HINDUSTAN ZINC
Zinc & Silver of India

Impact Assessment Report for Sewage Treatment Plant

Disclaimer for the Impact Assessment Report

- This report has been prepared solely for the purpose set out in the Memorandum of Understanding (MoU) signed between Renalysis Consultants Pvt. Ltd. (CSRBOX) and Hindustan Zinc Limited (HZL) to undertake the Impact Assessment of their Corporate Social Responsibility (CSR) project implemented.
- This impact assessment is pursuant to the Companies (Corporate Social Responsibility Policy) Amendment Rules, 2021, notification dated 22nd January 2021.
- This report shall be disclosed to those authorised in its entirety only without removing the disclaimer. CSRBOX has not performed an audit and does not express an opinion or any other form of assurance. Further, comments in our report are not intended, nor should they be interpreted to be legal advice or opinion.
- This report contains an analysis by CSRBOX considering the publications available from secondary sources and inputs gathered through interactions with the leadership team of HZL, project beneficiaries, and various knowledge partners. While the information obtained from the public domain has not been verified for authenticity, CSRBOX has taken due care to receive information from sources generally considered to be reliable.
- In preparing this report, CSRBOX has used and relied on data, material gathered through the internet, research reports, and discussions with personnel within CSRBOX as well as personnel in related industries.

With Specific to Impact Assessment, CSRBOX:

- Has neither conducted an audit or due diligence nor validated the financial statements and projections provided by the HZL;
- Wherever information was not available in the public domain, suitable assumptions were made to extrapolate values for the same;
- CSRBOX must emphasise that the realisation of the benefits/improvisations accruing out of the recommendations set out within this report (based on secondary sources) is dependent on the continuing validity of the assumptions on which it is based. The assumptions will need to be reviewed and revised to reflect such changes in business trends, regulatory requirements or the direction of the business as further clarity emerges. CSRBOX accepts no responsibility for the realisation of the projected benefits;
- The premise of an impact assessment is ‘the objectives of the project along with output and outcome indicators pre-set by the programme design and implementation team. CSRBOX’s impact assessment framework was designed and executed in alignment with those objectives and indicators.

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Executive Summary

Hindustan Zinc Limited (HZL) is deeply involved in thematic areas of education, sustainable livelihoods, community asset creation, environment & safety, women empowerment, health, water & sanitation and sports & culture. HZL's vision lies in improving the quality of life and financial well-being of communities near HZL's operations. The Sewage Treatment Plant (STP) is one such CSR initiative of HZL.

The programme intervention of Hindustan Zinc Limited closely aligns with 3 major National level policies, namely the Centrally Sponsored Scheme of **the National River Conservation Plan (NRCP), the Atal Mission for Rejuvenation & Urban Transformation (AMRUT) and Smart Cities Mission of the Ministry of Housing & Urban Affairs**

Alignment with SDGs

The key highlights of the intervention are as follows -

- More than 80 per cent of city's waste water is connected and treated by STPs
- About 1-1.5 crore litre of water being treated per day by 10 MLD STP
- About 1 MLD/day of discharge and inflow by 5 MLD STP
- About 300-400 M3 of water is being reused for gardening purpose in 45 MLD STP
- About 35-50 MLD of inflow and outflow in 45 MLD STP
- About 10 % increase in the annual income of the plant staffs
- About 70 % of city's wastewater is being treated by 45 MLD STP
- Conservation of river and aquatic life
- Increase in awareness among the residents and community members for proper handling, segregation and management of waste

The STPs are also creating and leading an impact at the operational and health as safety forefront –

- Frequent and regular technical and health & safety trainings for workers and staffs
- Adequate and proper health and safety standards are maintained
- Availability of proper first aid kits and safety uniforms
- Availability of clear evacuation, emergency response plan and POC
- Availability of emergency equipments - fire extinguishers, smoke detectors
- Power backup support available for uninteruppted round the clock operations

Abbreviations

AMRUT	Atal Mission for Rejuvenation & Urban Transformation
BEL	Bharat Electronics Limited
BOD	Biological Oxygen Demand
BRSR	Business Responsibility & Sustainability Reporting Format
CCT	Chlorine Contact Tank
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
Cr.	Crore
CSR	Corporate Social Responsibility
HZL	Hindustan Zinc Limited
IC	Intangible Costs
IDIs	In-Depth Interviews
KG	Kilo Gram
KIIs	Key Informant Interviews
KLD	Kilo Liters Daily
MBBR	Moving Bed Biofilm Reactor Technology
MLD	Million Liters Daily
NGO	Non-Governmental Organisation
NPV	Net Present Value
NRCP	National River Conservation Plan
pH	Power of Hydrogen
POC	Point of Contact
SBR	Sequencing Batch Bioreactor
SDGs	Sustainable Development Goals
SEBI	Securities & Exchange Board of India
SROI	Social Return on Investment
STP	Sewage Treatment Plant
TC	Tangible Costs
TI	Total Investment
UMC	Udaipur Municipal Corporation
USCL	Udaipur Smart City Limited

Chapter 1

Project Overview and CSR Initiatives

Chapter 1 – Project Overview and CSR Initiatives

This section provides an overview of the funding organization, the project cardinals and the detailed interventions.

1.1 Project Background and Overview

Hindustan Zinc Limited (HZL) is deeply involved in thematic areas of education, sustainable livelihoods, community asset creation, environment & safety, women empowerment, health, water & sanitation and sports & culture. HZL channelises their focus and interest in local economy strengthening and quality of life improvement.

The CSR Projects of HZL complements UN **Sustainable Development Goals (SDGs), National Development Goals, National Priorities** and community needs. The goal and motive of the CSR programmes is to provide sustainability at the grassroots. The projects executed and implemented are in deep collaborations with government, local communities and credible NGOs.

Realising the need to improve the quality of lake water, Udaipur Municipal Corporation (UMC) collaborated with HZL to dispose of the treated city wastewater into the river. This initiative of setting up STPs aligns closely with the HZL CSR thematic areas such as Environment & Safety and Health, Water & Sanitation. This helps in achieving a greater vision of environment conservation and sustainability.

1.2 CSR Initiatives of Hindustan Zinc Limited

HZL's vision lies in improving the quality of life and financial well-being of communities near HZL's operations. This is achieved through sustainable development and ensuring social well-being, thereby protecting human life, health and the environment.

Some of the HZL's CSR initiatives are listed below –

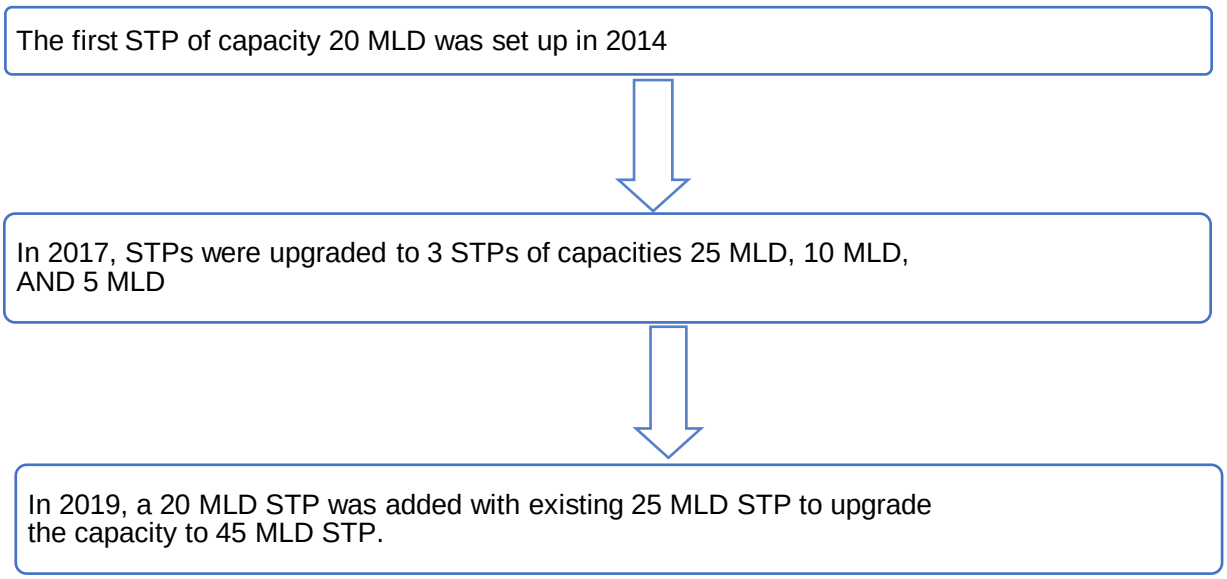
About the intervention

Udaipur generates about **180 Metric Tons of waste daily**[1] . In order to manage the city waste load, joint discussions were held between the HZL team, Udaipur Municipal Corporation (UMC) and Udaipur Smart City Ltd. (USCL). Through these joint discussions, the concept of setting up STP in Udaipur came up in **2012,** which was in alignment with the Udaipur Smart City Concept. As a result of these discussions, HZL decided to set up a Sewage Treatment Plant for the benefit of the city at large. The first STP of capacity **20 MLD was set up in 2014** with the aim of treating 180 metric tons of waste generated in the city.

Table 1 - Role and responsibilities of USCL

Name of the government body	About the body	Key Objectives
Udaipur Smart City Limited (USCL)	USCL is a special-purpose vehicle formed under the Smart Cities Mission. It is a flagship programme of the Government of India launched in 2015. USCL was incorporated in 2016 with a vision to transform Udaipur into a smart and liveable city[2].	The main objective of the programme is to develop sustainable and inclusive cities across the country. The ultimate goal of USCL is to create a sustainable urban ecosystem that is economically, financially and socially sustainable.

[1] DEP_Udaipur.pdf (rajasthan.gov.in)
[2] About – UDAIPUR SMART CITY



The 45 MLD plant uses about 40 MLD of treated water for industrial usage in the Dariba and Debari region of Udaipur and disposes of about 5 MLD of treated water into the Ayad River. The 5 and 10 MLD STPs are also disposing of treated wastewater in Ayad River. This is helping in freshwater conservation as well as helping in improving the quality of the Ayad River. This also blends and complements HZL's **commitment towards environmental protection**.

1.3 Alignment with CSR Policy

Schedule VII (Section 135) of the Companies Act, 2013 specifies the list of the activities that can be included by the company in its CSR policy. The below-mentioned table shows the alignments of the intervention with the approved activities by the **Ministry of Corporate Affairs**.

Table 2 - Alignment of the intervention with CSR Policy

Sub-Section	Activities as per Schedule VII	Alignment with Intervention
(i)	Eradicating hunger, poverty, and malnutrition, promoting health care, including preventive health care and sanitation, including contribution to the Swachh Bharat Kosh set up by the Central Government for the promotion of sanitation and making available safe drinking water	**Partially** The STPs are treating about **70 million litres** of Udaipur's average sewage and disposing of treated wastewater into the river. The intervention is resulting in an **increase in awareness of the adoption of good practices in waste management** at the domestic as well as at the STP level. This is helping in the maintenance of proper sanitation and hygiene.

