.L.W$ = the amount of pollutants removed by dry deposition (g/sec) $K_{cr}.C.V$ = the amount of pollutants converted by chemical reaction (g/sec) u = wind speed (m/sec) In equation, $V=LxWxH$ volume of City m³ (L: length (m), W; Width (m), H; height (m)) The model is further simplified with the following assumptions: <ul style="list-style-type: none"> Steady state condition (i.e. concentration is time invariant); $dc/dt= 0$ </p>	<p> m (Stack height 275 m + Plume Height 3.0m) with exit velocity of 6.5 m/sec and the flue gas temperature was 25°C. Emission of Sulphur dioxide concentration was 679 mg/Nm³, Oxides of Nitrogen as NO₂ was 267 mg/Nm³ and Carbon Monoxide was 75 mg/ Nm³. The concentration of Carbon Dioxide is 10.8 %. All these are emitted at the effective stack height of 275 m plus a Plume Height of about 3.0 m. Thermal Boiler Unit-II: Emission of Particulate matter concentration is 30.0 mg/Nm³ and dispersed at the effective stack height of 275 m (Stack height 275 m + Plume Height 3.0m) with exit velocity of 6.5 m/sec and the flue gas temperature are 25°C.Emission of </p>	<p>Response by UPCL</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<ul style="list-style-type: none"> • Pollutant does not give any deposition in the box; $k_{dd} = 0$ • Pollutant does not undergo any chemical transformation: $K_{cr} = 0$ <p>One can estimate the carrying capacity, Q_{cc} as per the following equation:</p> $Q_{cc} = (C - C_0) \times u.W.H$ <p>In this calculation,</p> <p>Area (A) of system boundary, Width (W) of the system boundary, mixing height (H) (average for winter and summer) within the system boundary, Wind Speed (s) within the system boundary is required.</p> <p>Background concentration (C_0) into the system boundary is also required. Alternatively, the multi-source simulation model may be used to estimate atmospheric assimilative</p>	<p>Sulphur Dioxide concentration is 779 mg/Nm³, Oxides of Nitrogen as NO₂ is 341 mg/m³ and Carbon Monoxide as 70 mg/m³. The concentration of Carbon Dioxide is 9.2 %. All these are emitted at the effective stack height of 275 m plus a Plume Height of about 3.0 m.</p>	<p>The report does not indicate that this study has been done as per CPCB methodology</p>



GOVT. OF GUJARAT (INDIA)
TEJAS K. MODI
AMERASAD CITY
OF GUJARAT STATE
REGD. No. 1054
EXPIRY Dt. 2
01/02/2025

GOVT. OF GUJARAT (INDIA)
TEJAS K. MODI
AMERASAD CITY
OF GUJARAT STATE
REGD. No. 1054
EXPIRY Dt. 2
01/02/2025

GOVT. OF GUJARAT (INDIA)
TEJAS K. MODI
AMERASAD CITY
OF GUJARAT STATE
REGD. No. 1054
EXPIRY Dt. 2
01/02/2025

Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>capacity based on air quality modeling which takes into consideration region-specific meteorological conditions, terrain characteristics, and emission loads from different sources. Following Goyal and Chalapati Rao (2007), the discharged emission load at which the maximum allowable concentration is reached under predefined critical conditions is taken to be the assimilative capacity of the region. Prediction of ground-level concentrations of pollutants is carried out using the US EPA approved ISCST-3 simulation model (EPA, 1995a, 1995b). It should be noted that the atmospheric assimilative capacity has a range of values, depending on the variation of emission characteristics with given meteorological and topographical conditions.</p>		
	Solid waste carrying capacity:	Solid waste carrying capacity	Waste calculation is based upon secondary data





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>Considering per capita solid waste generation in case of local population of the study area and that of tourist population, calculate the waste generated in the study area tons per day (TPD) during the base year. Out of the total waste generated, calculate the waste collected and transported to a dumping/ landfill site. Solid waste carrying capacity has been analyzed here from the standpoint of waste generation and management potential and public perception.</p> <p>Solid waste environment carrying capacity (SWECC) was first assessed using the following simple expression</p> <p>SWECC = SWMEF (tons) + RC (tons)/ SWG (tons)</p> <p>Where SWECC = Solid Waste Environment Carrying Capacity.</p>	<p>calculated as per the data available from Udupi district Environment plan.</p> <p>The total solid waste generation is 107 T/D is considered for calculating solid waste carrying capacity. Discussed in Chapter 6 Page no 126 & 127</p> <p>As per CCR the total solid waste generated in the district is 107.6 T/D. The Solid Waste Managed Environment-Friendly. Includes all SWM options (Recycling + Re-using + Reprocessing + Sanitary Land-filling + incineration in compliance with emission norms, etc.). Collection of waste is the foremost requirement. The wastes sent for land-filling, recycling, incineration, etc. is 79.64 MT/D and remaining capacity left for managing Solid waste is 27.96</p>	<p>Udupi district. Environment Plan does not consider the industrial waste which should have been done for this study, with present handling capacity.</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>SWMEF = Solid Waste Managed Environment-Friendly. Includes all SWM options (Recycling+ Re-using+ Reprocessing+ Sanitary Land-filling+ incineration in compliance with emission norms, etc.). Collection of waste is the foremost requirement before wastes are sent for land-filling, recycling, incineration, etc.</p> <p>RC = Remaining Capacity. Capacity left/available for managing more SW.</p> <p>SWG = Solid Waste Generated in tons.</p> <p>The foremost task is collection of the generated solid waste after which, the local authority can manage the waste by sending for recycling, land filling, incineration, etc.</p> <p>Threshold for assessment</p> <p>SWECC = 1 : Carrying Capacity on edge/break point. CC may</p>	<p>T/D,</p> <p>SWECC = 1: Carrying capacity on edge/break – point. Carrying capacity may overshoot very soon.</p>	

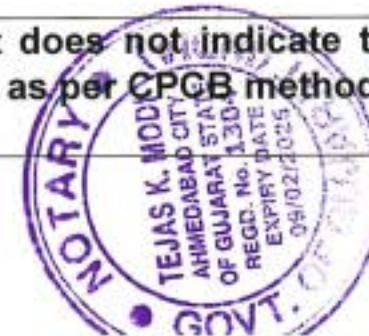




TEJAS K. MODI
AMBOLBAR CITY
OF GUJARAT STATE
REGD. No. 13114
EXPIRY DATE
03/02/2025
GUJARAT (INDIA)

