Initial Environmental Examination

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India: Tamil Nadu Urban Flagship Investment Project (Tranche 3) – Providing Storm Water Drains to Priority Areas in Thoothukudi City Municipal Corporation

Prepared by Thoothukudi City Municipal Corporation (TCMC) of the Government of Tamil Nadu for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 12 April 2022)

Currency Unit	–	Indian rupee
₹ 1.00	–	$ 0.013
$ 1.00	=	₹ 76.08

ABBREVIATIONS

ADB	–	Asian Development Bank
ASI	–	Archaeological Survey of India
BOD	–	Biochemical Oxygen Demand
CBO	–	Community Based Organisation
CMA	–	Commissionerate of Municipal Administration
CMSC	–	Construction Management and Supervision Consultant
CPCB	–	Central Pollution Control Board
CTE	–	Consent To Establish
CTO	–	Consent To Operate
DBOT	–	Design Build Operate Transfer
DWC	–	double wall corrugated
EAC	–	Expert Appraisal Committee
EC	–	Environmental Clearance
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
ESS	–	Environmental and Social Safeguard
EMP	–	Environmental Management Plan
GOI	–	Government of India
GoTN	–	Government of Tamil Nadu
IEE	–	Initial Environmental Examination
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NGO	–	Non-Government Organisation
NOC	–	No Objection Certificate
PIA	–	Project Implementing Agency
PIU	–	Project Implementation Unit
PMU	–	Project Management Unit
SPS	–	Safeguard Policy Statement
STP	–	Sewage Treatment Plant
TNPCB	–	Tamil Nadu Pollution Control Board
TCMC	–	Thoothukudi City Municipal Corporation
TNUFIP	–	Tamil Nadu Urban Flagship Investment Program
TNUIFSL	–	Tamil Nadu Urban Infrastructure Financial Services Limited
TWADB	–	Tamil Nadu Watersupply and Drainage Board
WHO	–	World Health Organization

WEIGHTS AND MEASURES

°C	-	Degree Celsius
km	-	kilometer
LPCD	-	liters per capita per day
m	-	meter
Mgd	-	million gallons per day
MLD	-	million litres per day
mm	-	millimeter
nos	-	numbers
km^2	-	square kilometer
m^2	-	square meter

NOTE

In this report, "$" refers to United States dollars.

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EXECUTIVE SUMMARY

The Tamil Nadu Urban Flagship Investment Program (TNUFIP) will advance India's national urban flagship programs to develop priority urban and environmental infrastructure in ten cities located within strategic industrial corridors of Tamil Nadu (the State), including those within the East Coast Economic Corridor (ECEC), to enhance environmental sustainability, climate resilience, and livability. It will also strengthen the capacity of state and local institutions and improve urban governance. TNUFIP is aligned with the following impact: urban livability and climate resilience in cities of economic importance improved. TNUFIP will have the following outcomes: smart and climate resilient urban services delivered in ten cities in priority industrial corridors.

The TNUFIP is structured under three outputs: (i) sewage collection and drainage improved and climate-friendly sewage treatment systems introduced, (ii) access to reliable and smart drinking water services improved, and (iii) Institutional capacity, public awareness, and urban governance strengthened. TNUFIP will be implemented over an 8-year period beginning in 2018, and will be funded by Asian Development Bank (ADB). via its multitranche financing facility (MFF).

Tranches. TNUFIP MFF comprises of three tranches sequenced based on readiness, absorptive capacity, and logical progression of investments. Tranche 1 (Project 1), approved in September 2018, is supporting water supply and sewerage facilities in six cities (Chennai, Coimbatore, Rajapalayam, Tiruchirappalli, Tirunelveli, and Vellore), capacity development of the DMA and ULBs and improvement in urban governance and financial management in all 135 ULBs. A transactional technical assistance approved in 2018 will strengthen capacity of the DMA to better support ULBs in preparing urban infrastructure projects and implement urban governance improvement programs. Tranche 2 (Project 2), approved in November 2019, is supporting water supply and sewerage facilities in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur, and Vellore) and facilitating reforms for improved service delivery and innovation in the program ULBs. A periodic financing request for the third last tranche under the TNUFIP MFF is submitted to ADB and is under processing. Tranche 3 (Project 3) will support water supply in Madurai, sewerage in Coimbatore and storm water drainage in Thoothukudi.

Providing storm water drains to priority areas in Thoothukudi City is one of the subprojects proposed under TNUFIP Project 3. Thoothukudi is located on the east coast of India, on the Gulf of Mannar. In the recent years, the Thoothukudi City and its surrounding areas are recognised as one of the most flood prone areas in Tamil Nadu. During the north east monsoon, Thoothukudi district receives heavy rains, due to the rapid urbanisation and increase in impervious areas results in increase of surface runoff, which leads to flooding. The frequent events of high intense storms are resulting in disruption to urban living and causing heavy damages to urban infrastructure such as roads, buildings, water supply other underground systems etc. Also it severely disrupts livelihoods of those dependent on daily wage earnings as flooding remains for longer hours. To sort out the flooding issue, Thoothukudi City Muncipal Corporation (TCMC) has taken up a project for improving its primary, secondary and tertiary drains under Tamil Nadu Sustainable Urban Development Program (TNSUDP) funded by the World Bank and other government funded projects in phased approach. Phases I to III are in various stages of implementation. Construction of approximately 289 km of tertiary storm water drains are planned under Phase IV.

Part of Phase IV, on priority basis, 36.367 km length of storm water tertiary drains are proposed for implementation under TNUFIP Project 3. The size of the drain ranges between minimum 0.9m

to 2.50m. The depth of drain is ranging from a minimum depth of 0.45 m to a maximum depth of 2.51m. Existing drainage pumping station at Loorthammalpuram will be augmented with additional pumping capacity under the project. Proposed drains will cover 291 streets located in Athiparasakthi nagar, Annai Indra Nagar, Ayappan Nagar, Barathipuram, Chinnakanrupuram, Devar nagar, Kurunji nagar, Ram nagar, Rahamath Nagar, Muthammal Colony, Nethaji Nagar, Dhanasekaran Nagar, Ayyasamy colony, Ponsubbiah nagar, Loorthammalpuram, St Mary's colony and Vishvapuram areas of TCMC. The proposed drains will be connected at 11 locations to secondary /primary drains for further conveyance and discharge (primary drains (Meelavittan drain and SBI drain) at 10 locations and into Buckle canal one location). Meelavittan drain discharges into Buckle canal, that flows ultimately into the sea (Bay of Bengal), while SBI drain directly flows into the sea. While Buckle canal is an existing large canal, Meelavittan drain and SBI drain are being constructed under Smart City Project. Works of both these drains are at advanced stages and nearing completion (scheduled to be completed by June 2022).

Project implementation arrangements. The Municipal Administration and Water Supply Department (MAWS) of GoTN acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) is the state-level executing agency. A Project Management Unit (PMU) is established in TNUIFSL which is headed by a Project Director and Deputy Project Director (senior official from Commissionerate of Municipal Administration, CMA), and comprising of dedicated full-time staff from TNUIFSL for overall project and financial management. The beneficiary of this project is Thoothukudi City Municipal Corporation (TCMC). TCMC is the Project Implementing Agency (PIA) for this subproject. A Project Implementation Unit (PIU) will be established in within TCMC. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL will coordinate all the safeguard related activities of the subproject and will ensure the compliance with Environmental Management Plan (EMP) and Environmental Assessment and Review Framework (EARF). Environmental Expert (Construction Management Supervision Consultant (CMSC)) will ensure implementation of subproject in compliance with EMP and EARF, and will carry out all necessary tasks at PIU level. At the contractor's level, the EHS personnel will carry out necessary actions in the site to ensure compliance to EMP and EARF requirements.

Screening and assessment of potential impacts. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the Government of India (GOI) Environmental Impact Assessment (EIA) Notification, 2006, this subproject does not require EIA study or environmental clearance (EC). None of the proposed components (drains and pumping station) are located in coastal regulation zone, and thereofore do not require CRZ clearance. Other anticipated environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment Checklist for Urban Development and accordingly the potential negative impacts were identified in relation to pre-construction, construction and operation stages of this subproject.

Categorization. Based on the outcome of the assessment and ADB Safeguard Policy Statement (SPS) 2009, the subproject is classified as environmental Category B, i.e., subproject potential adverse environmental impacts are less adverse than those of category A, and are site-specific, and in most cases mitigation measures can be designed more readily than for category A projects. For category "B" projects an initial environmental examination (IEE) is required and accordingly this IEE has been prepared.

Description of the Environment. Thoothukudi district experiences tropical climatic conditions characterized with immensely hot summer, gentle winter and frequent rain showers. The maximum temperature is 39°C and the minimum temperature is 22.6°C. Thoothukudi district

receives 673 mm average rainfall during a year out of which 467 mm rainfall is in October to December from the Northeast monsoon. The coolest month is January and the hottest months are from May to June. Thoothukudi is abundantly dotted with rain fed tanks. The city has gentle slope from west to east, i.e. towards sea in the portion on north side of Upparu River. Charnockite. Gnesis, Granite, Limestone, Sandstone, Alluvium, Sandy silt and Marine deposit are part of the geological formation of Thoothukudi district. The important aquifer system in the district are constituted by (a) unconsolidated and semi consolidated formation and (b) weathered and fractured crystalline rocks. The district is covered by Black Cotton soil in the west with isolated red soil patches in high ground. The sandy soil is present in the coastal tract. Alluvial soil is restricted to river flood plain and coastal part. As per Thoothukudi Local Planning Authority the residential areas covers 30.12% and costal regulation zone (CRZ) area is maximum i.e. 43.22%. None of the proposed drain alignments are located in CRZ. Proposed works are located within urban area of Thoothukudi where there are no environmentally sensitive areas. Nearest protected area is the Gulf of Mannar marine national park consisting of 21 off-shore islands in the Bay of Bengal, and is spread over an area of 560 sq. km. This is in the east/northeast of Project area. The areal distance between the project area and nearest boundary of national park is 6 km. Project area is also outside the ecosensitive zone created around the national park as buffer. Therefore there is no interefernce with sensitive areas. There are no notable archeological or cultural heritage monuments in the project area. The project area comprises of Ward 2,6,7,13 and 14 of Thoothukudi Taluka. The total population as per 2011 census was 26,970 in which 13,486 (50%) are male and 13484 (50%) are female. The Scheduled Caste population was 2,207, it is nearly 8% of the total population. There are no Scheduled Tribes population in the project area. The total literates are 78% (21,029) of the total population. The total workers population is 34.3%. , in that nearly 90.6% are main workers[1] and 9.4% are marginal workers[2]. The project area is well connected by internal roads, SH 49, East Coast Road, Ettapuram road, Melavittan road and Palayamkottai Road. Railway station is located at a distance of 3km from the project area. Thoothukudi district has a major and a minor ports such as Thoothukudi port and old port Kulasekara Patinam in Udangudi to facilitate major export and import of seafood and fish-based products. Other key industries includes Sterlite, SPIC, TAC, HWP DCW and Thermal Power Plant. Tiruchendur Murugan Temple, Kalugumali Sculptures of Jain Temple, Kattabomman Memorial Fort at Panchalankurichi, Bharathi Manimandapam at Ettayapuram, Manadpadu Church, Paniya Matha Church (Lady Snow), Navathirupathi Temples and Vanathirupathi Temple near Nazerath are important tourist places in Thoothukudi district.

Potential Environmental Impacts and Mitigation Measures. Construction of storm water drain in TCMC area is unlikely to cause significant adverse impacts that are irreversible, diverse or unprecedented because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) there are no significant sensitive environmental features in the subproject sites although careful attention needs to be paid to minimizing disruption to the community; and (iii) predicted impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements.

Some impacts and their significance have been reduced by amending the designs as per the site conditions. The concepts in the design of the subproject are: (i) covering residential areas prone for seasonal flooding; (ii) locating the storm water drain alignment within the road right of way

[1] The main worker is a person who is engaged in any economically productive work for at least 183 days in a year
[2] A marginal worker is one who engaged in only economically productive work for less than 183 days in a year

(ROW); and (iii) ensuring that all planning and design interventions and decisions are made in consultation with local communities and reflecting inputs from public consultations.

During construction, impacts will likely arise from the excavation and drainage construction activities, including storage of materials and maintenance of camp sites, these impacts are temporary and common for construction activities in urban areas, and there exist well-developed methods for their effective mitigation. The subproject will adhere to the World Bank Environmental, Health and Safety Guidelines on Construction and Decommissioning Activities. Traffic management will be necessary during excavation and drainage construction works on busy roads. Earthworks will be conducted during the dry season to avoid difficult working conditions that prevail during the monsoon. The location of stockyards will be identified at least 300m away from watercourses. Fuel and lubricant storage areas will be located away from drainage. Precautions will be taken to minimize construction wastes. Measures will be provided to prevent wastewater entering into streams, watercourses, or irrigation channels (if any). Open burning of solid wastes generated from the workers camp will be strictly prohibited. Better solid waste management practices will be adopted such as collection, segregation, reuse and recycling activities within the construction site and workers camps. The proposed construction activities likely to generate 11,803 cubic meters of surplus earth, which shall be recycled to the maximum, the remaining surplus earth will be disposed/ dumped in the Ambedkar Nagar dumping yard, which is owned and maintained by TCMC.

During operation, TCMC, will ensure to monitor and maintain the efficient functioning of the storm water drainage system. Regular inspections of all drain inlets and the drain lines to ensure that these are not clogged and are free from any obstructions for the continuous flow of rainwater. All sections will be inspected to ensure that all slab covers are in place to avoid any accidents to residents, animals and vehicles.

Environmental Management Plan (EMP). This draft IEE includes an environmental management plan (EMP) which describes and addresses the potential impacts and risks identified by the environmental assessment. The EMP includes proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. This draft IEE and the corresponding EMP will be included in bidding and contract documents with specific provisions requiring contractors to (i) comply with all other conditions required by ADB, and (ii) to submit a site-specific environmental management plan (SEMP), including (a) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (b) specific mitigation measures following the approved SEMP; (c) monitoring program per SEMP; and (d) budget for SEMP implementation. A copy of the EMP and approved SEMP will be kept on site during the construction period at all times.

