BOARD OF INVESTMENT (BOI) OF SRI LANKA

SUPPLEMENTARY ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED TEXTILE ZONE AT PUNNAIKUDAH, ERAVUR, BATTICALOA



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ABBREVIATION

AOP	Advanced Oxidation Processes
BEP	Best Environment Practices
BOI	Board of Investment
CEA	Central Environmental Authority
CWWTP	Common waste water Treatment Plant
EPL	Environmental Protection Licence
ETP	Effluent Treatment Plant
EU	European Union
FIFO	First-In-First-Out
GAC	Granular Activated Carbon
JAAF	Joint Apparel Association Forum
LRC	Land Reform Commission and the
MLSS	Mixed Liquor Suspended Solids
MSDS	Material Safety Data Sheet
NEA	National Environmental Act
PAC	Powdered Activated Carbon
SEIA	Supplementary Environmental Impact Assessment
STP	Sewage treatment plant
SVI	Sludge Volume Index
SWML	Schedule Waste Management Licence
VOC	Volatile Organic Compound
ZDHC	Zero Discharge of Hazardous Chemicals
ZDHC	Zero Discharge of Hazardous Chemicals

EXECUTIVE SUMMARY

In Sri Lanka, apparel manufacturing and textile dyeing industries is the largest net foreign exchange earner with reference to the manufacturing. However, at present most of the fabrics and other raw materials required for the manufacturing of Garments and textiles have been imported from other countries and therefore, the value addition to the Apparel Sector is limited to about 30-40%. Hence, the Joint Apparel Association Forum (JAAF) notified the Board of Investment (BOI) in 2019 that the local apparel sector is facing a major challenge in terms of capturing the international market (especially GSP +) due to lack of capacity to meet the country origin rules which are demanded by both unilateral and bilateral trading partners such as the European Union (EU). It is identified that a direct benefit to the country could be obtained if fabrics are manufactured within Sri Lanka itself. Therefore, to increase value addition to the local apparels industry, the BOI plans to utilize a 262 acre land at Punnaikudah, Eravur within Batticaloa District (Eastern Province) to operate apparel industrial park (textile and yarn dyeing plants) at an estimated cost is Rs 2.5 billion. This land belongs to the Land Reform Commission and the LRC has agreed to release this land for the BOI. In this respect, it is planned to have 5 textile processing units (cotton and synthetics) and 5 apparel plants (cut and sew operations). Total land requirement for the zone in terms of the built-up infrastructure will be 236.9 acres (i.e., 90.4% of the site). The project also aims to provide at least 10,000 employment opportunities too, while enhancing the investments in the Apparel Sector and to boost the economy of the national economy including the economy of the previously war-ravaged Eastern Province of the country (expected revenue per year is 1 billion US Dollars).

According to the National Environmental Act No. 47 of 1980 (NEA) and its amendments (1988 and 2000) implemented by the Central Environmental Authority (CEA), this project is a "Prescribed Project'' as per Gazette Extra-Ordinary No. 772/22 of 24th June 1993 amended by the Gazette Extra Ordinary No. 1104/22 of 05th November 1999) necessitating an Environmental Impact Assessment (EIA) study to obtain an Environmental Clearance. Therefore, an EIA has been conducted for the proposed project and the CEA has issued the Environmental recommendation letter to this **project on 07.09.2021.**

In the original project proposal, it was planned that each individual industry would pre-treat its wastewater to meet the BOI interim standards before discharging it into a proposed common wastewater treatment plant operated by the BOI. This pre-treated wastewater would then be further treated at the common facility to meet the effluent discharge limits set by the NEA **Tolerance limits for the discharge of wastewater or effluent into Marine Waters** -*Tolerance limit values for a short sea outfall* and subsequently released into the sea via a short outfall. However, due to current economic challenges and the unavailability of the anticipated water supply from the NWS&DB, the approach has been revised. It has now been decided that individual industries will independently treat their wastewater to meet the required discharge standards and release it directly into the sea through the short outfall. This will be a temporary arrangement until the Common Wastewater Treatment Plant proposed in the original EIA is constructed.

Now each industry will be required to treat its industrial effluent in an In-house Effluent Treatment Plant (EPT) and dispose the ETP sludge as per the guidelines of the CEA. Similarly, each industry will be required to treat sewage in an in-house sewage treatment plant (STP), most likely activated sludge systems. No permission will be granted for landscape irrigation of the industrial effluents and treated sewage. The final treated effluent needs to be complied

with the Tolerance limits for the discharge of wastewater or effluent into Marine Waters *Tolerance limit values for a short sea outfall* specified in Extraordinary Gazette Notification 2264/17 dated January 27th, 2022.
Total quantity of wastewater generated during the full operation is anticipated to be 12,000 m^3/day and the BOI will provide a treated wastewater collection station, which will be pumped to the sea via a short sea outfall with diffuser system through a pipeline that discharges wastewater with a mechanism to achieve intended dilution in such a manner that there should be a minimum dilution factor of 1:10 at a distance of 10 meters from the point of exit of the pipeline or tunnel.

All individual plants are required to segregate hazardous wastes from non-hazardous wastes from the generation points and store hazardous wastes in separate weather-proof storage areas and adopt cleaner production strategies largely focusing on hazardous wastes that otherwise requires treatment and / or high-temperature incineration or co- processing.

In light of the changes to the original project proposal, the CEA has issued a new Terms of Reference (TOR) for a supplementary Environmental Impact Assessment (SEIA). Accordingly, this SEIA outlines the areas where modifications have been made in the revised proposal, in line with the new TOR.

CHAPTER 01

1 INTRODUCTION

1.1 Background

In Sri Lanka, apparel manufacturing and textile dyeing industries is the largest net foreign exchange earner with reference to the manufacturing sector (Kularatne, 2017). However, the Joint Apparel Association Forum (JAAF) notified the Board of Investment (BOI) of the Government of Sri Lanka (GOSL) in 2019 that the local apparel sector is facing a major challenge in terms of capturing the international market (especially GSP +) due to lack of capacity to meet the country origin rules which are demanded by both unilateral and bilateral trading partners such as the European Union (EU). Presently, most of the fabrics and other raw materials required for the manufacturing of Garments and textiles have been imported from other countries and therefore, the value addition to the Apparel Sector is limited to about 30-40%. It has been noted by the BOI / GOSL and the JAAF that value addition to the Apparel Sector can be enhanced with a direct benefit to the country if fabrics are manufactured within Sri Lanka itself.

However, these industries consume large quantities of water and simultaneously, produce high polluting effluents as well as solid wastes and even gaseous, vapor or fume contaminants that could be very injurious to the health and safety of the employees (Kularatne, 2017). Due to the generation of significant quantities of effluents, such industries are required to be located at the downstream of water intakes as per a decision taken by the Cabinet of Ministers in 2012 in order to protect water bodies used as drinking water sources. Furthermore, according to the Ministry of Finance (2019), one of the activities of the Government of Sri Lanka (GOSL) is to "Protect rivers, lakes and reservoirs/tanks from chemicals, pesticides and other harmful chemicals" as a part of the National Policy Framework. However, the BOI has been facing enough constraints to find suitable locations including available lands within and outside the existing BOI run industrial zones.

Nevertheless, with recommendations from a Team from the Harvard University, USA in 2017, a 260.45acre land at Punnaikudah, Eravur within Batticalao District (Eastern Province) has been earmarked as the ideal place to establish an industrial zone exclusively for Textile manufacturing (**Figure 1.1**). This land which belongs to the Land Reform Commission (LRC) is accessible from Colombo through Colombo- Dambulla-Habarana-Polonnaruwa Road (AA 10). MIKE 21 hydrodynamic (HD) modelling studies conducted by the Lanka Hydraulic Institute (LHI) as a response to the BOI concluded that treated effluents could be safely disposed to the sea (which is located approximately 1 km away from the site from the eastern boundaries) through an outfall, hence further confirming that the given land is suitable to establish the said zone (Wickramaratne and Pathirana, 2020).

At the request of the BOI and the EIA Consultants, the LHI carried out the Dispersion Modelling of Effluent (Near-Field and Far-Field) through a short sea outfall[1] considering disposal scenarios of 5000 m^3/day, 10,000 m^3/day and 15,000 m^3/day (LHI, 2021). According to the CORMIX model runs (irrespective of the volumes of the effluent disposed), the BOD_5, COD, TSS and faecal coliform levels do not exceed 15 mgL, 50 mg/L, 30 mg/L and 150 MPN/100 mL, respectively (LHI, 2021) which are the tolerance limits proposed by the CEA for an

[1] This means a pipeline or a tunnel that discharge wastewater or effluent from a prescribed activity and is laid underneath the marine water with a mechanism to achieve intended dilution in such a manner that there shall be a minimum dilution factor of 1:10 at a distance of 10 m from the point of exit of the pipeline or tunnel

outfall leading up to nearshore waters. Far-field modelling results indicated that the maximum dispersion of the effluent could be obtained during the North-east monsoon with lower concentrations, but a weak dispersion of the effluent was observed during the South-west monsoon average condition as it run for the highest near-field concentration with a lower wave condition. However, the levels of BOD_5, COD, TSS and faecal coliform did not exceed the afore-mentioned proposed tolerance limits (LHI, 2021). Furthermore, the LHI study (LHI, 2021) concluded that the plumes created do not adversely impact the nearby coral reefs in Punnaikudah area as the pollutant concentrations near the plume edge is negligible.

Therefore, due to the afore-mentioned reasons, the afore-mentioned LRC site was selected to establish the proposed textile zone.

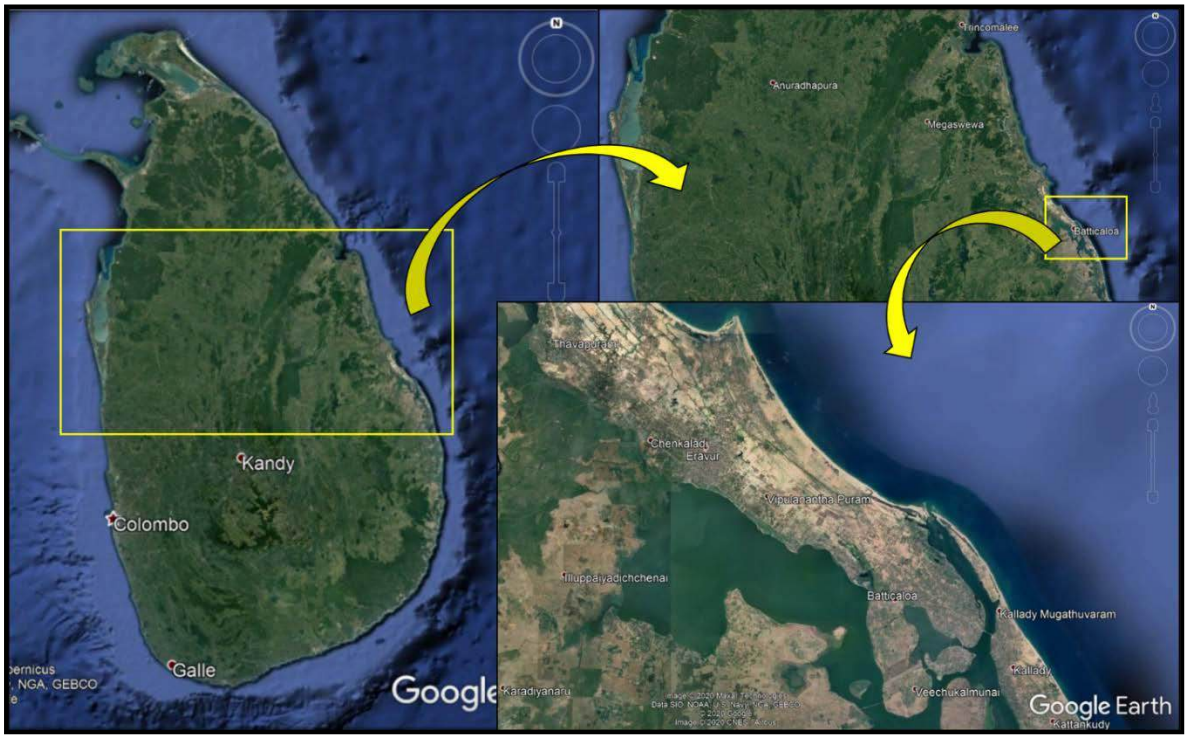


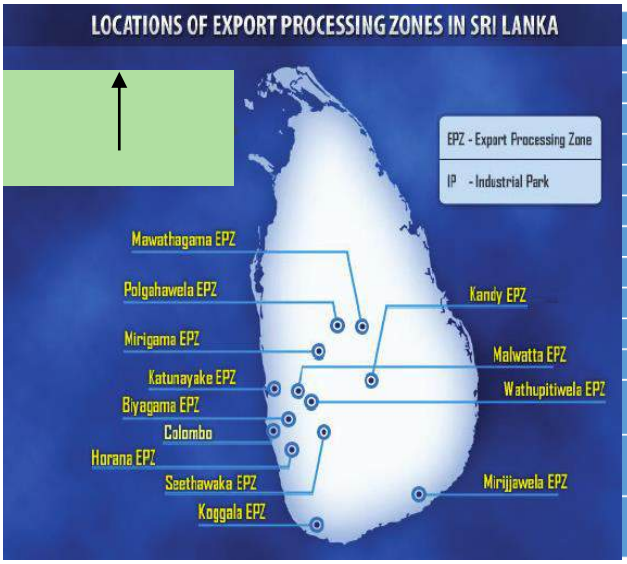
Figure 1-1 : Location Map of the proposed site

1.2 Objective and justification of the proposed alteration

An Environmental Impact Assessment (EIA) was previously conducted for the proposed project, and the CEA issued an Environmental Recommendation Letter on 07/09/ 2021**(Annex I)** and the Extension to Validity of the approval is given in **Annex II.** Subsequently, the project developer, BOI, proposed changes to the originally approved wastewater disposal mechanism. In light of these changes, the CEA has issued a new Terms of Reference (TOR) to carry out a Supplementary Environmental Impact Assessment (SEIA). The scope of work for the SEIA is defined in accordance with the newly issued TOR **(Annex III**).

The objective of the proposed project is to enhance the investments in the Apparel Sector and to boost the economy of the nation including the economy of the previously war-ravaged Eastern Province of the country. Currently, the BOI operates 14 export processing zones providing significant employment opportunities for Sri

Lankans (**Figure 1-2**) and a new zone has been established in Bingiriya[2]. The proposed project at Eravur plans to provide employment opportunities for at least 10,000 people and target to achieve an annual revenue of 1 billion US Dollars.



No	EPZ / IP	No employed
01	Mawathagama	5,749
02	Polgahawela	3,421
03	Mirigama	2,393
04	Katunayake	35,943
05	Biyagama	30,125
06	Horana	2,503
07	Seethawka	21,420
08	Koggala	13,245
09	Kandy	7,422
10	Malwatta	2,119
11	Wathupitiwala	10,436
12	Mirijjawila	1,450
13	Wagawatta industrial park	505
14	Wagawatta industrial Zone	31

Figure 1-2 : Employment under BOI's EPZ and Industrial parks in Sri Lanka as per June /July 2020 statistics

In the present project, it is now mandated that all industries treat their industrial effluents and sewage as per the norms of the CEA, while the BOI would be providing only a treated wastewater collection plant to pump and dispose the treated effluents to the sea via a short sea outfall. This arrangement is proposed until the CWWTP is install and commenced.

Objective of this SEIA

The primary objective of this SEIA is to systematically evaluate the environmental implications of the proposed modifications to the Eravur Textile Export Processing Zone. This involves assessing potential cumulative effects, ensuring that the updated project aligns with national development goals, and integrating environmental considerations into the early stages of decision-making alongside economic and social factors. By conducting this assessment, the SEIA seeks to:

- Identify and mitigate potential adverse environmental impacts resulting from the project's modifications.
- Ensure that the project complies with current environmental regulations and standards.
- Facilitate informed decision-making by providing a comprehensive analysis of environmental, social, and economic factors.
- Promote transparency and public participation in the environmental assessment process.

This approach ensures that the development of the Eravur Textile Export Processing Zone proceeds responsibly, with due consideration for environmental sustainability and community well-being.

[2] However, operations have not yet commenced at the Bingiriya zone. Four projects have been approved and 3 of them are under construction

1.3 Preliminary approvals/permits needed and any conditions laid down for the implementation of the proposed alteration by state agencies (eg. consent of the Department of Coast Conservation & Coastal Resource Management & Marine Environmental Protection Authority for discharge of treated wastewater to the sea.

The CC&CRMD permit is provided in **Annex IV**. The validity of the other permits remains unchanged, as the required consents from all relevant agencies have been already given in the original EIA report. Therefore, no new approvals are needed

1.4 Government policies applicable in this regard

The proposed project is aligned with the several government policies as referred in the original EIA Report.

The cornerstone of new government's current approach is the Economic Transformation Act No. 45 of 2024, which outlines a comprehensive strategy for economic growth and global trade integration. Key components include:

- **Establishment of Investment Zones (Zones SL):** Designated areas offering incentives and infrastructure to attract investment in sectors like technology, agriculture, and tourism.
- **Creation of the Economic Commission of Sri Lanka:** A central body responsible for promoting investment, facilitating business, and overseeing strategic projects.
- **Fiscal and Monetary Goals:** Targets such as maintaining a debt-to-GDP ratio under 95% by 2032 and achieving an annual GDP growth rate of at least 5% by 2027.
- **Trade and Export-Driven Growth:** Aiming to raise exports to 60% of GDP by 2040 through export diversification and trade agreement negotiations.
- **Incentives and Exemptions:** Provision of tax and regulatory incentives to attract strategic investments, with special protections for investments within the designated zones.

CHAPTER 02

2 DESCRIPTION OF THE INDIVIDUAL INDUSTRIES TO BE ESTABLISHED & WASTEWATER MANAGEMENT SYSTEM, ALTERATION TO THE ORIGINALLY APPROVED COMMON WASTEWATER TREATMENT SYSTEM

2.1.1 A revised layout plan indicating the proposed industries & types of industries which are altered/ omitted/ added from the originally proposed industry type related components together with remaining industries of the original proposal.

The location of the proposed project is given in **Figure 2.1**.