TEJAS
AMBOLBAR CITY
OF GUJARAT STATE
REGD. No. 13114
EXPIRY DATE
03/02/2025
GUJARAT (INDIA)

Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
	<p>overshoot very soon.</p> <p>SWECC > 1+: Carrying Capacity exists. More the value, more the CC.</p> <p>SWECC < 1: CC overshoot.</p>		
	<p>Carrying capacity of Sewage Management</p> <p>Calculate the total sewage generation in the region based on the present population scenario and for projected population for next 20 years and evaluate the efficiency of the Treatment plants installed for treating sewage</p> <p>Refer Table 01</p>		<p>Not calculated separately, included in solid waste generation carrying capacity</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>
6	<p>Comparison of Environmental indicators and carrying capacity – Environmental Condition will be compared with the carrying capacity of region</p>	<p>Comparison of Environmental indicators and carrying capacity is not addressed.</p>	<p>Environmental indicator providing status of current</p> <p>The report does not indicate that this study has been done as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
7	Interpretation - Obtained results and information	Obtained results and information limitations will be discussed. Conclusion end recommendations will be drawn based on the results and information	Conclusion end recommendations will be drawn based on the results and information
		<p>Recommendations</p> <p>a) This is a short-term study; long-term studies should be undertaken to comprehensively determine the impacts of the power plant and remaining carrying capacity to accommodate the additional quantum of impact across seasons.</p> <p>b) Prior to expansion UPCL should ensure strict adherence to all environmental norms.</p> <p>c) Third party ambient air quality monitoring on regular basis may ensure adherence to environmental norms.</p> <p>d) Monitoring of groundwater quality in open wells in the surrounding area of UPCL is necessary.</p> <p>e) Desirably the information on the agriculture, horticulture,</p>	<p>EMPRI has taken almost 2 years to complete the study. However, the study is still incomplete. The agency is not competent to carry out the Carrying Capacity Study as per CPCB methodology</p>





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
		<p>fishing and farming crops should be periodically collected and reasons for adverse impacts identified and mitigated in the study area and even beyond.</p> <p>f) Human health monitoring in the surrounding villagers as well as by the other villages beyond 10 Km from the plant is desirable.</p> <p>g) Airborne particles may be monitored in routine and data collected.</p> <p>h) A detailed study on the ramifications of the UPCL seawater discharges into Arabian Sea and on coastal zone, and the present status of the marine biology should be undertaken. A clear demarcation of HTL and LTL should be made and adherence to notifications under the CRZ Rules 2019</p>	





Step	Methodology and Framework for Calculating Environmental Carrying Capacity proposed by CPCB	Finding of the report	Response by UPCL
		<p>needs to be ensured.</p> <p>i) Comprehensive Social Audit of industrial activity would help in identification and prioritization of the concerns of local communities.</p> <p>j) There are several critical ecosystems in the study area like Myristica swamps, island ecosystems, and other pristine wildlife habitats. These critical ecosystems are influenced by monsoonal climate. Therefore, long-term monitoring and detailed study of the area is very essential with reference to the implications of UPCL and its capacity expansion for terrestrial, freshwater and marine biodiversity and ecosystems.</p>	





Table 01 Carrying capacity of Sewage Management

S.NO	Activities		Source
1	<p>Extent to which waste water management facilities are available to individual properties across the city, whether through centralized underground sewerage, decentralized systems or on- site systems such as septic tanks. This should be computed for the number of properties recorded in municipal records and not households, and should include all residential, commercial, industrial and institutional properties</p> <p>Total number of properties with connection (To waste water management systems / Total number of properties in the city) X 100 =</p>	100% door to door collection (Service Level Benchmarks, MoUD)	MoUD Report on Methodology Collection and Computation of liveability Standards in Cities
2	<p>The actual proportion of waste water generated in the city that is collected by the available sewerage Network</p> <p>(Total waste water collected per day / Total waste water generated in the city per day) X 100 =</p>	100% (Service Level Benchmarks, MoUD)	MoUD Report on Methodology Collection and Computation of liveability Standards in Cities
3	<p>The proportion of waste water received at the treatment plant that is recycled or reused for various purposes. Treated waste water can be used for horticultural purposes in parks and gardens, irrigation of farmlands on city periphery, and/or supplied to power plants and industries</p> <p>(Quantum of waste water recycled or reused per day / Total waste water received at treatment plants per day) X 100 =</p>	20% or more (Service Level Benchmarks, MoUD)	MoUD Report on Methodology Collection and Computation of liveability Standards in Cities



NOT POSTED
TEJAS K. N. MOOI
ADMINISTRATOR
OF CULINARY & SITE
ASST. MGR. 1304
EXP. 01/15/2014
GOVT. OF INDIA
GOVT. OF LAOS

TEJAS K. N. MOOI
ADMINISTRATOR
OF CULINARY & SITE
ASST. MGR. 1304
EXP. 01/15/2014
GOVT. OF INDIA
GOVT. OF LAOS

NOT POSTED
TEJAS K. N. MOOI
ADMINISTRATOR
OF CULINARY & SITE
ASST. MGR. 1304
EXP. 01/15/2014
GOVT. OF INDIA
GOVT. OF LAOS

Overall conclusion**Case 1**

$\frac{\text{Total sewage Generation}}{\text{Available treatment facility working}} = 1$ ----- System is conditionally safe

Subcase: Treated water must follow the prescribed standards

Case 2:

$\frac{\text{Total sewage Generation}}{\text{Available treatment facility working efficiently}} < 1$ ----- System is safe
With recycling of water in the system

Case 3:

$\frac{\text{Total sewage Generation}}{\text{Available treatment facility working efficiently}} > 1$ ----- Carrying capacity is overshooted





Carrying capacity of Sewage Management is not addressed as per the calculations addressed above.