The budget for EMP implementation includes costs for conducting ambient air quality monitoring, water quality monitoring, noise level measurements and capacity building. The implementation costs of mitigation measures are covered separately under civil work contract. The contractor will be responsible for implementing the applicable mitigation measures given in EMP and SEMP. PIU and CMSC will be responsible for monitoring the EMP implementation.

Consultation, Disclosure and Grievance Redress Mechanism. The stakeholders were involved during the environmental assessment activities through discussions conducted on-site and by public consultations. The views expressed by stakeholders were incorporated in the IEE and project design. This draft IEE will be made available to the public through the ADB, TCMC and TNUIFSL websites. The consultation process will continue during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate

in its development and implementation. A Grievance Redress Mechanism (GRM) is described within this draft IEE to ensure that public grievances are addressed quickly. GRM includes provisions for complainants to register complaints, and receive feedback, via phone, emails etc. remotely and safely, which is suitable in the current COVID-19 pandemic also.

Monitoring and Reporting. Contractors has to submit a monthly EMP implementation report to PIU. PIU, with the assistance of CMSC, will monitor the compliance of the Contractor, prepare a Quarterly Progress Report (QPR) and submit to PMU. The PMU will oversee the implementation and compliance and will submit environmental monitoring reports to ADB, semiannually during construction and annually during operation, until a project completion report (PCR) is issued by ADB. Per ADB's SPS 2009 and Access to Information Policy 2018, environmental monitoring reports will be publicly disclosed. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted on TCMC and TNUIFSL websites. The status of environmental safeguards implementation, issues, and corrective actions are to be clearly reported to ADB in these reports. The PMU will oversee and ensure the implementation and compliance.

Conclusions and Recommendations. As per ADB SPS 2009, this project is classified as environmental category B and does not require further Environmental Impact Assessment. This draft IEE is prepared based on preliminary desgns, and therefore requires to be updated during the detailed design phase and submitted to ADB for approval and disclosure. IEE will also need to be updated during implementation by CMSC in discussion with PIU to reflect any changes, amendments and will be reviewed and approved by ADB. IEE shall be part of tender and contract documents. The final IEE report will incorporate results of any changes and additional baseline monitoring as required (e.g., air, noise, surface water quality).

IEE also identifies that completion of works of two primary drains (Meelavittan drain and SBI drain) in implementation by TCMC under Smart City Project is necessary to function the tertiary drains proposed under this subproject. As per the present schedule, these works are scheduled to be completed by June 2022, which is well in advance of the works completion under this subproject (expected by November 2023). It must be ensured by TCMC that the ongoing works are completed on time. TCMC may also examine the CRZ clearance requirement for ongoing SBI drain works and obtain clearance as required.

I. INTRODUCTION

A. Background

1. The Tamil Nadu Urban Flagship Investment Program (TNUFIP) will advance India's National Urban Flagship Programs to develop priority urban and environmental infrastructure in ten cities located within strategic industrial corridors of Tamil Nadu (the State), including those within the East Coast Economic Corridor (ECEC), to enhance environmental sustainability, climate resilience, and livability. It will also strengthen the capacity of state and local institutions and improve urban governance.

2. TNUFIP will be implemented over an 8-year period beginning in 2018, and will be funded by Asian Development Bank (ADB) via its Multi-tranche Financing Facility (MFF). The Executing Agency is the Department of Municipal Administration and Water Supply (MAWS) of the State acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) who has established a Program Management Unit (PMU). The Thoothukudi City Municipal Corporation (TCMC) will be the Project Implementing Agency (PIA) of this sub-project and a Project Implementing Unit (PIU) will be established within the TCMC for executing the sub-project.

3. **Tranches.** TNUFIP MFF comprises of three tranches sequenced based on readiness, absorptive capacity, and logical progression of investments. Tranche 1 (Project 1), approved in September 2018, is supporting water supply and sewerage facilities in six cities (Chennai, Coimbatore, Rajapalayam, Tiruchirappalli, Tirunelveli, and Vellore), capacity development of the DMA and ULBs and improvement in urban governance and financial management in all 135 ULBs. A transactional technical assistance approved in 2018 will strengthen capacity of the DMA to better support ULBs in preparing urban infrastructure projects and implement urban governance improvement programs. Tranche 2 (Project 2), approved in November 2019, is supporting water supply and sewerage facilities in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur, and Vellore) and facilitating reforms for improved service delivery and innovation in the program ULBs. A periodic financing request for the third last tranche under the TNUFIP MFF is submitted to ADB and is under processing. Tranche 3 (Project 3) will support water supply in Madurai, sewerage in Coimbatore and storm water drainage in Thoothukudi.

4. TNUFIP Project 3 is aligned with the following impacts: (i) universal access to basic water and sanitation services achieved; (ii) "world-class" cities and industrial corridors across the state developed; and (iii) water security, reduced vulnerability to climate change in urban areas achieved. Project 3 will have the following outcome: livability and climate resilience in selected cities in priority industrial corridors enhanced. Outputs of the Project 3 are:

(i) **Output 1**: Climate-resilient sewage collection and treatment, and drainage systems developed in two cities. Sewerage works in Coimbatore include: (i) two new STPs with a combined treatment capacity of 34.92 million liters per day (MLD) constructed (zone 5: 15.43 MLD, zone 7: 19.49 MLD); (ii) 529 km of new sewage collection pipelines constructed (zone 5: 230.2km, zone 7: 298.9km) with 100% households connected (Total 67,545 households - zone 5: 24,969, zone 7: 42,576); (iii) 14 pump/lift stations (combined capacity of 348 kW) constructed (zone 5: 9 and 108 kW, zone 7: 5 and 240 kW); and (iv) 14.2 km of sewage pumping mains built (zone 5: 9.8 km, zone 7: 4.4 km). Climate-resilient stormwater drainage systems (36.3 km of tertiary drains and enhancement of an existing stormwater pump station) will be established in Thoothukudi. In Coimbatore and Madurai, two all-female self-help groups (one in each city) will be trained on benefits of household connection to sewage collection system, water conservation, sanitation, health and hygiene and in areas of leadership.

(ii) **Output 2:** Water supply system in one city improved with smart features. Works in Madurai include: (i) 813 km of new distribution pipelines commissioned with 100% households connected (163,958 households) in 115 newly established district metering areas with smart water features to reduce nonrevenue water; and (ii) 15 booster pumps (combined capacity of 70 kW) constructed.

(iii) **Output 3:** Institutional capacity, public awareness, and urban governance strengthened. This output includes targets to improve awareness of students, teachers and women's groups on water conservation and hygiene and develop capacity of stakeholders on gender mainstreaming in urban governance. The governance improvement and awareness consultants engaged under Project 1 for the program will continue to support output 3 under Project 3.

5. **Scope of the Subproject.** As a part of Output 1 (Climate resilient drainage and flood management systems established, it is proposed to provide tertiary drains in the Thoothukudi City Municipal Corporation area for a length of 36.367 Km. The size of the drain ranges from 0.9m to 2.50m wide and 0.45m-2.51m deep. The drains will be provided with (i) 3,637 inspection chambers (one in every 10 m), (ii) 808 silt traps (one in every 30 m), and (iii) 404 Rainwater harvesting structures (one in every 90m) within the drain section. Existing drainage pumping station at Loorthammalpuram will be augmented with additional pumping capacity under the project. Proposed drains will cover 291 streets located in Athiparasakthi nagar, Annai Indra Nagar, Ayappan Nagar, Barathipuram, Chinnakanrupuram, Devar nagar, Kurunji nagar, Ram nagar, Rahamath Nagar, Muthammal Colony, Nethaji Nagar, Dhanasekaran Nagar, Ayyasamy colony, Ponsubbiah nagar, Loorthammalpuram, St Mary's colony and Vishvapuram. These area falls under administrative ward of 2, 6, 7, 13 and 14 of TCMC limit. This subproject is expected to benefit 24,283 households.

B. Purpose of this Initial Environmental Examination Report

6. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for Urban Development (Appendix 1) accordingly, the potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts that are irreversible, diverse or unprecedented. Thus, this Initial Environmental Examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

7. This IEE report is based on the preliminary designs prepared by Thoothukudi City Municipal Corporation (TCMC). The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program developed as part of the Environmental Management Plan (EMP) will require the contractor to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the quarterly / semi-annual environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE. This draft IEE will be updated during the detailed design phase, and if required further updation can be done during the implementation to reflect any changes in storm water drain design/ alignment, pump

house location etc. This IEE will be updated by PMU during detailed design will be submitted to ADB for review, clearance and disclosure.

C. Report Structure

8. This Report contains the following ten (10) sections including the executive summary at the beginning of the report:

(i) Executive summary;
(ii) Introduction;
(iii) Description of the project;
(iv) Policy, legal and administrative framework;
(v) Description of the environment;
(vi) Anticipated environmental impacts and mitigation measures;
(vii) Public consultation and information disclosure;
(viii) Grievance redress mechanism;
(ix) Environmental management plan; and
(x) Conclusion and recommendation.

II. DESCRIPTION OF THE PROJECT

A. Project Area

9. Thoothukudi is a port City situated on the Gulf of Mannar about 125 km North of Cape Comorin. Thoothukudi City was elevated to Corporation status on 5th August 2008. Thoothukudi Corporation is divided into 60 wards after its expansion in the year 2011 and these wards are encompassed in four zones (i.e.) East, West, North & South. East zone has 14-16 and 19-33 wards, West zone has 34-47 wards, North zone has 1-13 and 17, 18 wards and South zone has 48-60 wards (Refer **Figure 1**).

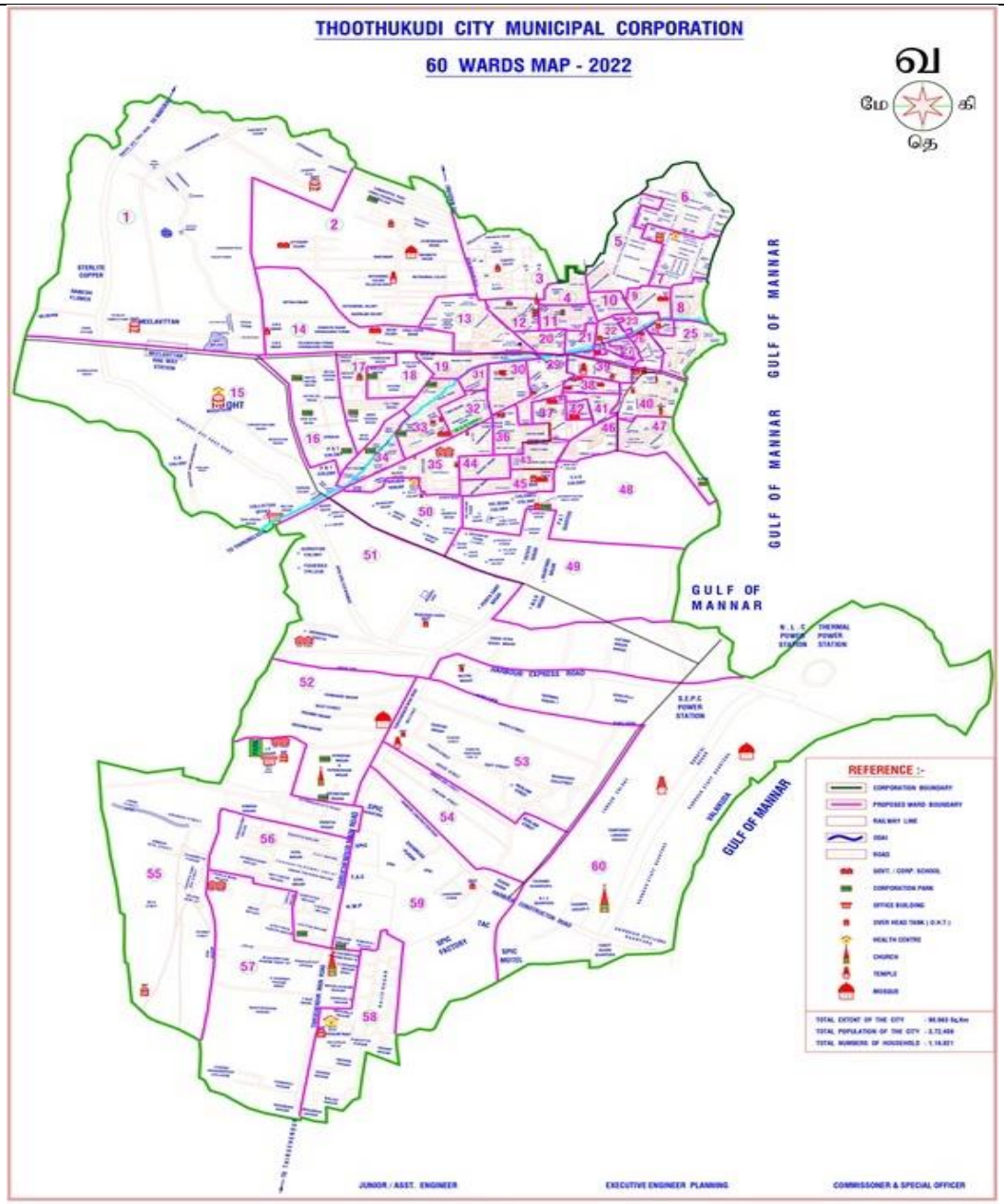


Figure 1: TCMC Ward Map

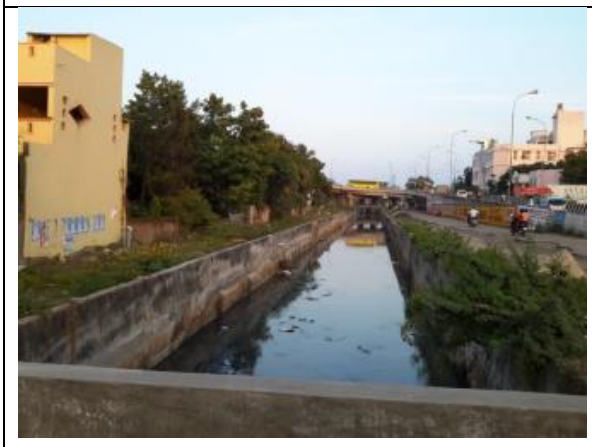
B. Existing Storm water Drain in Thoothukudi

10. The total length of existing roadside drains in Thoothukudi is about 153 Km. Moreover, those drains appear to have been designed as roadside gutters for disposal of the sullage than to work as storm drains. Details of major primary channels/drains/rivers in Thoothukudi is given in the following **Table 1**.