(iv)	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources, and maintaining the quality of soil, air, and water	**Completely** The awareness among individuals of segregation of waste at their homes, restaurants, hotels and workplaces is helping in proper segregation and management of waste at domestic level. This is **reducing the city's pollution load for environment sustainability.**

1.4 Alignment with Environment, Social and Governance (ESG) Principles

The project's intervention also aligns with the **ESG Sustainability Report** of the corporate. Particularly, concerning the **Business Responsibility & Sustainability Reporting Format (BRSR)** shared by the **Securities & Exchange Board of India (SEBI)**, the project aligns with the principles[3] mentioned below:

PRINCIPLE 2	PRINCIPLE 4	PRINCIPLE 6
Businesses should provide goods and services in a manner that is sustainable and safe	Businesses should respect the interests of and be responsive to all its stakeholders	Businesses should respect and make efforts to protect and restore the environment

1.5 Alignment with National Priorities

The programme intervention of Hindustan Zinc Limited is well aligned with 3 major National level policies, namely the **Centrally Sponsored Scheme of National River Conservation Plan (NRCP)**, **the Atal Mission for Rejuvenation & Urban Transformation (AMRUT) and Smart Cities Mission of the Ministry of Housing & Urban Affairs**. The below- mentioned Table shows the level of alignment of the project with the policies.

[3] https://www.sebi.gov.in/sebi_data/commondocs/may-2021/Business%20responsibility%20and%20sustainability%20reporting%20by%20listed%20entitiesAnnexure1_p.PDF

Table 3 - Alignment of the intervention with National Priorities

National Priorities	Details of the Priority	Alignment
Centrally Sponsored Scheme of National River Conservation Plan (NRCP)	The works taken up under NRCP, inter-alia, include interception & diversion of raw sewage, construction of sewerage system, setting up of sewage treatment plants, low-cost sanitation, riverfront/bathing ghat development, electric/wood-based crematoria, etc.	**Completely** The STPs are helping in treatment of city waste. The treated effluent from STPs is being discharged in Ayad River. This is helping in conservation of Ayad River.
Atal Mission for Rejuvenation & Urban Transformation (AMRUT)**4**	The Mission focuses on the development of basic infrastructure in the selected cities and towns in the sectors of water supply, sewerage and septage management, stormwater drainage, green spaces and parks, and non-motorised urban transport. A set of Urban Reforms and Capacity Building have been included in the Mission.	**Partially** 3 STPs of 45 MLD, 10 MLD and 5 MLD are present in the city.
Smart Cities Mission of Ministry of Housing & Urban Affairs**5**	The main objective of the Mission is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions'. The Mission aims to drive economic growth and improve quality of life through comprehensive work on social, economic, physical and institutional pillars of the city.	**Completely** The programme comprehends and blends with Udaipur Smart City Concept. The main objective of this concept is to develop sustainable and inclusive cities across the country. USCL was incorporated in 2016 with a vision to transform Udaipur into a smart and liveable city. The ultimate goal of USCL is to create sustainable urban ecosystem that is economically, financially and socially sustainable.

1.6 Alignment with Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2016 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

[4] Press Information Bureau (pib.gov.in)
[5] About The Mission | Smartcities

Table 4 - Alignment of the intervention with SDGs

Sustainable Development Goals (SDGs)[6]	Targets	Alignment to Project
	**Goal 6: Clean Water and Sanitation** Ensure availability and sustainable management of water and sanitation for all **Target 6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals, and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. **Target 6.6** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. **Target 6.b** Support and strengthen the participation of local communities in improving water and sanitation management	STPs are helping in **reducing and eliminating pollution and hazardous waste from wastewater**. This is also helping in **safeguarding our natural ecosystems**. The beneficiaries at the domestic level are adopting **good waste management practices** to dispose of waste at the domestic level to **reduce the pollution load of the city.**

[6] THE 17 GOALS | Sustainable Development (un.org)

	**Goal 12: Responsible Consumption and Production** Ensure sustainable consumption and production patterns **Target 12.2** By 2030, achieve the sustainable management and efficient use of natural Resources. **Target 12.4** By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment. **Target 12.7** Promote public procurement practices that are sustainable in accordance with national policies and priorities.	The intervention is helping in **safeguarding and sustainable management of wastewater**, filtering and **reducing hazardous components** from wastewater for human and environmental well-being. The intervention is also **aligned with key national priorities.**
	**Goal 14: Life Below Water** Conserve and sustainably use the oceans, seas and marine resources for sustainable development. **Target 14.1** By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.	The intervention is actively involved in **curbing the pollution in Ayad river**

Chapter 2

Impact Assessment Design and Approach

Chapter 2 - Impact Assessment Design and Approach

This section provides an overview of the objectives of the study, the adopted research methodology and other details revolving around the study.

2.1 Objective of the Study

- Assessment and documentation of the impact of the project on the results of the various beneficiaries and other stakeholders.
- Assessing the scale and effectiveness of the project and highlighting the direct as well as indirect impacts.
- Assess the stakeholder engagement process and its effectiveness.
- Identifying potential areas of improvement and providing short & long-term recommendations, suggestions, and ways forward to further enhance the impact.
- Benchmarking with respect to 5 organisations with similar kinds of projects, brand equity, and community perception for the projects
- Documenting impact stories and testimonials of stakeholders.

2.2 Geography of Study

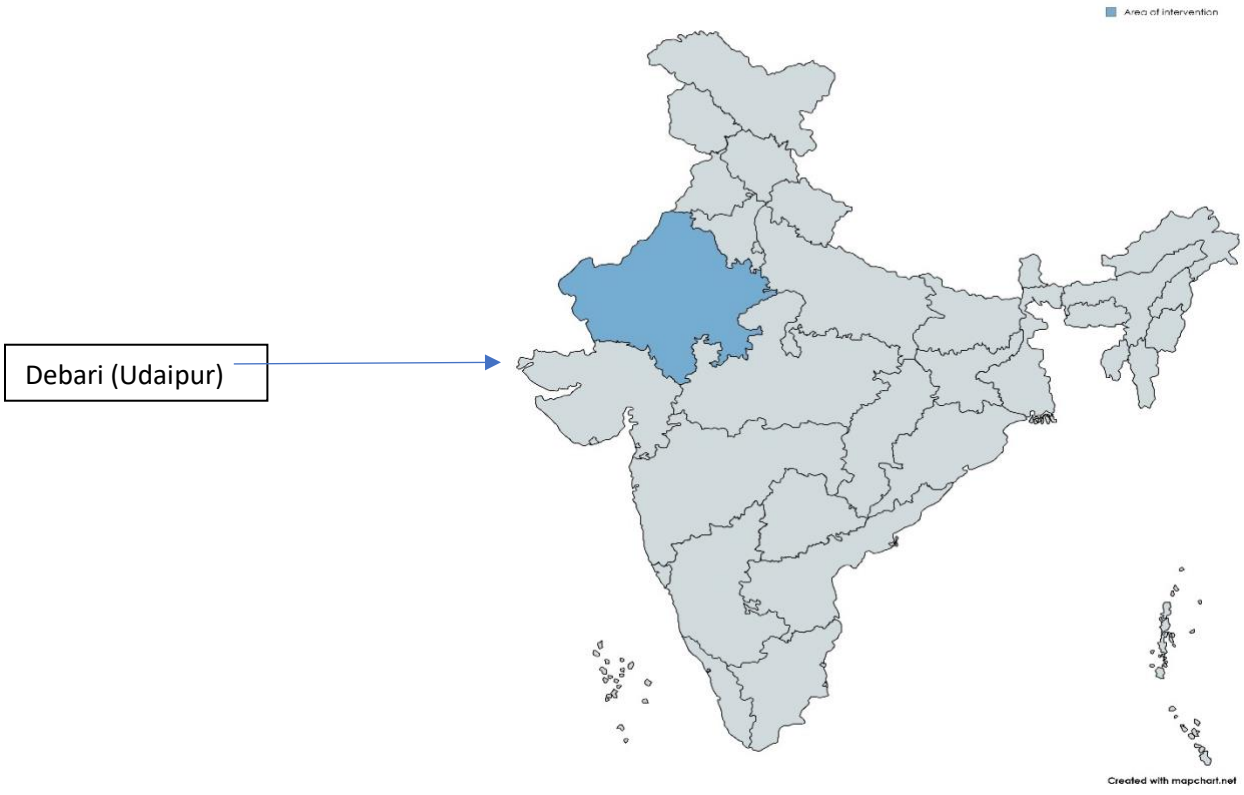
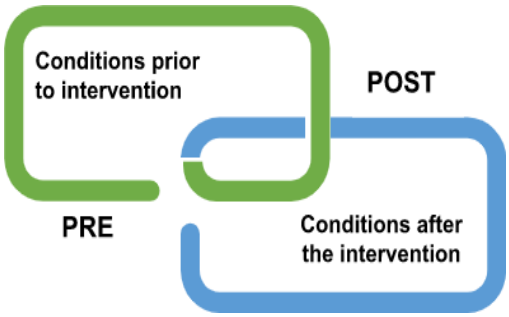


Figure 1- Geography of Intervention

2.3 Evaluation Approach, Methodology and Assessment Framework

Evaluation Approach

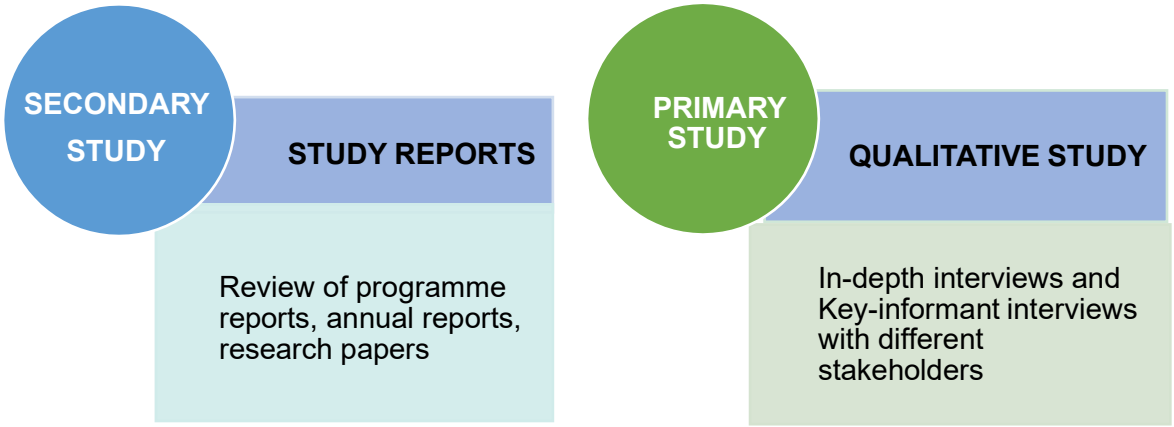
Given the study's objectives and key areas of inquiry, the design of the evaluation focused on learning as the prime objective. In this section, the approach for developing and executing a robust, dynamic, and result-oriented evaluation framework/design is presented.



To measure the impact, the study proposed a pre-post programme evaluation approach. This approach relied on the recall capacity of the respondents, where beneficiaries were queried about conditions before and after the programme intervention. The observed differences helped in understanding the programme's contribution to improving the intended conditions of the beneficiaries. While this approach provided insights into the programme's impact on enhancing living standards, it may not have solely attributed all changes to the programme.

Methodology

For the assessment of the programme, a two-pronged approach was employed for data collection and review, incorporating secondary data sources, literature, and primary data obtained from qualitative methods of data collection. The figure below illustrates the study approach used in data collection and review. The **secondary study** involved a review of annual reports, monitoring reports, programme documentation, consultation calls with the implementing team and research by renowned organizations available in the public domain to draw insights into the situation of the area.