Comments on Stack dispersion modelling conducted by GLens Innovation Labs Pvt Limited

S.no	Pollutant	Unit	Unit -I	Unit II
1	Stack Temperature	K	401	339
2	Velocity	m/sec	6.5	6.8
3	Volume of gas discharged	mg/Nm ³	627475	776388
4	Particulate matter	mg/Nm ³	25.9	30
5	Sulphur Dioxide as SO ₂	mg/Nm ³	679	779
6	Oxides of Nitrogen as NO ₂	mg/Nm ³	267	341

- 275 m stack with natural drift and ID Fan the velocity of flue gas cannot be less than 15 m/s,
- It is assumed during monitoring velocity of gas is measured on outer periphery of stack or position of pitot tube position not placed properly, where least velocity was observed
- There is an ambiguity in flue gas temperature in Table no 6.20 & 6.21 mentioned as 401 & 339 K respectively. However, in Page No 84 & 85 of CCR, undersection 6.14.1 Stack emission results of both boilers mentioned as 25°C.
- Modelling carried out with wrong plume height (Delta h) considered as 3 m (assumed) ($H = h + \text{Delta } h$) (Page No 84 & 85 of CCR)
- **These readings were neither shared with nor accepted by UPCL at the time of taking readings.**





Calculation

Plume Height

$$\Delta h_{plume\ rise} = \frac{21.425 F^{0.75}}{\bar{u}} \quad (F < 55 \text{ m}^4 / \text{s}^3)$$

$$\Delta h_{plume\ rise} = \frac{38.71 F^{0.6}}{\bar{u}} \quad (F > 55 \text{ m}^4 / \text{s}^3)$$

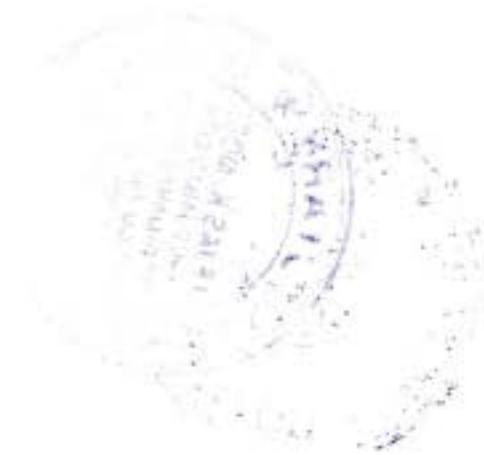
$$F = gV_s d^2 (T_s - T_a) / 4T_s$$

Where

g: gravity, 9.8 m/s²V_s: Stack exit velocity, m/s

d: Top inside stack diameter

T_s: stack gas temperature, KT_a: ambient temperature, KFor Unit I: $F = 9.8 * 6.5 * (6.8)^2 * (401 - 298) / 4 * 401 = 189.1429$ For Unit II: $F = 9.8 * 6.8 * (6.8)^2 * (339 - 298) / 4 * 401 = 78.7648$ 



Plume Rise:

As per equation

$$\Delta h_{plume\ rise} = \frac{21.425F^{0.75}}{\bar{u}} \quad (F < 55 \text{ m}^4/\text{s}^3)$$

$$\Delta h_{plume\ rise} = \frac{38.71F^{0.6}}{\bar{u}} \quad (F > 55 \text{ m}^4/\text{s}^3)$$

u: average wind speed (Source from Climatology tables) Approx. 2.0 m/s (6.5 kmph)

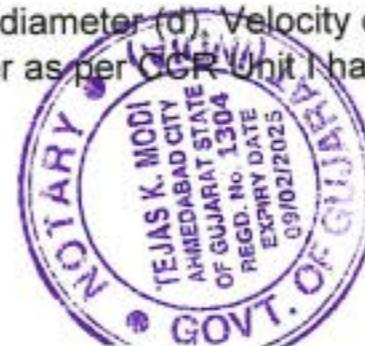
Unit I (m)		Unit II (m)	
$21.425*(189.1429)^{0.75}/u$	546.36	$21.425*(78.7648)^{0.75}/u$	843.76
$38.71*(189.1429)^{0.6}/u$	449.64	$38.71*(78.7648)^{0.6}/u$	265.82

As per available data in CCR the plume rise/height in Unit I & Unit II shall be 449 m & 265 m, if $F > 55 \text{ m}^4/\text{s}^3$. However plume rise/height wrongly taken as 3 m for calculations. Hence modeling aspects are erroneous.

Volume of gas discharge**Calculations**

Volume of gas discharged (Nm³/ hr.) = $\pi/4 * d^2 * \text{velocity} * (273 + \text{ambient temperature} / \text{stack temperature}) * 3600$

As per available data the volume gas discharged shall be calculated considering inside stack diameter (d), Velocity of flue gas (v) & Temperature (t). Volume of Unit I & Unit II shall be **632820 Nm³/hr. & 783106 Nm³/hr.** However as per CCR Unit I has discharge of **627475 Nm³/hr** & Unit II has **776388 Nm³/hr.**





Mass emission load

Mass emission shall be calculated considering (Volume of gas discharge * emission concentration * 24 / ton) which comes as follows

Emission load for two boilers	Volume of gas discharge (Nm ³ /hr)		Concentration (mg/Nm ³)		Emission load (Q1+Q2) = (C1*V1) + (C2*V2) * 24 / ton		
	#U1 (V1)	#U2 (V2)	#U1 (C1)	#U2 (C2)	#U1 (Q1)	#U2 (Q2)	Total
Particulate Matter	632820	783106	25.9	30	0.393361	0.563836	0.957197
Sulphur Dioxide			679	779	10.31244	14.64095	24.95339
Nitrogen Dioxide			267	341	4.05511	6.408939	10.46405

#U1: Unit 1; #U2: Unit 2

Emission load for two boilers	Calculations based on data available in CCR (Tons/day)	Value in Mentioned CCR (Tons/day)
Particulate Matter	0.957197	2.69
Sulphur Dioxide	24.95339	70.184
Nitrogen Dioxide	10.46405	27.598

As per above calculation, it is assumed that emission load is wrongly calculated. There is an ambiguity in data to carryout stack emission dispersion modelling using AERMOD



Handwritten text, mostly illegible due to fading and bleed-through.

Handwritten text, mostly illegible due to fading and bleed-through.

Handwritten text, mostly illegible due to fading and bleed-through.

GOVT. OF INDIA
NOTARY
TEJAS K. NODI
APPROVED OFFICER
OF GUJARAT STATE
PENN. No. 23324
11/03/2023

GOVT. OF INDIA
NOTARY
TEJAS K. NODI
APPROVED OFFICER
OF GUJARAT STATE
PENN. No. 23324
11/03/2023

9. I state that in view of what is stated above, reserving liberty to meet each and every adverse comment and conclusion in the Environmental Carrying Capacity Report, the Answering Respondent humbly prays that this Hon'ble Tribunal may be pleased to reject the Environmental Carrying Capacity Report submitted by EMPRI and the State of Karnataka may be directed to carry out the study by a qualified agency, in a time bound manner, in accordance with the CPCB methodology for conducting the carrying capacity study for Udupi district.

WHEREFORE, I pray that this Hon'ble Tribunal may be pleased to reject the Environmental Carrying Capacity Report, December 2021 dated 24.01.2022, in the interest of justice and equity.