2.1.2 Location Map

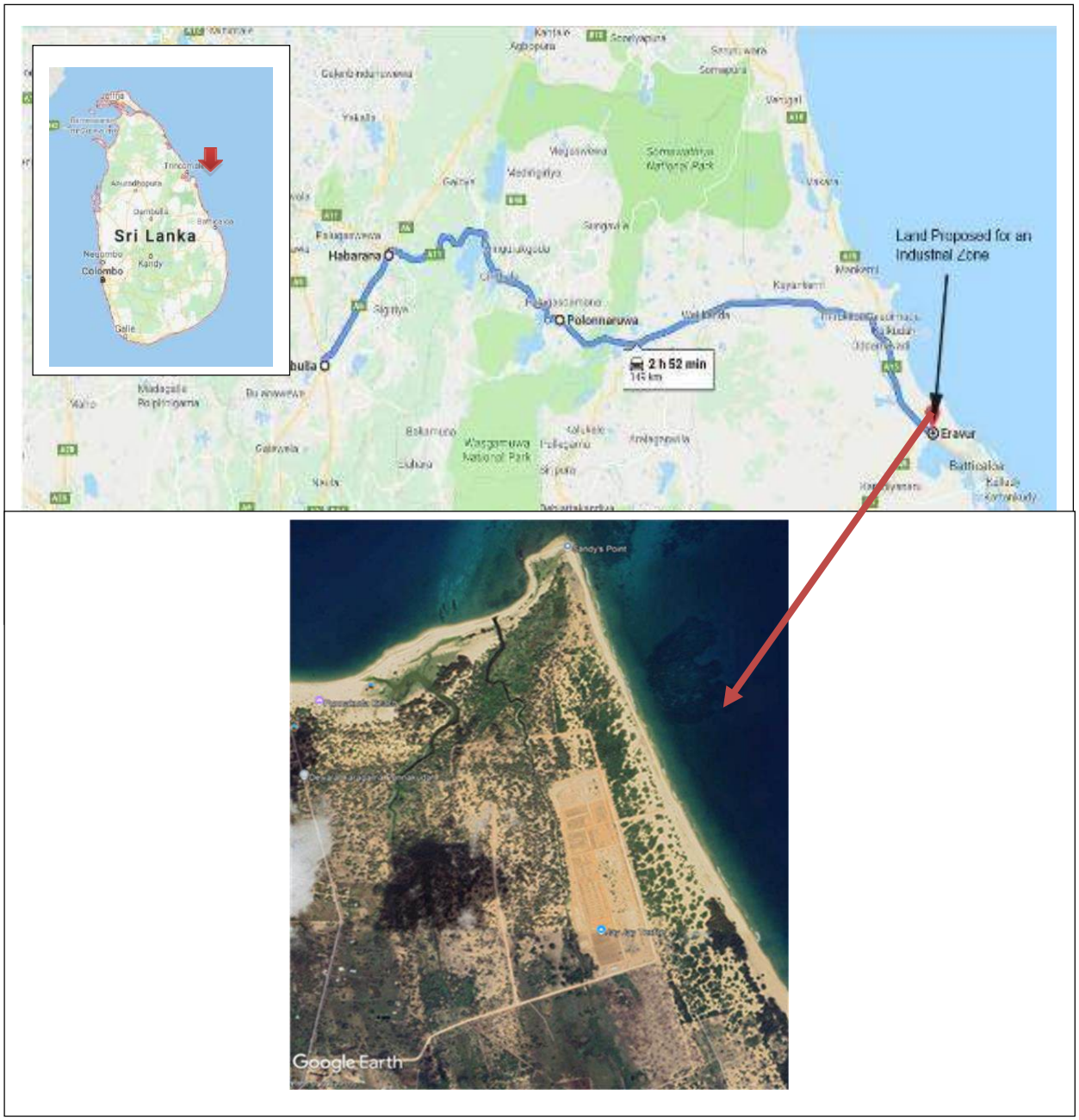


Figure 2-1 : Map of Proposed Site

Initially the proposed total land for the entire development was 262 acres but the new allocation the total land area is 225.28 acres due to the rearrangement of the originally proposed land mainly the reduction in the road reservation. The land allocation in the original proposal and the revised proposal are given in the **Table 2.1.**

Table 2-1 : The land allocation in the original proposal and the revised proposal

S.No	Allocation of land	Original Proposal Acres	Revised Proposal Acres
1	Total industrial area	184.67	182.4
2	Wastewater Treatment area/collection	4.28	4.73
3	Waste Management Area	10.00	15.46
4	Service Area	6.59	6.6
5	BOI Road Reservation	26.71	18.65
6	Buffer Zone	20.42	19.6
7	Jeep Track (5m)	2.62	2.35
8	Green Area	2.26	1.28
9	Other Reservation	4.45	4.21
	Total	**262.00**	**255.28**

The revised layout plan is shown in **Figure 2.3**, while **Figure 2.4** illustrates the location of the LHI discharge point, the original discharge point identified in the initial EIA, and the newly proposed discharge point respectively. There is no change to the boundary of the originally proposed land. However, some internal rearrangements of land allocation for various activities have been proposed within the same area. The main change in the plan is the removal of the Common Wastewater Treatment Plant originally proposed to be provided by the BOI. Instead, individual industries will now treat their wastewater to the standards stipulated by the CEA. This treated wastewater will then be discharged into a newly constructed common wastewater collection tank, from which it will be pumped to the sea. **This arrangement is a temporary arrangement until the common waste water treatment plant is installed.** Notably, the provision for this collection tank was already included in the original EIA. There are no changes to the types of industries or their production capacities as initially proposed. The only additional modification is the relocation of the wastewater discharge point to a new site, where hydrological modeling studies had already been conducted as part of the original EIA. The original layout plan, the revised layout, and the updated discharge point are presented in **Figures 2.2** and **2.3** respectively.

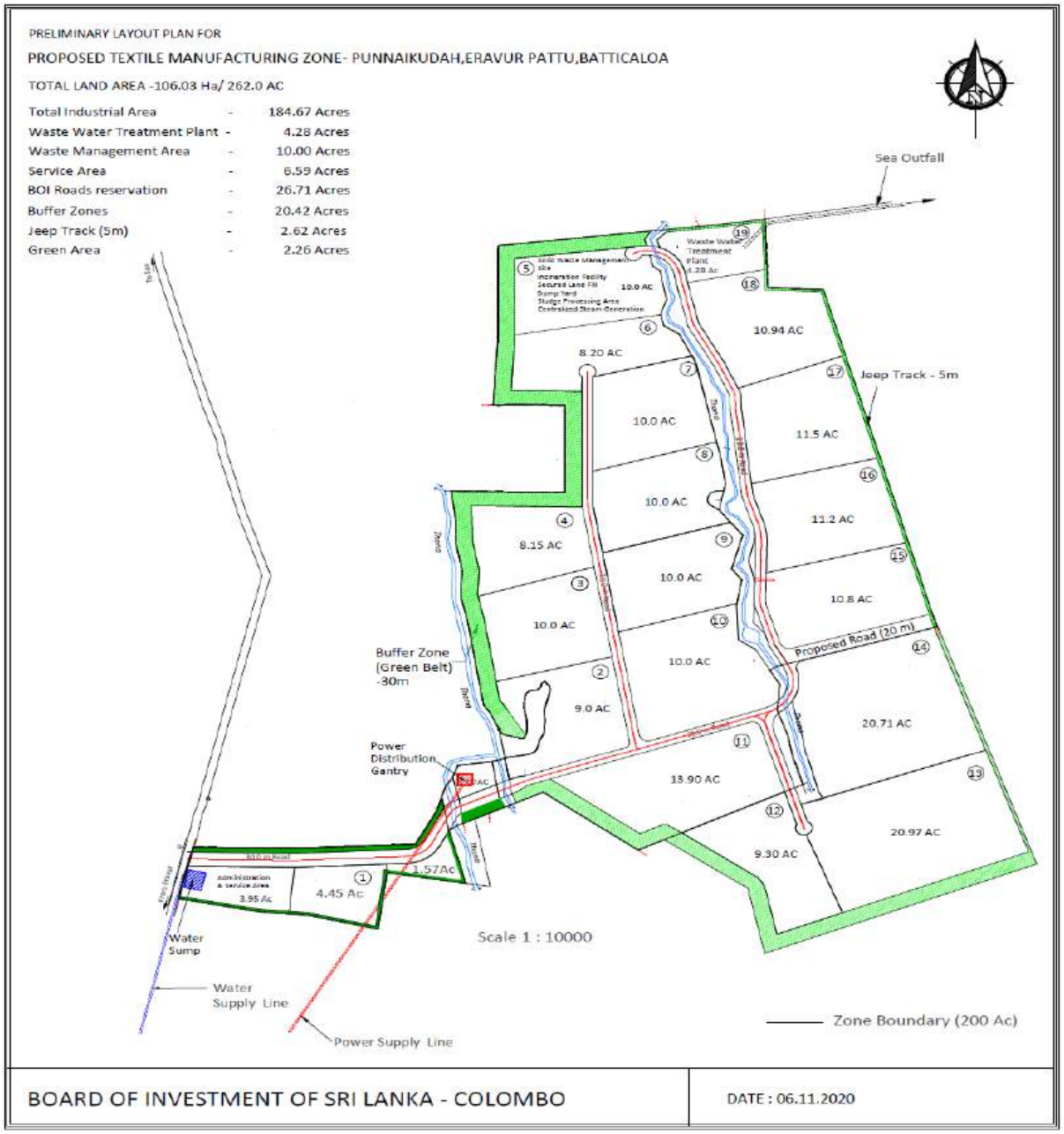


Figure 2-2 : Original Layout Plan

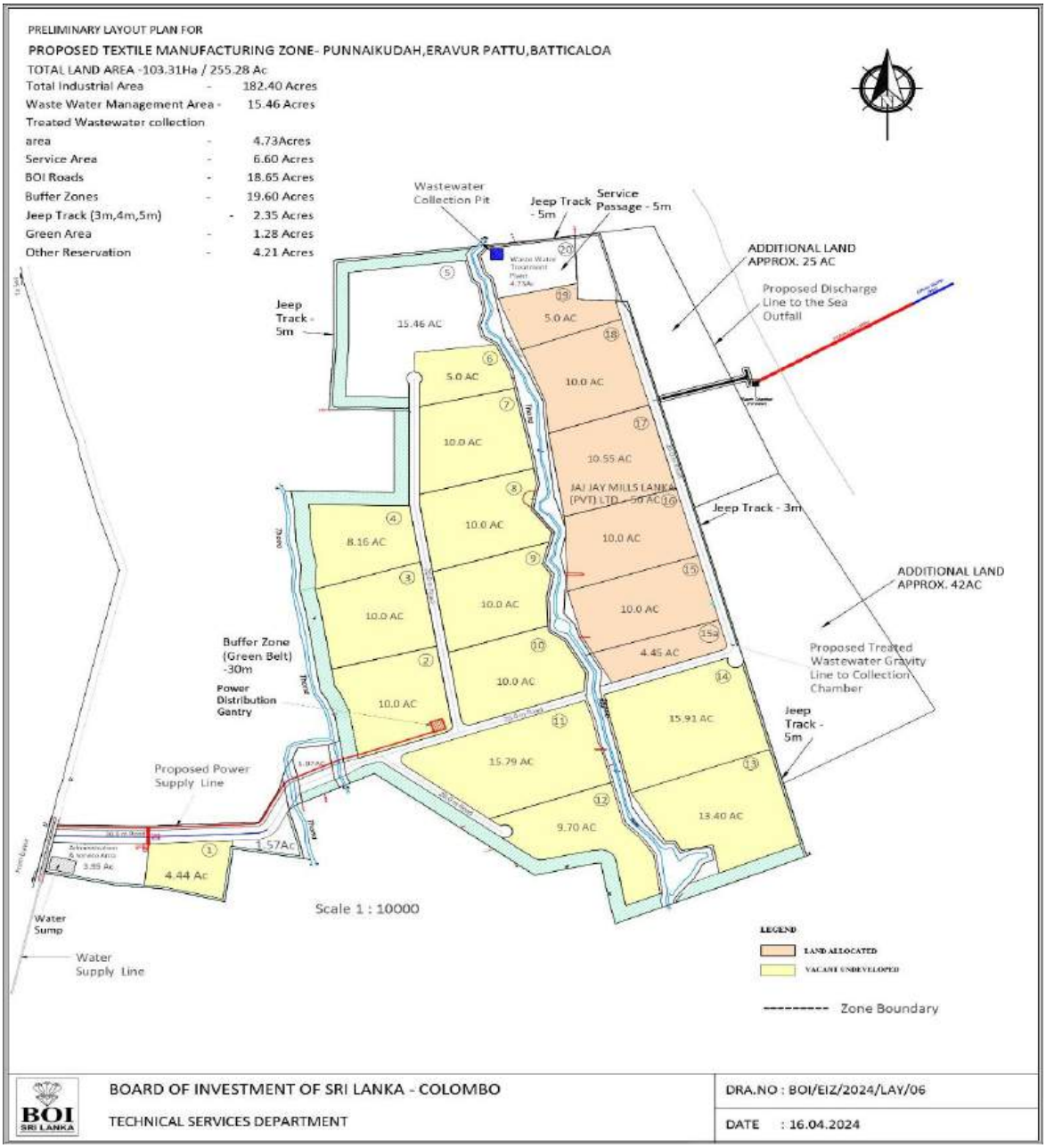


Figure 2-3 : Revised Layout Plan

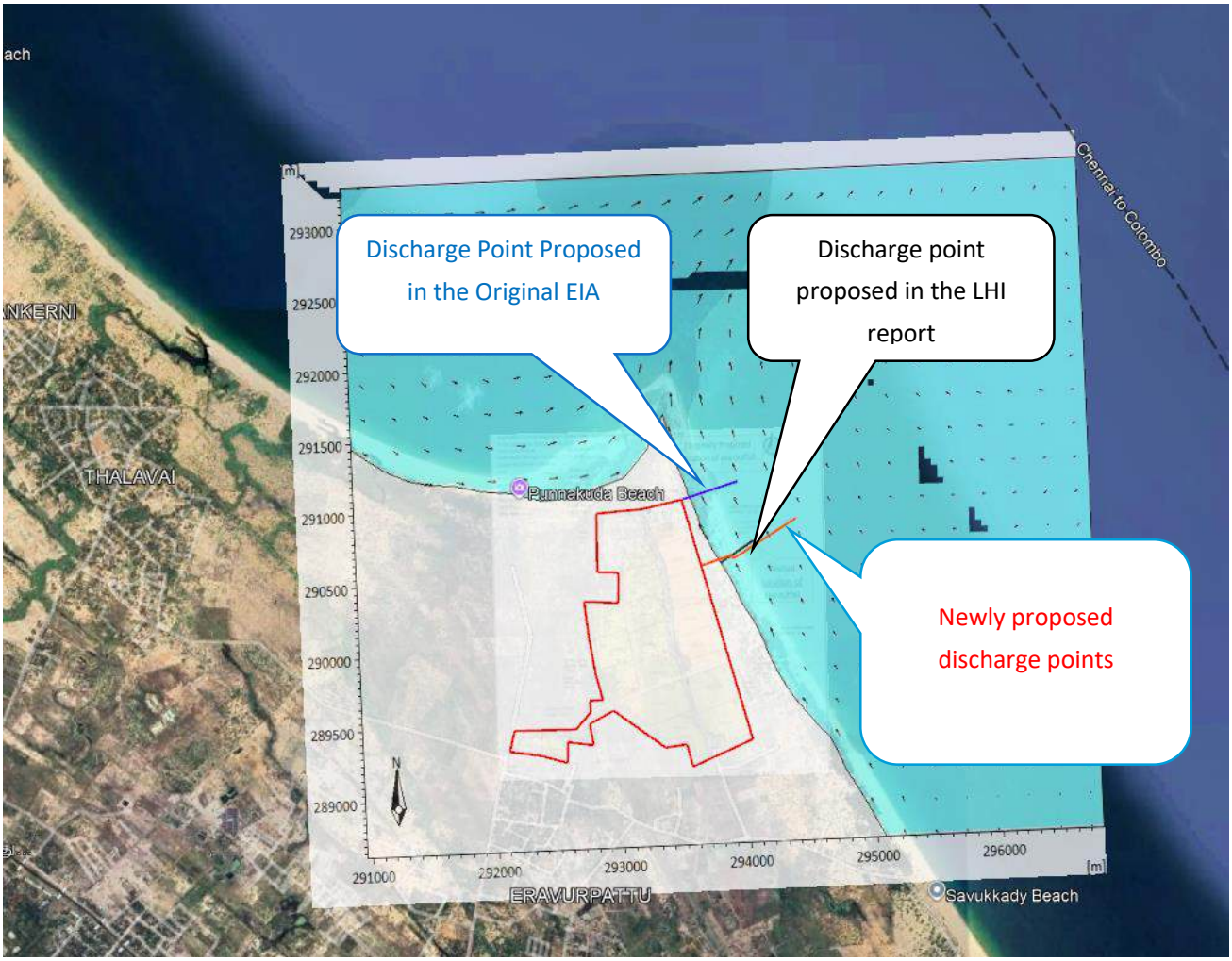


Figure 2-4 : Comparison of newly proposed and original discharge points

2.2 Details of the individual industries to be established with type, industrial process along with process flow diagrams, production capacities by products, waste etc. of each product / product type, rejected raw material management strategy

2.2.1 Details of the individual industries to be established with type

The land allocated for the industrial purposes are given in **Table 2-2.**

Table 2-2 : The land allocated for the industrial purposes

Land Plot	Nos
Total Number of Lots (Drawing No. BOI/EIZ/2022/LAY/08, Dated 02.11.2023)	21
Number of Lots Occupied	06
Number of Lots Reserved	-
Number of Lots Vacant	14
A land lot having an extent of 50 Acres allocated to Ms Jay Jay Mills Lanka Ltd.	01

According to the BOI proposal submitted to the CEA, only apparel industries (textile and yarn dyeing plants) will be operated. Five textile processing units (cotton and synthetics) and 5 apparel plants (cut and sew operations) have been proposed (**Table 2.3**). But, these numbers and sizes could be changed based on the demand of the land. However, there is no changes in the quantity of the water requirement and the wastewater discharge.

Out of the above proposed land plots the Jay Jay Mills has occupied about 50 acres and the construction activities are already commenced. The plots are indicated in the **Figure 2.5**

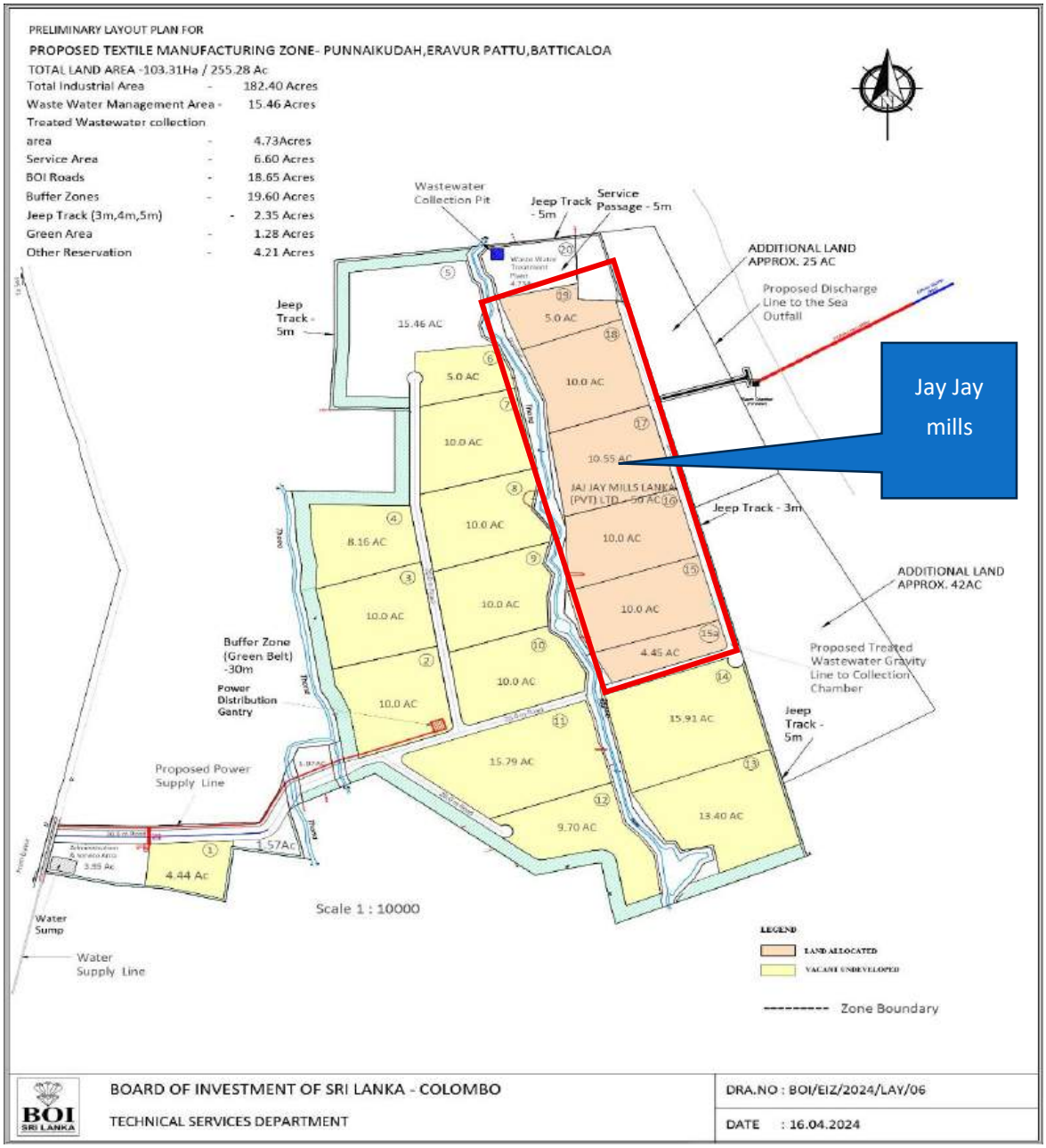


Figure 2-5: The Location of the Jay Jay Mills

Table 2-3 : Proposed industries

Industry	Land (acres)	Employees (Nos)	Water (Cu.m/day)	Electricity (MW)	Steam (Tons/hr)	Sewerage (Cu.m/day)	Effluent (Cu.m/day)	Solid Waste (Tons/day)	Biomass (Tons/day)
Textile 1 (Cotton + Synthetics)	20	2000	4000	4.0	14	200	3500	12.5	80
Textile 2 (Cotton + Synthetics)	20	2000	4000	4.0	14	200	3500	12.5	80
Textile 3 (Synthetics)	15	1250	2000	2.0	7	125	1800	5.0	40
Textile 4 (Synthetics)	15	1250	1750	2.0	5	125	1575	4.0	25
Textile 5 (Printing)	10	750	1000	1.0	3	75	900	3.0	20
Apparel (Five Units)	5 x 5 = 25	2500 x 5 = 12,500	200 x 5 = 1000	0.6 x 5 = 3.0	NA	125 x 5 = 625	50	Bio-sludge In-house Manage	NA
Other Industries (Lot)	60	2500	1000	7.0	NA	125	1475	3	No Visibility Yet
Common Infrastructure & Utilities	35	250	250	2.0	2	25	200	5	5
TOTAL	**200**	**22,500**	**15,000**	**25**	**45**	**1,500**	**13,000**	**45**	**250**

Note : All of the above Capacity numbers represent approximated current Industry Averages : Based on the Technology select and Resources optimized operations , there can be a % variation of these figures.