The primary study comprised qualitative approaches to data collection and analysis. It involved **in-depth interviews (IDIs)** and **Key-informant interviews (KIIs)** with the stakeholders, like the Plant Operators, Engineers, Restaurants, Hotels, Hospitals, Households, Government officials and implementing partners. In addition to primary data collection,the consultants also studied various project documents as shared, like Total Treated Water for 2021- 23, 45 MLD treatment Plant in Udaipur flows report (2017 - 2023), 20 + 25 MLD STP details in Udaipur Nagar Nigam, 20+ 25 MLD STP Lab Analysis and Production Report for November 2023, and other relevant reports/literature related to the projects. The consultants also studied project implementation-related documents, specifying details of activities carried out, processes undertaken, and number of beneficiaries reached.

Assessment Framework

To determine the relevance, efficiency, coherence, effectiveness, impact, and sustainability of the project, the evaluation used the **RECSS Framework**. Using the **RECSS Framework**, the evaluation was able to assess the HZL CSR Team's contribution to the results while keeping in mind the multiplicity of factors that may have affected the overall outcome.

The social impact assessment hinges on the following pillars:

Sustainability

The extent to which the direct/indirect impact of the intervention continues

Relevance

The extent to which project is geared to respond to the 'felt' needs of the communities

Expectation

The extent of intended and unintended positive (benefits), socio-economic, and culturalchanges have accrued for beneficiaries

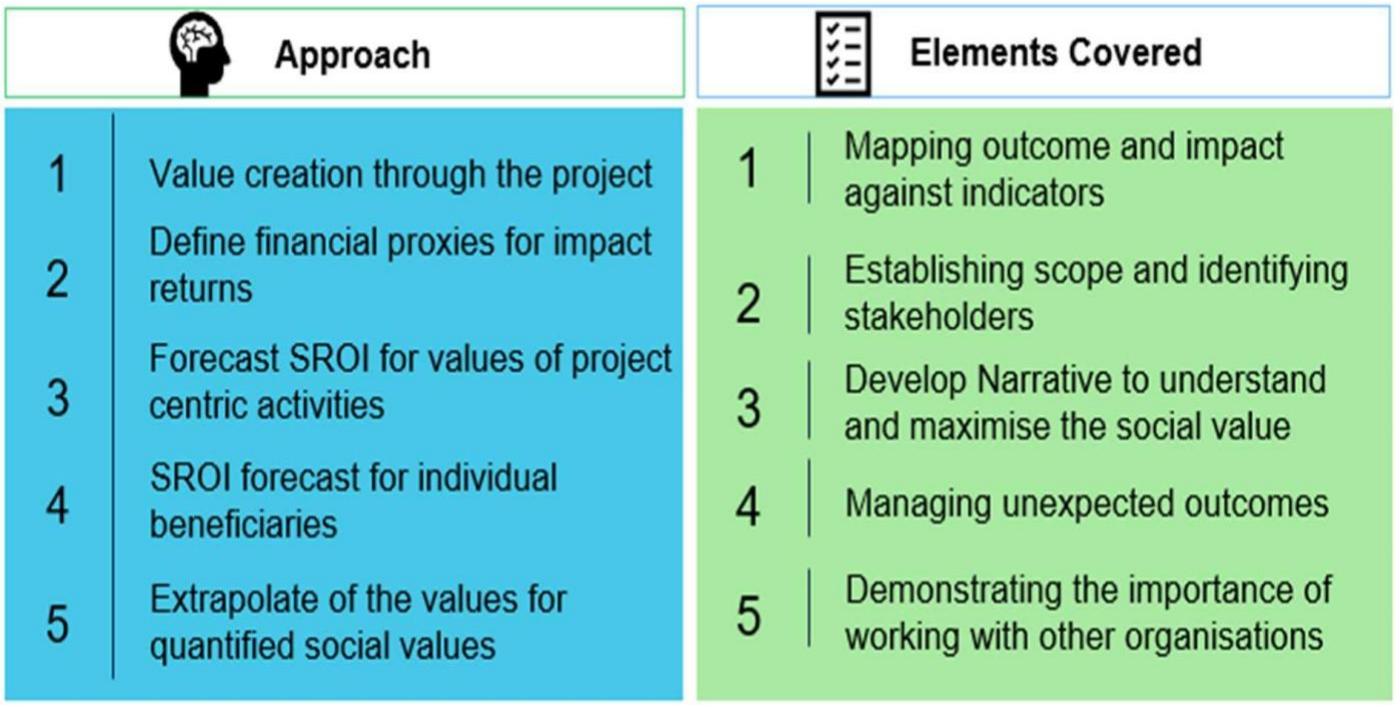
Convergence

Judging the degree of convergence with government/other partners; the degree of stakeholder buy-in achieved

Service Delivery

The extent to which cost-efficient and time-efficient methods and processes were usedto achieve results

CSRBOX created a framework for **Social Return on Investment (SROI)** analysis of the project. The following diagram gives an overview of the SROI evaluation:



SROI will help in understanding the social impact of the programmes on the community. While it is easy to measure the return on investment of an intervention through methods such as cost-benefit analysis etc. It is difficult to impute the value of outcomes for an intervention. However, there are methods which help in imputing values to outcomes. It is a framework to measure and account for the value created by a programme or series of initiatives beyond financial value. It incorporates social, health, environmental and economic costs and benefits. SROI primarily examines the costs that would have been incurred if the intervention had not been implemented.

The usual stages of SROI analysis include:

(i) Establishing scope and identifying key stakeholders;

(ii) Mapping project outcomes with the stakeholders using the theory of change;

(iii) Assigning a financial value to the project outcomes;

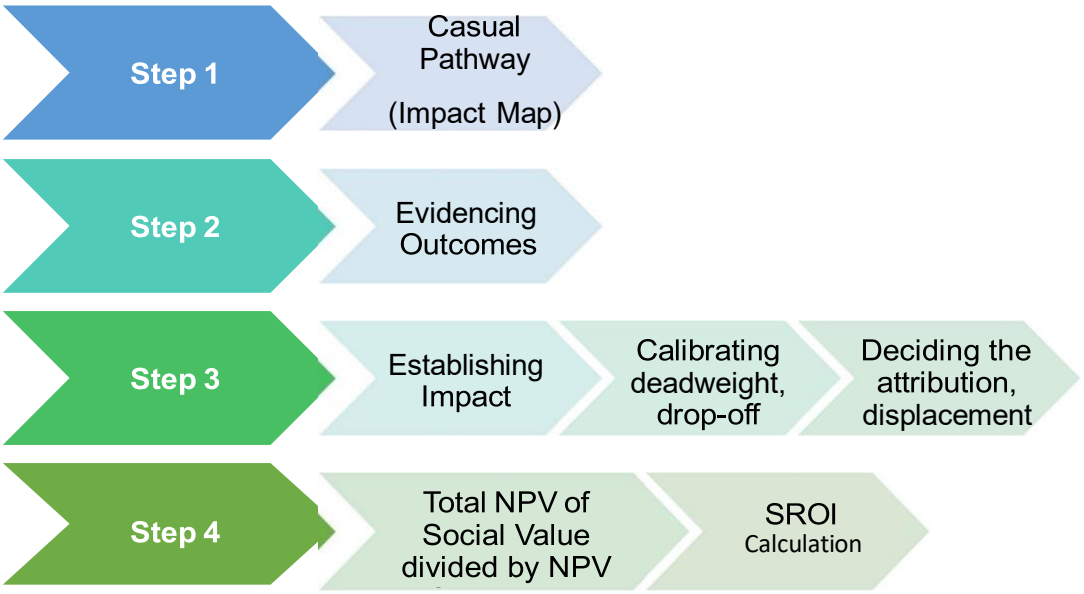
(iv) Establishing project impact from the project end line evaluation;

(v) Calculating inputs to the project;

(vi) Calculating the SROI

It is calculated by adding the **tangible costs (TC)** and **intangible costs (IC)** to the **total investment (TI)** made.

$SROI = (TC + IC)/TI$



Evaluative SROI is estimated. The following data/ information was collected:

1. Programme Cost
2. Overheads and administrative cost
3. Non tangible cost[7]

[7] Appendix-SROI-methodology_ENG.pdf (undp.org)
The-SROI-Guide-2012.pdf (squarespace.com)
(PDF) Social Return on Investment (SROI): a review of the technique (researchgate.net)

The final stage involves adding all the benefits, subtracting any negatives (direct expenses) and comparing the result to the investment. This is also where the sensitivity of the results will be tested. Since the investment and outcomes have happened over the years, to calculate the SROI, the values for the previous years are converted to the **net present value (NPV)**. After the values for both investment and returns are converted to NPV, SROI is calculated by dividing the NPV of benefits by the NPV investments made.

2.4 Sampling

Qualitative Sampling

Detailed interaction with the key stakeholders were conducted to get detailed insights into the impact of the project.

The data was collected from the following stakeholders:

Table 5 - Stakeholder Mapping

S.No.	Stakeholders	Mode of Data Collection	No. of Interviews
1.	People living/having establishments near the STPs (Restaurants, Hospitals, Hotels, Homes)	In-depth Interviews	13
2.	Plant Operators/ In charges/ Engineers	In-depth Interviews	3
Other Stakeholders			
3.	Govt. Officials - UMC	Key Informant Interview	1

**Total interactions varied based on the availability of stakeholders and number of interactions were decided as per interactionswith the HZL CSR team and Implementing Team*

Limitations

It was difficult to conduct and host interactions with domestic-level stakeholders. This was mainly because -
1. Most of the Hospitals, Restaurants, Hotels and Homes denied to have interactions and were not interested in discussing anything. They said that they are busy and won't be able to devote time.

2. Government approvals (the name of UMC, Letterheads or proofs) would have helped in facilitating the interactions to generate a sense of authenticity and reliability.

3. No Hotels available in the vicinity of all 3 STPs.

4. No Restaurants and Hospitals are available in the vicinity of 10 and 45 MLD STPs.

2.5 Theory of Change

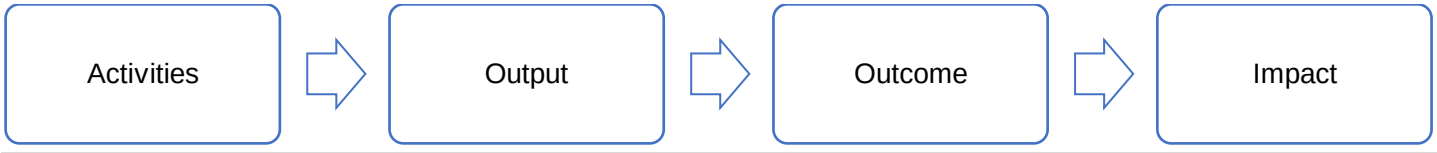


Table 6 - Theory of change

Activities	Output	Outcome	Impact
Setting up of 5 ,10 and 45 MLD STPs in Udaipur	**10 MLD –** From January 2022 – January 2024 There was a decrease in flow of about 23.50% during the inflow and outflow process. About 1-1.5 crore litre of water being treated per day. About 100-200 Kg of average waste generated per month from the STPs in a month. **5 MLD –** From January 2022 – January 2024 There was an increase in the flow of about 40.47% during the inflow and outflow process. On the basis of this, the total average inflow for 15 (5 + 10) MLD STP was 2,78,063.8 MLD. There is about 1 MLD/day of discharge and inflow. **45 MLD** From April 2018 to March 2019, there was about an 18 % increase in average treated water flow discharge. From April 2019 to March 2020, there was a further increase of about 32 % in average treated water flow discharge. From April 2020 to March 2021, there was even a further increase of about 9 % in average treated water flow discharge. From April 2021 to March 2022, there was still an increase of about 22 % in	From Jan 2022 – Jan 2024, **10 MLD** There was a decrease in water flow as total outflow for the given 2 years was less than that of total. **5 MLD** There was an increase in the water flow as the total outflow for the given 2 years was more than that of the total inflow **45 MLD** From April 2017 to March 2022, there was a constant increase in the trend of the average treated water flows. However, post-March 2022, there was a heavy decrease in the trend. Regular and real time monitoring of biochemical parameters on daily basis for parameters such as pH, Temperature, TSS, COD, BOD, TKN as N and Total Phosphorus at the STP inlet and Outlet. Increase in awareness at the domestic level of handling, management and segregation of waste.	• Improvement in water quality of rivers and lakes • Reduction in sewage load discharged into water bodies • Community participation and re-usage of wastewater. • Reduction in waterborne diseases • Proper waste management • Decrease in eutrophication of water bodies • Healthy aquatic ecosystem • Restoration of aesthetic and cultural heritage • Rise in tourism • Lesser frequency of plant malfunction/ failure occurrences • Introduction of nature-based solutions such as aeration through aerobic microbes. • Improvement in water treatment facilities of the city • Control of soil and water pollution of nearby water bodies, sewage flow on roads, etc., • sustainable handling of sewage, • Control of mosquito/vector breeding and disease transmission • safe handling of treated sewage from the plant • safe handling of sludge from the treatment plan — capturing instances of using