Ahmedabad
14.03.2022

Udupi Power Corporation Limited

[Signature]
Authorized Signatory

DEPONENT

VERIFICATION

Verified at Ahmedabad on this 14th day of March, 2022 that the contents of my above affidavit are true and correct to the best of my knowledge, information and belief and nothing material has been concealed therefrom.

Udupi Power Corporation Limited

[Signature]
DEPONENT Authorized Signatory

SOLEMNL AFFIRMED
BEFORE ME

T.K.M
T. K. MODI
NOTARY
GOVT. OF GUJARAT

14 MAR 2022

S.R. No. 366 Dt. 14/3/2022

T.K.M
T. K. MODI
NOTARY
GOVT. OF GUJARAT

14 MAR 2022



Uttam Power Corporation Limited

Authorized Signatory

Uttam Power Corporation Limited

Authorized Signatory



Uttam Power Corporation Limited

E. M. SIDI
NOTARY
DISTRICT OF GHARAT

ANNEXURE-R1

BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI
O. A. 606/2018

IN THE MATTER OF
COMPLIANCE OF MUNICIPAL SOLID WASTE MANAGEMENT RULE, 2016

INDEX

SL. NO.	PARTICULAR	PAGE NO.
1.	METHODOLOGY FOR ASSESSMENT OF ENVIRONMENT CARRYING CAPACITY OF CENTRAL POLLUTION CONTROL BOARD (CPCB) IN THE MATTER OF O. A. 606/2018 (COMPLIANCE OF MUNICIPAL SOLID WASTE MANAGEMENT RULE, 2016) IN COMPLIANCE OF HON'BLE NATIONAL GREEN TRIBUNAL (NGT) ORDER DATED 24.04.2019	
2.	ANNEXURE-I HON'BLE NATIONAL GREEN TRIBUNAL (NGT) ORDER DATED 24.04.2019.	

Divya
DIVYA SINHA
SCIENTIST 'E',
CENTRAL POLLUTION CONTROL BOARD
PARIVESH BHAWAN, EAST ARJUN NAGAR,
DELHI-110032

PLACE: DELHI
DATED: 09.09.2019

METHODOLOGY FOR ASSESSMENT OF ENVIRONMENT CARRYING CAPACITY

Carrying capacity is a concept which limits the potential ability of natural resources and species to withstand human intervention. It may be described as a test of the ability of land, water and air to keep itself usable and toxicity free despite pollution and effluent discharges and harmful developments over it.

Carrying capacity also refers to the number of individuals who can be supported in a given area within the limits of natural resources, and without degrading the social, cultural and economic environment for the present and future generations. The carrying capacity for any given area is not fixed. It can be extended to a certain level by improved technology, but mostly it is changed for the worse by pressures which accompany a population increase. As the environment is degraded, carrying capacity actually shrinks, leaving the environment with no ability to support even the number of people who could formerly have lived in the area on a sustainable basis.

Human activities may not be unsustainable in themselves but the thin line that separates them from being beneficial to mankind and becoming harmful is the environmental recognition of the concept of carrying capacity. If taken beyond carrying capacity, the activities may prove disastrous

$$\text{Carrying Capacity} = f \left(\begin{array}{l} \text{Environmental impacts and natural resources;} \\ \text{Infrastructure and urban services;} \\ \text{Public Perception;} \\ \text{Institution Setting;} \\ \text{Society Supporting Capacity} \end{array} \right)$$

Methodology and Framework for Calculating Environmental Carrying Capacity:

Indicator Benchmark Comparison method:

For calculating the Carrying Capacity, Indicator Benchmark Comparison method will be used; this method is the conventional procedure of many UCC assessment models, e.g. (Clarke, 1996; Graymore et al., 2010; Liu, 2012; Oh et al., 2005; Shi et al., 2013; Yu & Mao, 2002). In practice, carrying capacities values are compared with the threshold, acceptable, minimum, or recommended standards of UCC (Joardar, 1998; Liu & Borthwick, 2011). Initially, a set of indicators for measuring sustainability is identified. The sustainability standard for each indicator is established. Then, each determining factor is evaluated for carrying capacity assessment, by comparing human activity impacts to thresholds or targets (Graymore et al., 2010).

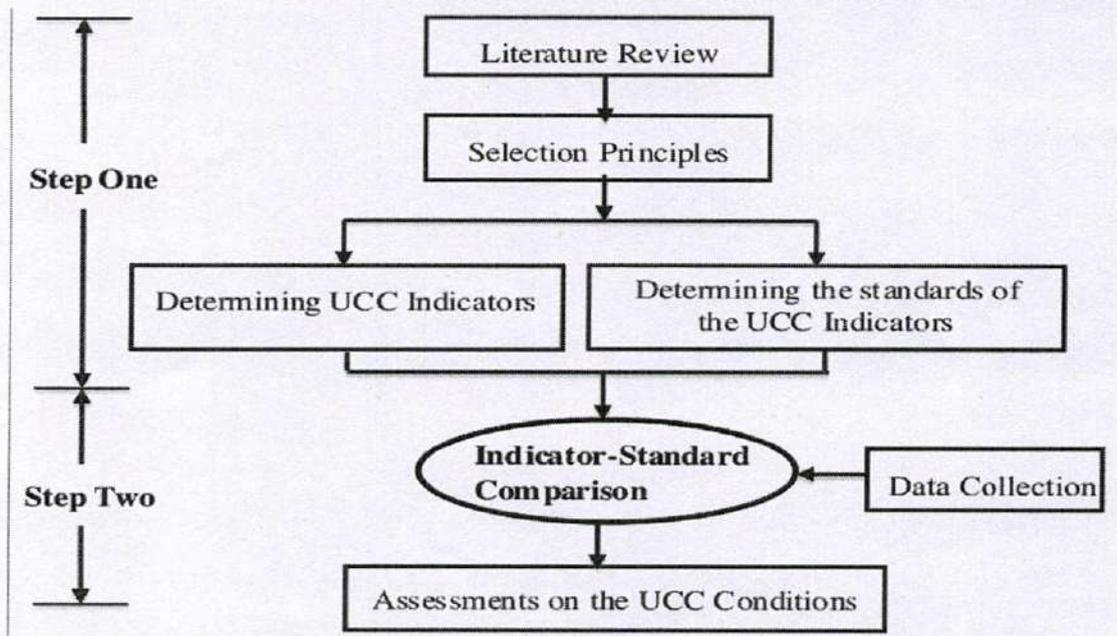


Figure 1: Flow chart for Urban Carrying Capacity (Source: Yigang wei et al ; 2015)