2.2.2 Production capacities by products

The BOI is yet in the process of receiving project proposals from the 10 investors who have given an expression of interest to operate within the Zone. However, each project application will be individually assessed for ensuring compliance with the approval granted for this EIAR/SEIA. It is expected that each industry has to organize specific raw material storage facilities with proactive hazard management steps taken.

2.2.3 Industrial Process along with the Process flow diagram

Nevertheless, raw material for fabric and yarn manufacturing works would involve 100% cotton based material and synthetic material (100% spandex, 100% nylon, 100% polyester, nylon-spandex, polyester-spandex, cotton- spandex material, etc.) and the composition of the different fabric and yarn type may vary depending on the type of customer's needs or type of material to be manufactured (example, sportswear will comprise to spandex mixed with nylon or polyester to provide the flexibility to the material). Also a significant quantity of polythene and paper / cardboard items would be used as packaging material for finished goods.

In addition to water and energy consumption, there will be a heavy usage of dyes, pigments, inks, softeners, adhesives, glues, etc for the direct manufacturing processes as well as chemicals that will be used in the cleaning, repairing and servicing of machinery and equipment that will also contain hazardous chemicals (e.g.. Co-contact cleaners used to degrease and clean machinery have flammable liquids). Depending on the extent of treatment and photolysis etc. in the treatment plants, these hazardous constituents especially heavy metals, phthalates and organometallic compounds would end up in the wastewaters or in wastewater treatment plant sludge as precipitates, co-precipitates and/ or in adsorbed forms. They can also end up as hazardous solid wastes (example contaminated

clothing generated during machinery cleaning, barrels, cans, cut pieces of fabric containing adhesives, etc.). The generalised process flow chart is given in **Figure 2.6**.

There are possibilities that textile dyeing facilities would use "Rhodamine" (an important basic xanthene dye to increase luminosity of fabrics).

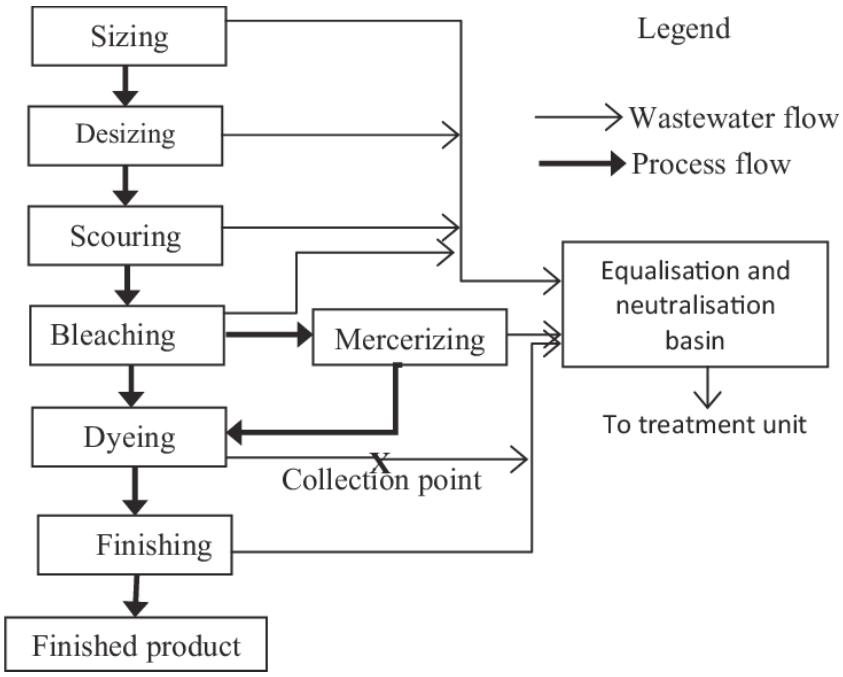


Figure 2-6 : Generalised process flow chart for textile dying industry

The chemicals are likely to be present in the various dyes, pigments, etc. to be used in the apparel/foot-wear industry are given in **Annex V**. These are actually banned by the Zero Discharge of Hazardous Chemicals (ZDHCs) programme that is currently recognized by recognized brands such as Nike, Gap, Lulu Lemon and organizations such as SGS and Bureau Veritas due to high persisted, Bio accumulative and Toxic (PBT) properties.

The chemicals used for the effluent treatment plants are alum, poly-aluminium chloride, ferrous sulphate, ferric chloride, caustic soda, polymers, de-colorants (including bleaching agents such as NaOCl) and sulphuric acid, etc.

2.2.4 By products

The by-products from the operation of the industrial zone is briefed in the following section.

1. Chemical By-products

These result from the use of dyes, mordants, and other processing chemicals:

- Spent dyes and auxiliaries: Leftover or degraded dye materials from the dye bath.
- Salt and alkali residues: Common in reactive dyeing (e.g., sodium chloride, sodium carbonate).
- Fixing agents & dispersants: Chemical residues from dye fixation processes.
- Acids and bases: Such as sulfuric acid, acetic acid, and caustic soda.
- Oxidation by-products: From bleaching and peroxide treatments.

2. Solid Waste By-products

Generated during fiber processing, dyeing, and finishing stages:

- Fabric trimmings and off-cuts: From inspection and cutting sections.
- Lint and fiber dust: Accumulated in machinery and air filters.
- Sludge: From Effluent Treatment Plants (ETPs) and chemical coagulation processes.
- Packaging waste: Plastic drums, cardboard, containers of chemicals/dyes.

3. Liquid By-products

Mainly wastewater containing:

- Dye bath effluent: Colored and often high in BOD/COD.
- Soaping and rinsing water: Contaminated with detergents and surfactants.
- Oil and grease residues: From machinery and fabric softeners.
- Heavy metals: From certain mordants (e.g., chromium, copper).

4. Gaseous Emissions

Usually from thermomechanical and chemical processes:

- Volatile Organic Compounds (VOCs): Released from solvents or heat curing.
- Ammonia and formaldehyde fumes: Especially from finishing agents and resin treatments.
- Particulate matter and steam: From boilers and drying units.

5. Potentially Valuable By-products

If managed well, some by-products can be recycled or upcycled:

- Recovered salt and soda ash: For reuse in dye baths.
- Sludge ash: Can be used in bricks or cement if non-toxic.
- Fiber waste: Used for insulation, stuffing, or low-grade textiles.
- Biogas from ETP sludge: If anaerobically digested.

2.2.5 Rejected raw material management strategy

Managing rejected raw materials in textile dyeing industries is crucial for minimizing environmental impact, reducing waste, and optimizing resources. Therefore, circular economy principle will be followed. The Rejected Raw Material Management Strategies involved in several steps and this should be followed by each industrial unit. A tentative Rejected Raw Material Management Strategy is given below:

1. Identification & Categorization of Rejected Materials

- Types of materials: Dyes, auxiliaries, fabrics, chemicals, packaging, etc.
- Reasons for rejection: Expired shelf life, contamination, incorrect specifications, damaged packaging, etc.
- Categorization:
    - Recyclable (e.g., some chemicals, water)
    - Reusable (e.g., unopened or unused materials)
    - Hazardous (e.g., expired toxic dyes)
    - Non-hazardous waste

2. Waste Minimization Strategies

- Inventory management: Use FIFO (First-In-First-Out) to minimize expiration.
- Supplier coordination: Return or exchange policies for rejected materials.
- Quality control improvements: Reduce rejection rate through better procurement and storage.

3. Recycling & Reuse Options

- Chemical recovery: Use recovery units for dyes, salts, and soda ash.
- Fabric reuse: Reuse defective fabric for testing, sampling, or low-grade products.
- Repackaging: If contamination is external, repack and reuse.

4. Safe Disposal Practices

- Follow local environmental regulations including schedule waste management regulations
- Partner with authorized hazardous waste handlers for chemical disposal such as INSEE for Co-processing in their cement plant.
- Implement on-site treatment for neutralizing chemical waste (e.g., ETPs – Effluent Treatment Plants).

5. Documentation & Monitoring

- Maintain logs for:
    - Material rejection reports
    - Recycling and disposal records
    - Environmental impact assessments
- Conduct regular audits to identify bottlenecks or areas for improvement.

6. Employee Training & Awareness

- Train staff on:
    - Proper material handling
    - Identifying reusable vs. non-reusable materials
    - Spill management and emergency response

2.3 Types of dyes to be used and MSDS

Various dyes used in the textile manufacturing industries. Therefore, for a fashion brand, it is important to choose the right kind of dye for a particular fabric. Here is the list of different types of **fabric dyes** that they can use for their clothes

1. Fiber reactive dyes

The reactive fiber dyes are the dyes that create a molecular bond with the fiber molecules and dye molecules. As the molecules bind, the fabric is washed safe fabrics are dyed with reactive fiber dyes. These dyes can be used in cotton fabric and cellulose/protein fiber fabric.

2. Natural dyes

Natural dyes are derived from various natural resources such as plants, animals, and minerals. Since they are derived from natural resources, they are environment friendly. And to fix this, dye mordants are used that are usually non-toxic.

Nowadays, most natural dyes are replaced by synthetic dyes as they are cheaper, reliable, and easily supplied by vendors. This is because natural dyes are considered less efficient than other dyes.

3. VAT dyes

VAT dyes are the types of dyes that are insoluble in water. These dyes require reducing agents. The name VAT is derived from the old indigo method of dyeing 'VAT,' where indigo had to be reduced to light form. So, to dye cloth in a vat, one must perform oxidation and reduction reactions and keep the pH level at its ideal level. These dyes offer high characteristics for color fastness. The dyeing process takes place in a vat or a bucket.

4. Direct dyes

Direct dyes are usually used for coloring cellulose-type textiles such as cotton. They are soluble in water and form colored anions. Natural dyes are easy to apply and are less expensive, so they are mostly preferred over fabric dyes. They are also dull in color, and they have medium color resistance. These dyes are not suitable for bright colors and are lightfast.

5. Acid dyes

For protein fibers such as wool and silk, acid dyes are used. They are the best dyes for coloring protein fabrics. Acid dyes have several subtypes of dyes, making them a large category in themselves. The two most popular acid dyes are leveling and lancet acid dyes.

6. Disperse dyes

Disperse dyes are **fabric dyes** that are sparsely soluble in water and are substantive to a few hydrophobic fibers. Dispersions make applications of this dye in water, as the name suggests. It was specially made for dyeing cellulose acetate and used mainly for polyester fiber. Disperse dyes are converted into fine particles for making their paste and are sometimes even spray-dried to obtain a powder. This dye can also be used on fabrics like georgette and nylon.

7. All-purpose dyes

All-purpose dyes are a combination of different dyes, such as direct and acid dyes, and are used on a wide range of fabrics. This dye can also be used on mixed fabrics, made by mixing two different types of fabrics. But this dye cannot be used on polyester or jacquard fabric.

8. Azoic dyes

This dye contains at least one azo group and is therefore called azoic dyes. These dyes have high coloring properties and are used for dyeing bright colors like red or yellow. These are mainly used for dyeing fabrics in shades of red or printing since many classes of high-fasting dyes lack red colors. Azoic dyes are produced using a two-component coupling compound and the Di-Azo compound.

9. Basic/Cationic dyes

Basic dyes are cationic and are one of the first synthetic dyes extracted from coal tar derivatives. Basic dyes are commonly used on natural silk cloth, nylon, wool, and other modified acrylic fabrics. Acetic acid is added to the dye bath to increase the absorption of this dye. This dye also finds its application in the coloration of paper.

10. Mordant dyes

This dye does not dye the fabric directly as it needs a binding agent that is mordant, which improves as well as increases the fastness of the fabric dye against light, water, and perspiration. It is usually used on cotton, wool, or other protein fabrics. It is very important to choose the right type of mordant or else the color of fabrics will not be as expected.

11. Sulfur dyes

Sulfur dye is the most commonly used fabric dye out of all. They are mostly used to dye cellulose-based materials. It is inexpensive, has good wash-fastness, and has poor sunlight resistance. Easy to apply the dye and most commonly used on cotton. Using sulfur dye to color fabrics includes several steps: reduction, dyeing, washing, oxidation, soaping, and final washing. Sulfur dyes also make fabrics tender or weak; thus, they get damaged easily.

Refer to Annex 08 and Annex 10 in the original EIA Report for further details. There are possibilities that textile dyeing facilities would use ”Rhodamine” (an important basic xanthene dye to increase luminosity of fabrics).

Industries are required to ensure that updated copies of Safety data Sheet (SDS) (i.e, revised within the last 3 years) are maintained (along with the chemical inventories) and the SDS are formulated in accordance to the GHS criteria. These will be required to be shared with the BOI’s Environmental Management Team.

2.4 Detailed description of the adoption of cleaner production techniques

Cleaner production technology has been discussed under the section of the Strategies for minimization of solid and hazardous waste in Section E 1.6, E1.8 of the original EIA, which provide the RECP concept discussed as well.

The same guidelines will be followed by all industries in the Zone. The plants are required to make use of cleaner production strategies to minimize the amount of wastes especially hazardous wastes that requires treatment and / or high-temperature incineration or co- processing. There is a requirement to recycle or co-process the wastes using the services of CEA registered vendors (i.e., third party reusers or recyclers having a CEA issued valid EPL and also a SWML for those who are dealing with hazardous wastes including e-wastes).

2.5 Details of proposed wastewater stream (domestic and process) to be provided separately indicating types and quantities generated by each industrial and domestic activities.

There will not be a significant change in the quantity of the waste water due to the proposed changes. As originally proposed, the Zonal water requirement is 15, 000 m3/day, but 80% of this will become

the zonal wastewaters amounting to 12,000 m3/day (500 m3/hr since the zone would be operated 24 hrs/day with 2 shifts per factory). This quantity will include sewage and industrial effluents (textile processing wastewaters),

The details on the domestic wastewater is discussed under **Sewage in Section B 2.2.8.1** in the original EIA report. There are no changes in the quantity of domestic wastewater originally proposed. During the peak operation period, there will be 22,500 persons. Hence maximum quantity of sewage generation is 50 L (per capita water consumption) x 22,500 x 0.8/1000 = 900 m3/day. This includes blackwater, greywater and kitchen / restaurant wastewaters. The composition of these wastewaters will be identical to the domestic wastewaters produced by houses, hotels and the commercial sector.

The kitchen wastewaters (after passing through screen chambers and oil and grease traps) along with the blackwater and greywater will be separated from the industrial effluents.

The proposed industrial zone is completely dedicated for the textile processing industries only. Therefore, no variation of the quality of the wastewater is expected. The details on the quality, quantity and the process details are given under the **Section B 2.2.8.2 Textile processing Effluents.** Presently, details pertaining to the capacities of the different plants (in terms of finished goods to be produced per day) and other details such as the total number of employees, dyeing machine capacity and their efficiencies, liquid ratios, etc. are not available.

Estimated textile processing wastewaters will be 12,000-900 = 11,100 m3/day.

2.6 Volume of wastewater, pollution load and level of treatment by individual Effluent Treatment Plants (ETPs) covering toxicants and dye; which are needed additional/industry specific treatment process prior to connect to the common system. Details of Toxicants removal techniques & method of verification of such remove prior to discharge to the common wastewater treatment system.

The proposed individual industries and the effluent generation are given in **Table 2-4**. As it is only an estimated industry, the number of industries could be changed. However, the quantity and quality of the wastewater will not be changed as estimated.

Table 2-4 : The proposed individual industries and the effluent generation

Industry	Land (acres)	Employees (Nos)	Water (Cu.m/day)	Electricity (MW)	Steam (Tons/hr)	Sewerage (Cu.m/day)	Effluent (Cu.m/day)	Solid Waste (Tons/day)	Biomass (Tons/day)
Textile 1 (Cotton + Synthetics)	20	2000	4000	4.0	14	200	3500	12.5	80
Textile 2 (Cotton + Synthetics)	20	2000	4000	4.0	14	200	3500	12.5	80
Textile 3 (Synthetics)	15	1250	2000	2.0	7	125	1800	5.0	40
Textile 4 (Synthetics)	15	1250	1750	2.0	5	125	1575	4.0	25
Textile 5 (Printing)	10	750	1000	1.0	3	75	900	3.0	20
Apparel (Five Units)	5 x 5 = 25	2500 x 5 = 12,500	200 x 5 = 1000	0.6 x 5 = 3.0	NA	125 x 5 = 625	50	Bio-sludge In-house Manage	NA
Other Industries (Lot)	60	2500	1000	7.0	NA	125	1475	3	No Visibility Yet
Common Infrastructure & Utilities	35	250	250	2.0	2	25	200	5	5
TOTAL	**200**	**22,500**	**15,000**	**25**	**45**	**1,500**	**13,000**	**45**	**250**

Note : All of the above Capacity numbers represent approximated current Industry Averages : Based on the Technology select and Resources optimized operations , there can be a % variation of these figures.

The untreated textile wastewater from different sections consists of high levels of TSS, dyes, chemicals & auxiliaries, metal toxicants and BOD which must be treated before they are discharged to environment. When wastewater passes through the ETP, pollutants are removed and the quality of the water is improved to an acceptance/standard level, allowing for final discharge to the environment without any risk. Each industry requires to install their own treatment system to treat the wastewater generated from their industry to the short outfall standards as per the NEA. The mechanisms which often used together in ETP are: Physical, Chemical and Biological. Generally, effluent treatment plant consists of four levels of treatment which undergoes in sequence are briefly described below:

1. Preliminary Treatment:

Pretreatment which involves physical mechanism to treat wastewater. It involves screening which uses bar screens to remove large solids like pieces of rags, fabric, yarn, lints, sticks, etc that may cause damage to equipment of the plant. Then waste water is subjected to next level to the physical treatment.

2. Primary Treatment:

Primary treatment of textile effluents within the Eravur Industrial Zone will comprise pH correction followed by coagulation, flocculation, and sedimentation processes to effectively remove suspended solids, colour, fibres, and other pollutants from wastewater generated during textile manufacturing operations. Proper pH adjustment is essential to optimize chemical treatment efficiency and improve the removal of contaminants prior to secondary treatment. Coagulants and flocculants will be added to destabilize fine particles and facilitate the formation of larger flocs, which can then be separated through sedimentation.

Depending on the types of dyes and chemicals used in textile production processes, additional colour removal measures may be necessary. These may include Powdered Activated Carbon (PAC) dosing prior to chemical treatment or Granular Activated Carbon (GAC) filtration after final treatment, including during emergency management situations. Furthermore, industries shall adopt additional pretreatment technologies and best industry practices suitable for the specific dye formulations and wastewater characteristics associated with their manufacturing operations to ensure compliance with applicable discharge standards.

Each industry will be required to maintain appropriate laboratory and process control facilities, including jar test equipment, to determine optimum chemical dosages and ensure efficient treatment performance. In addition, the recruitment of trained and qualified technical staff will be mandatory to ensure proper operation, monitoring, and maintenance of the treatment system.

3. Secondary Treatment:

Following chemical treatment processes such as coagulation, flocculation, and sedimentation, the concentration of biodegradable organic matter and essential macro- and micronutrients in the wastewater may be significantly reduced. Since these components are necessary to sustain microbial activity during biological treatment, it is strongly recommended to introduce domestic sewage, including black water and grey water generated by factory staff, into the treatment system prior to the biological treatment stage. This will provide an adequate food source and nutrient balance for the microorganisms responsible for biodegradation. In the absence of domestic sewage, artificial nutrient dosing may be required to maintain effective biological treatment performance.