	average treated water flow discharge. However, from April 2022 to March 2023, a slight dip of about 10 % in average treated water flow discharge was witnessed. From April 2023 to December 2023, the dip was even more – a heavy dip of about 29 % in the average treated water flow discharge • About 10 -12 tons of waste is generated every day with a volume proportion of 20 % Sludge and 80 % Volume. • The overall area occupied by the STPs is about 4-5 Hectares • About 35-50 MLD of inflow and outflow on an average • About 300-400 M^3 of water from the Chlorine Contact Tank is been reused for gardening purposes. • About 10 Per cent increase in the annual income of STP workers • About 70 per cent of the City's wastewater is being treated by 45 MLD STPs (20 + 25) MLD STPs and the remaining 30 per cent is being treated by 5 and 10 MLD STPs. • Regular technical and safety training every 10-15 days happens for staff and workers.		sludge as soil conditioners or other utility • Improvement in financial stability of staff in STPs

Chapter 3

Benchmarking

Chapter 3 - Benchmarking

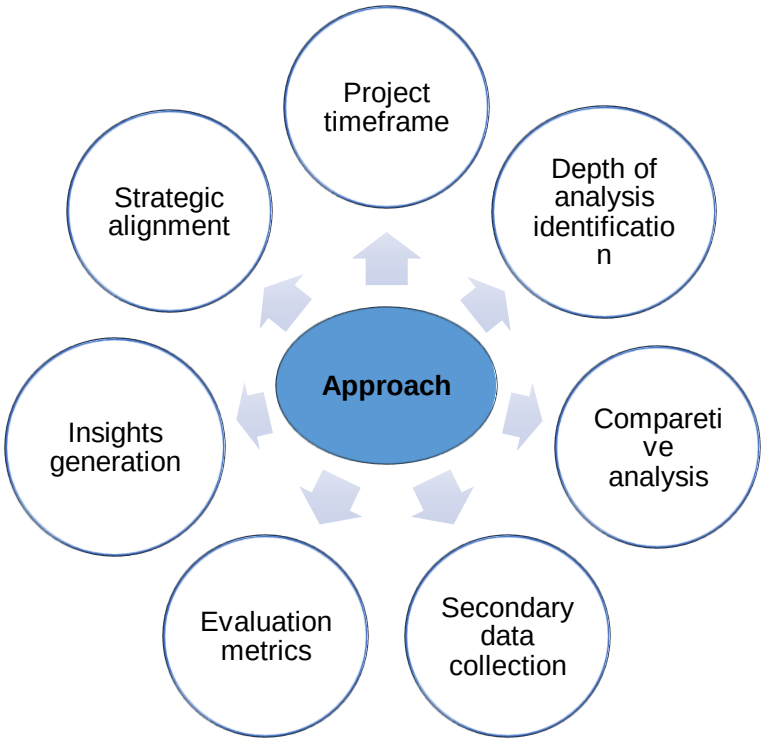
3.1 Introduction to benchmarking

Benchmarking is a process of comparing and measuring an organisation's performance, practices, or outcomes against those of industry leaders or best practices. It involves identifying standards, metrics, or benchmarks that represent the desired level of performance and then assessing how well an organisation or project measures up to these benchmarks.

In the context of CSR projects, benchmarking plays a crucial role in evaluating effectiveness by providing a means to measure performance and progress against established standards or goals. By comparing key indicators, outcomes, or practices with industry benchmarks or recognised best practices, benchmarking helps organisations assess their performance objectively, identify areas for improvement, and make informed decisions to enhance impact.

The purpose of benchmarking within the context of a specific CSR project is to assess its performance, effectiveness, and impact relative to industry standards, peer organisations, or established benchmarks. It allows stakeholders to gain insights into how well the project is achieving its objectives, where it stands compared to others in the field, and what opportunities exist for improvement. Benchmarking helps stakeholders understand the strengths and weaknesses of the CSR project, identify best practices or innovative approaches, and implement strategies to maximise impact and outcomes. Overall, benchmarking provides valuable insights and actionable data to support informed decision-making and continuous improvement in CSR initiatives.

3.2 Approach considered for identification of benchmarking report



1. **Selection Criteria:**
   Five companies operating within the same sector as HZL were chosen. These companies were selected based on their relevance to HZL's operations and their prominence in CSR initiatives.

2. **Timeframe:**
   CSR projects from the years 2020 to 2023 were considered. This three-year period provided a recent and

relevant snapshot of CSR activities, ensuring applicability to current trends.

3. **Depth of Analysis:**
The interventions were subjected to in-depth scrutiny. The focus was on understanding the scope, scale, and impact of CSR projects undertaken by the selected companies within the intervention area.

4. **Comparison Approach:**
Comparative analysis was conducted across the five companies. This comparison allowed for the identification of best practices and emerging trends.

5. **Data Collection:**
Relevant data, including CSR reports, Annual reports, project documents, and other publicly available information, were collected for each company.

6. **Evaluation Metrics**:
Key performance indicators (KPIs) and evaluation metrics were defined for assessing the effectiveness and efficiency of CSR projects. These metrics facilitated a systematic evaluation of project outcomes and impacts.

7. **Insights Generation:**
Insights were generated based on the comparative analysis and evaluation of CSR initiatives. These insights created informed decision-making and strategic planning for HZL's CSR activities, helping to identify areas of improvement and opportunities for innovation.

8. **Strategic Alignment:**
The ultimate goal was to align HZL's CSR strategies with industry best practices and emerging trends, thereby maximising the company's positive impact on society and the environment.

3.3 Comparative Metrics

Companies	Bharat Electronics Limited	Rural Electrification Corporation Limited	Rail Vikas Nigam Limited	Heritage Foods Limited	Rail Vikas Nigam Limited	HDFC ERGO General Insurance Company Limited
Name of the Project	Installation of 2 STP's at BEL Bengaluru Complex	Installation of 300 KLD STP at ACTRAC	Installation of 300 KLD STP at Railway Colony, Gandhidham , Gujrat	Sewage Treatment Plant installation at NTR Memorial Trust	Sewage Treatment Plant Installation at Mathura Railway Station	Sewage Water Treatment Plant at ADHAR Center
Implementation Year	2022	2020-21	2021-22	2023	Ongoing	2023
Location of STP	Bengaluru, Karnataka	Navi Mumbai, Maharashtra	Kutch, Gujrat	Gandipet, Hyderabad	Mathura, Uttar Pradesh	Badlapur, Thane, Mumbai, Maharashtra
Quantity	2	1	1	1	1	1

Capacity	2.7 and 10 MLD	300 KLD scalable to 600KLD	300 KLD	400 KLD	500 KLD	Data Unavailable
Project Purpose	BEL Bengaluru complex has achieved water positive status by way of operating Sewage Treatment Plants (STP) of 2 nos. of cumulative capacity 2.7 MLD and an STP which treats 10 MLD sewage and rejuvenates the local Bangalore Lake. 2 MLD of treated water from 10 MLD STP is used for BEL gardening and other applications that lead to enormous conservation of natural resources and groundwater. The sole effort is to improve flora and fauna, groundwater recharging, and preventing disposal of sewage water in lake.	An electromechanical set up for 300KLD plant scalable upto 600KLD in next 4-5 years. The project also consists of construction and execution of master sewer line throughout the campus	Treats the sewage generated from Gandhidham Railway Station, Gujrat.	This impressive facility can process 400 kilometers of sewage per day (KLD) to achieve 100% treatment for all the sewage generated by the NTR Memorial Trust.	Treats the sewage generated from Mathura Railway Station.	The STP supports 354 Differently abled at ADHAR, a specially abled adult home center near Mumbai.
Allocated CSR Amount for the Project (in Rs)	0.55 Cr.	Data Unavailable	Data Unavailable	Data Unavailable	2.16 Cr.	Data Unavailable
Actual Spent CSR Amount for	0.55 Cr.	2.95 Cr.	3.15 Cr.	0.438 Cr.	2.16 Cr.	0.2 Cr.

the Project (in Rs)						
Percentage of allocated CSR Amount Spent for the Project	100%				100%	
Relevant Theme of Schedule VII	1. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation. 2. Recycling and Waste Management	1. Eradicating hunger, poverty and malnutrition, promoting health care, sanitation & safe drinking water 2. Water Treatment and Recycling	1. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation. 2. Water Treatment & Recycling	17. Others	1. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation 2. Pollution Control measures, and related areas	1. Eradicating hunger, poverty and malnutrition, promoting health care, sanitation & safe drinking water 2. Water Conservation (Rainwater Harvesting, Watershed Management)
Relevant SDGs	SDG 11. Sustainable Cities and Communities	SDG 06. Clean Water and Sanitation	SDG 06. Clean Water and Sanitation	SDG 3 - Good Health and Well Being	SDG 9. Industry Innovation and Infrastructure SDG 11. Sustainable Cities and Communities	SDG 6. Clean Water and Sanitation
High Priority SDGs	SDG 6 - Clean Water and Sanitation (50%)					
Mode of Implementation	Direct Implementation	Through Implementing Partner	Through Implementing Partner	Through Implementing Partners	Through Implementing Partners	Through Implementing Partners
Implementing Partners	No	Tata Memorial Center	RVNL CPM/ ADI - PI-Lo	NTR Memorial Trust	RVNL PIU (PI-LO)	Association of Parents of Mentally Retarded Children, Mumbai (ADHAR)

Implementation Mode Proportion	83% Indirect – through Implementing Partners 17% Direct Implementation					
Any Collaborations with Government?	No	No	No	No	No	No
Reference	Integrated-Annual-Report-2022-23.pdf (ntc-us.com)	13-BRSR-FY-2022-23.pdf (recindia.nic.in) https://actrec.gov.in/sites/default/files/2021-03/technical_specifications.pdf	Annual_Report_on_CSR_Activities_FY_2021-22.pdf (rvnl.org) https://www.pi-lo.in/pmtr-stps/	Dr. Sambasiva Rao IAS(Retd), President of HFL, inaugurated a Sewage Treatment Plant at NTR Educational Institutions in Gandipet, Hyderabad. – NTR TRUST	20th_AGM_Notice_and_Annual_Report.pdf (rvnl.org)	annual-report-on-csr-2022-2023.pdf (hdfcergo.com)