Table 1: Major primary drains (rivers/channels) in TCMC area

Sl.no	Name of the Drain	Total length/ Length within TCMC limits
1	Upparu River	8900m.
2	Local creek to North of Upparu River (in Sub Catchment SC-17)	3740m.
3	Stream/channel coming from Chengulam Tank up to the flyover bridge of NH45B across the NH-7A (length within of the TCMC limits)	1380 m.
4	Buckle Canal (From assumed Chainage 0 below the fly over bridge of NH45B across NH7A	380 m (unconstructed part) + 7170 m (Constructed part). Total 7550 m.
5	Mullakkadu odai	1870 m (Athimarapatti Road Culvert to Upparu river) and 3104m (Athimarapatti Road Culvert to sea)
6	Kalangakari odai(Meeting buckle canal near railway crossing)	3930 m (including length through Vaishali Industry and TNEB substation)
7	Kalugupathai odai on North-East Side of the City near Sterlite finally joining to the S.V. Kulam (Up to S. V. Kulam)	3688 m
8	Kaluthapathai odai: Stream on North-East Side of the City (on north side of Kalugupathai odai) previously merging into Sankaraperi tank.	3510 m
9	Excavated/naturally formed drain along NH45B from its Crossing of NH7A to its crossing of SH176	3500 m

Source: TCMC

Upparu River	Kaluthapathai Odai
	
Kalangakari Odai Confluence with Buckle Canal	**Mullakkadu Canal Near SH-176**
	
Buckle Canal Near Ettayapuram Road Flyover	**Confluence of Buckle Canal with Sea**

C. Issues in Existing Storm Water Drainage System

11. Thoothukudi is a coastal town with very low elevation above the sea in most of the core area. There is only one artificially constructed drain viz. Buckle Canal to drain the rainwater of the core area and its discharge capacity is limited. Initially, this drain was quite wide but unconstructed which was subsequently provided with side walls but while constructing it, the width was substantially reduced due to which its carrying capacity is considerably reduced. Few of the road side drains are connected with the Buckle canal. Due to lack of sewerage system, wastewater from the city areas enter the drains and flow into Buckle canan and ultimately into Sea. Most of the drains are open type without cover from the top due to which the dry waste in the form of paper and plastic waste further obstructs the flow. All these factors leads to rise of unfavorable obnoxious odor as well as causes severe flooding.

12. Thoothukudi City and its surrounding areas in recent years is recognized as one of the most flood-prone areas in Tamil Nadu. In 2015, 220 mm rainfall was received within a span of 4 hours. This led to urban flood situation and low lying areas were inundated for weeks. Normal people life was heavily affected because of rain water stagnation. Similar condition was repeated in 2021 (Refer photos from the project site).

	
Athiparasakthi Nagar	**Muthammal Colony**
	
St. Mary's Colony	**Pon Subbiah Nagar**

D. Sewerage system in the project area

13. Thoothukudi is partially covered with a sewerage system, but is not functional. The system consists of sewerage collection system; three sub-pumping stations and one main pumping station at Cruzpuram, which pump sewage to a STP located at Tharuvaikulam. The STP is about 7.5 km from the town and currently defunct. There are about 3800 sewer household connections in the town. There is no sewerage system in the panchayat areas merged with the TCMC. Households mainly depend on onsite sanitation facilities (septic tanks), and sullage, and wastewater is discharged into road side drains causing environmental degradation and unhygienic situations.

14. An underground sewerage system (UGSS) project, including a new sewage treatment plant of 28 MLD capacity to cover the original TCMC area is under function in Thoothukudi Town by Tamil Nadu Water and Drainage Board (TWAD Board). TCMC has also proposed a new sewerage system, including a 18 MLD STP, to cover the newly added and previously omitted areas in TCMC jurisdiction. This project is presently under preparation phase.

E. Proposed Storm Water Drainage System in the Project Area

15. The total road length in the Thoothukudi City Municipal Corporation as per the survey is 607.855 Km. The total number of streets including the added area in the city is 714. The breakup

of road details and classification of roads for Thoothukudi City Municipal Corporation is also mentioned in the following **Table 2**.

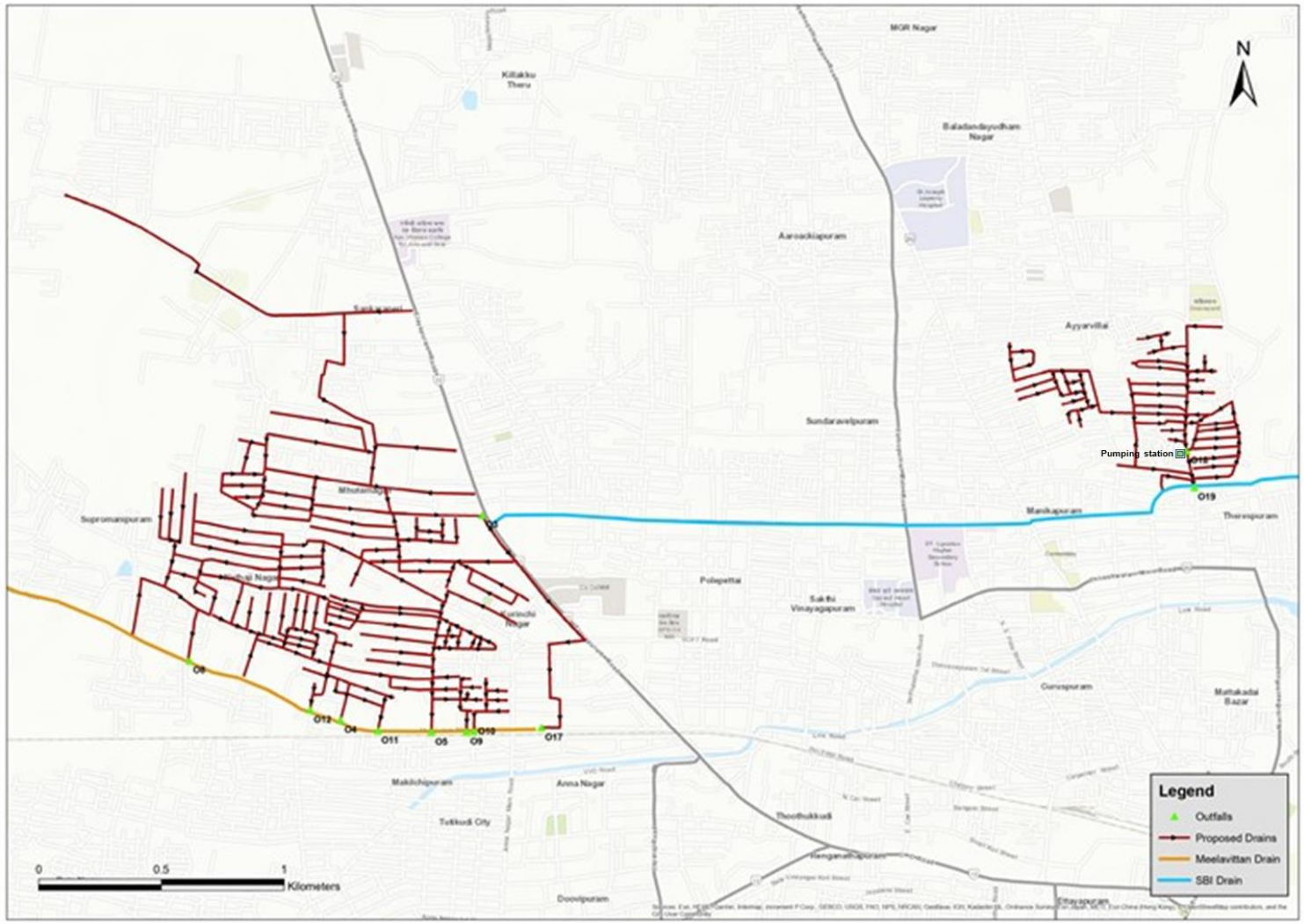
Table 2: Road details within TCMC

Sl. no	Description	Thoothukudi existing town	Thoothukudi Rural	Meelavitan Panchayat	Muthia-puram Panchayat	Athimara-patti Panchayat	Sankaraperi Panchayat	Total
1	No of House	70857	5573	12930	10402	7160	5410	112332
2	BT Road in KM	144.85	10.82	88.89	39.72	4.52	43.68	332.48
3	CC Road in KM	66.64	7.21	22.70	25.91	7.57	18.81	148.84
4	Metal Road in KM	15.35	1.74	16.99	-	-	7.25	41.93
5	Mud Road in KM	28.35	0.85	39.25	1.96	1.51	13.28	84.60
Total Road Length in KM		**255.19**	**20.62**	**167.83**	**67.59**	**13.60**	**83.02**	**607.85**

16. TCMC has prepared a DPR for the improvement of overall storm water drainage system of the city and has taken up its implementation under Tamil Nadu Sustainable Urban Development Program (TNSUDP) funded by the World Bank and other government funded projects in phased approach. Phases I to III are at various stages of implementation and construction of approximately 289 km tertiary storm water drain is planned under Phase IV.

(i) Phase I storm water drain construction has been carried out for the outer side of TCMC to prevent the entry of rain water from the nearby town limit area;
(ii) Phase II storm water drain construction was in main roads;
(iii) Phase III construction works are in progress for the interior TCMC.
(iv) Phase IV storm water drain construction is planned for the balance portion of the TCMC, which will be partially implemented under TNUFIP 3 (funded by ADB)

17. Given the large investment requirement, on priority basis, 36.367 km of storm water drains (of total 289 km planned in Phase IV) and augmentation of existing drainage pumping station at Loorthammalpuram have been proposed for implementation under the TNUFIP Project 3. Figure 2 shows the proposed drains in priority areas under TNUFIP project 3.



Note: Drain in yellow (Malavittan drain), Drain in blow (SBI drain)

Figure 2: Proposed SWD in Phase IV Priority Areas proposed under TNUFIP Project 3 (ADB financing)

1. Proposed drains

18. . The storm water drains are proposed within the roads right of way, on one side of the road. Within the 36.367 km, 2.1 km of collector drain is proposed along Ettayapuram road maintained by State Highways Department. No primary drains are proposed in the sub-project. The storm water drain is proposed to cover 291 streets located in Athiparasakthi nagar, Annai Indra Nagar, Ayappan Nagar, Barathipuram, Chinnakanrupuram, Devar nagar, Kurunji nagar, Ram nagar, Rahamath Nagar, Muthammal Colony, Nethaji Nagar, Dhanasekaran Nagar, Ayyasamy colony, Ponsubbiah nagar, Loorthammalpuram, St Mary's colony and Vishvapuram.

19. Proposed drains are of box type and sizes range from 0.9-2.5 m wide and 0.5-2.51 m deep (Table 4 and Table 5). Most of the drains are small - of 0.9 m wide (88%) and 1 m or less deep (87%). Drains will be constructed in reinforced cement concrete (RCC) - M-20 grade. The stability and other structure analysis have been carried out while adopting the sections. Typical cross section of the drain for single cell and double cell is given in the **Figure 3**.

20. Drains shall be provided withInspection chambers at every 10m, Silt Catch Pits at every 30m and Rainwater harvesting structures (RWH) at every 90m. The typical cross section of the silt catch pits, and the silt catch pit cum Rainwater harvesting structures are given in the **Figure 4** and **Figure 5** respectively.

Table 3: Proposed Width of the Storm Water Drain

Sl.no	Width of Drain(m)	Length(m)	% of toral length
1.	0.9	32105	88.3
2.	1.05	1277	3.5
3.	1.2	903	2.5
4.	1.5	462	1.3
5.	1.8	1173	3.2
6.	2.5	447	1.2
	Total	**36367**	**100**

Source: DPR 2022

Table 4: Proposed Depth of the Storm Water Drain

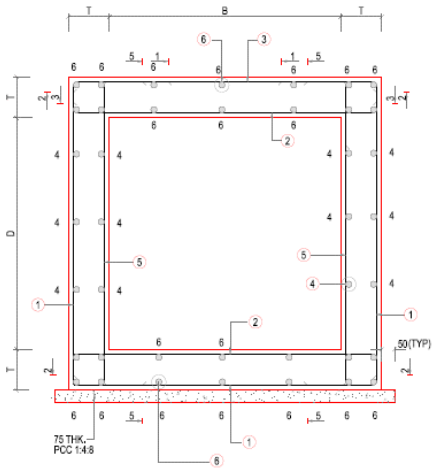
Sl.no	Depth of Drain (m)	Length(m)	% of toral length
1.	< 0.5m	5713	15.7
2.	>0.5 -1.0	25970	71.4
3.	>1.0 - <2.51	4684	12.9
	Total	**36367**	**100**

Source: DPR 2022

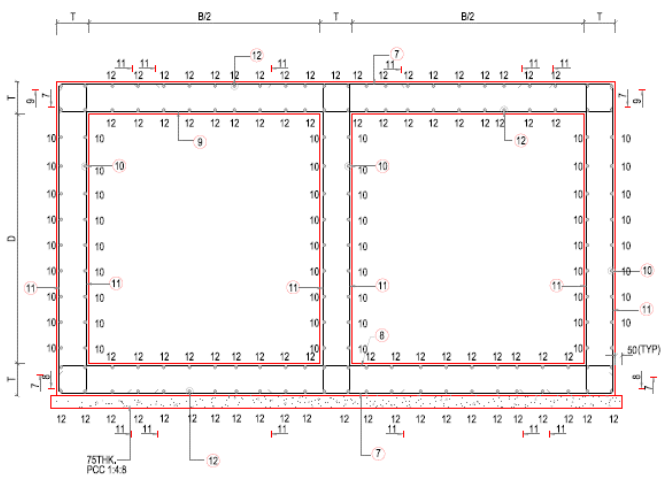
Table 5: Storm Water Drain Components

Sl.no	Components	Unit	Quantity
1.	Inspection Chambers	1 for every 10m	3637
2.	Silt Catch Pits	1 for every 30m	808
3.	RWH Structures	1 for every 90m	404