Furthermore, each industry should establish basic laboratory facilities to regularly monitor critical operational parameters, including Sludge Volume Index (SVI), Mixed Liquor Suspended Solids (MLSS), and the Food to Microorganism (F/M) ratio, to ensure efficient process control and stable biological treatment system performance.

4. Tertiary Treatment:

It involves physical, chemical and biological mechanism to remove residual suspended solids, dissolved solids and etc., that are not removed in the preceding treatment levels. Depending on the wastewater condition, several disinfection agents like chlorine, ozone, UV light are used in most common. Wastewater after this treatment is finally fit for disposal or for further use.

Special attentions will be given where the industries which uses rhodamine dyes, Several technologies can be used to remove rhodamine dyes, including adsorption, advanced oxidation processes (AOPs), and biological methods. Adsorption, a widely used technique, involves using materials like activated carbon or biochar to bind the dye to their surface. AOPs, like ozonation, use oxidizing agents to degrade the dye into less harmful compounds. Biological methods employ microorganisms to biodegrade or biosorb the dye. The individual industries will select suitable mechanism to treat their rhodamine dyes and incorporated in to their treatment system the details of options available for the rhodamine dyes removals are:

- **Adsorption:**

This method relies on the principle of surface attraction where the dye molecules are physically adsorbed onto the surface of a material like activated carbon or biochar. The effectiveness of adsorption depends on factors like the adsorbent's surface area, pore size, and the dye concentration.

- **Advanced Oxidation Processes (AOPs):**

AOPs utilize strong oxidizing agents, such as ozone or hydrogen peroxide, to break down the dye molecules into smaller, more biodegradable components. AOPs are often used in conjunction with UV irradiation to enhance the degradation process.

- **Biological Methods:**

These methods involve using microorganisms like bacteria, fungi, or algae to degrade or absorb the dye. This approach is environmentally friendly as it utilizes natural biological processes for dye removal.

Note: Each individual industries actual proposal for the wastewater treatment will be reviewed by the TEC appointed by the CEA prior to the commencement.

Method of verification of quality of the wastewater prior to discharge.

Each industry will treat its wastewater either individually or in combination with domestic wastewater generated within the premises. The treated wastewater will then be collected in a designated collection chamber within the respective industry and subsequently conveyed to a common collection chamber prior to discharge into the sea. Each industry will also provide suitable access points outside the factory premises for wastewater sampling and inspection purposes.

In addition, each industry will install an online monitoring system to continuously monitor selected wastewater quality parameters prior to discharge. The proposed monitoring parameters include pH, turbidity, electrical conductivity, chemical oxygen demand (COD), and colour.

This arrangement will enable the Board of Investment of Sri Lanka (BOI) to effectively ensure compliance with the required wastewater discharge standards before effluent is released into the sea. Furthermore, industries will be required to conduct regular effluent quality testing through laboratories registered with the Central Environmental Authority (CEA). The frequency and reporting schedule for submission of laboratory analysis reports will be determined by the CEA.

2.7 Details of the total wastewater quality and volume to be treated at the common wastewater treatment system proposed for the newly identified industries.

There is no common wastewater treatment plant proposed by the BOI in the updated proposal. Individual industry will treat their wastewater to the short outfall standards. The treated wastewater from the individual industries will be collected in a wastewater collection chamber to be constructed by the BOI (ref. **Annex VI**) and the collected effluents will be discharged to the sea. Therefore, the relevant section of the TOR which is applicable only addressed in the following section.

2.7.1 Quality & quantity of treated wastewater to be discharged

The final treated effluent needs to be complied with the Tolerance limits for the discharge of wastewater or effluent into Marine Waters *Tolerance limit values for a short sea outfall*–specified in Extraordinary Gazette Notification 2264/17 dated January 27th, 2022. Total quantity of wastewater

generated during the full operation is anticipated to be 12,000 m3/day and the BOI will provide a treated wastewater collection station, which will be pumped to the sea via a short sea outfall with diffuser system (a pipeline or a tunnel that discharges wastewater with a mechanism to achieve intended dilution in such a manner that there should be a minimum dilution factor of 1:10 at a distance of 10 meters from the point of exit of the pipeline or tunnel). The CEA has established tolerance limit values for a short sea fall in Extraordinary Gazette Notification 2264/17 dated January 27th, 2022,

2.7.2 Monitoring mechanism of treated wastewater prior to discharge to the sea *via* short sea outfall

The individual industries will establish their own online monitoring system. In addition, the BOI will install an online wastewater quality monitoring system at the beach chamber to monitor major wastewater quality parameters including colour standards and industry required construct interceptor manholes at their premises to collect wastewater samples for physical use testing.

2.7.3 Details of any recovery/reuse options for treated effluent (if so, provide details)

The individual industries will formulate mechanisms to recover and reuse the wastewater at their industrial premises. However, there is no proposal to recovery or reuse wastewater at the final stage.

2.8 Disposal of treated wastewater

2.8.1 Details of alternations made to the previously proposed wastewater system

2.8.1.1 Changes in quality and & quantity of the treated effluent to be discharged into sea via short sea outfall and dispersion model should be calibrated based number of industries are to be connected and the number of diffusers to be opened to meet velocity criterion along with number of industries to be in operational based on increase in effluent generation

No change in the quality of the wastewater initially proposed in the original EIA. As proposed in the original EIA, waste water will be discharge through a short sea outfall (a pipeline or a tunnel that is laid underneath the marine water with a mechanism to achieve intended dilution in such a manner that there shall be a minimum dilution factor of 1:10 at a distance of 10 m from the point of exit of the pipeline or tunnel) initially in order to enable Investors to commence their operations early. During the early stages of the zonal operations (up to about 4 years), the predicted volume of wastewater is about 2000 to 3000 m^3/day as per the NWSDB

The detailed sea outfall dispersion modelling has been conducted for the proposed Eravur EPZ by the LHI. The Section 9.3 “Conceptual Design of Short Sea Outfall” given in the “Dispersion Modelling for Proposed Sewerage Sea Outfall” at Punnaikudah, Eravur, Conceptual Design and Numerical Modelling report in the Annex 1 of the Original EIA is given in **Annex XI.** There are no changes in the discharge quality compared to the original EIA; therefore, the LHI hydraulic model conducted for Eravur remains valid.

The Details of the treated wastewater collection and pumping system to be operated by the BOI is given in the **Annex VI.**

2.8.2 Any alteration for the previously proposed outfall/ pathway/location

As mentioned earlier, there is no common wastewater treatment plant operated by the BOI at the initial stage of the industrial estate as a temporary measures. All industries will be required to treat their textile effluents and sewage to the CEA standards. Tolerance limits for the discharge of wastewater or effluent into Marine Waters *Tolerance limit values for a short sea* specified in Extraordinary Gazette Notification 2264/17 dated January 27th, 2022). The BOI will provide only a treated wastewater collection and pumping station only.

The final discharged point has been changed now. The originally proposed pathway and the outfall location have been changed. The originally proposed sea outfall pathway and the newly proposed pathway are given in the **Figure 2.7**. The discharge point is within the point identified in the Hydrological dispersion model conducted by the LHI.

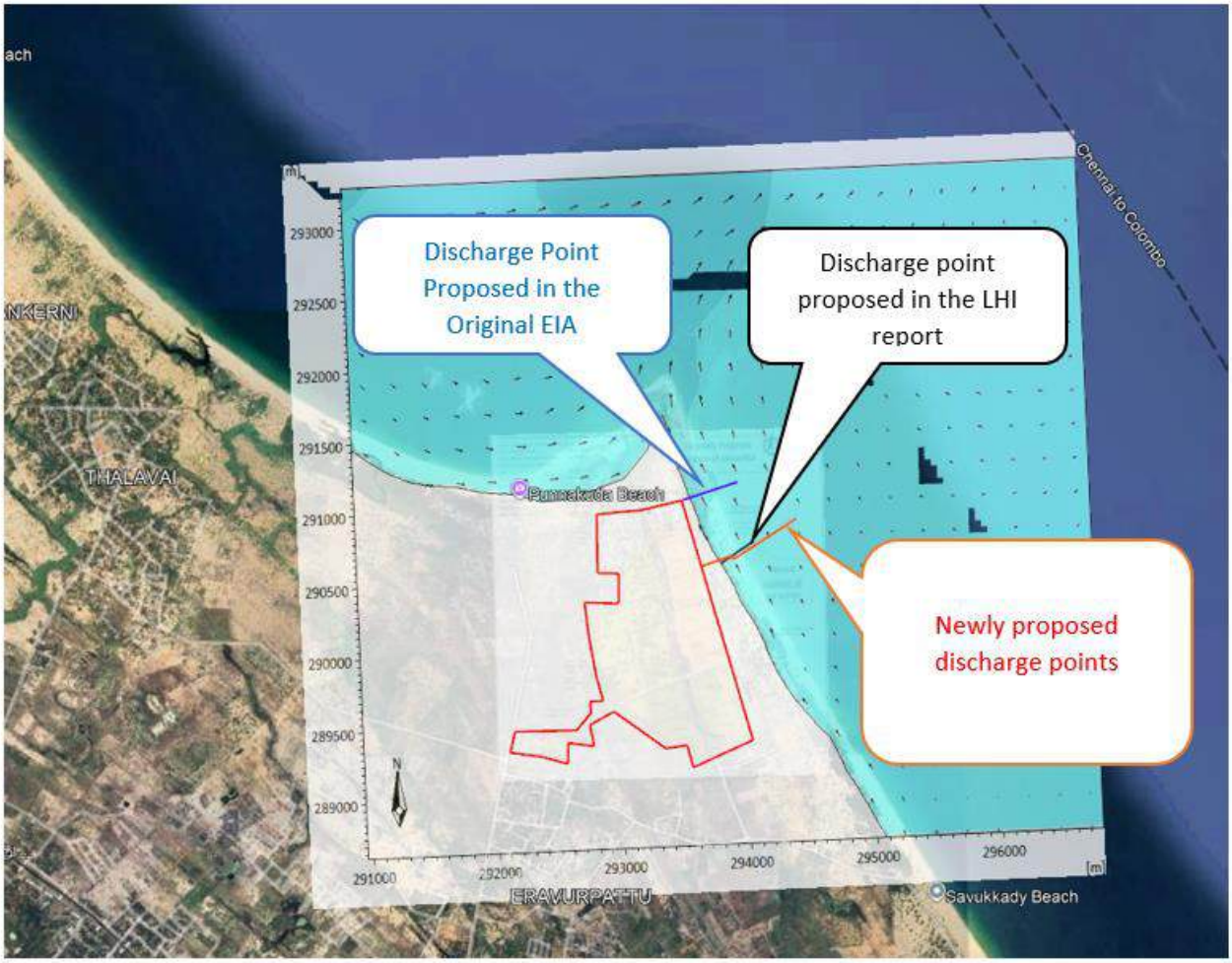


Figure 2-7 : Figure indicating the originally proposed and newly proposed path and the location of the sea outfall.

2.8.3 Any alteration in the components of the established wastewater disposal system (pipes, diffusers, other components etc.)

No changes in the type of pipes, diffuser and other component of the wastewater disposal system as originally proposed by the LHI in their report and in the original EIA

2.8.4 Rate of discharge of treated wastewater to the sea via short sea outfall

Total quantity of wastewater generated during the full operation is anticipated to be 12,000 m^3/day and the BOI will provide a treated wastewater collection station, which will be pumped to the sea via a short sea outfall with diffuser system through a pipeline that discharges wastewater with a mechanism to achieve intended dilution in such a manner that there should be a minimum dilution factor of 1:10 at a distance of 10 meters from the point of exit of the pipeline or tunnel

2.9 Sludge management (sludge generated from industry specific pre treatment (dewatering, storage and ultimate disposal) and sludge generated from common wastewater treatment system)

No common wastewater treatment plant is operated by the BOI. Sludge generated from the individual industrial effluent treatment plants (containing 1% solids by weight)[4] due to coagulation-clarification processes will require dewatering and the industries will use sludge drying beds or filter presses as a part of the in-house effluent treatment plants (ETP). The filtrate will be redirected to the ETP. Adequate ETP sludge drying requires at least 2 weeks (2 weeks drying time is generally sufficient in Eravur since it is located in the Dry Zone). However, efficient filter presses will be used especially during the rainy seasons to reduce the moisture content to 70-75%, but still the sludge is bulky to be transported and does not have adequate calorific value to be used for high-temperature incineration. ETP sludge and other chemical hazardous wastes have to be disposed by the respective industries in accordance to the requirements of the CEA. The current option is pre-processing and co-processing in cement kilns by Insee Ecocycle. The consent letter from the Insee is attached.

With reference to any solid wastes such as wasted sludge generated from STPs, the individual plants will be required to use it as a soil conditioner cum fertilizer provided the sludge is regularly tested and complies to Sri Lanka Standard 1246: 2003 (UDC 628.477.4) – Specification for Compost from Municipal Solid Waste and Agricultural Waste. If heavily contaminated it needs to be sent for co-processing (to the BOI's high-temperature incinerator plant or the respective industry will be required to consult Insee Ecocycle for possible co-processing).

The BOI will only provide a Material recovery facilities MRC (which was initiated in the Biyagama Zone and now replicated in other zones). The MRC will receive only the segregated non-hazardous wastes such as fabric, cardboard and paper (but not food wastes, construction and demolition wastes and hazardous wastes including ETP sludge) that will be generated due to the production processes and provision of axial services for the industry. The stacked material will be baled and after shredding (if required) prior to transportation for co-processing. All material coming to the MRC will be inspected to ensure that unacceptable wastes are not there and the waste is well segregated. A charge will be levied by the BOI for providing this service. Through Tendering procedures BOI will solicit expert waste management services providing parties to dispose the segregated and baled wastes (currently Insee Ecocycle has been selected for this purpose).

2.9.1 Quantity and quality of sludge generation and method of handling/ management of sludge generated.

The details are given in **Section 4.2 , Impacts of handling sludge disposal of all types of sludge**

2.10 Any provisions for amalgamation/ connectivity of the Proposed Common Wastewater Treatment System with already approved proposal.

In the new proposal, there is no common waste water treatment system is proposed by the BOI. The individual industries should treat their wastewater to the CEA standards and discharge to the common pumping area to disposed into the sea through a short outfall.

2.11 Anticipated water requirement & source for the proposed alteration and for future developments of the zone. The details on estimated water balance taking into account conservation measures, reuse and recycling of treated effluents should be given.

The total requirement of water for the entire peak operation will be 15,000m3. This water will be provided in phases based on the no. of individual industries that will be operated. The proposed water supply plan is given blow.

A) Interim Solution

As an interim solution, the NWSDB have already provided 5000m ^{3}/day from the Unnachchi Water Treatment Plant. In order to meet the peak water demand required when all industries are in operation, construction of 4000m ^{3} capacity water storage tank is at the tender evaluation stage and will be ready by end of year 2025.

B) Long Term Solution

According to the BOI, the anticipated water demand for Eravur Textile Zone is as follows;

Table 2-5 : Anticipated water demand for Eravur Textile Zone

	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Enterprise 01	1500	1500	2500	2500	5000	5000	5000	5000	5000	5000	5000	5000
Enterprise 02		1250	1500	1750	2000	2000	2000		2000	2000	2000	2000
Enterprise 03			400	750	750	1000	1000	1000	1000	1000	1000	1000
Enterprise 04					1400	1400	1400	1750	1750	1750	1750	1750
Enterprise 05						1000	1500	1500	1500	2000	2000	2000
Enterprise 06						1000	1000	1500	3000	3000	3000	3000
Total	1500	2750	4400	5000	9150	11400	11900	12,750	14,250	14,750	14.750	14,750

Following options have been considered as long-term proposals to cater water supply needs progressively as enterprises commence operation.

i) Application of 3R principle, best industry practices and cleaner production techniques to reduce the water usage in respective factories were requested by BOI. Already Enterprise 1 agreed to reduce the water consumption by 20%.

ii) Construction of new water treatment plant, supply and installation of new raw water intake pumps, supply & laying of new raw water pumping main from Unnachchi reservoir to proposed new treatment plant along with supply & installation 400mrn new DI treated water transmission main from proposed treatment plant to EFP is the next option for consideration. Since Unnachchi reservoir has a dedicated independent catchment it may not possible to additional water other than 10,000m ^{3}/day from Unnachchi as NWSDB need to consider growing water needs of the nearby community in order to avoid public protest by year 2027. Based on water demand predictions at EFP by BOI, it seems that further two to three years EFP can managed due to the fact that factories intend to recover and reuse 20% of their requirement. Beyond 2027-2030 NWSDB plan to extract water from proposed impounding reservoir at Rugam Kithul. However, in order to avoid conflicts with farmers, NWSDB regional office stress the need of implementing this reservoir for capacity of 90MCM. Since the proposed new treatment plant is located closer to Rugam Kithul it is possible to convey raw water upon completion of the Rugam Kithul. The revised implementation of Unnachchi option is Rs 17,643 million.

Therefor the committee strongly recommends implementation of this option as follows;

a) Implement supply and installation Of Unnachchi raw water pumps, pumping main, new treatment plant and 400mm DI transmission main to Eravur FP at a cost of Rs 17, 643 million as soon as possible after securing funds to ready the additional water needs of EFP preferably by year 2025 considering the importance of this zone to the national Economy.
b) Direct Irrigation Department to implement the Rugam kithul to meet 90 MCM capacity. In the event funding is limited to construct foundation structure, super structure up to 60 MCM level with design to suit 90 MCM and raising 90 MCM at a later stage.

2.12 Details on estimated energy requirement and source including electricity and auxiliary energy source such as renewable energy if proposed alteration & for future developments. A consent from the relevant authority in this regard is required.

No major changes in the total quantity of energy as in the original proposal.

It has been estimated that the Eravur Textile Manufacturing Zone requires 30 MVA Power supply out of which IOMVA has already been provided by the CEB. Since the current capacity of the Grid Substation is not adequate to supply the 30MVA requirement, it is proposed to request enterprises to use Solar Panels on their rooftops and to connect with the national grid. Also, it has been proposed to provide an opportunity to a private investor to fix solar panels on the rooftops of the enterprises to be located within the zone.

Further, the possibility of establishing a Solar power plant in a land within the zone or a land nearby the zone is also to be explored and private investors will be invited to commence this project.

2.13 Establishment of drainage management system of the zone along with new drainage plan and other infrastructure while ensuring conservation of surface water bodies within the site (e.g. "thona" etc.)

There will not be any significant changes in the proposed alteration to the land development as proposed originally. As discussed in the original EIA report there are two water holes associated with existing *thõna* and drainage network are identified. These two *thõna* will be developed and maintained as flood control and retention areas with necessary improvements.

A suitable storm water drainage network will be designed as a part of the internal road design and all drainage flows will be connected to the existing flow paths and outlets.

A proper Drainage Management Master Plan will be prepared for the overall project development, incorporating project site drainage management as well as flood control, flood conveyance enhancement, drainage canal improvements and erosion protection was essential components. The details are given in the Original EIA under Section E.1.16 " Drainage management plan". The proposed conceptual drainage plan is given in **Annex VII.**

2.14 Phase implemental schedule

Several preliminary and enabling activities for the proposed industrial estate development are already in progress during the initial implementation period of Years 1–2. These activities include land preparation, site clearing, boundary demarcation, access road improvement, and basic utility planning. In parallel, preliminary engineering investigations, environmental assessments, and stakeholder coordination activities have also completed. The initiation of these early-stage works demonstrates the commitment toward timely project implementation and will support the smooth execution of the major infrastructure development and industrial construction phases scheduled over the 10-year development period.