3.4 Key inferences from the Metrics

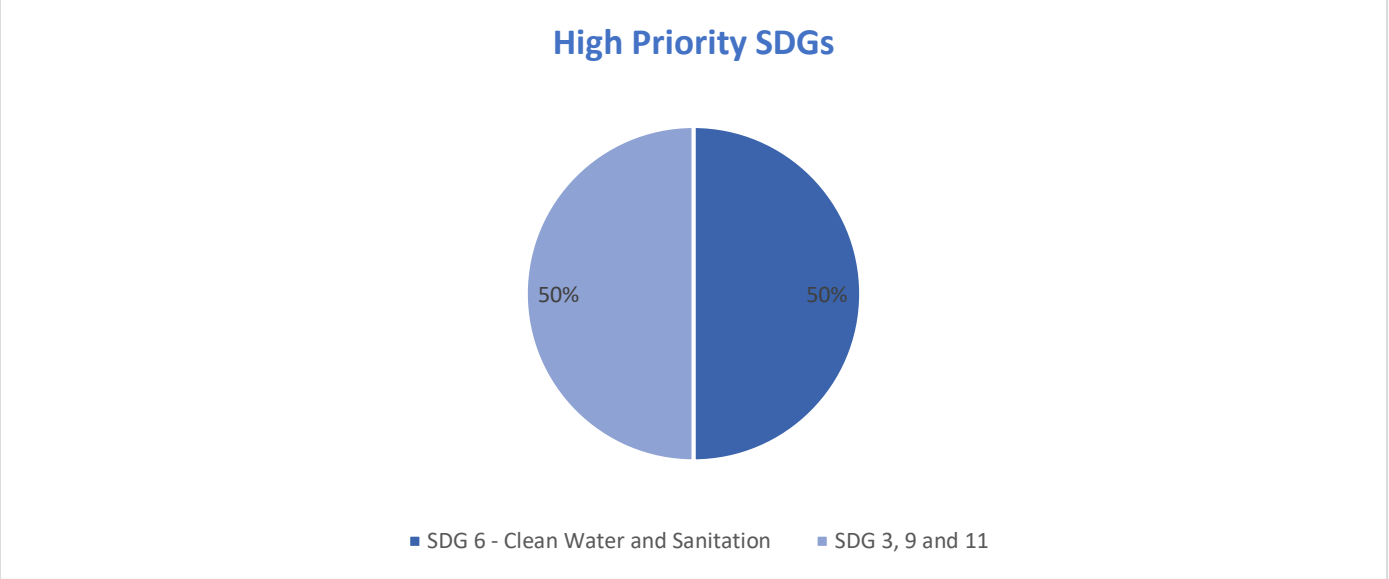
The key inferences from metrics are listed below –

A. Number of Projects = 6

Hindustan Zinc Limited competes with its key competitors such as **Bharat Electronics Limited, Rural Electrification Corporation Limited, Rail Vikas Nigam Limited, Heritage Foods Limited** and **HDFC ERGO General Insurance Company Limited.** The competitors are working on similar CSR projects in the same thematic area.

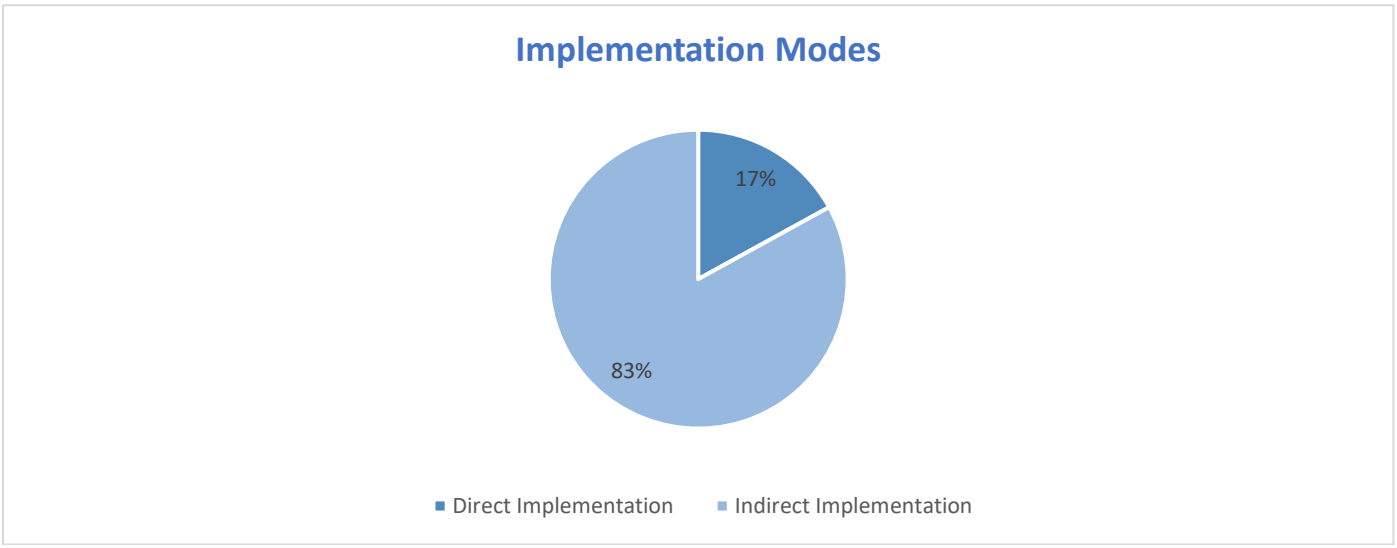
B. High-Priority SDGs of the Projects

50 % of the interventions are deeply involved in operationalizing the STPs installed for sewage treatment and water conservation and hence closely align with **SDG 6 - Clean Water and Sanitation.**



C. Implementation Modes of the Projects

In 83 per cent of the indirect implementations, the interventions are executed either through the foundations of the company itself or through the external NGO partners.



D. Company wise inference-

1. Bharat Electronics Limited

- BEL Bengaluru complex has achieved water positive status by way of **operating 2 Sewage Treatment Plants (STP)** of cumulative capacity **2.7 MLD** and an STP which **treats 10 MLD sewage** and rejuvenates the local Bangalore Lake. **2 MLD of treated water from 10 MLD STP is used for BEL gardening** and other applications that lead to enormous conservation of natural resources and groundwater. The sole effort is to improve flora and fauna, groundwater recharging, and preventing disposal of sewage water in lake.
- The project was implemented in **Bengaluru, Karnataka**
- The project was implemented and completed in **FY 2020-21** through the complete use of the allocated CSR amount.
- The project closely aligns with **SDG 11 - Sustainable Cities and Communities**
- The project also aligns with themes of **Schedule 7 –**

a. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation.
b. Recycling and Waste Management.

2. Rural Electrification Corporation Limited

- The support of the intervention was to set up an electromechanical set up for **300KLD plant scalable up to 600KLD in next 4-5 years**. The project also consists of construction and execution of master sewer line throughout the campus
- The project was implemented in **Navi Mumbai, Maharashtra**
- The project was implemented and completed in **FY 2021-22.**
- The project closely aligns with **SDG 6 – Clean Water and Sanitation**
- The project also aligns with themes of **Schedule 7 –**

a. Eradicating hunger, poverty and malnutrition, promoting health care, sanitation & safe drinking water.
b. Water Treatment and Recycling.

Rail Vikas Nigam Limited

- Rail Vikas Nigam Limited supported in installation of the **300 KLD STP** to treat the sewage generated from Gandhidham Railway Station, Gujrat.
- The project was implemented in Kutch, Gujrat
- The project was implemented and completed in **FY 2021-22.**
- The project closely aligns with **SDG 6 – Clean Water and Sanitation.**
- The project also aligns with themes of **Schedule 7 –**

a. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation.
b. Water Treatment and Recycling.

Heritage Foods Limited

- The STPs installed can process **400 kilometers of sewage per day (KLD)** to achieve 100% treatment for all the sewage generated by the NTR Memorial Trust.
- The project was implemented in Gandipet, Hyderabad.
- The project was implemented and completed **in FY 2022-23.**
- The project closely aligns with **SDG 3 – Good Health and Well Being**

Rail Vikas Nigam Limited

- Rail Vikas Nigam Limited supported in installation of **the 500 KLD STP** to treat the sewage generated from Mathura Railway Station.
- The project was implemented in Mathura, Uttar Pradesh
- The project is for **FY 2022-24 and is ongoing.**
- The project closely aligns with **SDG 9 – Industry, Innovation and Infrastructure and SDG 11 – Sustainable Cities and Communities**
- The project also aligns with themes of **Schedule 7 –**

a. Ensuring environmental sustainability, ecological balance, wildlife & natural resources conservation.
b. Pollution Control Measures and Related areas

HDFC ERGO General Insurance Company Limited

- The STP installed supports the needs of 354 Differently abled at ADHAR, a specially abled adult home center near Mumbai.
- The project was implemented in **Badlapur, Thane, Mumbai, Maharashtra**
- The project was implemented and completed **in FY 2022-23.**
- The project closely aligns with **SDG 6 – Clean Water and Sanitation.**
- The project also aligns with themes of **Schedule 7 –**

a. Eradicating hunger, poverty and malnutrition, promoting health care, sanitation & safe drinking water.
b. Water Conservation (Rainwater Harvesting, Watershed Management).

Chapter 4

Impact Findings

Chapter 4 – Impact Findings

4.1 Impact Findings

CSRBOX followed the criteria of the **RECSS evaluation** system for international development projects based on **Relevance, Expectation, Convergence, Service Delivery, and Sustainability**. These assessments aim to ensure that projects align with actual needs, achieve intended goals, utilise resources efficiently, have lasting positive effects, and harmonise with broader development strategies. The evaluation process enhances accountability, informs decision-making, and facilitates continuous improvement in international development efforts.

4.1.1 Relevance

Udaipur has a rich historical heritage, boasting numerous lakes and lush greenery, which adds to its aesthetic appeal and cultural significance, making it a popular tourist destination. However, the city faces a significant challenge in treating the approximately 70 million litres of sewage it generates daily. The majority of this sewage was previously discharged into the Ayad River, resulting in a decline in water quality and adversely affecting both human and aquatic life.[8].[9].

To address and manage the pollution load of city waste
To improve the quality of Ayad River water
To avoid cases of water borne diseases and infections
To help in conservation of aquatic life
To maintain aesthetic beauty

On interacting with Government officials and the Implementation team, it was known that prior to the intervention, the lands occupied by the STPs were barren, and all the wastewater from domestic city waste was being directly disposed of into the Ayad River. This was **deteriorating the quality of the Ayad River** as well as posing a threat to the urban ecosystem and human well-being. The river was acting as the **breeding ground for disease-causing vectors** as well as the reason for a number of water-borne diseases.

The UMC, hence, wanted an organisation to treat the city's wastewater to improve the quality of the Ayad River. For this, HZL wished to use the freshwater from UMC to run their STPs as well as join UMC in its mission of treating Udaipur's raw sewage and wastewater. This interdependency between UMC and HZL resulted in this intervention.