Source: DPR 2022



TYPICAL RC DETAIL OF SINGLE CELL DRAIN



TYPICAL RC DETAIL OF DOUBLE CELL DRAIN

S.No	WIDTH OF DRAIN (m)	DEPTH OF DRAIN (m)	THICKNESS OF SLAB (m)	REINFORCEMENT DETAILS (mm)											
	B	D	T	1		2		3		4		5		6	
1	0.90 TO 1.05	1.5	0.175	Y12 AT 150 C/C	300 300	Y12 AT 150 C/C	T25 125	Y12 AT 150 C/C	T25 125	Y8 AT 200 C/C	T25 125	Y12 AT 150 C/C	150 150	Y8 AT 200 C/C	T25 125
2	1.20	0.90	0.2	Y12 AT 150 C/C	400 400	Y12 AT 150 C/C	T25 125	Y12 AT 150 C/C	T25 125	Y8 AT 200 C/C	T25 125	Y12 AT 175 C/C	200 200	Y8 AT 200 C/C	T25 125
3	1.50	1.05	0.2	Y16 AT 175 C/C	500 500	Y16 AT 175 C/C	T25 125	Y16 AT 175 C/C	T25 125	Y8 AT 200 C/C	T25 125	Y16 AT 175C/C	250 250	Y8 AT 200 C/C	T25 125
4	1.80	1.70	0.2	Y16 AT 175 C/C	600 600	Y16 AT 175 C/C	T25 125	Y16 AT 175 C/C	T25 125	Y8 AT 200 C/C	T25 125	Y16 AT 150 C/C	300 300	Y8 AT 200 C/C	T25 125

TABLE FOR RC DETAIL OF SINGLE CELL DRAIN

S.No	WIDTH OF DRAIN (m)	DEPTH OF DRAIN (m)	THICKNESS OF SLAB (m)	REINFORCEMENT DETAILS (mm)											
	B	D	T	7		8		9		10		11		12	
1	2.7	1.6	0.2	Y16 AT 175 C/C	T25 125	Y16 AT 175 C/C	T25 125	Y16 AT 175 C/C	T25 125	Y10 AT 200 C/C	T25 125	Y16 AT 175 C/C	450 450	Y10 AT 200 C/C	T25 125

TABLE FOR RC DETAIL OF DOUBLE CELL DRAIN

Figure 3: Proposed Drain Sections

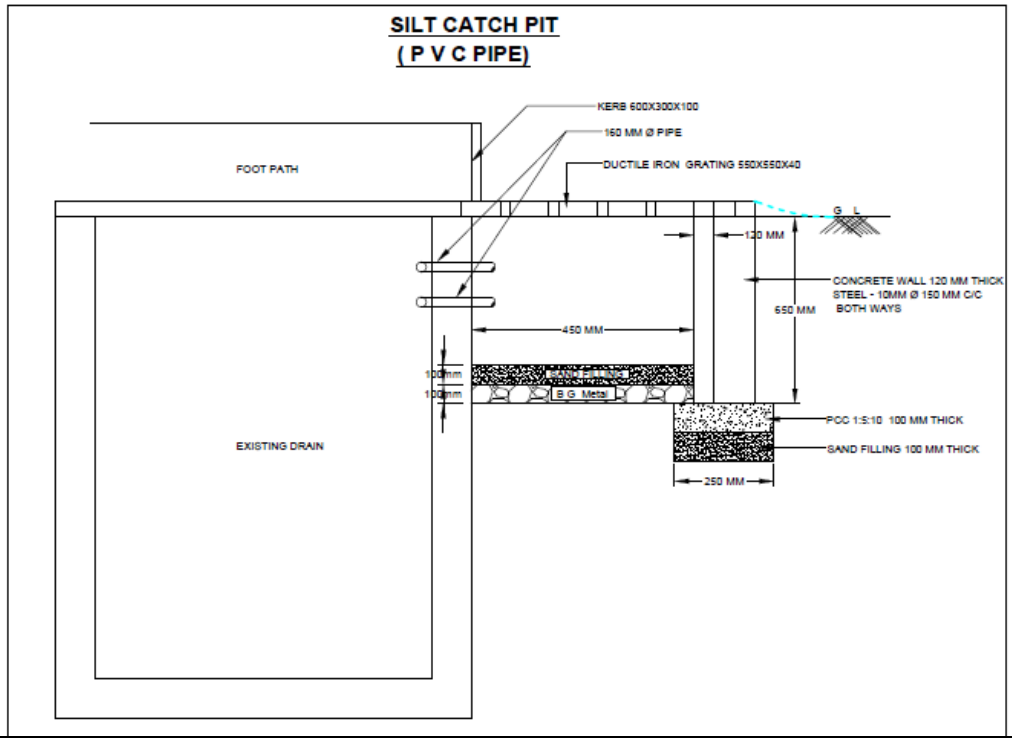


Figure 4: Typical Cross section for Silt Catch Pit

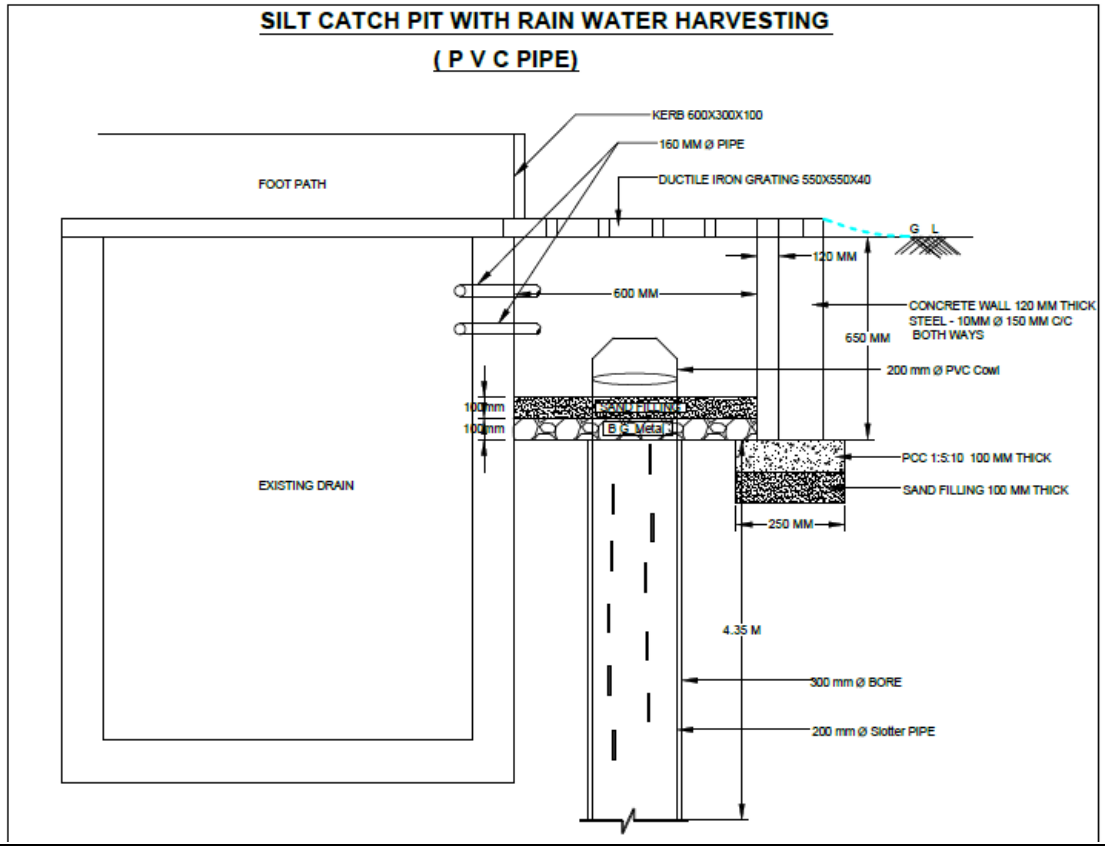


Figure 5: Typical Cross section for Rainwater Harvesting Pits

2. Augmentation of Drainage Pumping Station

21. It is proposed to augment the capacity of the existing stormwater drainage pumping station at Loorthammalpuram. This will include: increasing the existing ground level sump capacity to 20 m3 and erecting new submersible pump sets of higher capacity to replace the old pumps. Sump shall be extended linearly to increase the capacity for which land is available. Two numbers of new pumps each of 1100 cum/hr discharge against a head of 15 m shall be erected. The stormwater shall be pumped to the proposed stormwater drain leading to outfall O-19 into a primary drain, which is under construction.

3. Outfall / Discharge Locations of Proposed Drains

22. The proposed subproject includes construction of tertiary drains (collector drains) in the selected/priotized areas of the city where the flooding and water logging is experienced during rains. These drains will be connected to secondary/primary drains, which are being constructed/improved under the ongoing projects (including the World Bank funded Tamil Nadu Sustainable Urban Development Program (TNSUDP) and government funded AMRUT and Smart City projects), for further conveyance and disposal. As mentioned in the **Table 6**, proposed drains will discharge into 2 primary drains (Meelavittan drain and SBI drain) at 10 locations and into Buckle canal one location. Meelavittan drain discharges into Buckle canal, that flows ultimately into the sea (Bay of Bengal), while SBI drain directly flows into the sea.

23. While Buckle canal is an existing large canal, Meelavittan drain and SBI drain are being constructed under Smart City Project. Works of both these drains are in advanced stages and nearing completion (scheduled to be completed by June 2022) well in advance of taking up works for the proposed project.

Table 6: Storm Water Drain outfall locations and receiving water bodies

Outfalls Nodes	Outfall Location	Receiving Drains	Width of the receiving drain
O-10	Polpetiai West St	Disposal to B.Canal Via Meelavittan Drain	2m
O-11	Barathi Puram	Disposal to B.Canal Via Meelavittan Drain	2m
O-12	Chinnakanupuram	Disposal to B.Canal Via Meelavittan Drain	2m
O-17	Chinnakanupuram	Disposal to B.Canal Via Meelavittan Drain	2m
O-18	Loorthammal Puram Sanguli Colony 7th street	Disposal to Sea Via SBI Drain	4m
O-19	Loorthammal Puram Main road	Disposal to Sea Via SBI Drain	4m
O-3	Muththammal Colony 3th St	Connects with O17 and Finally Disposal to B.Canal Via ailway Culvert	3m
O-4	Barathipuram	Disposal to B.Canal Via Meelavittan Drain	2m
O-5	Chinnakanrupuram	Disposal to B.Canal Via Meelavittan Drain	2m
O-8	VMS Nagar ELSR	Disposal to B.Canal Via Meelavittan Drain	2m
O-9	Indra Nagar	Disposal to B.Canal Via Meelavittan Drain	2m

Source: DPR 2022

F. Implementation Schedule

24. This subproject is split into four contract packages for implementation:

(i) Package 1: Stormwater drain from Athiparasakthi Nagar to Dhanasekar nagar (O3)
(ii) Package 2: Stormwater drain from Bharathi Nagar to Chinnakannupuram (O4, O8, O11, O12)
(iii) Package 3: Stormwater drain from DhanaSekar Nagar to Meelavittan Main Road (O5, O9, O10, O17)
(iv) Package 4: Stormwater drain from Ponsubbiah Nagar to Loorthammalpuram area (O18, O19) including augmentation of existing pumping station at Loorthammalpuram

25. Packages are of 'employer's design works' type contracts, and all packages will be implemented simultanously. The bids for all packages works will be invited in June 2022 and the contracts will be awarded by October 2022. Construction is likely to start in November 2022 and will take about 12 months (for each package) to complete the project. Detailed implementation schedule (including design/pre-construction, construction, commissioning, and operation phases) will be provided in the updated IEE.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

26. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

27. **Screening and Categorisation:** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

(i) **Category A**. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
(ii) **Category B**. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
(iii) **Category C**. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
(iv) **Category FI**. A proposed project is classified as category FI if it involves investment of ADB funds to or through a Financial Intermediary (FI).

28. **Environmental Management Plan:** An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

29. **Public Disclosure :** PMU shall submit the following documents to ADB for disclosure on ADB website, per ADB's SPS 2009 and Access to Information Policy 2018, so affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation[3]:

(i) Final or updated IEE upon receipt; and
(ii) Environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

B. National Environmental Laws:

30. **Environmental Assessment:** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance is required for specified activities/projects, and this must

[3] Per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorised as A or B depending on the scale of the project and the nature of its impacts.

31. **Category A** projects require Environmental Clearance from the central Ministry of Environment, Forests and Climate Change (MoEF&CC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEF&CC prepares comprehensive Terms of Reference (TOR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF&CC considers the recommendation of the EAC and provides the Environmental Clearance if appropriate.

32. **Category B** projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorises the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the Environmental Clearance based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

33. The proposed storm water drain project components does not fall under the ambit of the EIA Notification 2006, and therefore EIA Study or EC is not required for the subproject.

34. **Applicable Environmental Regulations :** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in **Table 7**.

Table 7: Applicable Environmental Regulations

Law	Description	Requirement
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	To comply with applicable notified standards
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	The act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under this Act. Under this law, it is mandatory to obtain consent from Tamil Nadu State Pollution Control Board (TNPCB) for discharge from construction activities.	No wastewater discharge anticipated from this storm water drainage project; no permission/ clearance required under this Act The contractor should obtain consent from TNPCB for discharge from construction activities. Application has to be submitted online at http://tnocmms.nic.in/OCMMS/
Noise Pollution (Regulation and Control) Rules, 2000 and amended	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	To comply with the CPCB Ambient Noise Standards. (see rule 3(1) and 4(1))

Law	Description	Requirement
Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and it's Rules, 1982.	Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles);	Equipment and machinery such as diesel generators, hot mix plants, wet mix plants, stone crushers, etc. if installed for construction to comply with applicable emission standards.
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing, and disposal.	The solid waste generated at the construction site should be managed and disposed of by following the SWM Rules
Construction and Demolition (C & D) Waste Management Rules, 2016	Rules to manage construction and waste resulting from construction, re-modelling, repair and demolition of civil structure. Rules define C & D waste as comprising of building materials, debris resulting from demolition / re-modelling or repairs	Construction and demolition waste that are generated from the project should be managed and disposed as per the rules
Central Ground Water Authority, Notification, 1997	It provides for regulation and control of ground water development and management	Permission for the extraction of groundwater for construction purposes from Central Groundwater Board (CGWB)
Tamil Nadu State Ground Water (Development and Management) Act, 2003	This Act is to protect groundwater resources and provide safeguards against groundwater overexploitation, and to ensure its planned development and management; notifies areas for development, regulation and control of groundwater; prohibits sinking of wells and groundwater transport in notified areas without prior permission of the designated authority; requires all wells to be registered	Groundwater abstraction in any of the notified areas will be subject to the provisions of this Act.
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon the equal opportunity and fair treatment and shall not discriminate concerning aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	**Appendix 2** provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in the construction of civil works.
Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	Act is applicable to any establishment that employs 5 or more inter-state migrant workers through an intermediary (who has recruited workers in one state for employment at an establishment situated in another state).	Contractor should register with the Labour Department in case of hiring of inter-state migrant workers. Adequate and appropriate amenities and facilities to be provided to workers including housing, sanitation, portable water, medical aid, traveling expenses from home to work place, etc.