Table 2-6 Implementation Schedule

No	Activity / Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Feasibility Studies and Master Planning										
2	Land Acquisition and Legal Approvals										
3	Detailed Engineering Design										
4	Environmental and Social Impact Assessments (ESIA)										
5	Environmental Permits and Regulatory Clearances										
6	Access Roads and Internal Road Network Construction										
7	Water Supply Infrastructure Development										
8	Electricity and Power Distribution Systems										
9	Wastewater Treatment Plant Construction										
10	Solid Waste Management Infrastructure										
11	Stormwater Drainage and Flood Control Systems										
12	Telecommunication and ICT Infrastructure										
13	Plot Allocation and Investor Mobilization										
14	Construction of Phase 1 Industries										
15	Construction of Phase 2 Industries										
16	Construction of Phase 3 Industries										
17	Construction of Phase 4 Industries										
18	Construction of Phase 5 Industries										
19	Utility Connections to Individual Industries										
20	Machinery Installation and Factory Setup										
21	Recruitment and Workforce Development										
22	Testing and Commissioning of Industries										
23	Environmental Monitoring and Compliance Audits										
24	Occupational Health and Safety Programs										
25	Industrial Estate Management and Administration Setup										
26	Expansion and Upgrading of Infrastructure										
27	Full Industrial Operations and Production Scaling										
28	Long-Term Monitoring and Sustainability Programs										

2.15 Duration of operation of the new proposal unit establishment of approved proposal.

The construction period of the Jay Jay Mill is about three years and the construction works are already commenced.

2.16 Arrangement or proposal for accommodating of additional industries which can be proposed by different time intervals.

This proposed industrial zone is dedicated only for the textile processing industries, and the all wastes including wastewater, solid waste and sludge are calculated based on the maximum capacity. Therefore, the internal changes in locating individual industries within the zone will not causes any impacts other than the impacts discussed in the original EIA.

2.17 Details on operational and maintenance activities and procedures within the zone together with institutional arrangement/responsibility for such activities. Role and responsibilities of the BOISL for such arrangement need to be indicated clearly.

There are no major changes in the original development proposal submitted by the BOI except that initially the BIO has proposed a common waste water treatment system, but in the new proposal the waste water from the individual industries will be treated by the individual industries itself upto the short outfall standards and directly discharged to the sea through the wastewater collection tank operated by the BOI. This is a temporary arrangement until the common waste water treatment plant is installed. The other operational and maintenance activities are as same as proposed in the original EIA. The details are given in the Section B.3.1 and B. 3.2.

CHAPTER 03

3 EXISTING ENVIRONMENT OF THE AREA IDENTIFIED FOR INDUVIDUAL INDUSTRIES WITHIN THE MAIN PLAN OF THE PROJECT SITE

3.1 Details on the hydrological /hydraulic conditions of the receiving water body.

3.1.1 Baseline surface water quality of "thona"/drains/canals/sea considering the present context.

The surface water quality is discussed in the Section C.1.4 of the original EIA. In addition, water quality of Thona, ground water and sea water was tasted on 12th March 2026, and the copy of the report is given in **Annex VIII**.

The detailed dispersion modelling for the sea distribution pattern of the effluent plume as been discussed in in Annex 1 of the LHI report in the Annex 1 of the Original EIA Report. Further this attached for easy reference. **(Annex IX)**

3.2 Any alterations for existing storm water drainage pattern/ pathways / thona" to facilitate wastewater disposal/ discharge.

There is no changes to existing storm water drainage pattern/pathways/thona to facilitate the waste water disposal. The new sea out fall is discussed in Section 2.8.2.

3.3 Details of maximum observed floods in the area including water spread areas.

The details on the flood prone areas are discussed in the Section C.3.7. in the original EIA. According to the estimations made based on available secondary flood inundation data, the proposed project area is subjected to partial inundation during minor flood events (up to 15% based on minor or 5-year return period storm/flood events and up to 40% based on critical or 10-20 year return period storm/flood events). However, the entire site is prone to flooding during an extreme or severe cyclonic weather event (~30 year return period). Accordingly, necessary mitigations are proposed in the relevant section of the EIA report.

3.4 Details of the existing fishing activities of the area.

Two fish landing sites are located in Punnaikudah and Saukady in the project influencing area. All fisherman are organized to one fisheries society called Thalaval Rural Fisheries Society. The details of the fishers in the two fishing villages are given in the **Table 3.2.**

Table 3-1 : The details of fishing families in the area.

No	GN Division	2019		Remarks
		Families	Fishermen	
03	Thalawai/ Punnikudha	401	425	Project influencing area fishing villages/ landing sites
04	Savukkady/ Savukaddy	246	264	

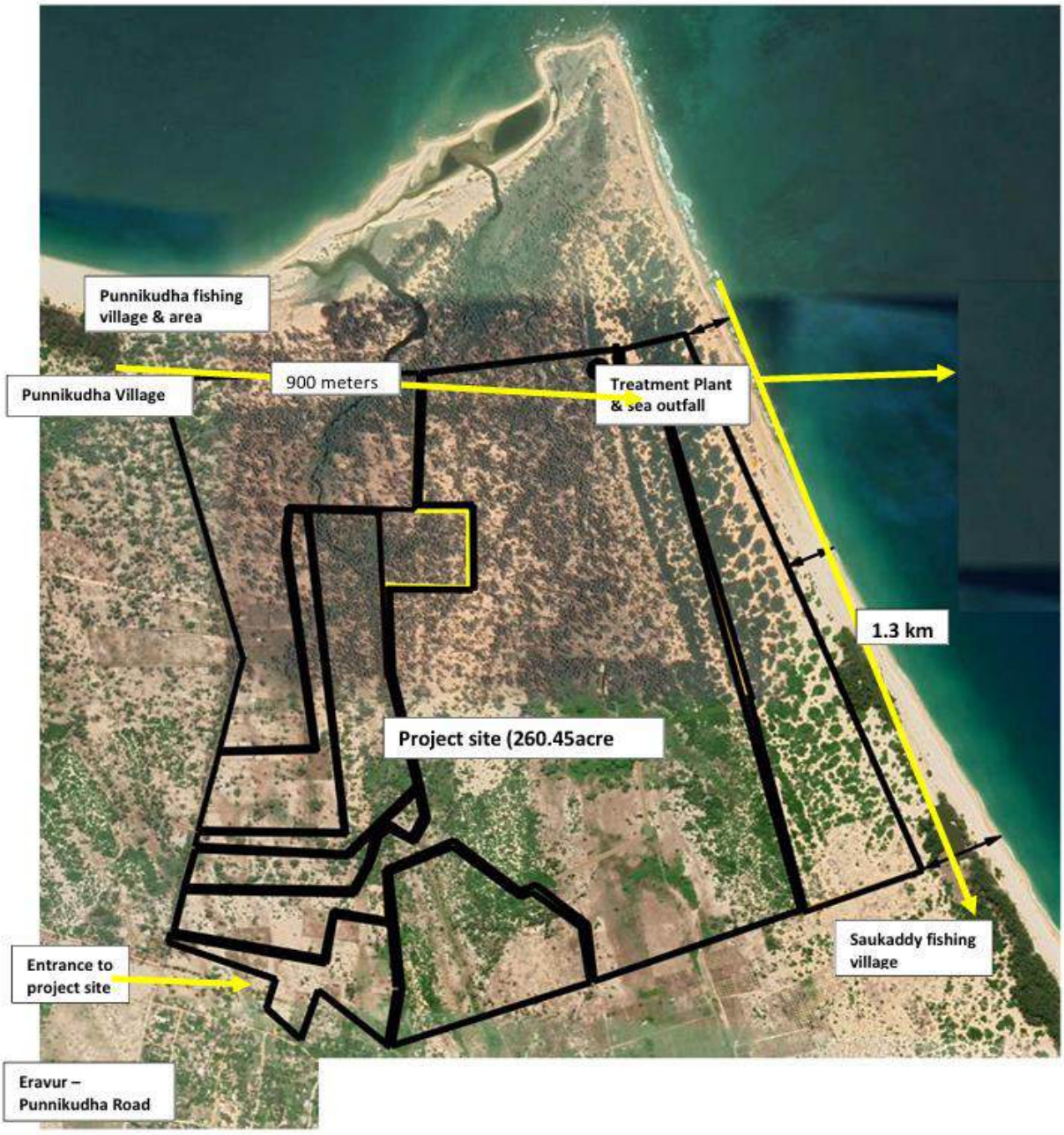


Figure 3-1 : Map showing the fishing villages in the project influence area

No changes in the fishing activities in the project influence area with compare to the original EIA. Therefore, no additional impacts are expected from the changes proposed by the BOI.

The existing air quality and the noise level are given in **Annex X and XI** respectively
The constructional activities with ongoing monitoring systems are given in **Annex XII**

CHAPTER 04

4 ENVIRONMENTAL IMPACTS DUE TO OPERATION OF INDIVIDUAL INDUSTRIES AND PROPOSED CHANGES MADE TO THE ORRIGINALLY APPROVED COMMON WASTEWATER TREATMENT SYSTEM

4.1 Quantity and quality of treated effluent to be discharged to the sea via short sea outfall and anticipated impacts due to discharges on quality of receiving waters.

It is estimated about 12,000m3 /day of wastewater will be discharged to the sea through the proposed short outfall. The discharge water quality will be in accordance The National Environmental (Protection and Quality) Regulations, No. 2264/17 dated 2022.01.27 *Tolerance limit values for an outfall leading up to nearshore water in the Schedule I List 1A* Tolerance limits for the discharge of wastewater or effluent into Marine Waters.

The water quality modelling was done considering the above standards. Therefore, no impacts are expected due to the discharge of the treated effluents to the sea through the short outfall.

The proposed new sea outfall is located within the marine ecological assessment conducted for the original EIA. Therefore, no major changes and impacts are expected.

4.2 Impacts of handling sludge disposal of all types of sludge

Impacts due to handling Textile ETP sludge

Haphazard disposal or mishandling of textile ETP sludge (another hazardous wastes) may seriously cause soil and groundwater contamination in the long-run considering the sandy nature of the soil and the groundwater tables which tend to rise in certain areas towards the thonas. pH of the sludge is variable (7.1-9.1), but it can be characterized with a high content of heavy metals; Balasubramium et al. (2006) reported 3.96 Cd mg/kg, 57.48 Cu mg/kg, 2.98 Cr mg/kg, 91.60 Zn mg/kg, 0.68 Ni mg/kg, 12.1 Pb mg/kg and 180.5 Fe^{2+} mg/kg with high levels of sulphates (1167 mg/L) and chlorides (5445 mg/L)[3]. Therefore, proper dewatering and handling of ETP sludge is essential. Areas of generation and dewatering (e.g., sludge drying beds and filter presses) needs to be made water proof to prevent leakages and entry of runoff and rainwater.

Wastes from STPs

Waste sludge from activated sludge systems

Excess activated sludge produced has to be wasted either from the return sludge line or directly from the aeration tank to maintain the required food-to-microorganisms (F/M) ratios or a steady level of

[3] Parameters expressed in mg/L are from 1:5 sludge to water extracted (Balasubramanium et al., 2006).

Mixed Liquor Suspended Solids (MLSS). **Table 4.1** shows the quantity of wasted sludge (fresh sludge) that is likely to be generated considering the Mixed Liquor Suspended Solids range desired to be maintained is 3000 mg/L (assuming that the plant is well functioning with a Sludge Volume Index (SVI) of 100 mL/g).

Table 4-1 : Anticipated quantities of fresh wasted sludge

Plant	Required Volume (m3)	HRT (days)	Net VSS (kg/day)	Net SS (kg/day)	Q_w (m^3/day)
Textile 1	1491.7	10	167.8	239.7	24
Textile 2	1491.7	10	167.8	239.7	24
Textile 3	770.8	10	86.7	123.9	12.4
Textile 4	677.1	10	76.2	108.8	10.9
Textile 5	387.5	10	43.6	62.3	6.23
5 apparel units	229.2	10	25.8	36.8	3.68
Other industries	721.9	11	81.2	116.02	11.6
Common infrastructure and utilities	96.3	11	10.8	15.5	1.55

Above calculations are based on the following: Plants are well functioning plant is well functioning with an SVI of 100 mL/g, BOD_5 will be reduced to 20 mg/L, SS are removed as underflow from the settling tank with a solid concentration of 1% and the specific gravity of sludge is 1, VSS/SS of 0.7, MLSS 3000 mg/L, yield coefficient Y is 0.73, decay coefficient K_d is 0.075 day^{-1} and biodegradable fraction f_b is 0.55 (from Arceivala and Asolekar, 2007).

HRT, SS and VSS denotes hydraulic retention time, suspended solids and volatile suspended solids, respectively. Q_w refers to liquid sludge to be removed. Calculated sludge age is 18.7 day^{-1} and mixed liquor volatile suspended solids / MLVSS is 2100 mg/L (from Arceivala and Asolekar, 2007)

Wasted sludge with a brownish, flocculent appearance has a musty odor and may contain traces of metals and organics. It contains a range of different types of microorganisms which may include pathogenic material, worms, protozoa, cysts and extracellular biopolymer (ECP) complexed / adsorbed heavy metals and microplastics. The sludge can become septic (dark in color) rapidly when exposed to rains during the heavy rainy periods and anaerobic decay could produce a bad smell.

If the sludge contains heavy metals exceeding the limits specified in Sri Lanka Standard 1246 : 2003 (UDC 628.477.4), then it needs to be considered as a hazardous waste. Therefore, the sludge should be disposed through co-processing in cement kilns (as per the CEA's guidelines). There is also a need to see the reasons as to why the sludge would be heavily contaminated with heavy metals under such circumstances and take preventive actions.

4.3 Impacts on surrounding neighbourhoods due to odour and gaseous emission

There are no major changes in the location of the project area in the new proposal as in the original EIA. The odor and gaseous emission from the individual industries will be control by the industrialist itself. The proposed industrial estate is located well far away from the residential houses. Therefore, any impacts due to odour and gaseous emission is expected.

4.4 Possible environmental risk due to storage of raw. materials/ chemicals/ oil/ by products, accidental spillage, industrial discharges, leakages, surface run off of raw materials/ chemicals/ oil/by products, breakdown of emission control systems, waste water treatment systems etc.

The impacts are discussed in the original EIA under **Section D.2.8.** Impacts due to storage, handling, transporting etc. of raw materials, products/ by produces, fuel etc. due to spillage, accidental discharge/emission etc. and the respective subsections. As there are no major changes in the industrial process, no significant changes are expected in the impacts as discussed in the original EIA report. .

4.5 Impacts on fishing activity due to wastewater discharge to the sea Impacts on beach and beach activities in the area.

The newly proposed sea outfall is as same as in the LHI Dispersion Model Studies for Proposed Industrial Zone Punnaikudah. Therefore, no additional impacts other than the impacts identified in the original reports are expected.

4.6 Impacts on drainage/ drainage pattern

The Proposed Drainage Management Plan is discussed in **Section E.16** in the original EIA, it explained. The proposed drainage management indicating the direction of flows is given in **Annex VII.**

4.7 Any other impacts

The anticipated impact due to the changes are already discussed in the relevant section of this report. No additional impacts to be considered.

CHAPTER 05

5 PROPOSED'MITIGATION MEASURE

5.1 Mitigation measures for the maintenance of individual STP

The proposed individual treatment plant designs, along with the deployment of technical staff for operation, monitoring, and laboratory functions, shall be submitted for review by the CEA.

The actions described in **Table 5.1** will be implemented by experienced and competent STP maintenance personnel to ensure that the activated sludge suspension will not die. Maintain relevant records/reports and checklists.

Table 5-1: Proposed maintenance schedule for STPs encompassing activated sludge systems

Unit and Parameters	Description	Frequency	Remarks
Aeration Tank			
Aerators	Grease the bearing support	Once a month	Oil leaks from gear units should be checked on a daily basis
	Inspection for any material that may have clogged the aerators	Daily or once a week	
Sludge levels	Take a sample of mixed liquor from the outlet of the aeration tank or near the discharge end when aeration is in progress and then measure the sludge levels using a graduated 1 L capacity cylinder or a 100 mL measuring cylinder (i.e., after shaking and 30 min of settling). Simply monitor and record	Daily	See Chapter 7 for further details
Aerators and catwalk	Clean and wash	once a week	
Clarifier / settling tank			
Gutters / weir outlet	Clean using brushes or pressure guns/hoses	Once a week	-
Return sludge pumps			

	Check operation	Daily	
Chlorination system Dosing pump NaOCl solution	 Check operation ensure the availability in the tank	 Daily Daily	-

During the long vacation times such as Sinhala-Tamil New Year, when there is no wastewater flow to the STP a constant source of nutrients must be regularly fed to the activated sludge / activated sludge tank. Therefore, in anticipation of these holidays, the operators will collect the sewage in to the individual septic tank the previous day to the holiday and during the holidays pump it to the aeration tank and operate the aerators. Also, plenty of milk and sugar dissolved in water on a daily basis shall be added to the aeration tank.

Standby electro-mechanical units such as pumps and aerators including their spare parts (in good working condition) shall be readily available in case of emergencies.

Monitoring works to be implemented are revised and **discussed in Chapter 7.**

Note that the proposed locations for the ETPs and STPs of the individual plants, MRC and the treated wastewater collection and pumping station to be operated by the BOI needs to be well raised by considering the maximum flood levels in the area.

5.2 Measures to minimize the impact of any toxicants on the activated sludge system of the STP

To further ensure that the BOD_5/COD of the textile processing effluents to the STP will not go ≤ 0.3 as well as to avoid any toxicity to the activated sludge suspension, conserve water usage for textile processing, reduce chemical usage and improve EHS compliance, the plants / factories will be required to reduce the color, COD levels, TDS levels including heavy metal contents and salts and the quantity of wastewaters generated by implementing the following actions. Reducing the color and metal contents will invariably reduce the amount of ETP sludge due to reduced optimum dosages of coagulants and flocculants.

5.3 BEPs for hazardous wastes

Table 5.2 provides the BEPs that will be considered for hazardous wastes.