Framework Description for Calculating Environmental Carrying Capacity

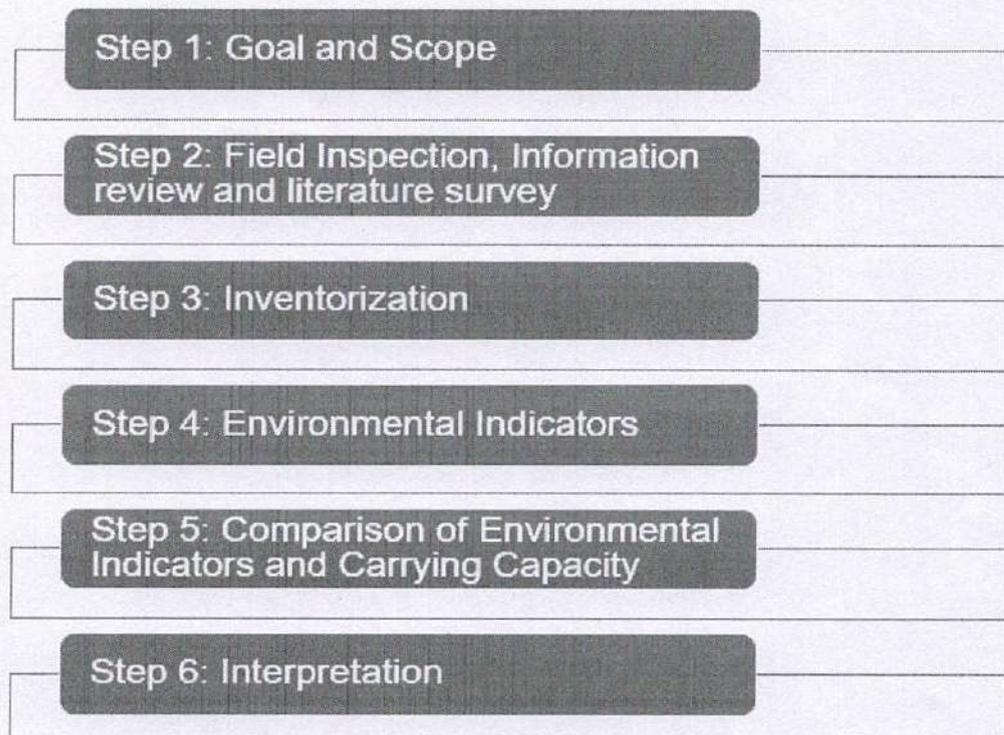


Figure 2. Schematic of Framework for Environment Sustainability Assessment

Step 1: Goal and Scope - Aim of the study and scope comprising of system boundary, functional unit, and environmental indicators shall be defined.

Step 2: Field Inspection, Information review - Information concerning the system, will be obtained through field inspection, survey, literature review etc.

Step 3: Inventory - Systematic accounting of major resource, material, activity and waste flows within the region's system boundary will be performed.

Step 4: Environmental Indicators - Specified indicators will be evaluated.

Step 5: Carrying Capacity - Carrying capacity of the region concerning different environmental aspects will be evaluated.

Step 6: Comparison of Environmental Indicators and Carrying Capacity - Environmental indicators providing status of current environmental condition will be compared with the carrying capacity of the region.

Step 7: Interpretation - Obtained results and information limitations will be discussed. Conclusion and recommendations will be drawn based on the results and information.

In the report, system boundary will represent area under study

Approach For Quantifying Carrying Capacity

Step 1: Goal and Scope

Macro-level assessment of major resource and waste flows within the system boundary. The region will be assessed for the direct resource use and waste flows. Environmental indicators will be identified in terms of specific resources and waste flows. Most common Environmental Indicators under study are land use, water use, solid waste, waste water and air emissions. Status of environmental indicators for current year and projection until year 2035 should be evaluated.

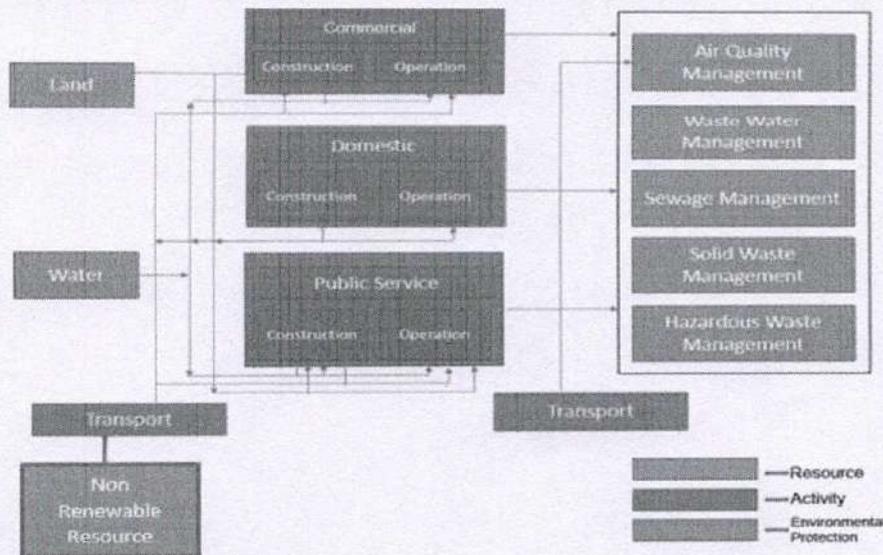


Figure 3.: System boundary for region under study

Step 2: Field Inspection, Information review

Field Inspection to collect the relevant information about area under study. In this, field inspection includes survey of industries, commercial areas, residential areas, dumpsites, landfill sites, sewage treatment plants, water treatment plants, discussion with government officials, discussion with local residents, migrants and tourists etc. to get real scenario of the region

Step 3: Inventory

To illustrates the major resource flows from within and outside the boundary region to various activities, and waste flows from activity to various waste management systems. Inventory for the system is to be developed based on information provided in development plan, discussion with authorities, literature values and field inspection.

Population: Population of the region is to be evaluated by data extrapolation using the census data. Changes in population are influenced by three factors: birth rate, death rate and population Migration numbers (Qin et al. 2011). Birth rate and death rate can be deduced from historical information and empirical data. Population migration rate will be predicted based on the analysis of labor supply and demand balance, namely the difference between the local labor force and labor demand.