Law	Description	Requirement
Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	It regulates the employment and conditions of service of building and other construction workers and provides for their safety, health and welfare	This act is applicable for safeguarding the construction labours/ workers engaged in this subproject.
Coastal Regulation Zone (CRZ) Notification, 2018 dated 18/01/2019.	This notification under the Environment (Protection) Act, 1986 supplements the law on-site clearance by declaring certain zones as CRZ and regulates activities in these zones. Permission from Coastal Regulation Zone authority is required for construction works in CRZ. Storm water drain is allowable activity in most of the CRZ zones, but permission will be required.	None of the subproject components (drains and pumping station) are located in CRZ, therefore no permission or clearance required.
Ancient Monuments and Archaeological Sites and Remains Acts, 1958, its Rules, 1959 and notification, 1992. Ancient Monuments and Archeological Sites and Remains (Amendment and Validation) Act, 2010	This act provides, inter alia, for the preservation of ancient and historical monuments and archaeological sites and remains of national importance • Notifies 100m around the monument as a prohibited area and 100 to 300m as a regulated area for construction works; • No excavation/construction work is allowed within 100m of the boundary of the protected monument; • Requires prior permission of National Monument Authority (NMA) for taking up works within 300m of the boundary of protected monuments	There are no protected monuments in project area. Not applicable to the project.

35. **Clearances/ Permissions to be obtained by TCMC and the Contractor:** Following Table shows the list of clearances/permissions required for project construction.

Table 8: Clearances and Permissions Required for Construction – TCMC

S. No	Construction Activity	Statutory Authority	Statute under which Clearance/ permission is Required	Responsible Agency
1	Tree Cutting	Revenue Divisional Officer, Thoothukudi District / District Green Committee under District Collector	TN Forest Act, 1882	TCMC & CMSC

Table 9: Clearances and Permissions required for Construction - Contractor

1	Regulatory permits (license and insurance) required concerning applicable labour laws	Government of Tamil Nadu Labour Department	Permits obtained by the contractor shall be periodically examined and validity is ensured.	Contractor
2	Hot mix plants, Crushers and Batching plants	TNPCB	Consent to establish and consent to operate under the Air Act, 1981	Contractor
3	Discharges from construction activities	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contractor
4	Storage, handling and transport of hazardous substances	TNPCB	Hazardous Wastes (Management and Handling) Rules. 1989 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	Contractor
5	Sand mining, quarries and borrow areas	Department of Geology and mining, GoTN	Tamil Nadu Minor Mineral Concession Rules, 1959 (corrected up to 31.3.2001)	Contractor
6	For establishing new quarries and borrow areas	MOEF&CC	Environmental clearance under EIA Notification 2006	Contractor
7	Groundwater Extraction	Public Works Department	Tamil Nadu Groundwater Development and Management Act 2000	Contractor

36. **ADB SPS Requirements.** During the design, construction and operation of the project the PMU and Project Implementation Unit (PIU) will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the International Finance Corporation's (IFC) Environmental, Health and Safety (EHS) Guidelines Guidance Notes and standards of the World Health Organization (WHO). These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIU will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

37. The following IFC (World Bank Group) EHS and WHO Guidelines will be adopted in the EMP for the subprojects such as:

- WHO Guidelines on Air Emissions and Ambient Air Quality, Noise Management, Wastewater and Ambient Water Quality,
- Guidelines for Construction and Decommissioning (2007)
- Guidelines for Hazardous Material Management and Waste Management

- ADB Good Practice Guidance for the Management and Control of Asbestos Protecting Workplaces and Communities from Asbestos Exposure Risks (March 2022)[4]
- Guidance Note on Workers Accommodation: Processes and Standards, August 2006[5]
- Guidelines on Occupational Health and Safety and Community Health and Safety (2007)

38. Comparison of national emissions standards and International Standards / Best Practices are provided in **Table 10** and **Table 11**. Due to different measuring conditions, the emission values are not directly comparable. However, IFC Guidelines / WHO standards are stricter than the national standards if converted to comparable values. The relevant standards applicable to this sub-project is identified in the column "applicable per ADB SPS".

Table 10: National Ambient Air Quality Standards and WHO Guidelines

Parameter	Location [a]	National Ambient Air Quality Standards [b]	WHO Air Quality Guidelines (µg/m³)		Applicable Per ADB SPS (µg/m³) [e]
			Global Update 2005 [c]	Second Edition 2000 [d]	
Particulate Matter PM_{10} (µg/m³)	Industrial	60 (Annual)	20 (Annual)	-	20 (Annual)
	Residential, Rural and Other Areas	100 (24-hr)	50 (24-hr)		50 (24-hr)
	Sensitive Area	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
Particulate Matter $PM_{2.5}$ (µg/m³)	Industrial	40 (Annual)	10 (Annual)	-	10 (Annual)
	Residential, Rural and Other Areas	60 (24-hr)	25 (24-hr)		25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)		10 (Annual) 25 (24-hr)
Sulfur Dioxide SO_2 (µg/m³)	Industrial	50 (Annual)	20 (24-hr)	-	50 (Annual)
	Residential, Rural and Other Areas	80 (24-hr)	500 (10-min)		20 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
Nitrogen Dioxide NO_2 (µg/m³)	Industrial	40 (Annual)	40 (Annual)	-	40 (Annual)
	Residential, Rural and Other Areas	80 (24-hr)	200 (1-hr)		80(24-hr) 200 (1-hr)
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)
Carbon Monoxide CO (µg/m³)	Industrial	2,000 (8-hr)	-	10,000 (8-hr)	2,000 (8-hr)
	Residential, Rural and Other Areas	4,000 (1-hr)		100,000 (15-min)	4,000 (1-hr) 100,000 (15-min)
	Sensitive Area	2,000 (8-hr)	-	10,000 (8-hr)	2,000 (8-hr)

[4] https://www.adb.org/sites/default/files/publication/783636/good-practice-management-control-asbestos.pdf
[5] IFC Guidance Note: Workers Accommodation

		4,000 (1-hr)		100,000 (15-min)	4,000 (1-hr) 100,000 (15-min)
Ozone (O_3) (µg/m^3)	Industrial	100 (8-hr)	100 (8-hr)	-	100 (8-hr)
	Residential, Rural and Other Areas	180 (1-hr)			180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)	-	100 (8-hr) 180 (1-hr)
Lead (Pb) (µg/m^3)	Industrial,	0.5 (Annual)	-	0.5 (Annual)	0.5 (Annual)
	Residential, Rural and Other Areas	1.0 (24-hr)			1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)	-	0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
Ammonia (NH_3) (µg/m^3)	Industrial	100 (Annual)	-		100 (Annual)
	Residential, Rural and Other Areas	400 (24-hr)			400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)	-	-	100 (Annual) 400 (24-hr)
Benzene (C_6H_6) (µg/m^3)	Industrial	5 (Annual)	-	-	5 (Annual)
	Residential, Rural and Other Areas				
	Sensitive Area	5 (Annual)	-	-	5 (Annual)
Benzo(o) Pyrene (BaP) (ng/m^3)	Industrial	1 (Annual)	-	-	1 (Annual)
	Residential, Rural and Other Areas				
	Sensitive Area	1 (Annual)	-	-	1 (Annual)
Arsenic (As) (ng/m^3)	Industrial	6 (Annual)	-	-	6 (Annual)
	Residential, Rural and Other Areas				
	Sensitive Area	60 (Annual)	-	-	60 (Annual)
Nickel (Ni) (ng/m^3)	Industrial	20 (Annual)	-	-	20 (Annual)
	Residential, Rural and Other Areas				
	Sensitive Area	20 (Annual)	-	-	20 (Annual)

[a] Sensitive area refers to Ecologically sensitive areas notified by the India Central Government

[b] http://cpcb.nic.in/uploads/National_Ambient_Air_Quality_Standards.pdf

[c] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006.

[d] Air Quality Guidelines for Europe Second Edition. WHO 2000.

[e] As per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 11: National Noise Standards and WHO Guidelines

Receptor/ Source	Noise Level Standards [a] (dBA)		WHO Guidelines Value For Noise Levels Measured Out of Doors [b] (One Hour LAeq in dBA)		Applicable Per ADB SPS [c] (dBA)	
	Day	Night	07:00 – 22:00	22:00 – 07:00	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial area	65	55			65	55
Residential Area	55	45	55	45	55	45
Silent Zone	50	40			50	40

a Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010 (http://cpcb.nic.in/displaypdf.php?id=Tm9pc2UtU3RhbmRhcmRzL25vaXNlX3J1bGVzXzIwMDAucGRm)

b Guidelines for Community Noise. WHO. 1999.

c As per ADB SPS, the project proponent shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the project proponent will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

Table 12: National Drinking Water Quality Standards and WHO Guidelines

Group	National Standards for Drinking Water [a, b]			WHO Guidelines for Drinking Water Quality, 4th Edition, 2011[c]	Applicable Per ADB SPS [d, e]
	Parameter	Unit	Max. Concentration Limit		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6.5 – 8.5	None	6.5 – 8.5
	Color	Hazen Units	5 (15)	None	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2,000)	-	500 (2,000)
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	None	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Barium	mg/l	0.7	None	0.7
	Sulphate	mg/l	200 (400)	None	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Anionic Detergents	mg/l	0.2 (1.0)	None	0.2 (1.0)
	Phenolic Compounds	mg/l	0.001(0.002)	None	0.001(0.002)
	Residual Chlorine	mg/l	0.2	5	0.2

Group	National Standards for Drinking Water [a, b]			WHO Guidelines for Drinking Water Quality, 4th Edition, 2011[c]	Applicable Per ADB SPS [d, e]
	Parameter	Unit	Max. Concentration Limit		
Microbial indicator	E-coli	MPN/100ml	Must not be detectable in any100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml Sample
	Total Coliform	MPN/100ml			

[a] http://cgwb.gov.in/Documents/WQ-standards.pdf.

[b] Bureau of India Standard 10500: 2012 (Indian Standard, Drinking Water — Specification (Second Revision).

[c] Health-based guideline values.

[d] As per ADB SPS, the government shall achieve whichever of the drinking quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

[e] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

C. International Treaties/Conventions/Declarations on Environment Management

39. India is a signatory to the following international treaties/ conventions/ declarations on environment, social, safety and occupational issues that are relevant for the subproject. The list of international agreements is provided in **Table 13**.

Table 13: International Treaties/ Conventions/ Declarations on Environment

Sl. no	International Treaties/ Conventions/ Declarations	Description
1.	United Nations Conference on the Human Environment - Stockholm 1972	To coordinate global efforts to promote sustainability and safeguard the natural environment
2.	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975	Its aim is to ensure that international trade in specimen of wild animals and plants does not threaten their survival
3.	Ramsar Convention, 1971, 1975	The Convention on Wetlands is the inter-governmental treaty that provides the framework for the conservation and wise use of wetlands and their resources
4.	The Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes, 1989	The Convention aims to protect human health and the environment against the adverse effects resulting from the generation, trans boundary movements and management of hazardous wastes and other wastes
5.	Strategic Approach to International Chemicals Management (SAICM)	SAICM is an international non-binding policy framework to support efforts to achieve the Johannesburg Plan of Implementation (WSSD) goal for chemicals, notably “achieve by 2020 that chemicals are used & produced in ways that lead to the minimization of adverse effects on human health & the environment”

Sl. no	International Treaties/ Conventions/ Declarations	Description
6.	United Nations Conference on Environment and Development (UNCED), 1992, 2002	The conference had three objectives (Agenda – 21, Rio Declaration and Millennium Development Goals), to secure renewed political commitment for sustainable development, to assess the progress and implementation gaps in meeting previous commitments, and to address new and emerging challenges
7.	United Nations Framework Convention on Climate Change (UNFCCC), 1992 • Kyoto Protocol, 1997	It operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets
8.	The Vienna Convention, 1985 • Montreal Protocol on Ozone depleting substances, 1992	It sets binding progressive phase out obligations for developed and developing countries for all the major ozone depleting substances, including chlorofluorocarbons (CFCs), halons and less damaging transitional chemicals such as hydro chlorofluorocarbons (HCFCs)
9.	Convention on Biological Diversity, 1992 • Cartagena Protocol on Biosafety, Ratified on 17th January, 2003	It is an international treaty governing the movement of living modified organism (LMO) resulting from modern biotechnology from one country to another
10.	Convention to Combat Desertification, 1996	It is the only binding international agreement linking environment and development to sustainable soil management
11.	Rotterdam Convention on Prior Informed Consent Procedure for certain Hazardous Chemicals in International Trade, 2002	It is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals
12.	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	It aims to eliminate or restrict the production and use of Persistent Organic Pollutants (POPs)

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

40. **Data collection and stakeholder consultations:** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.

41. The literature survey broadly covered the following:

- Project details, reports, maps, and other documents prepared by TCMC;
- Discussions with Technical experts of the PPTA team, TNUIFSL, Implementing Agency (TCMC), and other relevant government agencies
- Secondary data from previous project reports and published articles; and
- Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from government agencies and websites.