Table 5.2: BEPs for hazardous wastes

Waste Category	BEPs	Alternative methods of disposal
E-wastes		
Fluorescent bulbs and tube lights	Prioritize to replace such bulbs with LED bulbs which are Hg free and more energy efficient wherever possible Handover any remaining items to Government approved firms for the recovery of white P and Hg and salvaging of metal items and glass, etc	-
Toner and ink jet cartridges	Prioritize to use refillable material so that they could be sent back to the supplier (for re-filling) Handover to government approved / licensed e-waste collectors cum recyclers	-
Other e-wastes	Handover to government approved / licensed e-waste collectors cum recyclers	-
Capacitors from sewing machines, air-conditioners and fabric cutters	Handover to government approved / licensed e-waste collectors cum recyclers Recommended to verify for the presence of PCBs from suppliers through a reputed laboratory / institute. If PCBs are present, then send to a licensed high temperature incineration or co-processing facility. Also items suspected to contain PCBs[4] shall be given to a licensed high temperature incineration or co-processing facility	-
Sludge, resins and other wastes from water and effluent treatment plants		

[4] Occurrence of PCB in machinery and equipment may be conducted for all facilities at least once or whenever new machinery or electrical or electronic equipment are introduced. This needs to be done through the Division of Occupational Hygiene, Department of Labor

ETP Sludge – Chemical sludge	After sufficient dewatering, hand over to Insee Ecocycle for co-processing Refer to the sub-section on "BEPs for Textile ETP Sludge"	-
EQ tank sludge	EQ tank can be designed to minimize sludge accumulation by deepening a sludge pocket with submersible wet well pumps. EQ tank should be ventilated (preferably via odour control system) and adequate mixing not to create anaerobic conditions. Sufficiently dry in sludge drying beds (which shall be placed underneath transparent roofs) and then handover to Insee Ecocycle for co-processing	-
Waste activated sludge from the STP	Use as a soil conditioner cum fertilizer within the zonal premises If the heavy metal levels > limits stipulated under the Sri Lanka Standard 1246 : 2003 (UDC 628.477.4) – Specification for Compost from Municipal Solid Waste and Agricultural Waste, then it shall be disposed through co-processing (Insee Ecocycle has to be consulted)	-
Softener resins and activated carbon	Co-processing through Insee Ecocycle	-
Empty bags of NaCl used for softening and other chemicals used for effluent treatment	Co-processing through Insee Ecocycle	-
Chemical dyes, pigments and other hazardous wastes such as flammable material		
Filters from machinery and equipment such as sewing machines, compressors and generators	Send to a licensed high temperature incineration or co-processing facility.	-

Expired or outdated chemicals, inks, dyes and glues / adhesives	Prioritize on inventory control of dyes, pigments, etc needed to avoid surplus accumulation and engage in chemical leasing programmes See whether such material could be given back to the supplier (with evidence of acceptance and documentation regarding disposal) as the first option. If this is not possible, then send to a government licensed high temperature incineration or co-processing facility[5] In the case of chemicals that are not expired (in terms of shelf life) but no longer needed for the production, then give back to the supplier (as the first priority) or trade off to a third party organization (having a valid Environmental Protection License and a scheduled waste management license) that may need the chemical/s (before considering sending to licensed high temperature incinerator or co-processing facilities)	-
Glue wastes (includes material generated due to cleaning of machinery and collected in poly bags, glue stained polythene material inside the original HDPE barrels and items such as fabric stained with glue during cleaning works)	Those plants that use glues containing ZDHC, Stockholm Convention Annex A listed material and other material banned / restricted by the BOI are mandated to look into alternative glues containing less hazardous material Handover to a government approved high temperature incineration facility or for co-processing facility	-

[5] Inventory of such chemicals to be disposed shall be kept updated (with the inclusion of the product name, physical status, constituents / ingredients and the CAS numbers, hazard class, quantity and expiry date) along with retaining the SDS. Unidentified chemicals shall be tested (qualitative and quantitative analysis) through a reputed facility having state of the art facilities such as headspace GC-MS to provide further advice regarding disposal

Waste printing glue after bed washing	Considering reducing the quantity of generation by applying less material to the bed. Dispose by means of handing over to a government approved high temperature incineration or cement kiln facility	-
Photographic Ag residues	Use new laser engraving techniques	-
Empty plastic Chemical Containers / barrels / and buckets (contaminated items) – HDPE (Plastic Paint cans and stain removers are also included)	Prioritize to handover to responsible recyclers having a suitable washing plant with an ETP (recycler should have a valid EPL and a scheduled waste management license). The recycler should be making material that are of non-food grade material (not for toys, water storage tanks, tables and chairs and for any food-grade usages) or not sending pellets to such industries. The containers could be thoroughly washed prior to handing over to recyclers	-
Metal drums (example, dye barrels), and large adhesives drums, adhesive tubes and spray cans	Handover to a licensed facility having an arc furnace to make steel or bar wires. Otherwise, such material needs to be handed over to a CEA approved high-temperature incineration or co-processing facility	-
Paint cans, pad printing ink cans and small adhesive / glue cans, paint cans, oil cans, etc	Those plants having an ETP shall wash and handover to a licensed facility having an arc furnace to make steel or bar wires. Otherwise, such material needs to be handed over to a CEA approved high-temperature incineration or co-processing facility	-
Clamp board / scrap board	Handover to a pre-processing facility where the removed mesh shall be given to a government approved cement kiln (co-processing) or high temperature incinerator. The metal waste needs to be given to a licensed smelter with clear evidence	-
Dye paste	Consider quantity reduction as a high priority by means of reviewing the recipes, improvements in machinery / process operations, etc	-

	Consider one of the disposal options - Handover to a government approved high temperature incinerating facility or cement kiln - Handover to a government approved brick making facility	
Used Oil / waste oil (except transformer oil and oils from capacitors and welding plants known or suspected to contain PCBs)	Handover to a government approved waste oil recycling firm Use as fuel for in-house boilers after proper analysis where appropriate	-
Oil sludge in fuel storage tanks	Handover to a licensed high temperature incineration or co-processing facility	-
Used or waste oil removed from welding plants (known or suspected to contain PCBs)	Carefully remove the oil and contaminated material, store in a leak proof drum / container which shall be sealed and labelled as "Caution: Contains PCB" and then handover to a licensed high temperature incineration or co-processing facility as the last option (do not reuse / recycle due to possible occurrence of PCBs)[6]	-
Used Pb Acid Batteries	Handover to a government licensed recycling facility	-
Lace, fabric material, wood dust, polythene foam material, surgical gloves and other contaminated PPE, etc contaminated with oil or other chemicals such as inks, dyes and glues (example, gunny	Handover to a Government approved high temperature incineration or co-processing facility	-

[6] Persons who are required to carry out any work exposing them to materials either proven or suspected to contain PCB, must use the appropriate PPE. This includes impermeable long gloves, coveralls or aprons, overshoes, chemical type safety goggles and respiratory protective equipment. Clothing manufactured from absorbent materials should be avoided

bags containing glue pellets, spill kit material, etc)		
Spent perchloroethylene (C_2Cl_4) solutions	Handover to a Government approved high temperature incineration or co-processing facility In the long-run, looking at alternatives for C_2Cl_4 through machinery modification or replacement is needed considering health risks to team members	-
COD vials containing Hg, Ag and Cr (including Cr^{6+})	First consider using Hg free methods for COD analysis after consulting reputed laboratories.	Handover the spent vials to reputed laboratories / wastewater R&D firms that can reuse for comparative COD analysis (provided the methods have been okayed by the CEA with "NO OBJECTION" letter[7]
Broken and blunt needles and small metallic parts removed from sewing machines and other machinery	-	Needles shall be either disposed to a well concreted pit[8] (i.e., the side walls and the bottom are totally concreted) having a seal / cover or handed over to a facility having an electric arc burner. If disposed to a concreted pit then add some salt solution (NaCl) In terms of the WHO criteria, these waste can be considered as "SHARPS" too which can given to a company that disposes biomedical wastes through

[7] The method to reuse spent COD vials by Thurul Safe Laboratories have been okayed by the CEA (CEA Ref. No: 07/WM/25/2015 dated 09/12/2016)

[8] Such pits should be located within the facility and not close to waterways and in areas where the groundwater table is shallow or where there are drastic seasonal variations in the groundwater table

		high-temperature incineration (example, Sisili Hanaro Encare).
Ash (bottom and fly ash) from biomass boilers and thermic fluid heaters	Mix with wasted activated sludge or compost and use for landscape application[9]. There should be no direct application to the soil or plants/crops. Send to brick manufacturers (depending on pH, heavy metals, N, P, K, TOC and total Si content obtained through a reputed laboratory)	-
Janitorial chemicals and other chemicals used for maintenance		
Empty plastic cans	-	Prioritize to handover to responsible recyclers having a suitable washing plant with an ETP (recycler should have an EPL and a scheduled waste management license). If the plant has a physico-chemical effluent treatment plant, the containers could be thoroughly washed prior to recycling Send back to the supplier for refilling / reuse (evidence of proper reuse is needed)
Empty Gas Cylinders		
LPG cylinders	Send back to the supplier for refilling / reuse	-
Refrigerants (e.g., R 22, R134)[10]	Send back to the supplier for refilling / reuse	-
Cylinders due to oxy-acetylene works (oxygen and acetylene gas cylinders) [11] used in workshops	Send back to the supplier for refilling / reuse	-

[9] However, at least once a year the constituents should be tested for pH, heavy metals, N, P, K, TOC and total Si content through a reputed laboratory to decide on the best disposal practices
[10] R22 (HCFC-22) is chlorodifluoromethane or difluoromonochloromethane (CHClF2), a hydrochlorofluorocarbon (HCFC) that is phased out in USA and EU since it is an O3 depleting chemical
[11] Liquid oxygen is a cryogenic fluid, but acetylene is a flammable gas (UN Class Hazard 2.1)

Construction & Demolition (CD) Wastes		
Asbestos	Handover to Built Element Limited Elephant for recycling. Handle and stack the waste with care until handing over (fibres are air-borne / respirable when damaged or abrased). Letters of acceptance issued by such CEA licensed recyclers and Hazardous Waste Declaration Forms have to be maintained as evidence of proper disposal.	-
Glass wool	-	Normally, synthetic glass fiber material should be wetted before placing in heavy duty plastic bags or other impermeable objects and then buried within site (in a water-proof area). Use for screed concreting or as a covering material of plastic made water tanks (as an insulator) Consult the CEA for further advise
Chemical Containers / barrels / empty paint buckets, adhesive tubes, paint brushers, spray cans, etc	-	Plastic material: Prioritize to handover to responsible recyclers having a suitable washing plant with an ETP (recycler should have an EPL and a scheduled waste management license). If the plant has a physico-chemical effluent treatment plant, the containers could be thoroughly washed prior to recycling Metal items: Handover to a licensed facility having an arc furnace to make steel or bar wires, etc Send to a licensed high temperature incineration or co-processing facility

Also refer to Annexes 21-23 in the original report.

BEPs for Textile ETP Sludge

The sufficiently dried ETP (after pre-processing and solar drying works) contains around 9-32% of VS (depending on the water content), which means it is not suitable for incineration or co-processing due to a significant amount of residue generation (Balasubramanian et al., 2006; Begum et al., 2013). Biyagama and Seethawaka Zones have been reported to produce 500 MT/month and 728 MT/month of textile sludge, respectively (as of 2020) which is given to Insee Ecocycle for co-processing in cement kilns (located in Puttalam District). It is expected that the amount of the ETP sludge produced at Eravur would be comparable to the amounts generated at Biyagama and Seethawaka Zones. Therefore, the total ash content would be variable in the range of 340-663 MT/month. The following options have to be considered by the respective plants.

- Insee Ecocycle should be contracted to co-process the dried ETP sludge
- As an alternative (as a CSR) project with concurrence from the CEA and the BOI, employ locals to make bricks and other construction material such as paving stones (Figure E-2) using the bottom ash and the fly ash (which may contain volatile or semi-volatile metals such as Hg and Pb) extracted from the air pollution controlling devices set up in the incinerator. Otherwise, organizations (e.g., Seatra Technologies, SMS Engineering (Pvt) Ltd. and SINO-STI Cooperation) currently involved in the making of bricks using the fly ash and bottom ash from the ash yard of the 900 MW coal powered plant at Norochcholai may be selected through Tendering Procedures. This is a proven upcycling technique.

Some studies have concluded that textile ETP sludge could be used to make construction material for non-structural applications (Balasubramanian et al., 2006; Begum et al., 2013). According to Balasubramanian et al. (2006), substitution of textile ETP sludge for cement, up to a maximum of 30%, is technically possible in the manufacturing of non-structural building material. Begum et al. (2013) showed that bricks comprising textile ETP sludge up to 15% (with replacement of clayey soil) satisfied the prescribed norms of India for compressive strength, water absorption, efflorescence, density and weight loss on ignition. In Sri Lanka, Brandix successfully manufactures bricks from dried ETP sludge.

However, technical assistance for this brick making project will be initially obtained from the National Building Research Organization (NBRO) or the National Engineering Research and Development Centre (NERD). The material will also be randomly subjected to compressive tests and the USEPA defined Toxicity Characteristics Leaching Protocol (TCLP) test (to ascertain that fixed metals do not leach out) with assistance from the NBRO.

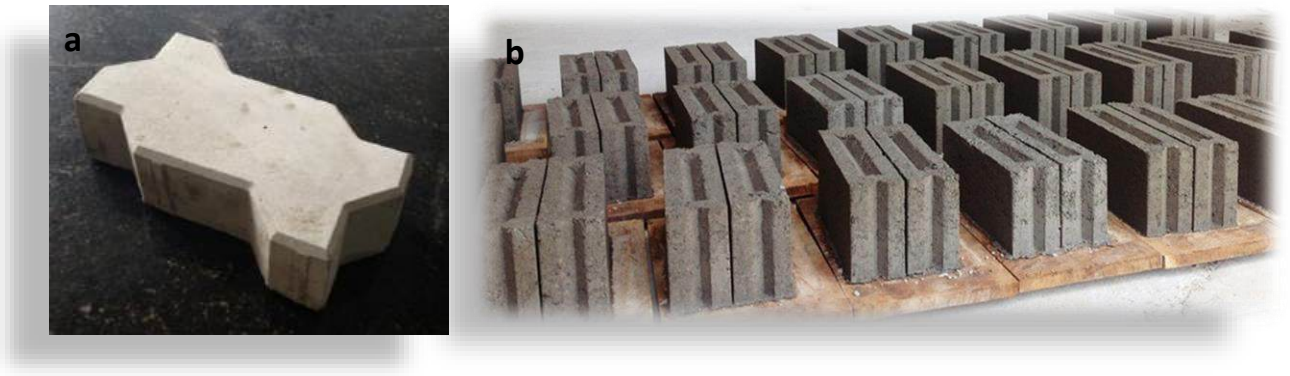


Figure 5-1 : Some examples of pavement stones (a) and bricks (b) made from textile ETP sludge ash (Source: BOI)

5.3.1 BEPs for waste generated from the STPs

5.3.1.1 Screenings

Since the screenings will be coated with some organic material, this along with the biodegradable MSW will be either composted or after sufficient drying it should be disposed through co-processing (along with the ETP sludge).

5.3.1.2 Grit material from the Grit Chambers

After sufficient drying, the material will be used as a fill material within the site.

5.3.1.3 Wasted Activated sludge

This will be dried for 1-2 weeks in the sludge drying beds (which will be kept underneath transparent roofing sheets to prevent exposure to rain during the rainy periods) to remove at least 30% moisture; once cracks develop and the sludge has a stable humus like appearance with a tary black or brown / grey color and with no odor. Thereafter, the material will be used as a soil conditioner cum fertilizer. However, the individual plants with BOI will periodically (once a month) assess the quality of the sludge to ascertain that any heavy metals do not exceed the limits specified in Sri Lanka Standard 1246 : 2003 (UDC 628.477.4) – Specification for Compost from Municipal Solid Waste and Agricultural Waste.

CHAPTER 06

6 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

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There is a necessity for the Zone to prepare and implement a detailed Contingency Management Plan / Emergency Response Plan (ERP) (which may be updated time to time) prior to commencement of the operations.

Also each industry must prepare and implement a detailed Contingency Management Plan / Emergency Response Plan (ERP) (which may be updated time to time) prior to commencement of the operations.

All such plans need to be worked out with the Disaster Management Centre, Ministry of Health, CEA, NIOSH, Department of Labor and the local Fire Brigade Services, etc. BOI and the industries shall have a qualified and experienced ESH team to respond to emergency / disaster situations and work closely with the Ambulance services, Armed Forces, Police, Fire Fighting Services and the Disaster Management Centre. All properties and workforce[12] needs to be insured against accidents including natural disasters.

This section of the report discusses a conceptual plan that is confined to the Zone. The detailed ERP shall encompass / consider the following as a minimum.

- Fire hazards including protection and escape routes
- Explosion hazards
- Spills
- Accidental ruptures of pipelines
- Floods tsunamis, cyclones and other natural hazards
- Bomb / terrorist threats
- Food poisoning
- Contagious disease spreading (example, SARS, COVID-19)
- Failure of treatment plants
- Failure of incinerators
- Failure of equipment / machinery used in Solid Waste Management Facilities
- Electricity breakdown
- Contamination of potable water
- Potable Water scarcity
- Warning organization
- First aid
- Training and behavior
- Access for Rescue Services
- What to do in case of an emergency?
- Contact details of Emergency Organizations

[12] All workers shall be subjected to compensation if injured during the course of their employment in accordance to the Workmen's Compensation Ordinance No 19 of 1934 and its amendments

Therefore, the plan must include the following contents

- Introduction to Disaster Planning
- Definition of a Disaster
- Type of Disasters
- Emergency Team and Roles and Responsibilities
- Emergency action plan and responsibilities
- Important contact numbers (including Emergency Contact Numbers of Government Stakeholders such as Fire Brigade, etc)
- Action for the different hazards / issues
- Updated map / layout of the zone showing the evacuation routes, effluent and solid waste management infrastructure, emergency generators, active firefighting systems, assembly point, Fire Brigade Unit. Security Unit, etc

For the ERP accidents / disasters must be defined as

- Type A; incidents / accidents that needs immediate evacuation and immediate attention
- Type B; incidents / accidents that may not need immediate evacuation, but immediate attention

However, enough proactive hazard management practices should be implemented with regular auditing, hence to get better prepared for accidents prevention and to ensure that normal work conditions may be attained as soon as possible after the disaster / accident. **Table 6.1** provides some strategies that are recommended to be included for the ERP with reference to anticipated issues or hazards in the BOI Zone.

Table 6-1 : Recommended strategies for consideration in the ERP

Issue / Hazard	Proactive EHS Hazard Management strategies	Reactive EHS Hazard Management Strategies	Remarks
Type A incidents			
Fire Hazards	With reference to fire hazards, the following actions are recommended. - ensure active fire fighting systems are stringently implemented and regularly inspected (Annual maintenance of fire fighting and protection system and testing them on a monthly basis while keeping records of the tests.) - All emergency escape routes and exits are not blocked at all times - The exit signs (in all 3 languages) are always illuminated even during power failure periods and the emergency lighting system is in working condition - Types and number of Fire extinguishers in the relevant areas such as the incinerator, office complex, generator room and storage areas shall be available in pairs as a precautionary measure so that one set is available when the other is under replenishment. - Ensure that water is available in the fire hydrant system (daily basis) - Each extinguisher shall be marked with the following information in all 3 languages: the	Use the break glass to operate the fire alarm. Evacuations and roll calling. Call the fire brigade and police Find out whether all have arrived at the assembly point. In case of a missing person, rescue / ESH team to carry out search operation fire rescue team (Internal) & fire brigade rescue team. Try to find the location of fire using the fire panel and visual evidence. Call ambulance if necessary from the closest hospital or Police If necessary, Transfer casualties to hospital and others given with first-aid treatment. Assess the damage of loss due to fire. Contact the Finance officials and compile a report and replace the damaged machinery. Equipment, infrastructure, etc	-

	type/class of fire which the extinguisher could be used, instructions for use, types / classes of fire in which the extinguisher should not be used and producer / supplier details of the extinguishers - Fire and evacuation drills are to be performed with assistance from the local Fire Services Department or a reputed services provider every 6-12 months Other tasks shall be - Carrying out fire risk assessments periodically. - Take the necessary precaution to minimize the fire risk. - Health and safety induction for all employees their first date. - Training of employees on fire and first aid training. - Update departmental fire registers twice per day. - Strictly adhering to “No Smoking” policy - Maintenance of electrical equipment and connections on the regular basis through a qualified electrician and Electrical Engineer.		