Tourist Inflow: Tourist Inflow is to be calculated by data extrapolation of peak tourist inflow in peak season.

Water Resource

- a) Identify the source of water supply i.e. Ground water or surface water
- b) Quantify the Total water supply to residents and industries and other commercial zone
- c) Calculate the water balance of the region under study

Water supply for region is to be collected for calculating the total water available per capita to civil population, commercial activities and Industrial area.

Land Resource: Land use classifications mainly based on Non developable area (A_{ND}) and Area for infrastructure development (A_{IF})

- Non developable area (A_{ND}) consists of forests, agriculture, waste lands and nallahs
- Area for infrastructure development (A_{IF}) consists of area required for commercial, industrial, public, governmental and transportation activities and organized open spaces

For Domestic Establishments and Public services:

Water consumption: Calculate the amount of water consumption in the region. As per MOHUA, average requirement of water is 135L/day/person (MOUD, 2012) and 180L/day/person (MOUD, 1999) for tourists.

Solid waste generation: Calculate the amount of solid waste generation in the region. Municipal solid waste generated in the range 0.2 - 0.6kg/day/person, MOUD, 2016.

Waste water generation: Calculate the amount of waste water generation in the region. Approx. 80% of total water use is assumed for waste water generation rate.

Traffic volume: Survey is to be carried out during weekends and weekdays to:

- a) Assess the mode wise traffic composition at hotspot area of the region.
- b) Estimate the number of vehicles manually and with videography if feasible.
- c) Origin and Destination Survey is to be carried out in the area to estimate the extent of traffic demand from zone to other.
- d) Fuel Station Survey is to be carried in the study area road network to identify the type of fuel, fuel saving, quantity and frequency of fuel filling and their mileage, type of engine, age profile and the composition of fuel types (petrol, diesel, (CNG) in total fleets.
- e) Meteorological survey
Calculate the number of vehicle inflow and number of local vehicles.
- f) Calculate the average vehicle trip lengths for different vehicle categories (truck, car, and two-wheeler) by mapping the distance for general probable stops covered by the vehicles.
- g) Types of vehicles
- h) Type of fuel consumption,
- i) Travel time data

Air Emission: Inventorization of air emission sources like biomass burning, open waste burning, stubble burning and construction activities

For Commercial Establishments: In this part all the commercial establishment will come like factories, hotels, restaurants and Dhabas etc.

Industries: Inventorization of legal and illegal industries and type of industries

Transport: Calculate the number of commercial vehicles, type of vehicles, fuel used and average trip length

Water consumption: Find out the source of water consumption, Calculate the water consumption per establishment.

Waste Water Generation: Calculate the waste water generation, evaluate the capacity for treatment of waste water

Solid waste generation: Calculate the amount of solid waste generation from the commercial establishments.

Air emission sources:

- a) Inventorization of coal based tandoors are being used in the hotels, restaurants and dhabas and other areas specific area.
- b) Inventorization of type of fuel being used in the industries in the boilers and for heating purpose.
- c) Inventorization of Municipal Waste Incinerators, Biomedical Incinerators and Hazardous waste incinerators and evaluate their efficiency.
- d) Inventorization of Construction activities in the region.
- e) Inventorization of Road dust and unpaved road.

Step 4: Environmental Indicators:

1. Population (residents)+ Migration rate
2. Tourist Inflow
3. Traffic volume
4. Urban land
5. Water available: Ground water + Surface water
6. Water use : For domestic purpose , industrial use , agricultural use & others
7. Solid waste
8. Sewage
9. Air Emission: Industrial Emissions, DG set emission, emission from coal based tandoors, construction activities, open burning, transport (commercial & local) Biomass burning, road dust, crematoria's, residential and incinerators.

Step 5: Assessment of Carrying Capacity:

Carrying capacity of the region will be evaluated for urban land, water resource, atmospheric assimilation and waste carrying capacity of the region.

Urban Land Carrying Capacity

ULCC may be evaluated based on methodology presented in Urban Carrying Capacity Report by IIT Guwahati (IIT Guwahati, 2012).

$$A_R = [A_U - (A_{ND} + A_{IF})] * FAR/S$$

where, A_R = area for residential requirements

A_U = total urban area

A_{ND} = non developable area

A_{IF} = area for infrastructure development

FAR = Floor Area Ratio

S = Floor area requirement per head

Non developable area (A_{ND}) consists of forests, agriculture, waste lands and nallahs. Area for infrastructure development (A_{IF}) consists of area required for commercial, industrial, public, governmental and transportation activities and organized open spaces.

As per IIT Guwahati 2012 report,

FAR need to be determined by considering various aspects like, provision of intended free space, safe bearing capacity of soil, economy of people for affording earthquake resilient structures, drainage and transportation requirement and so on. While the proposed “SAFE” method itself will determine an acceptable FAR, one need to provide an initial value of FAR. This value can be given from guidelines provided by different organization including ULB. In absence of any such guidelines, a **value of 1.5** can be used for initial trial value. This value is suggested based on the general trend observed so far in Indian condition.

Floor area requirement per head: Based on analysis of socio- economic status of the present population and considering future possible matrix of different classes, an average logical area requirement is to be calculated

Water Resource Carrying Capacity

Amount of available water resources (AWR), and the amount of surface water withdrawal (SWW). These can be estimated by the following equations:

$$AWR = AGWR + ASWR + OAWR$$

- AGWR is the available ground water resource,
- ASWR is the available surface water resource,
- OAWR is other available water resources, mainly wastewater reuse and collection of rainwater.

$$SWW = TWS - GWS - OSWS$$

- TWS is total water supply,
- GWS is ground water supply,
- OSWS is other sources of water.

Water demand:

Gross water amount consumed by all types of water users. The gross amount of water demand includes the conveyance loss of water, domestic water demand, industrial water demand, agricultural water demand, and “other” water demand (Water Resources Bulletin of Tieling 2011).

- **Domestic water** demand includes urban domestic water demand, made up of the residential use of water and the public use of water (including the water use by tertiary industry and the construction industry),
- **Industrial water demand** consists of the demand for fresh water, excluding water recycling within enterprises.
- **Agricultural water demand** is made up of irrigation water demand water recharge.
- **Other water demand** consists mainly of the demand for sanitation water in the urban area and the water restoration requirements of rivers, lakes and wetlands.

Water resource carrying capacity (WRCC) depends on the water availability and water demand, and is given as,

$$WRCC = WA/WD$$

Where, WA = water availability

WD = water demand

Widodo et al., 2015 stated that for $WRCC < 1$ capacity is overshoot, $WRCC 1 - 3$ capacity is conditionally safe and $WRCC > 3$ capacity is safe.