42. Ocular Inspection: Site visits to the project area were made during the DPR and IEE preparation to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. Physical Resources

43. **Landuse pattern.** Thoothukudi City Municipal Corporation has been recently extended with merger of the adjacent 4 Panchayats and Thoothukudi Rural area. The present coverage of Thoothukudi Municipal Corporation is about 90.66 sq.km, out of which, old Thoothukudi corporation area is only 13.47 Sq.km whereas an added adjacent 4 Panchayats and Thoothukudi Rural area is 77.19 Sq.km which is about 85% of total area of 90.66 Sq.km. Proposed land use pattern for Thoothukudi City Municipal Corporation Area is given in the following Table 14. The residential areas covers 30.12% and costal regulation area is maximum i.e. 43.22%. In future, the open areas may get converted into residential areas due to rapid urbanization and other infrastructure developments. The project area (Ward 2, 6, 7, 13 and 14 of Thoothukudi Taluk) does not fall under the Coastal Regulatory Zone.

Table 14: Land use pattern for Thoothukudi Corporation Area (Up to Year 2021)

Sl.no	Landuse	Area in Hectare	Percentage of Area
1	Residential	3274.21	30.12
2	Commercial	364.27	3.35
3	Industrial	1251.53	11.51
4	Institutional	75.05	0.69
5	Public and semi public	227.12	2.09
6	Roads	625.24	5.75
7	Agriculture	233.28	2.15
8	Water bodies	121.67	1.12
9	Coastal Regulation	4699.09	43.22
	Total	10871.46	100.00

Source: Thoothukudi Local Planning Authority

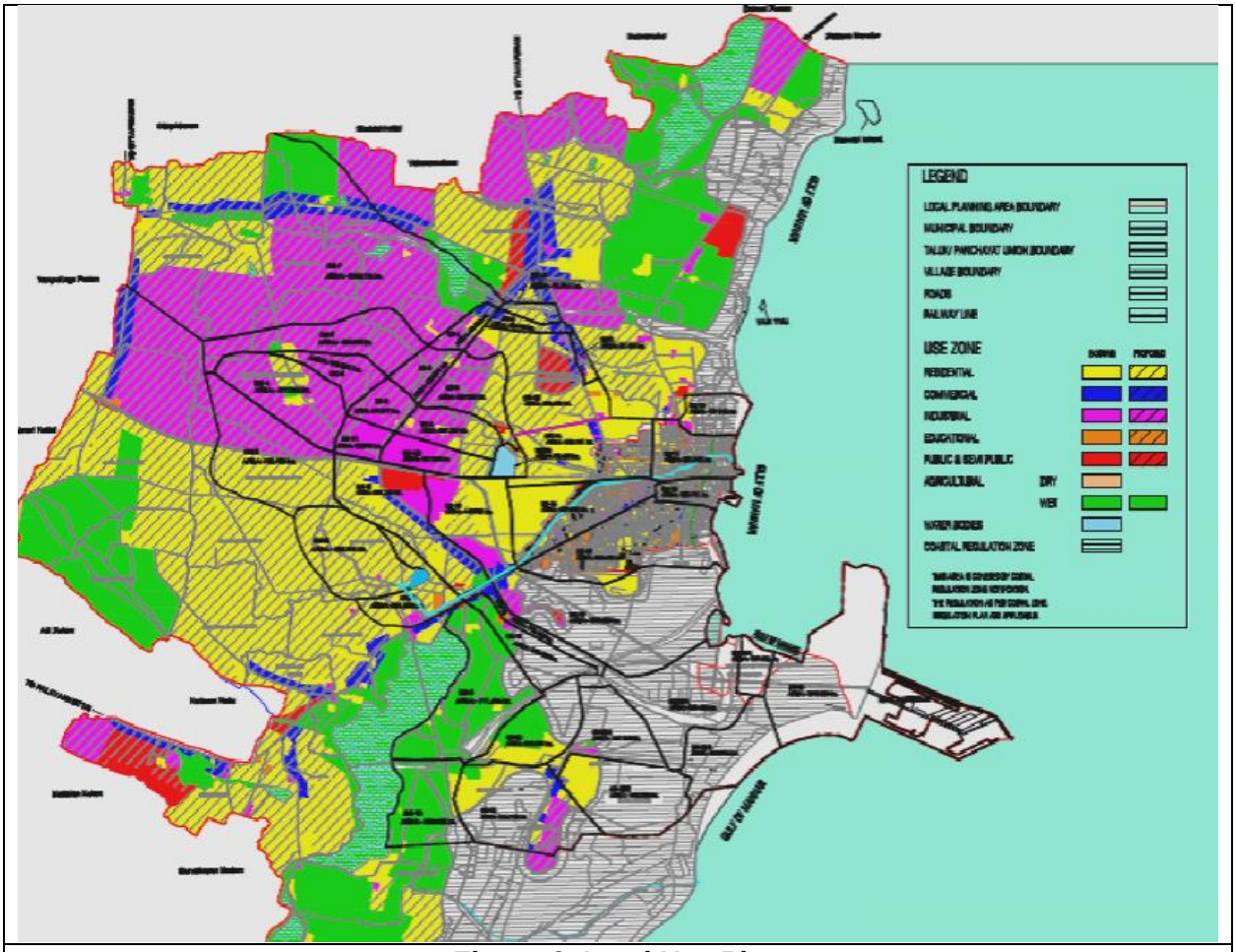


Figure 6: Land Use Plan

Source: Thoothukudi Local Planning Authority

44. **Geology and Hydrogeology.** Thoothukudi district is characterized by the presence of hard rock (73%) and Sedimentary rock (27%), Charnockite. Gnesis, Granite, Limestone, Sandstone, Alluvium, Sandy silt and Marine deposit are part of the geological formation of Thoothukudi district. The hydrogeological conditions of Thoothukudi district is provided in Table 15.

Table 15: Hydrogeology of Thoothukudi District

Type of aquifer	**Unconsolidated to Semi consolidated conditions**	
Aquifer parameters	**Hard rock**	**Alluvial**
Well yield in lpm	45 to 135	315 to 1080
Transmissivity (T) m^2/day	15 to 60	210 to 1500
Permeability (K)m/day	1 to 3	19 to 48
Depth of water level	5m to 20m	

Source: TWAD

45. The district is underline by both porous and fissures formations. The important aquifer system in the district are constituted by (a) unconsolidated and semi consolidated formation and (b) weathered and fractured crystalline rocks, some of the salient feature of the geological formations in Thoothukudi district are as follows

Limenite-garnet sand	It occurs at the mouth of Vaippar and Kallar rivers. They extend over a length of 3.2 to 48km and a width of 122Red garnet sands occurs between the south of Ovarai and Mavaladi. The proportion of garnet is 75% in the rich Kodambakkam Tank, Tiruchendur Taluk. Concentration of heavy minerals has also been reported from Ovari-Mavaladi-Athangarai breaches.
Lime shell	Lime shell with 50 to 55% CaO is known from the Coastal tracks of Thoothukudi and Srivaikundam Taluks
Gypsum and Salt	Gypsum associated with Kankarhas been reported from a few localities. Gypsum is a by-product in the salt pans, located along the East coast between Veppalodai and Ayyanapuram
Mica	Pegmatite shows presence of mica in Kovilpatti
Minor minerals	Rough stone, jelly, sand, gravel, clay, earth and granite are the minor minerals and leases are granted for quarrying of the sand minerals in Thoothukudi district

46. **Topography and Soil.** Thoothukudi district is situated near to the Gulf of Mannar about 125 km North of Kanyakumari and its environs form part of the coastal belt which forms a continuous stretch of the flat country relieved here and there by small rock outcrops. The region, surrounding Thoothukudi is abundantly dotted with rain fed tanks. The city has gentle slope from west to east, i.e. towards sea in the portion on north side of Upparu River. Highest level is RL 19.0 m almost on the municipal boundary of Thoothukudi Municipal Corporation which is on eastern side of Sterlite Industry and lowest point is RL 0.05 near sea (low tide level). Topography map of Thoothukudi is given in the following **Figure 7**. The district is covered by Black Cotton soil in the west with isolated red soil patches in high ground. The sandy soil is present in the coastal tract. Alluvial soil is restricted to river flood plain and coastal part. Alkaline and saline soils are also noticed at places

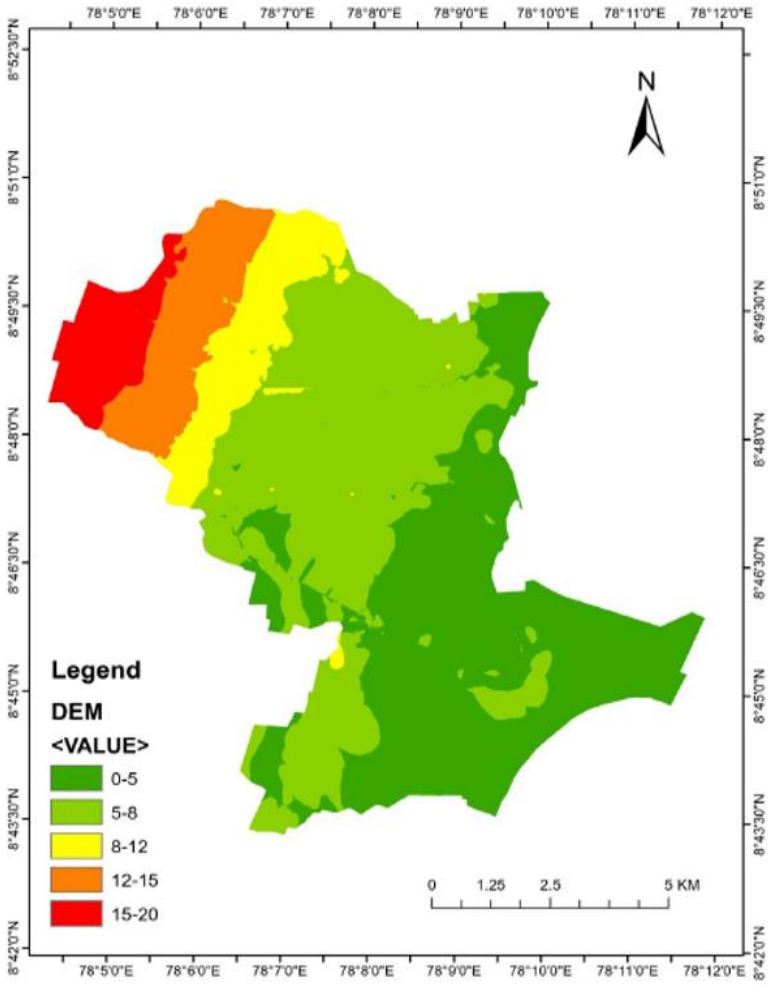


Figure 7: Thoothukudi Topography Map

47. **Climate and Rainfall.** Thoothukudi experiences tropical climatic conditions characterized with immensely hot summer, gentle winter and frequent rain showers. Summer extends between

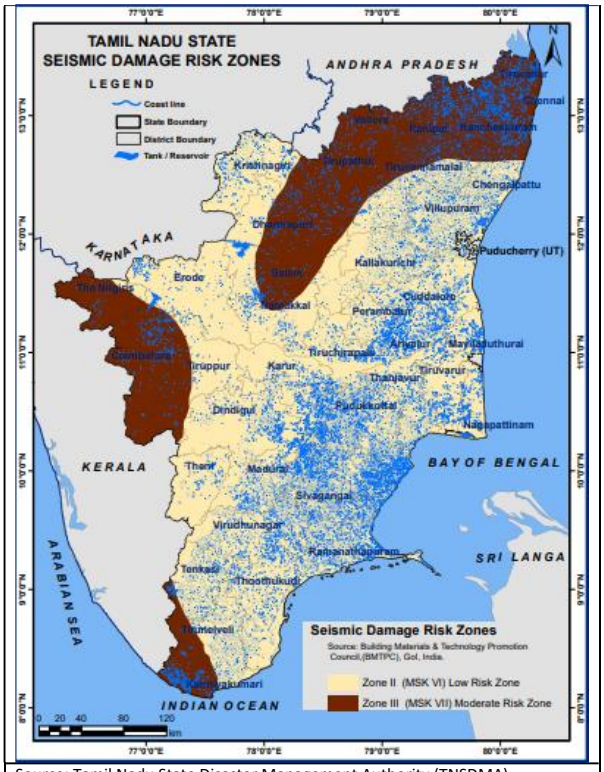
March & June when the climate is very humid. Thoothukudi registers the maximum temperature of 39°C and the minimum temperature of 22.6°C. Thoothukudi receives adequate rainfall during the months of October & November. The city receives around 673 mm average rainfall during a year out of which 467 mm rainfall is in October to December from the Northeast monsoon. The coolest month is January and the hottest months are from May to June. The city has a very high humidity being in the coastal sector.

Table 16: Climate data for Thoothukudi

Month	Avg. Max Temp (°C)	Avg. Min Temp (°C)	Avg. Rainfall (mm)
January	30.4	22.6	8
February	32.2	22.9	29
March	34.6	24.5	16
April	35.2	26.1	48
May	39.0	27.3	28
June	35.0	27.0	4
July	33.9	26.6	4
August	34.2	26.5	3
September	34.4	26.1	14
October	33.0	25.2	136
November	30.5	23.8	238
December	30.0	23.0	93

Source: TWAD

48. **Seismicity.** Per Bureau of Indian Standards (IS 1893: Par 1: 2002) earthquake zoning map of India, Tamil Nadu falls in Zones II & III (Low & Moderate Damage Risk Zones). Seismic hazard in the state is governed by Zone III in a few cities (for example, Chennai, Kancheepuram, Coimbatore, Cuddalore), and the rest of the state, which has few or no records of earthquakes, has been assigned to Zone II as shown in zoning map. Sub-project area in Thoothukudi fall under Zone II (low damage risk) based on national level classification and probabilistic seismic hazard macro-zonation at the state level.



Source: Tamil Nadu State Disaster Management Authority (TNSDMA)

Tamil Nadu Seismic Damage Risk Zone Map

49. **Flooding.** Due to its coastal location, and flat and low-lying topography, Thoothukudi project area is prone flooding, and has medium to high exposure to coastal flooding from tropical cyclones and heavy rainfall events. During the monsoon rains in the year 2015, the project area has expereinced severe flooding.