	- Control of outside contractors through permits of work and Strictly adhering to hot work permits. Plants are also required to ensure incompatible chemicals and hazardous wastes (that will lead to fires and explosions if coming into contact with one another) are not stored as per the MSDS Separate dedicated facilities such as workshop involving hot works are isolated from other units and where hot works are needed ensure that hot works are performed with issuing of Work Permits and under the supervision of a Safety Officer		
Explosions	The factories must ensure that hazardous raw chemicals and hazardous wastes are stored with material that are compatible with them (as per the storage instructions given in their MSDS) and devoid of ignition sources. The Zone and the factories shall adopt a strict "No Smoking" policy with issuing of Work permits for those who are engaged in performing hot works Only authorized personnel with passes issued by the BOI shall be allowed to enter the zone and the security shall be entrusted to check this regularly. Permanent employees shall be required to have their	- Evacuate all employees to a safe place / assembly points. In case of a missing person, rescue / ESH team to carry out search operation (Internal) & rescue teams from Police, Forces, etc. If necessary, Transfer casualties to hospital and others given with first-aid treatment. - Carrying out roll calling. - Call the Ambulance if needed, bomb disposal unit, police and Sri Lankan forces - Call to the BOI security office. - Assess the damage of loss due to explosion - Contact the Finance officials and compile a report and replace the damaged machinery. Equipment, infrastructure, etc.	-

	national ID cards and company ID cards with them at all times.	- Inform the situation to the head office.	
Tsunamis, floods and other natural hazards	The Zone must have a workable siren system to communicate impending disasters and hence must work very closely with the Disaster Management Centre and the Meteorology Department. Such sirens and / or any other warning systems (covering the entire zone should be audible enough) must be tested every month (on pre-determined dates) with prior notification of the plants. A daily check with the meteorology departments for weather forecasts is crucial. Take necessary action immediately when there is a risk of flood without waiting till the last moment. Seek support from the Sri Lankan Forces for this matter. Also the Zonal Director and the ESH Director must establish a quick system to communicate impending disasters to the CEO/GM and the ESH Manager of each plant	- Move all the raw materials and stored wastes (with extreme care) and finished items to higher areas. Inform the plants to do this immediately - Switch off main electricity. - Make auxiliary arrangement for work force to vacate the premises or bring them to the inside if the flood is out side (surrounding areas). Seek the services of the Air Force and Navy to assist evacuation of people and for other relief - Clear out all electricity appliances. - Advise the factories to pump out water inside the factories - Advise the plants to try to make dams using soil and sand to avoid the water coming to very important machinery and waste storages which cannot be moved in places where can be done	According to the CCCRM, this area was not heavily hit by the tsunamis in 2004, unlike in the nearby areas such as Kallady, Nawalady, Vakarai, Kalkudah and Passikudah
Type B incidents			
Accidental Spills of potentially	BOI shall advise the following to each plant - Regularly perform condition monitoring of their facilities especially raw chemical	BOI shall advise the following to each plant Note that spills up to 300 cm^3, 300 cm^3-5 L and > 5 L are considered as small spills, medium spills and large	These strategies should be included in

hazardous substances	storages, hazardous wastes storages, fuel storage tanks and their pipelines, etc - Liquid chemicals and fuels, and solids will be stored within dedicated facilities constructed on concrete floors made impermeable to infiltration by spillages. The facilities will be engineered with collecting drains to carry spills to sumps from where the substances can be collected for recycling on site or for handling at an off-site disposal and recycling facility. Example, where there are fuel oil storages, the floor shall be angled to 1% and directed to an oil trap. - There shall be secondary containment for liquids and fuels with the capacity of the secondary containment is 10% more of the total material stored.	spills, respectively. The response for small spills and medium spills is neutralization and / or absorption spill kit (depending on the type of chemical). But large spills (if not controlled) may require the assistance of outside help (fire brigade services and armed forces) with possible evacuation of people - Measures to be taken in the event of spills involving hazardous chemicals, shall be erected as posters in all 3 languages especially in critical working areas like the dye houses and hazardous waste storages. Persons exposed to spills shall be immediately washed off for 15 minutes in running water using the emergency showers / eye washing units and then taken to the nearest hospital for medical surveillance - Plants must have readily accessible and workable emergency showers and eye washing units in areas close to where places hazardous material are handled (example, dye houses, waste storages). First aid clinics are available at each factory. - Plants must have readily accessible spill kits and dry powder extinguishers to deal with Class A, B and C fires (if flammable material are involved) close to where places	detail in the ERP

		hazardous material are handled (example, dye houses, waste storages). - Contaminated spill kit material shall be safely placed to a well tied bag which should be well labelled and then kept inside a labelled puncture proof bin. The material must be immediately disposed as a hazardous material	
Response to injury and worker exposure to hazardous material	-	The BOI Zone must have a common clinic. A programme of response should be established by the BOI and each plant that prescribes the actions to be taken in the event of injury or exposure to a hazardous substance. In this respect, - Emergency measures to be taken in the event that persons have been contaminated (Splashing of chemicals onto the skin and eyes, cloth; Procedure in the event of chemical ingestion and Procedures to be followed in the event of inhalation of toxic gases) - Above procedures must be exhibited as posters in all 3 languages in critical working areas like the incinerators and biomedical waste storages	These strategies should be included in detail in the ERP

		All staff who inspect and handle hazardous waste should be trained to deal with injuries and exposures. The programme should include the following elements: - immediate first-aid measures, such as cleansing of wounds and skin, and irrigation (splashing) of eyes with clean water o an immediate report of the incident to a designated responsible person; o retention, if possible, of the item involved in the incident; details of its source for identification of possible infection; o additional medical attention in an accident and emergency or occupational health department, as soon as possible; o medical surveillance; o blood or other tests if indicated; o recording of the incident; o investigation of the incident, and identification and implementation of remedial action to prevent similar incidents in the future. In case of a	

		needle stick injury, bleeding of the wound should be encouraged and the area should be washed under clean running water. The remaining elements of the accident response plan should then be followed. The purpose of incident reporting should not be seen as punitive; active support by managers should encourage prompt and accurate reporting	
Power failure	There needs to be an emergency generator which shall be programmed to automatically start within 15 seconds during a power failure event. Oil levels in the generator shall be checked daily	-	These strategies should be included in detail in the ERP
Breakdown of machinery / equipment in the MRC	Regular servicing and maintenance of the shredders and baling machines is required and should be indicated in a record book. It is also advised for the BOI to discuss and agree with the party that will operate the MRC to ensure that they maintain a maintenance schedule too. There shall be 2 sets of shredders and baling machines so that both can be alternately operated and one will be available in case of a failure or during repairs and maintenance works. It is also advised for the BOI to discuss and agree with the party that will	-	These strategies should be included in detail in the ERP

	operate the facility to ensure that spare parts needed for equipment / machinery are readily available.		
Breakdown of the STP of each facility	The treatment plant must have 2 sets of screening chambers and grit chambers in parallel so that one of them could be used when the other is under cleaning or maintenance works. The STP should have standby aerators in the extended aeration tank and standby sludge pumps in the clarifier (sedimentation tank) so that they can be alternately operated and one will be available in case of a failure. Similarly, there shall be 2 sets of NaOCl dosing pumps and in the equalization tank there shall be 2 sets of submersible pumps so that they can be alternately operated and one will be available in case of a failure. Environmental Management Unit (EMU) with the Maintenance Department of each factory must discuss and agree with the party that will operate the ETP/STP to ensure all electro-mechanical equipment including spare parts of them are readily available in case of malfunctioning of the installed equipment The ETP should be regularly well maintained as suggested in this report and the original report.	In case of a breakdown of the STP, diversion to the treated effluent collection and pumping station of the BOI should be stopped until the STP is rectified. BOI needs to be notified immediately.	-
Potable water scarcity	BOI is advised to have a suitable RO plant (with consideration given to the disposal of brine / reject water along with the treated effluent to the sea	-	-

	through the same sea outfall) and ensure that accessories are readily available in good condition including RO membranes and pre-treatment systems. In this respect, it is advised to have a MOU with the NSWDB to operate this unit if the necessity arises and / or to provide bowzers		
ETP of each facility	The Environmental and Safety Unit (ESU) with the Maintenance Department of each factory shall ensure that standby chemical dosing pumps, stirrers and other electro-mechanical equipment (including spare parts of these equipment) are readily available in case of malfunctioning of the installed equipment. The floor area of the ETP including areas where the ETP sludge will be generated and dried, etc. should be made of impervious material or containerized (to prevent leaks, runoff and rainwater entry) with provision of secondary containment around reactors such as coagulation-flocculation tanks and clarifiers (so that spills, leaks collected could be pumped or directed back to the EQ tank). Note that capacity of secondary containment should be 10% more of the total capacity of the reactor. Reactors such as coagulation-flocculation tanks and clarifiers must have a free-board space of 0.5-1.0 m to avoid spills.	In case of a breakdown of the ETP, disposal to the facility's STP should be stopped until rectified. BOI needs to be notified immediately. EQ tank must have sufficient capacity to collect the industrial effluent until the ETP is rectified.	BOI shall mandate each factory to prepare and implement an ERP (copies shall be submitted to the BOI and they shall be used for auditing / monitoring purposes). The ERP shall be updated each year and whenever new facilities are added or due to expansions, etc.

	Each year or twice a year the reactors made of mild steel must be applied with corrosion-proof paints. The operations of the dosing pumps, stirrers and other electro-mechanical units, valves and leaks, etc shall be checked on a daily basis; plant personnel involved in operating and maintaining the ETPs shall be experienced personnel who will supervise the performance of the ETPs through usage of checklists. BOI must mandate plants to have emergency holding tanks of sufficient capacity (at least 1.5-2.0 times the total daily volume) to collect the effluents in case the plant's ETP is malfunctioning and until it is rectified. The BOI will not permit any factory to dispose untreated or partially treated effluent within or outside the zone under any circumstances. BOI is advised to regularly monitor the textile effluent quality of each plant. Each facility will be mandated to provide treated effluent collection points (prior to entering the STP) for the BOI (with the assistance from CEA officials) to randomly collect grab samples or composite samples for analysis. They shall be placed such that BOI or its authorized agents could enter for sampling works without seeking factory's permission. Plants whose effluent quality is not conforming to the BOI/CEA norms must be informed immediately and debarred from disposal to the		The facility specific ERP must furnish the proactive and reactive strategies that will be taken in the event of ETP failures, etc In addition, each facility shall submit an operation and maintenance plan of their ETP to the BOI (BOI shall use this for auditing / monitoring purposes including any reports and checklists, etc. that have been

	plant's STP until satisfactory rectification works have been done.		maintained by the facility)
Breakdown of the treated effluent collection and pumping facilities	BOI must discuss and agree with the party that will operate this facility to ensure all electro-mechanical equipment including spare parts of them are readily available in case of malfunctioning of the installed equipment.	In case of a breakdown, disposal to the sea should be stopped until the facility is rectified and the CEA, CCD and MEPA needs to be informed. The collected effluents have to be fully chlorinated with support from the NWSDB; alternative arrangements may be need for disposal (e.g., deployment of gully suckers operated by the Eravur UC or private waste management services).	Regular monitoring of the incoming effluent from each plant to this facility is essential to be done by the BOI.

CHAPTER 07

7 ENVIRONMENTAL MONITORING PROGRAMME

7.1 EMP and Monitoring Programme

A conceptual Environmental Management Plan (EMP) for the Zone during both the construction and operational phases was provided in the original EIA, in Tables G-1 and G-2, respectively. However, due to the temporary removal of the CWWTP and the revised approach of discharging treated wastewater from individual industries directly to the sea via a collection tank, until install the CWWTP, additional information has been incorporated into the EMP. The updated EMP is presented in **Table 7.1**. Relevant sections from the original EMP are repeated below for ease of reference.

During the operation phase overall operation and maintenance of the Zone (in terms of EHS compliance) will be the responsibility of the Environmental Management Unit (EMU) of the BOI. Also the Engineering Unit in collaboration with the EMU will play a serious role to ensure that the ETPs and STPs are performing well at all times. Therefore, considering the "Precautionary Principle" and the "Polluter Pays Principle" (which will be embodied to the EPLs and the SWMLs), the BOI must have necessary funds to implement the mitigatory measures and perform the monitoring activities.

Obviously, serious consideration needs to given to the treatment and disposal of treated effluents to the sea, continuous monitoring of the effluent quality of each plant to the treated effluent collection and pumping facility and the proper disposal of textile ETP sludge as well as other hazardous wastes generated from the zone.

Likewise respective Management of the different Plants are totally responsible to ensure that they adhere to the conditions stipulated in their EPLs and SWMLs[13] and any other conditions pertaining to EHS management that will be imposed by the BOI (example, adhering to the ZDHC programme). Plants shall bear the necessary costs associated with EHS compliance and monitoring matters. Since many apparel and textile industries have the habit of slashing funds for EHS compliance matters (considering it as a nuisance) and often employ unqualified persons (e.g., Economists, Accountants, Facilities Management, HR professionals) to look into EHS matters (just to satisfy the CEA and other government authorities), BOI must stipulate a mandatory condition that each plant must have an EMU, which will only employ a qualified and experienced EHS Team to manage EHS matters. There should be a stringent requirement that EHS Team members must have academic qualifications (BSc, MSc) in Environmental Management / Environmental Engineering or equivalent[14] and professional qualifications in Health and Safety (e.g., NIOSH Diploma and NEBOSH). Therefore, the BOI will maintain records such as CVs and certified academic certificates, etc. of the ESH members in each factory (with submission of copies to the CEA-Batticaloa Office).

Funds associated with environmental compliance monitoring works (in accordance to the conditions stipulated in the CEA issued EPL and the scheduled waste management licenses) have to be borne by the BOI. With regards to the monitoring of air, noise and vibration; the state organizations who possess expertise for those areas are CEA, ITI and NBRO. With regards to water and effluent quality monitoring, ITI is an SLAB accredited State organization while there are many other private sector enterprises who are also dealing with

[13] In many cases EPLs are jointly issued by the BOI and the CEA, whereas the SWML is issued by the CEA.
[14] Environmental Science, Chemistry and/or Chemical Engineering are acceptable too.

it. BOI has the liberty to consult these organizations for environmental monitoring. Tsunami status will be monitored and funded by the Disaster Management Centre.

Likewise respective Management of the different Plants are totally responsible to ensure that they adhere to the conditions stipulated in their EPLs and SWMLs and plants shall bear the necessary costs associated with EHS compliance monitoring matters. In many cases EPLs are jointly issued by the BOI and the CEA, whereas the SWML is issued by the CEA. Plants also have the liberty to seek the services of reputed government and / or private parties that will have state of the art facilities for environmental monitoring works.

The external Environmental Monitoring Program (EMP) for Eravur Textile zone project and its impacts will be undertaken by an interagency committee compromising of the key agencies that have jurisdiction on various entities of the Project area. A core monitoring team headed by Secretary to the Ministry of Industries will be formed with the representatives of the most relevant organizations mentioned as follows;

The probable Monitoring Committee

- Secretary to the Ministry of Industries
- Director General of Board of Investment Sri Lanka (BOI)
- District Secretary – Batticaloa district
- Director Planning – Batticaloa district Secretariat
- Divisional secretary – Earvurpattu/ Chenkaldy D.S division
- National Water Supply and Drainage Board (NWSDB)
- Marine Environment Protection Authority (MEPA)
- Palmyrah Development Board- Batticalao office
- Irrigation Department – Batticaloa5ay5
- Central Environment Authority (CEA)
- Eastern Provincial CEA
- Urban Development Authority (UDA), (Batticlaoa district office)
- Chenkalady Pradeshiya Saba (PS)
- Ceylon Electricity Board (CEB)
- Road Development Authority – Road Development Department -Batticalao
- Land Reform Commission – Batticalao office
- Coast Conservation Department (CCD) – Batticlao office
- Forest Department – DFO Batticlaoa
- Fisheries Department – Batticaloa
- Agriculture Department – Batticaloa
- Police Department- Batticaloa and Eravur stations

Table 7-1: EMP – Operation Phase

Environmental aspect / Impact	Mitigatory Measure	Time frame	Institutional framework for implementation	Remarks
Extensive washing of finished goods containing nylon or polyester could be sources of microplastics	Adopt water conservation strategies and plants should reduce the amount of synthetic material usage such as nylon and polyester and focus on recycled cotton usage A subsurface flow wetland as a tertiary treatment system would be helpful to remove any particulates (dissolved as well as particulate components of organic matter) that may escape from the clarifier / sedimentation tanks, microplastics, any remaining traces of heavy metals and nutrients (especially phosphorous)	During the operation phase (at all times)	BOI for the operation and maintenance of the SSF wetland Water Conservation measures - plants	BOI is advised to regularly monitor / audit the water conservation measures taken by the plant
The sea outfall and its anchoring structures are a safety hazard to those	Install and regularly maintain floating and luminous or illuminated buoys around the entire perimeter (length) of	During the operation phase – once a week monitoring by the BOI	BOI	BOI may seek the services of the Sri Lanka Navy to maintain the buoys and

Environmental aspect / Impact	**Mitigatory Measure**	**Time frame**	**Institutional framework for implementation**	**Remarks**
involved in beach seine ("Madel") fishing activities	the outfall (at least 200 m from all sides of the outfall) to warn fishermen. It is also advised to regularly maintain the floating buoys It needs to be buried in the sea bed			monitor the condition of the bouys. BOI must attend to any complaints made by the local fishermen
Effuent quality of each plant not conforming to the BOI norms	Regular monitoring of the effluent quality by the BOI – see Table G-3 for more details	Frequency of monitoring: once a week (minimum), but needs to be accordance to the dyeing operations / schedules or as per the contractual agreement between the BOI and the Management of the plant. See Table G-3 for more details	BOI	Plants are also required to regularly monitor the performance of their ETPs and report to the BOI. See Table G-3
Improper SS practices and storage of wastes by plants (both hazardous and non-hazardous wastes)	Regular monitoring of the SS practices within the areas of waste generation and the waste storages (both hazardous and non-hazardous waste storages)	See Table G-3 for more details	Plants and the BOI. See Table G-3 for more details	See Table G-3.

Environmental aspect / Impact	**Mitigatory Measure**	**Time frame**	**Institutional framework for implementation**	**Remarks**
Increase in dust (PM) and gaseous pollutants in ambient air	Usage of Bharat-IV compliant vehicles. Motorable roads in the complex shall be paved to reduce dust emission. Ensure operational procedures are adequately implemented and regularly reviewed so as to identify opportunities for continual improvement.	-	Plants, BOI and other service providers	Sources are Vehicular traffic. Use of well-maintained vehicles will be encouraged and preferablt common transport for staff (separate arrangements for executives and above and minor employees)
Increase in noise levels	Equipment shall be designed to conform to noise levels prescribed by regulatory agencies Green belt will also be developed all along the boundary wall for attenuating the nois	-	Plants for noise attenuation from machinery and equipment BOI – Green belt maintenance	Sources are Vehicular movement, pump house &D G sets operation

Table 7.3 provides a conceptual plan applicable during the operation phase of the Zone with reference to impacts on the physical environment.

Note that a detailed EMP with a monitoring plan too needs to be developed and implemented after obtaining the Environmental Clearance from the CEA. Similarly, the plants shall be requested to prepare and implement an updated EMP and a monitoring plan (for approval by the BOI).

Table 7-2: Environmental Monitoring Plan proposed for the Zone (O&M Phase)

Environmental Impact / activity / aspect	Parameters	Frequency of monitoring, detection limits and thresholds	Location / timing of sampling	Responsible Agency	Agencies for monitoring	Monitoring and Reporting Procedures	Remarks
ETPs and STPs							
Disposal of treated textile processing effluent from each plant	pH, BOD_5, COD, TSS, TDS, temperature, phenolic compounds, ammonical nitrogen, chlorides, cyanides, sulphides, sulphates, oil and grease and heavy metals (total Cr, Hg, Pb, Cu, Ni, Zn, As), free residual chlorine and color as follows: 400-499 nm (yellow range-maximum spectral	Frequency: once a week (minimum), but needs to be accordance to the dyeing operations / schedules or as per the contractual agreement between the BOI and the Management of the plant Detection Limits: reports shall describe the detection	Outlet of the plant's ETP; there shall be a treated effluent collection point in the ETP (after going through the entire treatment reactors) to obtain grab samples Timing of sampling: during the peak operation periods	EMU (comprising a qualified ESH Team) of the industry or Plant	Plants may establish a laboratory that could carry out effluent quality analysis in accordance to the Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF). Otherwise, plants could seek the services of	Plant to report the results after Quantitative analysis of effluent as per Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF) Copies are to be handed over to the BOI and the CEA.	Regular monitoring is very essential Necessary funds have to be borne by the plant. Recommended to seek the services of a SLAB accredited lab for analysis

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	absorption coefficient is 7 m^{-1}) 500-599 nm (red range- maximum spectral absorption coefficient is 5 m^{-1}) 600-750 nm (blue range- maximum spectral absorption coefficient is 3 m^{-1}) *– need to comply with the tolerance limits for the discharge of wastewater or effluent into a treatment plant or a sea outfall or a combination of both (LIST VIA) specified in Extraordinary*	limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant tolerance limits. Threshold: tolerance limits stipulated by the BOI (See Annexes 11 and 12). Also the BOD_5/COD ratio of the final treated			SLAB accredited labs to sample and analyse the treated effluent quality		

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	Gazette Notification 2264/17 dated January 27th, 2022 (See Annexes 11 and 12 in the original report)	effluent of each plant should not be < 0.3					
Disposal of treated textile processing effluent from each plant	pH, BOD_5, COD, TSS, TDS, temperature, phenolic compounds, ammonical nitrogen, chlorides, cyanides, sulphides, sulphates, oil and grease and heavy metals (total Cr, Hg, Pb, Cu, Ni, Zn, As), free residual chlorine and color	Frequency: once a week (minimum), but needs to be accordance to the dyeing operations / schedules or as per the contractual agreement between the BOI and the Management of the plant	Outlet of the plant's ETP Timing of sampling: during the peak operation periods	BOI	BOI	BOI to report the results after Quantitative analysis of effluent as per Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF) Copies are to be handed over to the respective	Regular monitoring is very essential Necessary funds have to be borne by the BOI BOI must also assign an Environmental Officer from CEA to assist BOI to strictly monitor the industry specific

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	as follows: 400-499 nm (yellow range- maximum spectral absorption coefficient is 7 m^{-1}) 500-599 nm (red range- maximum spectral absorption coefficient is 5 m^{-1}) 600-750 nm (blue range- maximum spectral absorption coefficient is 3 m^{-1}) – *need to comply with the tolerance limits for the discharge of wastewater or effluent into a treatment plant or a sea outfall or a*	Detection Limits: reports shall describe the detection limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant tolerance limits. Threshold: tolerance limits stipulated by the BOI (see				plants and the CEA. Plants that are not conforming to the required limits shall be informed in writing immediately and to stop the operations until the treatment processes are rectified. Extra costs involved in the undertaking the sampling and analysis of treated effluents after ETP rectification shall be borne by the Management of the respective plant (a condition that may be	pretreatment of effluents. Each facility will be mandated to provide treated effluent collection points (prior to entering the common ETP) for the BOI (with the assistance from CEA officials) to randomly collect grab samples or composite samples for analysis. They shall be placed such that BOI or its authorized agents could enter for sampling works