[8] Case-Study-Hindustan-Zinc.pdf (indiasanitationcoalition.org)

[9] Hindustan Zinc treating 30 percent of Udaipur's sewage (business-standard.com)

Figure 2 - Domestic sewage and waste water disposing into Ayad river

The intervention is a key change maker in **the effective management and treatment of the city's wastewater load**. The intervention is helping in the conservation of the Ayad River **and safeguarding our urban ecosystem**. This helps in the **well-being of aquatic flora and fauna** as well as **stabilising the ecological balance for environmental sustainability**. The intervention is saving a lot of freshwater and maintaining the integrity of the aesthetic beauty of the city.

4.1.2 Expectations

Awareness for management and safe handling of waste

The intervention has led to an in increase in awareness among the residents and communities for proper and safe handling and management of waste at their homes and workplaces. The city waste is usually collected through the **UMC Waste collection vehicle,** which eventually disposes of all the waste into an authorised Balicha dumping ground.

> *'We keep handwashes and sanitisers at all places in our restaurant. All the waste is properly segregated in our dustbins'.*
>
> - *A restaurant owner in vicinity of 10 MLD STP*

More than 80 per cent of city's waste water is connected and treated by STPs
About 1-1.5 crore litre of water being treated per day by 10 MLD STP
About 1 MLD/day of discharge and inflow by 5 MLD STP
About 300-400 M3 of water is being reused for gardening purpose in 45 MLD STP
About 35-50 MLD of inflow and outflow in 45 MLD STP
About 10 % increase in the annual income of the plant staffs
About 70 % of city's wastewater is being treated by 45 MLD STP
Conservation of river and aquatic life
Increase in awareness among the residents and communities for proper handling, segregation and management of waste

Streamlined process for Collection and Channelisation of Domestic Wastewater to STPs

The USCL has streamlined the process of collection and channelisation of wastewater from different domestic households, hotels, restaurants and hospitals. The USCL have installed and connected infrastructural pipelines to each of the domestic places for the channelisation of their wastewater. This pipeline straightaway connects the city's wastewater to the 3 STPs installed by HZL. **About 70 per cent** of this goes to the 45 MLD STPs, and the remaining **30 Percent goes** to the 5 and 10 MLD STPs for treatment. **More than 80 per cent** of city waste is connected and treated by STPs. This is subject to the extent to which the USCL has laid down the pipeline infrastructure in cities for the collection and channelisation of city wastewater.

> *'Our homes are connected through sewerage pipes installed by UMC to channelise our home's wastewater to STPs'.*
>
> - *A resident in vicinity of 5 MLD STP*

Improvement in the quality of Ayad River

Regular biochemical parameters monitoring at both the inlet and outlet of STPs ensures the disposal of treated water into the Ayad River. This has helped in the improvement of the quality of the Ayad River, which is helping in the **conservation of aquatic life.** The intervention has helped **support and treat the city's waste load pressure**.

4.1.3 Convergence

Award and Recognition

STPs have been visited **by Rajasthan's Chief Minister** as well as many dignitaries. There were presentations given by HZL team while hosting them in workshops. Udaipur city has been honored with **Swachh Survekshan Award for the intervention by government of India.**

'The STPs set up by HZL are becoming role models. City has been honored with **Swachh Survekshan Award** *from this intervention. The intervention is improving the aesthetic quality of Ayad river which is becoming an attraction for tourists' .*

- **UMC**

Alignment with National Priorities

The programme intervention of Hindustan Zinc Limited closely aligns with 3 major National level policies, namely the **Centrally Sponsored Scheme of National River Conservation Plan (NRCP), the Atal Mission for Rejuvenation & Urban Transformation (AMRUT) and Smart Cities Mission of the Ministry of Housing & Urban Affairs**

Alignment with SDGs

Alignment with CSR Policy

Eradicating hunger, poverty, and malnutrition, promoting health care, including preventive health care and sanitation, including contribution to the Swachh Bharat Kosh set up by the Central Government for the promotion of sanitation and making available safe drinking water

Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of naturalresources, and maintaining the quality of soil, air, and water

Alignment with ESG Principles and Framework

Partners involved

The project receives full funding from Hindustan Zinc Limited with support from the Udaipur Municipal Corporation. Additionally, other partners are also involved in the intervention.

Table 7 - List of the partners involved in the intervention

S.No.	Name of the Partner	Type of Partnership	Responsibilities
	Thermax	Implementing Partners	Staff of Thermax operates and manages 45 MLD STP **Approximate Team Size –** 38 engineers
	Nalco Water	Implementing Partners	Staff of Nalco Water operates and manages 5 and 10 MLD STP **Approximate Team Size –** 12 engineers for 5 MLD and 12 engineers for 10 MLD
	Compass Water Solutions	3rd Party Payroll	Salaries paid to the staff of 5 and 10 MLD STP
	DS Enterprises	3rd Party Payroll	Salaries paid to the staff of 45 MLD STP

4.1.4 Service Delivery

STP Layout Plan

Figure 3 - Blue print of 5 and 10 MLD STPs

STP Process and Functioning

The below-mentioned processes are generalised steps followed by all the STPs. In a few places, the processes differ and are complex in 45 MLD STP Plant, which will be highlighted.

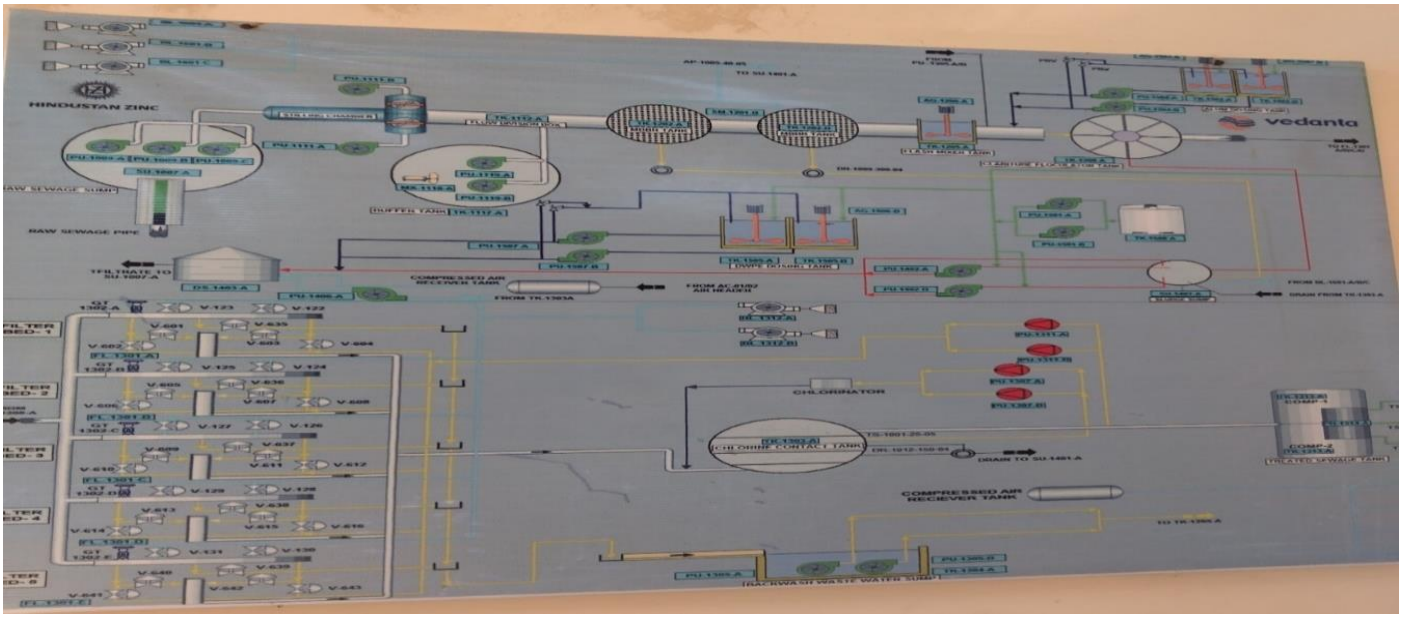
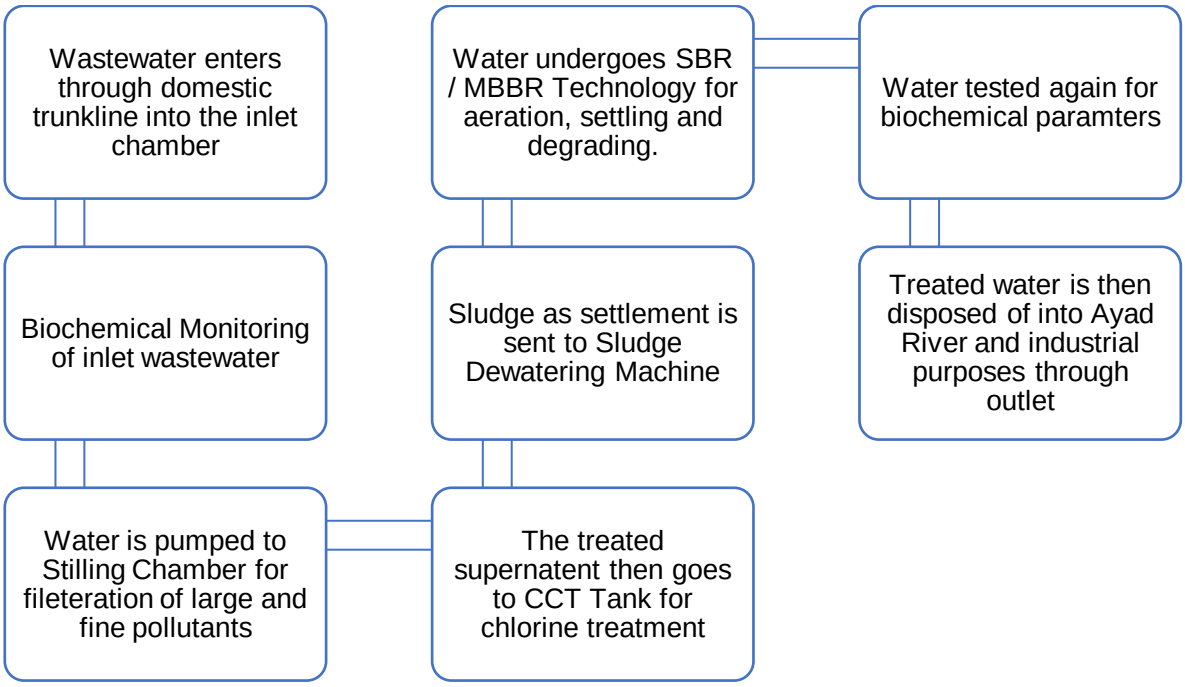


Figure 4 - Basic flow chart of the flow of the process

The domestic wastewater initially enters the **inlet chamber** of STPs through the trunkline and collection pipes installed and connected by USCL.

Figure 5 - Waste water entering the STP through inlet

Before going to the main pumping station, the water is tested **for biochemical parameters** such as **pH, Temperature, TSS, COD, BOD, TKN as N and Total Phosphorus.**



The water then goes to the **main pumping station,** which pumps the water to the **stilling chamber**. The stilling chamber has a **fine screen bar** which filters the larger pollutants, organic pollutants and particles present in water. The stilling chamber also has a **grit separator and grit classifier,** which also helps in the removal and separation of large particles or sludge from water as a settlement. There is a fine chamber which separates and removes fine particles and pollutants from the water. The stilling chamber helps in reducing the pressure of the flow of water. The pollutants separated are manually collected by the workers and disposed of in the **waste collection vehicle.**

Figure 6 - Stilling Chamber helping in filtration through Grit separator and classifier

The water then moves through motorised walls moves and divides into **SBR 1 and SBR 2 tanks** for the **Sequencing Batch Bioreactor (SBR) Technology**. In both SBR 1 and 2, the supernatant water undergoes a **4-hour cycle,** which includes **2 hour aeration, 1 hour settling of and 2 hours of degrading**. Alternatively, in 45 MLD STP, in the place of SBR Technology, there is **Moving Bed Biofilm Reactor Technology (MBBR)**. Similar to SBR, in this system, the effluent is divided into two tanks: MBBR1 and MBBR2.