50. **Air Quality.** Secondary information on the air quality from an ongoing storm water project (under Tamil Nadu Sustainable Urban Development Project (TNSUDP)) in TCMC area has been utilized for discussing the project area's ambient air quality. Air quality monitoring has been conducted at 4 locations within Thoothukudi city. Air quality monitoring locations are given in the Table 17. The recorded observations for key air

quality parameters are given in the Table 18. From the observation, the PM_{10} concentration was in the range between 10.2 µg/m^3 to 17.3 µg/m^3. $PM_{2.5}$ concentration was between 5.2 µg/m^3 to 7.5 µg/m^3. The observed values are well within the stipulated values of 100 µg/m^3 and 60 µg/m^3 respectively. This indicates the project site do not have any major industrial or commercial activities. Other key air quality parameters including the SO_2, NO_2, Ozone and CO are well within the NAAQ standard.

Table 17: Air Quality Monitoring Sampling Locations

S. No	Location of Sampling points	Parameters covered	Date of Sampling
1	National Highways 45B (AAQ 1)	SO_2, NO_2, PM_{10}, $PM_{2.5}$, Ozone, and CO	18th January 2022
2	Kalangari (AAQ 2)		18th January 2022
3	Meelavittan Road (AAQ 3)		25th January 2022
4	National Highways 138 (AAQ 4)		11th January 2022

Table 18: Air Quality Monitoring Observations

S.No.	Parameter	Unit	Averaging Period	NAAQ standard Values µg/m^3	AAQ 1	AAQ 2	AAQ 3	AAQ 4
1	PM_{10}	µg/m^3	24 hours	100	13.5	10.2	17.3	10.3
2	$PM_{2.5}$	µg/m^3	24 hours	60	5.2	7.3	6.5	7.5
3	SO_2	µg/m^3	24 hours	80	0.6	0.2	0.4	0.2
4	NO_2	µg/m^3	24 hours	80	10.1	13.3	8.2	13.3
5	Ozone	µg/m^3	1 hours	180	5	5	6	5
6	CO	µg/m^3	1 hours	4000	0.13	0.15	0.12	0.15

Source: TNUIFSL

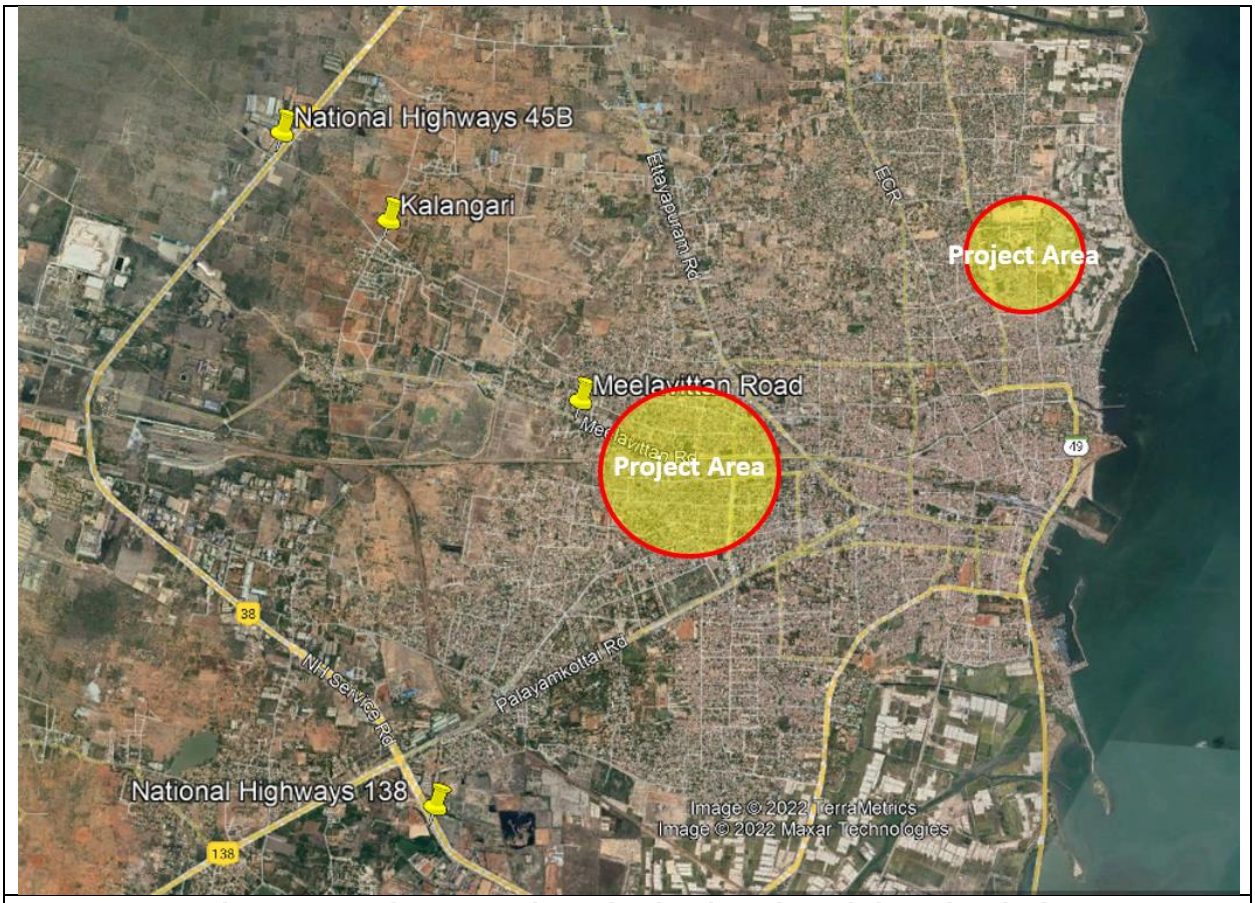


Figure 8: Environmental Monitoring locations (Air and Noise)

51. **Noise Quality.** In the similar location to the air quality monitoring, the ambient noise levels are recorded. The date of sampling is similar to the AAQ monitoring (Refer Table 17). The outcome of the noise levels are given in the following Table 19. From the inference, it is evident that the ambient noise level around the study area is well within the stipulated limit as per the Noise Pollution (Regulation and Control) Rules 2000 as well as World Bank Group's EHS Noise Level Guidelines.

Table 19: Ambient Noise Observations

Sl No.	Location	Type of Area	Test Results (dB(A) Leq)		Permissible Limits (Leq dB(A)	
			Min	Max	Day Time 07.00 -22.00)	Night Time (22.00 – 07.00)
1	National Highways 45B	Commercial area	28	30	65	55
2	Kalangari	Residential area	26	28	55	45
3	Meelavittan Road	Residential area	26	28	55	45
4	National Highways 138	Commercial area	26	28	65	55

Source: TNUIFSL

52. **Groundwater Quality.** Secondary information on the groundwater has been collected from the ongoing storm water project (under Tamil Nadu Sustainable Urban Development Project (TNSUDP)) in Thoothukudi. Groundwater samples has been collected on 31st March 2016 from five locations namely (i) Sundaram nagar (GW 1), (ii) American hospital junction (GW 2), (iii) Sub collector office (GW 3), (iv) Collector office (GW 4) and (v) Ganeshan nagar (GW 5) and analysed

for its physico-chemical properties in TWAD Board District Water Testing Laboratory at Manjalneerkayal, Thoothukudi. The outcome of the results are given in the following Table 20. From the analysis, the pH of the groundwater samples ranged between 7.25 to 7.46 and it is well within the limits. The TDS value is observed to be exceeding for GW 1, GW 3 and GW 4, indicating the salinity. The water quality parameters including TDS, Total Alkalinity, Total Hardness and Calcium concentration are observed to be exceeding the stipulated value for all groundwater samples. Calcium concentration was observed to be high for the samples collected at GW 1, GW 3 and GW 5, whereas Magnesium concentration was recorded high for GW 1 and GW 5. Chloride concentration was recorded high for GW 1 and GW 5 sampling stations.

Table 20: Groundwater Quality Analysis

Sl. no	Parameters	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	BIS IS 10500:2012 Acceptable Limit)
1	Appearance	-	Clear	Clear	Clear	Slightly greenish	Clear	-
2	Colour	Hazen	< 5	< 5	< 5	< 5	< 5	5
3	Odour		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH		7.3	7.46	7.25	7.36	7.29	6.5 to 8.5
5	Turbidity	NTU	1.2	1	1.2	3	1	1
6	Electrical Conductivity		1840	990	1030	870	1785	-
7	TDS	mg/l	1250	665	710	562	1215	500
8	Total Alkalinity as $CaCO_3$	mg/l	404	271	307	259	238	200
9	Total Hardness as $CaCO_3$	mg/l	555	263	360	246	545	200
10	Calcium (Ca)	mg/l	148	70	96	69	146	75
11	Magnesium (Mg)	mg/l	44	21	29	21	43	30
12	Sodium (Na)	mg/l	160	90	76	76	156	-
13	Potassium (K)	mg/l	20	10	10	8	16	-
14	Iron (Fe)	mg/l	BDL	BDL	BDL	BDL	BDL	0.3
15	Manganese (Mn)	mg/l	BDL	BDL	BDL	BDL	BDL	0.1
16	Free Ammonia (NH_3)	mg/l	0.2	0.2	0.2	0.1	0.1	0.5
17	Nitrite (NO_2)	mg/l	0.18	0.16	0.16	4	0.18	-
18	Nitrate (NO_3)	mg/l	20	10	10	10	16	45
19	Chloride (Cl)	mg/l	255	120	124	59	245	250
20	Fluoride (F)	mg/l	0.8	0.4	0.4	0.2	0.4	1
21	Sulphate (SO_4)	mg/l	122	48	28	62	250	200
22	Phosphate (PO_4)	mg/l	BDL	BDL	BDL	0.2	0.2	-
23	Fecal Coliform	MPN/ 100 ml	NIL	NIL	NIL	NIL	NIL	Nil/ 100 ml

Source: TNUIFSL, BDL-Below Detection Limit

53. **Surface water Quality.** Similar to groundwater, Secondary information on the surface water has been collected from the ongoing storm water project in Thoothukudi. Surface water samples

has been collected from five location along the storm water alignment on 31st March 2016, the collected samples are analysed for its physico-chemical parameters in TWAD Board District Water Testing Laboratory at Manjalneerkayal, Thoothukudi. The outcome of the results are given in the following Table 21. From the analysis, the color of the surface water exceeds the stipulated standard limit. The pH of the groundwater samples ranged between 6.26 to 7.41 and it is well within the limits. Turbidity, TDS and Total Hardness are observed to be in high concentration for all surface water samples. Total Alkalinity concentration was observed to be high for SW 3, SW 4 and SW 5. Calcium and Magnesium concentration was observed to be high for SW 2, SW 3 and SW 5. Nitrate concentration was observed to be high for SW 2. Very high concentration of Chloride has been recorded at SW 2, SW 3 and SW 5. Sulphate concentration was observed to be high at SW 1 and SW 2. The presence of Fecal Coliforms are observed for all the surface water samples indicating the sewage contamination. The pollution is due to the domestic waste water. There are no industries located within the project area.

Table 21: Surface Water Quality Analysis

Sl. no	Parameters	Unit	SW 1	SW 2	SW 3	SW 4	SW 5	BIS IS 10500:2012 Acceptable Limit)
1	Appearance	-	Slightly greenish	Slightly Brownish	Greenish	Greenish	Brownish	-
2	Colour	Hazen	< 15	< 15	< 15	< 15	< 15	5
3	Odour		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH		6.26	7.12	7.41	7.26	7.14	6.5 to 8.5
5	Turbidity	NTU	3	3.4	8	6.2	8	1
6	Electrical Conductivity		875	11180	3910	850	1970	-
7	TDS	mg/l	570	7620	2620	570	1360	500
8	Total Alkalinity as $CaCO_3$	mg/l	24	154	562	238	505	200
9	Total Hardness as $CaCO_3$	mg/l	214	2525	1010	194	545	200
10	Calcium (Ca)	mg/l	56	672	268	52	146	75
11	Magnesium (Mg)	mg/l	18	263	82	15	43	30
12	Sodium (Na)	mg/l	86	1120	360	92	180	-
13	Potassium (K)	mg/l	8	106	30	8	20	-
14	Iron (Fe)	mg/l	0.05	0.05	0.05	BDL	0.05	0.3
15	Manganese (Mn)	mg/l	BDL	0.1	BDL	BDL	BDL	0.1
16	Free Ammonia (NH_3)	mg/l	0.05	0.2	1.6	0.5	0.5	0.5
17	Nitrite (NO_2)	mg/l	2	0.24	0.6	0.32	0.36	-
18	Nitrate (NO_3)	mg/l	8	108	44	10	16	45
19	Chloride (Cl)	mg/l	41	3117	892	122	265	250
20	Fluoride (F)	mg/l	1.2	0.2	0.2	0.2	1	1
21	Sulphate (SO_4)	mg/l	325	408	103	24	48	200
22	Phosphate (PO_4)	mg/l	0.2	0.2	0.5	0.2	0.2	-
23	Faecal Coliform	MPN/ 100 ml	100	400	1200	300	500	Nil/ 100 ml

Source: TNUIFSL, BDL-Below Detection Limit

C. Ecological Resources

54. **Flora.** The forest type available in the Thoothukudi District is 6A/DSI that is Southern Thorn Shrub. The species composition as furnished below is mostly of thorny hardwood and xerophytes. *Dalbergialatifolia*, *Dichrostachys cinerea*, *Acacia latronum*, *Acacia pennata*, *Albiziaamara, Zizyphus oenoplia* Species and a few *Azadirachtaindica, Dillenia pentagyna, Calotropis gigantean, Pongamia pinnata, Euphorbia nivilia, Acalyphafruticosa, Ocimum sanctum*. Some of the floral species observed in the project area is given in the following Table 22. None of the floral species identified in the project area are endangered or protected species.