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	combination of both (LIST VIA) specified in Extraordinary Gazette Notification 2264/17 dated January 27th, 2022. (See Annexes 11 and 12 in the original report)	See Annexes 11 and 12). Also the BOD_5/COD ratio of the final treated effluent of each plant should not be < 0.3				stipulated in the agreement between the BOI and the plant's Management)	without seeking factory permission BOD_5/COD ratio of the final treated effluent of each plant must be estimated and should not be < 0.3 Copies are to be handed over to the respective plants and the CEA. Plants that are not conforming to the required limits shall be informed in writing immediately and to stop the operations until

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
							the treatment processes are rectified. Extra costs involved in the undertaking the sampling and analysis of treated effluents after ETP rectification shall be borne by the Management of the respective plant (a condition that may be stipulated in the agreement between the BOI and the plant's Management)
STP; treated effluent (pre-treated effluent and sewage)	pH, BOD_5, COD, TSS, oil and grease, heavy metals such as Hg, Cu, etc and other parameters	Frequency: once a month or as the conditions stipulated in	There shall be a final treated effluent collection point (after going	EMU (comprising a qualified ESH Team) of the	Plants may establish a laboratory that could carry out	Plant to report the results after Quantitative analysis of effluent	Regular monitoring is very essential Necessary funds

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	mentioned in *Gazette no. 2264/17 dated 2022.01.27.* under the NEA - **Tolerance limits for the discharge of wastewater or effluent into Marine Waters** - *Tolerance limit values for a short sea outfall* (**see Annex XIV)**	the EPL by the CEA Detection Limits: reports shall describe the detection limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant tolerance limits. Threshold: **Tolerance limits for the discharge of**	through the entire treatment reactors) to obtain grab samples during the peak operation periods (peak wastewater flows) Timing of sampling: during the peak operation periods (when peak flows are receiving to the plant)	industry or Plant	effluent quality analysis in accordance to the Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF). Otherwise, plants could seek the services of SLAB accredited labs to sample and analyse the treated effluent quality	as per Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF) Copies are to be handed over to the BOI and the CEA.	have to be borne by the plant. Recommended to seek the services of a CEA registered lab for analysis

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		wastewater or effluent into Marine Waters - *Tolerance limit values for a short sea outfall* (**see Annex XIV)**					
STP; totally treated treated effluent from each factory (pre-treated textile processing effluent and sewage)	pH, BOD_5, COD, TSS, oil and grease, heavy metals such as Hg, Cu, etc and other parameters mentioned in *Gazette no. 2264/17 dated 2022.01.27* – **Tolerance limits for the discharge of wastewater or effluent into**	Frequency: once a month or as the conditions stipulated in the EPL by the CEA Detection Limits: reports shall describe the detection limits of the instruments	There shall be a final treated effluent collection point (after going through the entire treatment reactors) to obtain grab samples during the peak operation periods (peak	BOI	BOI shall contract Independent SLAB accredited R&D firms	Through independent R&D firms (SLAB accredited labs); Quantitative analysis of treated effluent as per Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF)	Necessary funds have to be borne by the BOI

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	Marine Waters - *Tolerance limit values for a short sea outfall* (**see Annex XIV)**	used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant tolerance limits. Threshold: **Tolerance limits for the discharge of wastewater or effluent into Marine Waters** - *Tolerance limit values for a short sea*	wastewater flows) Timing of sampling: during the peak operation periods (when peak flows are receiving to the plant)			Reports have to be maintained by the BOI and copies are to be submitted to the CEA in accordance to the conditions stipulated in the EPL	

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		outfall (**see Annex XIV)**					
Treated effluent to be disposed to the sea through the short sea outfall	pH, BOD_5, COD, TSS, oil and grease, heavy metals such as Hg, Cu, etc and other parameters mentioned in *Gazette no. 2264/17 dated 2022.01.27 NEA* - **Tolerance limits for the discharge of wastewater or effluent into Marine Waters** - *Tolerance limit values for a short sea outfall* (**see Annex XIV)**	Frequency: once a month or as per the conditions stipulated in the EPL by the CEA Detection Limits: reports shall describe the detection limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant	There shall be a final treated effluent collection point (after going through the entire treatment reactors) to obtain grab samples during the peak operation periods (peak wastewater flows) Timing of sampling: during the peak operation periods (when	BOI	BOI shall contract Independent SLAB accredited R&D firms	Through independent R&D firms (SLAB accredited labs); Quantitative analysis of treated effluent as per Standard Methods for Examination of Water and Wastewater (APHA, AWWA and WEF) Reports have to be maintained by the BOI and copies are to be submitted to the CEA in accordance to the conditions	Necessary funds have to be borne by the BOI Note that monitoring the quality of the effluent to be pumped out has to be just before discharging via short sea outfall

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		tolerance limits. Threshold: **Tolerance limits for the discharge of wastewater or effluent into Marine Waters** - *Tolerance limit values for a short sea outfall* **(see Annex XIV)**	peak flows are receiving to the plant)			stipulated in the EPL	
Sludge bulking events in the STP	Sludge Volume Index or SVI Foaming and sludge bulking (example,	For SVI analysis sample should be taken from the outlet of the aeration tank or	Activated sludge tank	EMU of the plant	EMU of the plant	Monitoring Methods for SVI: use a graduated cylinder of capacity 1 L and observe the settlement	Plant Management to bear any expenses involved in maintenance of the STP.

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	filamentous microbial formation, bad smell and *Nocardia* formation – brown, viscous foams).	near the discharge end – regularly (daily) or once a week Daily monitoring for foaming and sludge bulking events when the mill is in operation				characteristics 30 min after mixing Foaming and sludge bulking : visual inspections and olfactory detection (for odor only) SVI Reports shall be maintained by the ETP maintenance staff of the BOI. Checklists too to be maintained	A properly functioning activated sludge plant should not have any odor and the color should be coffee or chocolate brown. If SVI is 0-100 mL/g and 100-200 mL/g, then settling characteristics are good and acceptable, respectively. If SVI > 200 mL/g, then poor. pH should not be < 6.5. DO levels should be 2-3 mg/L (improvements to the

Environmental Impact / activity / aspect	Parameters	Frequency of monitoring, detection limits and thresholds	Location / timing of sampling	Responsible Agency	Agencies for monitoring	Monitoring and Reporting Procedures	Remarks
							aeration system is needed if DO is low). If SRT is not within the range of 20-30 days, then sludge wasting rate should be adjusted accordingly. In emergency situations of filamentous bulking use chlorine or hydrogen peroxide in the return activated sludge. Check the DO levels, pH, F/M ratio (organic loading) or SRT and types of microbes

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
							through a reputed laboratory) if sludge bulking occurs
Rising sludge in the clarifier / sedimentation tank of the common ETP	Rising sludge	Daily monitoring	Clarifier	EMU of the plant	EMU of the plant	Visual inspections Maintain and report in the checklists	BOI Plant Management to bear any expenses involved in maintenance of the ETP STP If rising sludge occurs, increase the return activated sludge pumping rate to reduce the detention time of the sludge or reduce the SRT by increasing the sludge wasting rate.
Nature of wasted sludge	Nature of sludge	Daily	Sludge drying beds	EMU of the plant	EMU of the plant	Visual inspections	Good sludge should have a

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
							brownish, flocculent appearance and a musty odor.
Heavy metals in the wasted sludge	Heavy metals (Cd, Cr, Cu, Pb, Hg, Ni and Zn) with pH as a minimum	Frequency: once a month Detection Limits: reports shall describe the detection limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should be below the relevant tolerance limits.	Sludge drying beds or material stacked for landscaping Timing of sampling: once moisture content has been reduced by 30% with appearance of cracks and the sludge has a stable humus like appearance with a tary black or brown	EMU of the plant / BOI	EMU and the BOI shall contract Independent SLAB accredited R&D firms	Through independent R&D firms (SLAB accredited labs); needs to be composite samples and tested as follows pH as per ISO 10390 Heavy metals as per AOAC (975.03) (Digestion) and AAS or ICP-AES Reports have to be maintained by the BOI and	Necessary funds have to be borne by the EMU and BOI for sludge quality monitorin g pH should be within 6.5-8.5 and heavy metal values shall not exceed the following Cd 10 mg/L Cr 1000 mg/L Cu 400 mg/L Pb 250 mg/L Hg 2 mg/L Ni 100 mg/L Zn 1000 mg/L

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		Threshold: Sri Lanka Standard 1246 : 2003 (UDC 628.477.4) – Specification for Compost from Municipal Solid Waste and Agricultural Waste	/ grey color and with no odor			copies are to be submitted to the CEA and to plants if required	Occurrence of high metal levels in the wasted sludge could be an indication that the metal sources are the chemicals used by the plants (which are escaping the coagulation-flocculation processes if the ETPs are malfunctioning); Zn could also be due to galvanized plumbing; Pb could be from solder joints in plumbing
Solid Waste Management facilities							
Operation of the MRC	Cleanliness (example no litter trapped by the	Daily	MRC and the immediate surrounding	BOI	BOI	Visual inspections / surveys	Material unloaded and sorted shall be always kept within

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	perimeter fences) and proper segregation and storage of any recyclables that were recovered		and the immediate surrounding (including the access road to the MRC)			(checklists may be used)	the premises (not outside). Recyclables recovered shall be correctly stored in the designated storages and ensure that storages are not overfilled
SS Practices and Operation of the Waste storages of the plants	SS practices and the points of generation Cleanliness and condition monitoring as per the Waste Management Plan of the plant submitted to the BOI	Monthly or bi-weekly or as per the contractual agreement between the BOI and the plant	Waste generating areas as per the Waste Management Plan of the plant Hazardous and non-hazardous waste storages of the plants	BOI	BOI	Audits with usage of checklists (administering questionnaires, verification of documents, etc) as in conducting ISO 14,001	Violations / non-compliances are to be reported to the relevant Plant Management by the BOI for rectification purposes. Further inspections may be needed depending on the effectiveness of the corrective or

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
							preventive actions taken
Thona water quality							
Possible pollution of the thona	pH, TSS, turbidity, temperature, COD, BOD_5, electrical conductivity or salinity, oil and grease, phenolic compounds, DO, Cl^-, SO_4^{2-}, total coliform, faecal coliform, NH_3-N, NO_3-N, TP, Fe, Mn and heavy metals (Co, Cu, Se, Hg, Ni, Cr, Cd, As, Pb, Zn, etc)	Frequency: Twice a year covering the driest and rainy seasons and depending on serious complaints Detection Limits: reports shall describe the detection limits of the instruments used such as AAS or ICP-AES for heavy metal analysis. Detection limits should	At least 4 locations per thona (i.e., 2 within the site and 2 within the Project Influencing Area) to adequately cover the upstream and downstream	BOI during the operation phase and pre-construction phase Contractors shall be required to engage in Thona water quality monitoring during the construction phase (also the pre-construction phase can be covered too) under the strict	BOI and Contractors shall contract Independent SLAB accredited R&D firms	Through independent R&D firms (SLAB accredited labs); needs to be grab samples Construction Phase: Contractor/s shall hand over the reports to the BOI Operation Phase: BOI to handover the relevant reports to CEA and key members of the	Sampling and analysis must cover the pre-construction phase (once) and the construction phase too. Frequency for construction phase (irrespective of the year) should be Twice a year covering the driest and rainy seasons and depending on serious complaints Same locations shall be sampled and analyzed (irrespective of the Phase, etc) and the

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		be below the relevant limits described under National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 – limits for Category C (water suitable for aquatic life) Threshold: National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 – limits for Category C		supervision of the BOI		environmental monitoring committee (MEPA and CC&CRM Department)	reports must furnish the GPS points of the sampled locations All results reported must be compared with the baseline values reported in this study (where appropriate) and with reference to the National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 – limits for Category C (water suitable for aquatic life)

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
		(water suitable for aquatic life)					
Ambient air quality deterioration, noise emissions and vibration							
Ambient air Quality/During construction	24 hr continuous measurements of PM10, PM2.5, SO2, NOx & CO	Once in every 6 month	Project site or Each industry premises	Contractor	BOI or independent accredited laboratory	As per the National Environmental (ambient air Quality Regulation) or USEPA approved methodology	Violations / non-compliances are to be reported to the BOI and contractor to take management actions
	TSPM	Once in 3 months	Upwind and downwind of the site	contractor	BOI or independent accredited laboratory	As per the fugitive dust measurements in National Environmental (Stationary source emission regulation) 2019 or USEPA approved methodology	Violations / non-compliances are to be reported to the BOI and contractor to take management actions

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
Ambient air Quality/During Operation	24 hr continuous measurements of PM10, PM2.5, SO2, NOx & CO	Once in year	Surrounding Area	Industrialist and BOI	BOI or independent accredited laboratory	As per the National Environmental (ambient air Quality Regulation) or USEPA approved methodology	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions
Stack/point source emission monitoring	Smoke Opacity and PM - depending on the capacity Maintain required Stack High & Fuel quality	Once in year	Equipment (Boiler, Generator, Heaters etc & Emission Stack	Industrialist	BOI or independent accredited laboratory	As per the National Environmental (Stationary source emission regulation) 2019 or USEPA approved methodology	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions
Stack/point source emission monitoring	Sulfur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM), Smoke Opacity, Carbon Monoxide (CO),	Once in year	Equipment (Incinerator) Emission Stack	Industrialist	BOI or independent accredited laboratory	As per the National Environmental (Stationary source emission regulation) 2019 or USEPA	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions

Environmental Impact / activity / aspect	**Parameters**	**Frequency of monitoring, detection limits and thresholds**	**Location / timing of sampling**	**Responsible Agency**	**Agencies for monitoring**	**Monitoring and Reporting Procedures**	**Remarks**
	Hydrogen Chloride (HCl), Mercury (Hg), Lead (Pb), Dioxin and Furans					approved methodology	
Boundary noise Level	1 hour average Day time LeqA in dB, L90A, L50A, 15 min average night time LeqA in dB, L90A, L50A,	Once a year	Boundary of each industry	industrialist	BOI or independent accredited laboratory	As per the National Environmental (noise control) regulation 1996 or ISO 1,2 &3 or BS 4142	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions
Boundary noise Level	1 hour average Day time LeqA in dB, L90A, L50A, 15 min average night time LeqA in dB, L90A, L50A,	Once a year Or compliance	Boundary of industrial zone	BOI	independent accredited laboratory	As per the National Environmental (noise control) regulation 1996 or ISO 1,2 &3 or BS 4142	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions
Vibration level	1 hour average (15 min intervals) ppv mm/s	Once a year Or compliance	Nearby structures	BOI	independent accredited laboratory	As per the interim vibration standards stipulated by the CEA	Violations / non-compliances are to be reported to the BOI & CEA for regulation actions

CHAPTER 08

8 CONCLUSION AND RECOMMENDATIONS

This Supplementary Environmental Impact Assessment (SEIA) addresses the new modifications proposed by the Board of Investment (BOI) for the Eravur Textile Processing Zone. In the original project proposal, individual industries were expected to pre-treat their wastewater to meet BOI interim standards before discharging it into a Common Wastewater Treatment Plant (CWWTP) operated by the BOI. The treated wastewater from the CWWTP was then to be discharged into the sea via a short outfall.

However, due to the current economic conditions and the unavailability of the expected water supply from the National Water Supply and Drainage Board (NWS&DB), it has now been decided that each industry will independently treat its wastewater to meet the required discharge standards and release it directly into the sea via the short outfall. This is a temporary arrangement until install the CWWTP.

There are no significant changes to the originally proposed development activities. The modifications are limited to minor internal layout adjustments, and the removal of the CWWTP temporarily. Consequently, each industry must now treat its wastewater to meet the tolerance limit values for a short sea outfall, as specified in Schedule I, List IA of the "Tolerance Limits for the Discharge of Wastewater or Effluent into Marine Waters." The effluent discharge point aligns with the LHI Hydrological Modelling Report.

The original EIA studies remain valid for this SEIA, and no further studies are required. No additional environmental impacts are anticipated beyond those identified in the original EIA. However, this SEIA includes further details on sludge management and water quality control. It is also proposed that individual industries, in collaboration with the BOI, implement a real-time online monitoring system at the final discharge point.

It is strongly recommended that this project be closely monitored by the designated monitoring committees at regular intervals to ensure that the guidelines and recommendations outlined in the Environmental Management Plan (EMP) are effectively implemented. Subject to these measures, the proposed changes to the original plan are recommended for approval.

REFERENCES

- Arceivala, S.J., Asolekar, S.R. (2007). Wastewater Treatment for Pollution Control and Reuse. 3rd Edition, Tata McGraw Hill Education Private Limited, New Delhi, India.

- Ashton M.S., Gunatilleke, S., de Zoysa, N., Dassanayake, M.D., Gunatilleke, N. and Wijesundera, S. (1997): A field guide to the common Trees and Shrubs of Sri Lanka. WHT Publications (http://www.wht.lk/ebooks/singlegallery/15475786)

- Balasubramanian, J., Sabumon, P.C., Lazar, J.U., Ilangovan, R. (2006). Reuse of textile effluent treatment plant sludge in building materials. Waste Management, 26, 22–28.

- Begum, B.S.S., Gandhimathi, R., Ramesh, S.T., Nidheesh, P.V. (2013). Utilization of textile effluent wastewater treatment plant sludge as brick material. Journal of Material Cycles and Waste Management, 15, 564–570.

- Bhatia, S.C. (2005). Environmental Pollution and Control in Chemical Process Industries. Khanna Publishers, New Delhi, India.

- BOBLME. (2011). Biodiversity and Socio-economic Information of Selected Areas of Sri Lankan Side of the Gulf of Mannar. BOBLME-2011-Socioec-03

- Bride, J.L. (1995). Report Tropical Cyclone Formation, WMO/ TD- No. 693. No TCP-38, WMO, Geneva, pp 63-105.

- Coastal Zone Management Plan, Sri Lanka 1997, Coast Conservation Department.

- Central Environmental Agency & Disaster Management Centre of Sri Lanka Supported by UNDP & UNEP, 2014. Integrated Strategic Environmental Assessment of the Northern Province of Sri Lanka

- Dassanayake, M.D. (and others), Editors (1980-2005): A Revised Handbook to the Flora of Ceylon, Volumes 1-15. (Revisions of the original series by Trimen and Hooker, first published in 1893-1900)

- de Silva, A. (2006): Marine Turtles of Sri Lanka: A Historical Account. In: Marine Turtles of the Indian Subcontinent (Eds: Shanker K and Choudhury BC), Universities Press, India, 324-353

- Dela, J.D. S. (2009): Fourth Country Report from Sri Lanka to the United Nations Convention on Biological Diversity. Government of Sri Lanka (https://www.cbd.int/doc/world/lk/lk-nr-04-en.pdf)

- Dhameja, S.K. (2014). Environmental Engineering and Management. S.K. Kataria & Sons, New Delhi, India.
- Document), 76pp (https://www.adb.org/documents/environment-safeguards-good-practice-sourcebook)

- Garcia, J., Rousseau, D.P.L., Morato, J., Lesage, E., Matamoros, V., Bayona, J.M. (2010). Contaminant removal processes in subsurface-flow constructed wetlands: a review. Critical Reviews in Environmental Science and Technology, 40, 561–661,

- Garg, S.K. (1999). Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol. II). Khanna Publishers, New Delhi, India.

- Garg, S.K. (2001). Water Supply Engineering – Environmental Engineering (Vol. I). 12th edition, Khanna Publishers, New Delhi, India.

- Gunatilleke, I.A.U.N. and Gunatilleke, C.V.S (1990): Distribution of Floristic Richness and its Conservation in Sri Lanka. Conservation Biology, 4 (1) 21-32 (http://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.1990.tb00262.x/abstract)

- Kularatne, R.K.A. (2017). Occurrence of selected volatile organic compounds in a bra cup manufacturing facility. International Journal of Environmental Science and Technology, 14, 315-322.

- Kularatne, R.K.A. (2020a). Sri Lanka's legal framework for marine pollution control: an evaluation of the Marine Pollution Prevention Act, No. 35 of 2008. Journal of the Indian Ocean Region, 16, 244-267.