Figure 7 - SBR and MBBR Technology

In **aeration,** the **aerobic microbes** feed on or degrade the **organic matter** present in water. The aeration happens through the **diffusers** present at the bottom of the aeration tank. The organic matter is food for the aerobic microbes, and hence, feeding on the organic matter by microbes in a way helps in getting rid of the organic pollutants present in water. The **blowers** are used to provide aeration to water. The frequency of blowers is altered depending on the frequency of water received.

Figure 8 - Aeration happening through diffusers

The sludge generated as settlement is sent to a **sludge dewatering machine,** where the sludge is dried and dewatered and then disposed of into the waste collection vehicle.

Figure 9 - Sludge dewatering unit and process

Before going to the **Chlorine Contact Tank (CCT),** additionally, in the 45 MLD treatment plant, water is subjected to **polyelectrolytes, alum dosing and sand filtration** (including sand beds, charcoals) used for enhanced and further cleaning and filtration of the water.

Figure 10 - Sand filtration and Alum Dosing

The treated supernatant then goes to a Chlorine Contact Tank (CCT) where **Chorine dosage** is provided to water to kill and get rid of bacteria, germs, algae and coliforms present. In 5 MLD STP, **bleaching powder** is used as an alternative to chlorine to prevent and avoid health hazards and risks associated with chlorine gas leakage.

Figure 11 - Chlorination happening in CCT Tank

Before disposing of the treated water in Ayad River, the water is tested again for biochemical parameters to check if the values after treatment are coming out within standard acceptable permissible limits. The monitored data is also shared with the **Central Pollution Control Board (CPCB).**

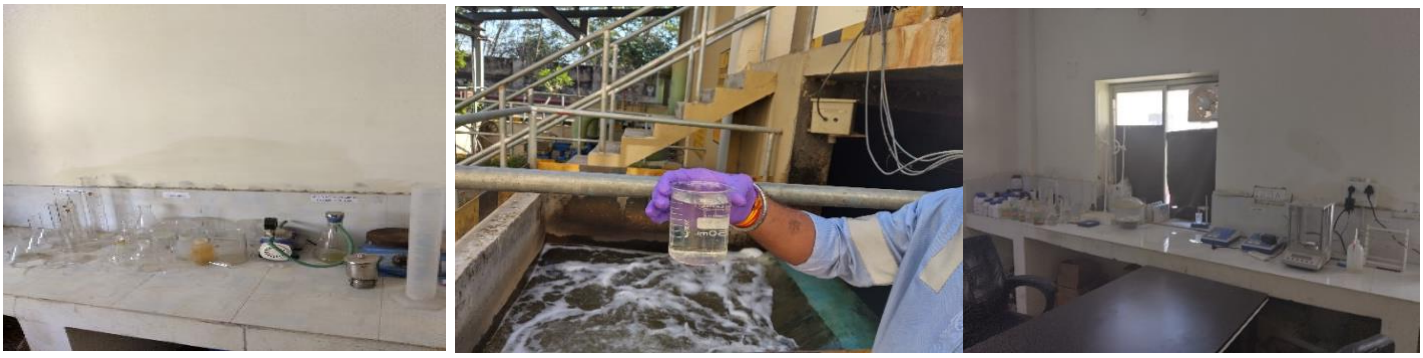


Figure 12 - Biochemical testing prior treated water disposal

Additionally, in 45 MLD, about 5 MLD of treated water is being disposed of into the Ayad River, and 40 MLD of treated water is being used for industrial purposes in Debari and Dariba.

Figure 13 - Treated water disposed into Ayad river and for industrial purposes

Operations, Health and Safety

Health and Safety

All the STPs have proper legal compliance, frequent safety and technical training for staff and regular auditing/ physical visits by senior officials of HZL, UMC and USC.

There is availability **of fire extinguishers, first aid kits, and smoke detectors** to comprehend, support and maintain the health and safety standards in all the STPs.

Figure 14 - Fire control and safety measures in STPs

There are **clear evacuation plans, emergency response plans and emergency contact numbers** available in cases of emergencies.

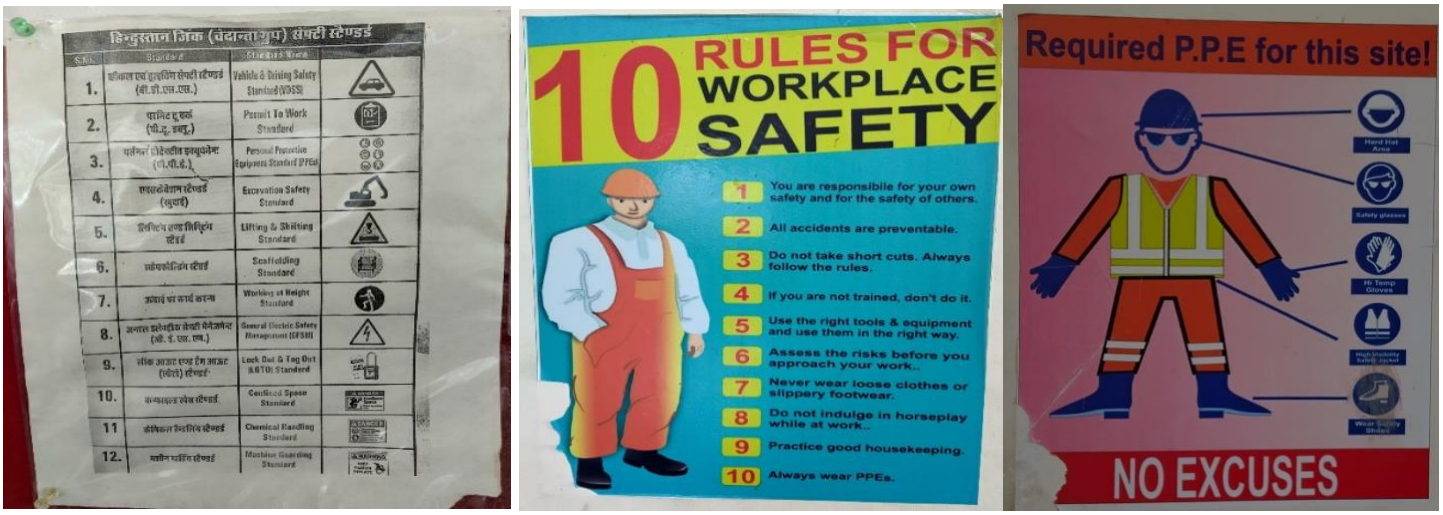


Figure 15 - Safety instruction for the staffs

The staff is equipped with **proper safety uniforms.** They wear **helmets, masks, jackets and boots** at all times.

Figure 16 - Safety kits for the Staffs

The technical and safety training happens in every **10-15 days for staffs** and workers of STPs. The audits happen **2-3 times a month.**

Frequent and Regular Technical and Health & Safety Trainings for workers and Staffs
Adequate and proper Health and Safety Standards are maintained
Availability of proper first aid kits and safety uniforms
Availability of clear evacuation, emergency response plan and POC
Availability of Emergency equipments - fire extinguishers, smoke detectors
Power backup support available for uninteruppted round the clock operations

Uninterrupted Operations

The services and operations in all the STPs are uninterrupted and run **round the clock** due to the **power backup support available**. All **the STPs are automated**, and operations are usually conducted from a single place through a common server system. The minor repairs are fixed promptly. For maintenance purposes, the breakdown of STPs happens only after approval, which usually lasts for 3-4 days.

Figure 17 - Power Backup supporting round the clock operations for STPs

4.1.5 Sustainability

Water Reusage and Waste Management

The water in STPs is reused for **gardening purposes, fire safety purposes and chemical preparations**. The 45 MLD STP has its waste transportation vehicle, which disposes of the waste to **Balicha Dumping Ground**. While handling the waste, proper segregation happens into categories of **liquid and dry waste.**

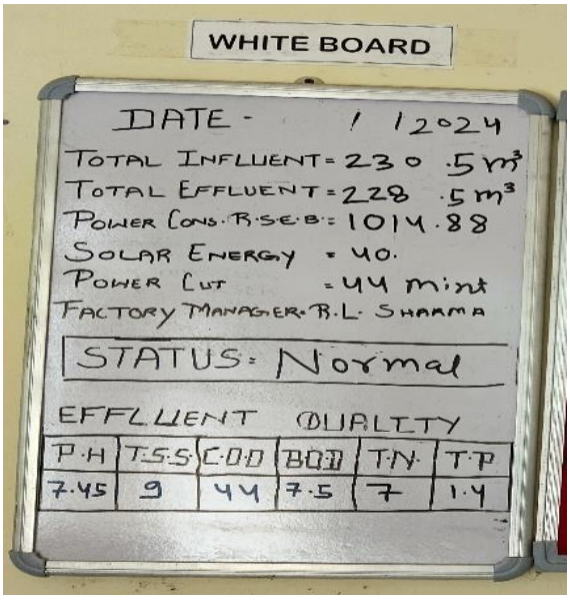
Ecosystem Well-being

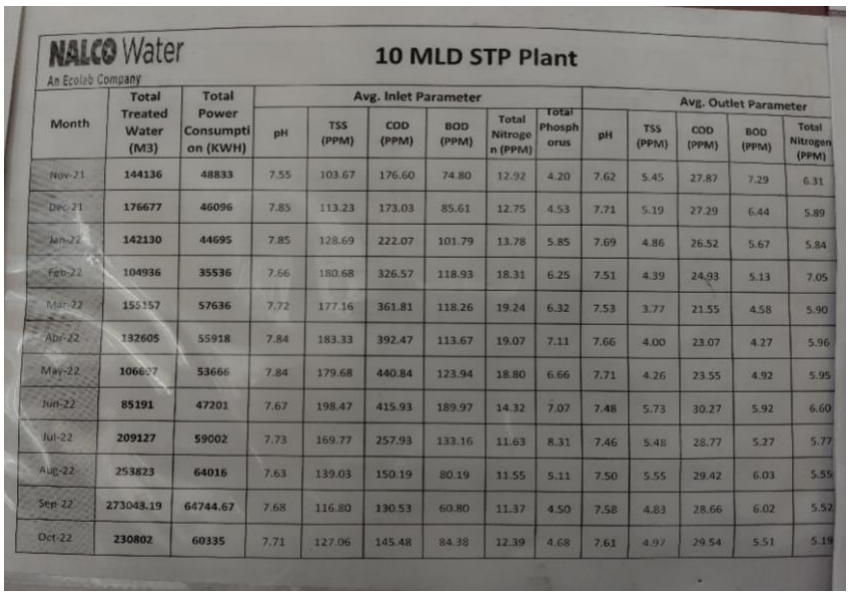
The treated water from STPs is improving the quality of Ayad River water as well as the quality of aquatic life. There are no emissions in air generated at any stage of the process and no contamination of groundwater and land involved.