Water Environmental Carrying Capacity (WECC):

Surface Water Carrying Capacity:

Rivers:

The water environmental capacity is the maximum pollutant loading that the water body can hold under a certain water environment quality target. The dominant water pollutant is BOD. The length and width of the computed river is relatively large, so we can ignore the horizontal changes of pollutant concentration, and only take into account changes of pollutant concentration along the river, so we select one-dimensional water quality model to calculate the Surface water environmental capacity. The water environment capacity can be calculated with following equation as per Qingchun Yang et al; 2019

Assuming stream and waste water discharge are at steady state and instantaneous full mixing of all flows.

$$W_R = \left[C_s - C_o \exp\left(\frac{-KL}{u}\right) \times Q \right]$$

- W_R represents the river's pollutant carrying capacity, g/s;
- C_s represents the water quality target concentration at the downstream cross-section of the river, mg/L;

- C_o represents the actual water quality concentration at the upstream cross-section of the river, mg/L;
- K represents the pollutant degradation coefficient, d^{-1} ;
- L represents the length of river, m; u represents the average flow velocity at the river's cross section, m/s;
- Q represents the designed flow at the river's cross section, m^3 /s

Note: As per Yingrong Wen et al; 2017, the reported range for laboratory-measured k values is from 0.3 to 0.5 day^{-1} at a temperature of 20 °C, which is considered representative of field conditions

Lakes

Pollutant carrying capacity of the lake:

Considering, Lake is of small size with equilibrium of multi-year average in flowing water and outflowing water, it is desirable to adopt the uniform mixture model to calculate the pollutant carrying capacity.

Based on the material balance equation, the pollutant carrying capacity

$$W_L = (C_s - C_o)V + KC_sV + C_s q_{out}$$

In this equation,

- W_L represents the pollutant carrying capacity of the lake, t/a;
- C_s represents the water quality target concentration, mg/L;
- C_o represents the actual water quality concentration, mg/L;
- V represents the average storage capacity of the lake in dry seasons, m^3 ;
- q_{out} represents multi-year outflowing water of the lake in dry seasons, m^3 /a ;
- K represents the pollutant degradation coefficient, d^{-1} mainly BOD parameters under consideration

Ground Water

For estimating the level of groundwater pollution with low-hazard pollutants the following formula can be used as per Anna Belousova, 2006

$$\frac{C_1}{MPC_1} + \frac{C_2}{MPC_2} \pm \dots \mp \frac{C_n}{MPC_n} = 1$$

Where C_1, C_n are concentration of separate pollutants, and MPC_1, MPC_n represent maximum permissible concentration.

If the sum of the concentration ratios is more than 1, then the groundwater is polluted. For all cases, pH must not be outside the limit 6.5–8.5.

Atmospheric Assimilation Capacity:

Various approaches are described in the literature for estimating the atmospheric assimilative capacity of a region. (Goyal et al. (2006) propose two approaches, one based on a ventilation coefficient, the other through pollution potential. SEPA (2003) recommend an A-P value method and multi-source simulation model to estimate atmospheric assimilative capacity in China.

Here we are discussing the atmospheric assimilative capacity using simple Box Model:

A simple box model based on mass balance and assuming that all pollutants in the box are uniformly mixed (Figure 2) is used for preliminary estimates for step (ii) in Fig 1(a). It is a simple model and has several limitations; however, for the purpose of demonstrating the framework and preliminary analysis, the model may provide broad estimates of carrying capacity. Mathematically, the model can be described as below:

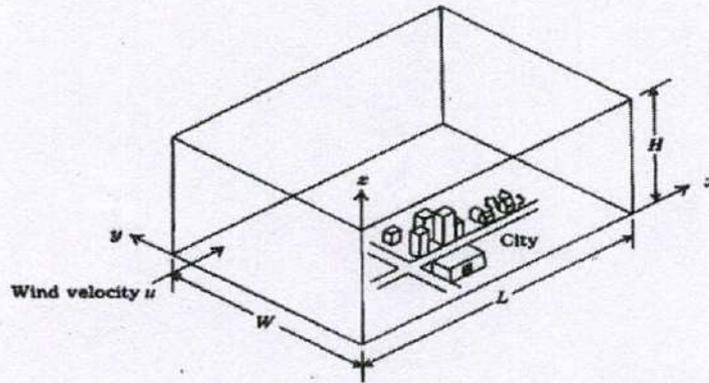


Figure 4: Schematic of box model (De Nevers, 1995)

Mathematically,

$$V \frac{dc}{dt} = qC_{in} - qC_{out} + S - K_{dd} CLW - K_{cr} C_{out}V \quad (1)$$

where, q = volumetric flow rate (m^3/sec)

C_{in} = influent concentration of a pollutant (g/m^3)

C_{out} = effluent concentration of a pollutant (g/m^3)

K_{dd} = dry deposition velocity (m/sec)

K_{cr} = First order chemical reaction constant ($1/sec$)

S = source emission rate(g/sec)

$K_{dd}.C.L.W$ = the amount of pollutants removed by dry deposition (g/sec)

$K_{cr}.C.V$ = the amount of pollutants converted by chemical reaction (g/sec)

u = wind speed (m/sec)

In equation, $V=L \times W \times H$ volume of City m^3 (L: length (m), W; Width (m), H; height (m))

The model is further simplified with the following assumptions:

- Steady state condition (i.e. concentration is time invariant); $dc/dt = 0$
- Pollutant does not give any deposition in the box; $k_{dd} = 0$
- Pollutant does not undergo any chemical transformation: $K_{cr} = 0$

One can estimate the carrying capacity, Q_{cc} as per the following equation:

$$Q_{cc} = (C - C_0) \times u \cdot W \cdot H \quad (2)$$

In this calculation,

Area (A) of system boundary, Width (W) of the System boundary, mixing height (H) (average for winter and summer) within the system boundary, Wind Speed (s) within the system boundary is required.

Background concentration (C_0) into the system boundary is also required.

Alternatively, the multi-source simulation model may be used to estimate atmospheric assimilative capacity based on air quality modeling which takes into consideration region-specific meteorological conditions, terrain characteristics, and emission loads from different sources. Following Goyal and Chalapati Rao (2007), the discharged emission load at which the maximum allowable concentration is reached under predefined critical conditions is taken to be the assimilative capacity of the region. Prediction of ground-level concentrations of pollutants is carried out using the US EPA approved ISCST-3 simulation model (EPA, 1995a, 1995b). It should be noted that the atmospheric assimilative capacity has a range of values, depending on the variation of emission characteristics with given meteorological and topographical conditions.

Solid Waste Carrying Capacity:

Considering per capita solid waste generation in case of local population of the study area and that of tourist population, calculate the waste generated in the the study area tons per day (TPD) during the base year. Out of the total waste generated, calculate the waste collected and transported to a dumping/ landfill site. Solid waste carrying capacity has been analyzed here from the standpoint of waste generation and management potential and public perception. Solid waste environment carrying capacity (SWECC) was first assessed using the following simple expression-

$$SWECC = \frac{SWM_{EF} \text{ (tons)} + RC \text{ (tons)}}{SWG \text{ (tons)}} \dots\dots\dots (1)$$

where;

SWECC = Solid Waste Environment Carrying Capacity.

SWM_{EF} = Solid Waste Managed Environment-Friendly. Includes all SWM options (Recycling + Re-using + Reprocessing + Sanitary Land-filling + incineration in compliance with emission norms, etc.). Collection of waste is the foremost requirement before wastes are sent for land-filling, recycling, incineration, etc.

RC = Remaining Capacity. Capacity left/available for managing more SW.

SWG = Solid Waste Generated in tons.

The foremost task is collection of the generated solid waste after which, the local authority can manage the waste by sending for recycling, land-filling, incineration, etc.

Threshold for assessment;

SWECC = 1 : Carrying Capacity on edge/break-point. CC may overshoot very soon.

SWECC > 1+ : Carrying Capacity exists. More the value, more the CC.

SWECC < 1 : CC overshoot.

Carrying Capacity of Sewage management:

Calculate the total sewage generation in the region based on the present population scenario and for projected population for next 20 years and evaluate the efficiency of the Treatment plants installed for treating sewage.

S.NO	Activities		Source
1	Extent to which waste water management facilities are available to individual properties across the city, whether through centralized underground sewerage, decentralized systems or on-site systems such as septic tanks. This should be computed for the number of properties recorded in municipal records and not households, and should include all residential, commercial, industrial and institutional properties <i>Total number of properties with connection to waste water management systems</i> $\frac{\text{Total number of properties with connection to waste water management systems}}{\text{Total number of properties in the city}} \times 100 =$	100% door to door collection (Service Level Benchmarks, MoUD)	MoUD Report on Methodology Collection and Computation of liveability Standards in Cities
2	The actual proportion of waste water generated in the city that is collected by the available sewerage Network <i>Total waste water collected per day</i> $\frac{\text{Total waste water collected per day}}{\text{Total waste water generated in the city per day}} \times 100 =$	100% (Service Level Benchmarks, MoUD)	MoUD Report on Methodology

			Collection and Computation of liveability Standards in Cities
3	<p>The proportion of waste water received at the treatment plant that is recycled or reused for various purposes. Treated waste water can be used for horticultural purposes in parks and gardens, irrigation of farmlands on city periphery, and/or supplied to power plants and industries</p> $\frac{\text{Quantum of waste water recycled or reused per day}}{\text{Total waste water received at treatment plants per day}} \times 100 =$	20% or more (Service Level Benchmarks, MoUD)	MoUD Report on Methodology Collection and Computation of liveability Standards in Cities

Overall conclusion:**Case 1:**

$$\frac{\text{Total Sewage Generation}}{\text{Available treatment Facility working}} = 1 \text{ ----- System is conditionally safe}$$

Subcase: Treated water must follow the prescribed standards

Case 2:

$$\frac{\text{Total Sewage Generation}}{\text{Available treatment Facility working efficiently with recycling of water in the system}} < 1 \text{ ----- System is safe}$$

Case 3:

$$\frac{\text{Toatl Sewage Generation}}{\text{Avaliable treatment Facility working efficiently}} > 1 \text{ ----- Carrying capacity is overshooted}$$

References:

1. Centre of Excellence Civil Engineering Department, IIT Guwahati, Integrated Landuse Planning and Water Resources Management, Urban Carrying Capacity, concept & calculation, IIT Guwahati
2. Wei, Yigang & Huang, Cui & Lam, Patrick & Sha, Yong & Feng, Yong. (2015). Using Urban-Carrying Capacity as a Benchmark for Sustainable Urban Development: An Empirical Study of Beijing. *Sustainability*. 7. 3244-3268. 10.3390/su7033244. <http://indicators.report/indicators/i-70/>
3. Bureau of Indian Standards, IS:1172-1993
4. https://app.cpcbcr.com/AQI_India/
5. Oh, Kyushik & Jeong, Yeunwoo & Lee, Dong-Kun & Lee, Wangkey. (2019). Determining Sustainable Development Density using the Urban Carrying Capacity Assessment System. Oh, Kyushik and Jeong, Yeunwoo and Lee, Dongkun and Lee, Wangkey (2004) Determining Sustainable Development Density using the Urban Carrying Capacity Assessment System. Working paper. CASA Working Papers (78). Centre for Advanced Spatial Analysis (UCL), London, UK.
6. Anna Belousova, Indicators and indexes of groundwater quality, Sustainability of Groundwater Resources and its Indicators (Proceedings of symposium S3 held during the Seventh IAHS Scientific Assembly at Foz do Iguaçu, Brazil, April 2005). IAHS Publ. 302, 2006.
 - a. Yingrong Wen, Gerrit Schoups & Nick van de Giesen (2017) Organic pollution of rivers: Combined threats of urbanization, livestock farming and global climate change
7. Analysis of water environment carrying capacity based on water quality and quantity. Yang Zhe et al.
8. Water Problems Institute Russian Academy of Sciences, 3 Gubkina str., 119991 Moscow, Russia
anabel@aqua.laser.ru
9. http://delhi.gov.in/DoIT/DoIT_Planning/ESEng.pdf
10. http://www.censusindia.gov.in/2011census/hlo/District_Tables/HLO_Distt_Table_NCT_of_Delhi.html
11. <http://delhi.gov.in/wps/wcm/connect/e7c2da004579fb4e91e1b3e55f38377c/Transport.pdf?MOD=AJPERES&lmod=-1868249619&CACHEID=e7c2da004579fb4e91e1b3e55f38377c>
12. https://www.teriin.org/sites/default/files/2018-08/Report_SA_AQM-Delhi-NCR_0.pdf

**ATTESTED AS TRUE COPY
RAJESWARA.P.N**