- Water reusability in gardening, firesafety and chemical preperations
- Adoption of waste management and handling good practices
- Safeguarding of urban ecosystem and aquatic life
- Regular monitoring of biochemical parameters
- Management of hazardous chemicals
- Generation of employment opportunities

Biochemical Monitoring

All the STPs have proper laboratory facilities to analyse some of the key biochemical parameters such as **pH, Temperature, TSS, COD, BOD, TKN as N** and **Total Phosphorus.** These parameters are monitored both at the inlet as well as at the **outlet level** before disposing of treated water into the Ayad River. The monitored data is shared with CPCB in real time. The treated water is only disposed of into the river once the monitored levels of parameters adhere to or are within standard permissible limits.




NALCO Water
An Ecolab Company

10 MLD STP Plant

Month	Total Treated Water (M3)	Total Power Consumption (KWH)	Avg. Inlet Parameter						Avg. Outlet Parameter				
			pH	TSS (PPM)	COD (PPM)	BOD (PPM)	Total Nitrogen (PPM)	Total Phosphorus	pH	TSS (PPM)	COD (PPM)	BOD (PPM)	Total Nitrogen (PPM)
Nov-21	144136	48833	7.55	103.67	176.60	74.80	12.92	4.20	7.62	5.45	27.87	7.29	6.31
Dec-21	176677	46096	7.85	113.23	173.03	85.61	12.75	4.53	7.71	5.19	27.29	6.44	5.89
Jan-22	142130	44695	7.85	128.69	222.07	101.79	13.78	5.85	7.69	4.86	26.52	5.67	5.84
Feb-22	104936	35536	7.66	180.68	326.57	118.93	18.31	6.25	7.51	4.39	24.93	5.13	7.05
Mar-22	155157	57636	7.72	177.16	361.81	118.26	19.24	6.32	7.53	3.77	21.55	4.58	5.90
Apr-22	132605	55918	7.84	183.33	392.47	113.67	19.07	7.11	7.66	4.00	23.07	4.27	5.96
May-22	106607	53666	7.84	179.68	440.84	123.94	18.80	6.66	7.71	4.26	23.55	4.92	5.95
Jun-22	85191	47201	7.67	198.47	415.93	189.97	14.32	7.07	7.48	5.73	30.27	5.92	6.60
Jul-22	209127	59002	7.73	169.77	257.93	133.16	11.63	8.31	7.46	5.48	28.77	5.27	5.77
Aug-22	253823	64016	7.63	139.03	150.19	80.19	11.55	5.11	7.50	5.55	29.42	6.03	5.55
Sep-22	273043.19	64744.67	7.68	116.80	130.53	60.80	11.37	4.50	7.58	4.83	28.66	6.02	5.52
Oct-22	230802	60335	7.71	127.06	145.48	84.38	12.39	4.68	7.61	4.97	29.54	5.51	5.19

Figure 18 – Regular Monitoring of Biochemical Parameters

Hazardous Chemical Management

Proper management of hazardous chemicals happens in laboratories. For handling chemicals, there are **specific guides and safety kits available in laboratories**. **Trained and qualified experts and lab technicians** are involved in the entire process.

Creation of Employment Opportunities

The STPs are involved in creating employment opportunities. The staff and operators realised that there has been **professional as well as educational growth in their careers**. Workers have gained a lot of technical knowledge and skills and realised to be in a better position and place professionally.

'This intervention has led to our personal and professional growth. Our learning curve has immensely increased. Grateful to HZL for all the support'.

- ***Engineers and Plant Operators, STPs***

Chapter 5

Social Return on the Investment (SROI)

Chapter 5 – Social Return on the Investment (SROI)

Social Return on Investment (SROI) is a framework used to measure and understand the broader value created by an organization or project, going beyond just financial returns. It provides funders with insight into the monetary value of the social and environmental benefits generated by the initiative. Going beyond standard financial measures of economic return, SROI captures both social and financial value. Here, the social value created has been computed based on the potential outcomes of the Sewage Treatment Plant project. The data has been sourced from the primary survey and secondary references.

INR 6.17 social value generated on investment of INR 1

The assessment period for computing the SROI values is from 2018-23. The SROI value highlights the potential social value created by the intervention. The computation of the input costs is limited to the administration and management costs and doesn't include the capital cost and pipeline infrastructural costs associated with the STPs and the sewage network of the city.

Stakeholders	Indicators	Rationale	Proxy Estimation	Source
Local Communities and Residents	Savings in healthcare cost	The operation of STPs is resulting in reduced episodes of water borne diseases which thereby is resulting in savings on the treatment costs incurred for the same by local community.	No of incidences of WASH related illness	Secondary Research
	Job creation	The intervention is creating and providing the community with better job prospects for their professional and financial growth	No of employment created	Primary Research
Government Agencies and Municipal Authorities	Reduced costs for wastewater treatment	The intervention is resulting in the reduction in the cost of wastewater treatment incurred by the government and municipal authorities before the intervention.	Reduction in cost of waste water treatment	Secondary Research
	Avoided costs related to environmental damage - aquatic ecosystems and biodiversity	The intervention is resulting in the savings on river conservation and environmental projects by the government due to the release of treated wastewater into water bodies.	Cost of rejuvenation of the Ayad river	Secondary Research
	Potential for increase in tourism around water bodies	The STPs are improving the scenic and aesthetic beauty of the city of lakes. The intervention is resulting in the rise in riverfront tourism.	No of tourists visiting Udaipur city	Secondary Research

Industrial and Commercial Entities	Reduced cost in raw water	The 45 MLD STP is supplementing the manufacturing industries with treated wastewater for their industrial use which is resulting in the decrease of cost incurred by the industries in buying raw water.	Cost of raw water	Secondary Research
Health Departments and Public Health Agencies	Avoided stress on health care system	The intervention is resulting in decline in number of cases for water borne diseases which is reducing the stress on healthcare system of the city	No of incidences of WASH related illness	Secondary Research

SROI Calculation

Social Return on Investment for the period 2018 - 2023	
Total Input Cost	INR 2,004,756,000
Net Present Value (NPV)	INR 10,357,260,635.6
SROI	**6.17**

Chapter 6

Recommendations and Way Forward

Chapter 6 – Recommendations and Way Forward

1. **Exploring more options for water reuse -** While the STPs currently reuse water for gardening, fire safety, and chemical preparation, there is potential for further exploration of recyclable options. Implementing water conservation and harvesting approaches and structures on STP premises could be beneficial. Additionally, exploring options for water usage in toilets is recommended.

2. **Waste handling and Management -** It is suggested that the vehicle transporting the waste should be properly covered to avoid spillage or foul odour for the city's wellbeing. The waste collectors should collect waste with a complete safety uniform comprising gloves and masks.

3. **Opening scope for CSR Activities** - The region surrounding the 45 MLD STP is a remote and village area. It is suggested that the region can be included as part of HZL's CSR Activities. Providing **water to the agricultural fields** in the vicinity can open another option for reusing water.

4. **Buffer Tank Requirement for 45 MLD STP –** In order to store the excess water for later treatment, it is suggested to have a Buffer tank for 45 MLD STP. This will further **increase the capacity** of the plant and will avoid wastage of excess water. The 45 MLD STP roughly treats 70 % of the city's waste, and hence buffer tank can be useful for this plant.

5. **Odour and Noise Control -** The homes adjacent to 45 MLD STP showed their grievance of smelling foul odour from the STP. One of the respondents was a worker of 45 MLD STP. The family complained hearing noises of the processes running in STP, specifically at night, which sometimes disturbs their sleep. It is suggested that proper management practices for **odour control and noise minimisation** should be adopted for the well-being of the homes in the vicinity. Some suggestive ways are as follows –

Noise Control[10]

- **Noise monitoring and assessment –** This comprehensive assessment can help in identifying and controlling noise sources and their impact on the community. This will help in developing effective management strategies.
- **Engineering Solutions –** The noise from the source can be stopped by using techniques such as **noise-attenuating materials, sound barriers, mufflers, silencers, acoustic baffles and acoustic enclosures** to absorb and contain noise. Also, using vibration isolation systems can minimise noise transmission.
- **Rescheduling Operations –** It is suggested to run, schedule and distribute operations throughout the day. The operations should be avoided at sensitive time periods such as at night or early morning.
- **Community Engagement –** Address the challenges of the community through regular feedback and survey meetings.

Odor Control[11]

- **In the primary treatment area – Hydrogen Sulphide** is the main reason for the foul odor. This can be controlled or minimised by using **vapour or fan systems** at the Bar screens and digestors.
- **Covering Sludge –** The dry sludge isolated from the sludge dewatering process should be properly covered. It should be subjected **to biochemical treatment** to curb foul odour.
- **Investing in technologies – Fan or nozzle atomisation systems and vapour phase technology** are useful in removing odors. Vaporisation creates small particle sizes to increase the surface area of the odour control method, which increases your chances of odour control.

6. **Streamlining wastewater collection channels -** It is suggested that USCL should complete, fix and **streamline the pipe connections for all the domestic places** to channel their wastewater to STPs. Currently, there are still houses where the pipe connections are non-functional, and the wastewater from their homes is being

[10] Community Impact of Sewage Treatment Plant Noise Pollution (netsolwater.com)
[11] Odor Control in Wastewater: What's Right for Your Site | WaterWorld

disposed of into nalas, which are eventually disposed of in the Ayad River. For the existing pipe connections, there are some pipes subjected to breakage and leakage. This hinders the transportation of wastewater to STPs and results in the blockage and overflow of the local nalas on roads.

Figure 19 - Waste water leakage in nalas

7. **Awareness about the intervention -** It is suggested to **increase the awareness among the people** in the city about the intervention through advertisements or awareness drives. Most of the places were unaware of the intervention.

8. **Health and Safety in CCT** - It is suggested to have **proper care and safety while working in CCT**. The chlorine gas is dangerous and harmful to inhale and hence should be treated as a health hazard for people in the near vicinity of STPs. If possible, alternates of chlorine should be explored and used. The table below describes the toxic effects of chlorine –

Table 8 - Toxic effects of chlorine at specific concentration levels

Toxic Effects of Chlorine[12]	
Chlorine Concentration	**Effects**
0.03 - 0.1 ppm	Range of odour threshold
1 - 3 ppm	May cause mild irritation to eyes, nose, throat

[12] Chlorine_Document.doc (live.com)

3 - 5 ppm	Stinging or burning in eyes, nose, throat. May cause headache, watering eyes, sneezing, coughing, breathing difficulty, bloody nose and blood-tinged sputum.
5 - 15 ppm	Severe irritation of eyes, nose, throat and respiratory tract
10 ppm	Immediately Dangerous to Life & Health (IDLH)
30 - 60 ppm	Immediate breathing difficulty resulting in pulmonary edema, possibly causing suffocation and death.
430 ppm	Lethal after 30 minutes.
1000 ppm or more	Fatal after a few breathes

Impact Stories

Impact Stories

Testimonials

Great initiative, but the status of pipe connections can be improved. Currently, the wastewater from our homes is being disposed of in the Ayad River. There are pipes, but are not connected to STPs.

- *A resident in vicinity of 5 MLD STP*

There needs to be awareness among the waste pickers for the collection and handling of waste. They don't wear proper safety kits or masks while collecting the waste. Apart from this waste collection facility, in our colony, there is a specific spot where people are dumping waste as well as burning it. Awareness needs to be provided.

- *A resident in vicinity of 10 MLD STP*

In 45 MLD STP, we are thinking of using Sludge as a biofuel in future. This can play a huge role towards sustainability and environmental protection.

- *Mr. Ram Sharma, HZL*

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