Table 22: Floral Species in the Project Area

Sl.no	Scientific name	Family name
1	Dalbergia horrida	Fabaceae
2	Dichrostachys cinerea	Fabaceae
3	Acacia planifrons	Fabaceae
4	Albizzia amara	Fabaceae
5	Zizphus sp	Rhamnaceae
6	Azadarichta Indica	Meliaceae
7	Dodonea viscosa	Sapindaceae
8	Carissa carandus	Apocynaceae
9	Pteriobium indicum	Fabaceae
10	Euphorbis sp	Euhorbiaceae
11	Acalypha fruticose	Euhorbiaceae
12	Ocimum sanctum	Lamiaceae
13	Prosopis juliflora	Fabaceae
14	Acacia ieucocepioea	Mimosaceae
15	Acacia niotica	Mimosaceae
16	Borasus flabeifer	Arecaceae
17	Leucaena leucocephala	Mimosaceae

Source: Site observation

55. **Fauna.** Based on the secondary information obtained from the Forest department (Forest working plan), the available faunal species including the herpetofauna, avifauna and mammals in the project area are discussed in the following sections.

- **Herpetofauna.** Six herprtofauna have been identified in the project area. Four species i.e. Oriental garden lizard (calotes versicolor), Rat snake (Ptyas mucosa), Indian Chameleon (Chamaeeleo zeylanicus) and India skink (Sphenomorphus indices) was observed commonly in the project area. Two species i.e. Python (Python molurus) and Monitor lizard (Varanus benghalensis) are reported. As per the Wildlife Protection Act, 1972 these two species are protected. However, being a nocturnal animals in nature, both the species will not have any impact due to the construction of the storm water drain.

- **Avifauna**. A total of Fifty seven (57) bird species were observed in the Thoothukudi district (Refer **Appendix 3**), in which nearly forty three (43) of the bird species was observed commonly observed (throughout the year). Two of the species was observed to be winter visitor i.e. (Himantopus himantopus) and greater Flamingo (Phoenicopterus roseus). Four species are protected under the Indian Wildlife Protection Act 1972 namely Black Kite (Milvus migrans), Brahminy Kite (Haliastur indus), Eurasian Spoonbill (Platalea leucorodia) and Indian Peafowl (Pavo cristatus). However in the project area the avifauna observed

are Crow (Corvus splendens), Eagle (Clanga hastata), Parrot (Psittacula krameri), Owl (Bubo bengalensis), and Kingfisher (Alcedo atthis).

- **Mammals**. Seven mammal species were observed in the Thoothukudi district, in which three species including Spotted Deer (Axis axis), Common mongoose (Herpestes edwardsii) amd Black naped hare (Lepus nigricollis) were commonly observed. Other four mammal species were reported, which includes, Black buck (Antilope cervicapra), Sambar (Cervus unicolor), Jungle cat (Felis chaus) and Indian flying fox (Pletropus giganteus). As per the IUCN, the Sambar (Cervus unicolor) is comes under threatened species. However in the project only domestic animals such as Cow, Buffalo, Goat, Dogs, and house cats are observed.

56. **Ecological sensitive area.** The nearest ecological sensitive area is Gulf of Mannar Marine National Park and its eco sensitive zone. The nearest boundary of the national park (southern most boundary of the national park) is about 6 km (areal distance) away from the project area (refer Figure 9). Notified as national park in 1986, the marine national park lies between Latitude $8^0$49'00"N and $9^0$15'00"N and Longitude $78^0$11'30"E and $79^0$10'5"E, and encompasses 21 off-shore islands (including 2 submerged) and surrounding coral reef system in the Bay of Bengal, along the coastal districts of Ramanathapuram and Tuticorin extending to an area of 560 sq. km. The marine national park is endowed with a rich variety of marine flora and fauna as it includes ecosystems like coral reefs, rocky shores, sandy beaches, mud flats, estuaries, mangrove forests, seaweed stretches and sea grass beds. These ecosystems support a wide variety of fauna and flora including rare chanks, shrimps, lobsters, pearl oysters, whales, dugongs, turtles, seahorses, sea snakes, sea cucumbers, etc. The diverse nature of ecosystems in the Gulf of Mannar supports a wide variety of significant species including 117 species of corals, 13 species of sea grasses, 641 species of crustaceans, 731 species of molluscs, 441 species of fin fishes and 147 species of seaweeds apart from the seasonally migrating marine mammals like whales, dolphins, porpoises and turtles.

57. In 2020, an ecosensitive zone has been notified around the national park to conserve and protect the area, the extent and boundaries of Gulf of Mannar Marine National Park from ecological, environmental and biodiversity point of view and to prohibit industries or class of industries and their operations and processes in the Eco-sensitive Zone. ESZ extent varies from 0.73 km to 5.57 km around the boundary of Gulf of Mannar Marine National Park as the Gulf of Mannar Marine National Park Eco-sensitive Zone (ESZ). The area of the ESZ is 720.89 sq. km.

58. Project area is located outside the boundary of ESZ, and nearest boundary is about 1-2 km east of the project area. Project is confined to the urban area of Thoothukudi town, and therefore does not interfer with the national park. No regulatiory celarances or permissions are required.

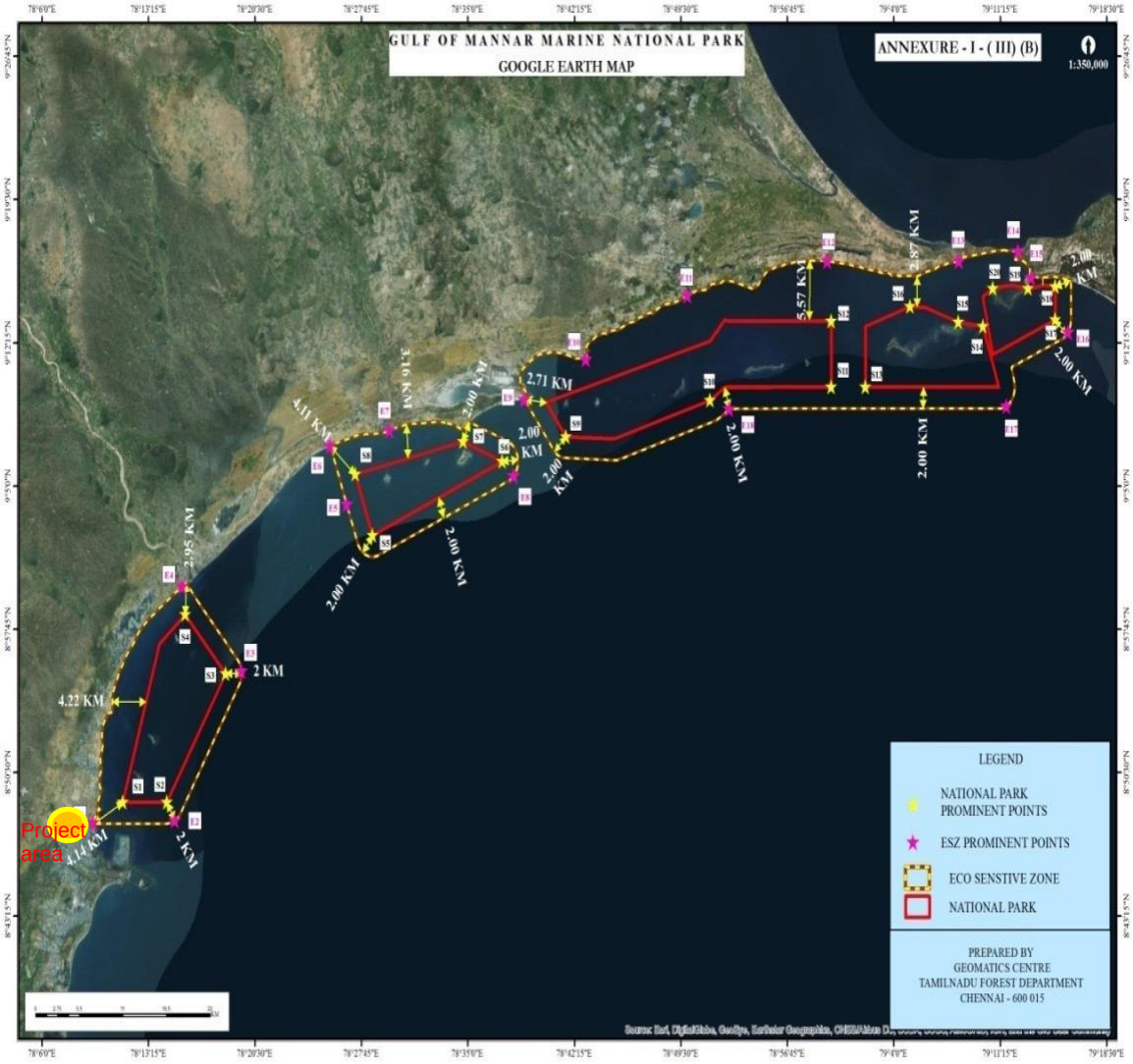


Figure 9: Gulf Mannar Marine National Park and Eco Sensitive Zone

D. Socio-econimic Environment

59. **Demographic Profile.** The project area comprises Ward 2,6,7,13 and 14 of Thoothukudi taluka. Well balance male and female population was observed in the project area. The total population in the project area is 26,970, in that male population stands at 13,486 (50%) and female population is 13,484 (50%). The presence of Schedule caste population was 2,207 which is almost 8.2% of the total population. There are no Schedule Tribes Population in the project area. The literacy rate was observed to be high, nearly 78% of the population are literate out of which 51.2% are male and 48.8% are female. Total workers population in the project area is 9,256, in that nearly 90.6% are main workers and 9.4% are marginal workers. Nearly 98% of the marginal workers are working in Industries and other commercial activities.

Table 23: Demography Profile of the Project Area

Sl.no	Thoothukudi Thaluka	Total population	Scheduled Castes population	Literates	Total workers	Main workers	Marginal workers
1	Ward No. 2	4,369	1,093	3,335	1,633	1,604	29
2	Ward No. 6	5,568	120	4,565	1,998	1,657	341
3	Ward No. 7	6,517	328	5,439	2,241	2,093	148
4	Ward No. 13	4,853	280	3,733	1,503	1,197	306
5	Ward No. 14	5,663	386	3,957	1,884	1,839	45
	Total	**26,970**	**2,207**	**21,029**	**9,259**	**8,390**	**869**

Source: Census 2011

60. **Socio-Economic Profile.** Salt pans in and around the city contribute majorly to the economy of the city. The salt pans produce 1.2 million tons of salt every year, contributing to 90% of the salt produced in the state and 50% needed by the chemical industries of the state. The other major industries are shipping, fishing, and agricultural, power and chemical industries. Fishing is one of the largest contributors to the local economy. Thoothukudi Fishing Harbor is one of the oldest and largest in Tamil Nadu. There is a large capacity thermal power station in the city called as the Tuticorin Thermal Power Station which has five 210 megawatt generators. The first generator was commissioned in July 1979. The thermal power plants under construction include the coal-based 1000 MW NLC TNEB Power Plant. In addition to this there are several private power plants like IndBarath Power Limited, Coastal Energen, Sterlite Industries Captive power plant etc. Southern Petrochemical Industries Corporation (SPIC),Tuticorin Alkali Chemicals, Heavy Water Board Plant, Sterlite Industries, Venus Home Appliances, Madura Coats and Mills, Dhrangadhra Chemical works, Kilburn Chemicals, Nila Sea foods, Diamond Sea foods Maris Associates, VVD Coconut oil mill, AVM oil mill, Tuticorin Spinning Mills Ltd and KSPS Salts are some of the small scale and large-scale industries in the city. Proposed subproject area is confined to the residential areas, and there are no industrial establishments.

61. **Infrastructure facilities.** Thoothukudi has an extensive transport network and is well-connected to other major cities by road, rail and air. The corporation maintains a total length of 428.54 km. The city has 37.665 km concrete roads, 329.041 km black topped surface roads, 56.592 km water bound macadam roads and 5.242 km earthen roads. Thoothukudi district has a major and a minor ports such as Thoothukudi port and old port Kulasekara Patinam in Udangudi to facilitate major export and import of seafood and fish-based products. There are 4 water supply scheme available in Thoothukudi district to meet the water demand. The first scheme was initiated in the year 1932, under this scheme, purified water was supplied to Thoothukudi city from Vallanadu Water supply Head works which is situated 42 kms away from Thoothukudi city. Second scheme was initiated in the year 2000. The second scheme was required to supply

additional purified drinking water to meet Thoothukudi City's requirement as per increase in population. This scheme was funded by HUDCO. Third scheme was initiated in the year 2013, under this scheme water is extracted from the Tamirabarani river bed from the village Agaram, Vallanadu by storing in collector well. Fourth scheme was initiated in the year 2017, to cater the water demand for the upgraded TCMC, with a new head work at Kalliyavoor which is 49 km away from Thoothukudi. Under this scheme the purified water was supplied on an average of 60 MLD per day.

62. **Cultural and Heritage sites.** Tiruchendur Murugan Temple, Kalugumali Sculptures of Jain Temple, Kattabomman Memorial Fort at Panchalankurichi, Bharathi Manimandapam at Ettayapuram, Manadpadu Church, Paniya Matha Church (Lady Snow), Navathirupathi Temples and Vanathirupathi Temple near Nazerath are important cultural and heritage sites in Thoothukudi district. None of the cultural or archeological sites are located within or in the vicinity of the project area.

V. ANALYSIS OF ALTERNATIVES

A. With- and Without-Subproject Alternatives

63. Storm water drainage system in the TCMC has become necessary due to the flat and gentle slope topography and expected flooding during rainy season. During the monsoon rains in the year 2015, the project area has faced severe flooding issues, which is a serious problem and it should be sorted out. In this regard, the storm water drain project has been proposed under the TNUFIP 3. Besides this, there are some other issues regarding drainage in the project area that are briefly discussed below:

(i) There are some existing storm water drains in the project area, which are constructed without proper planning & design;

(ii) There is no storm water drain plan to cover the entire Thoothukudi corporation limit; and

(iii) In some areas of the project site, being a sparsely developed settlement and relatively rural in nature, natural or manmade watercourses used for irrigation have been used as drains. Most of these watercourses discharge in open fields/ vacant land without being connected into water bodies nearby.

64. **Without-subproject or 'do-nothing' alternative**: ''Doing nothing'' about the drainage issues as mentioned above would be allowing the project area to further develop as "under-serviced," put the life and health of its residents and the public at more risks and worsen its living environment. This option would impede further social and economic development of the TCMC.

65. **With subproject' alternative**: With the subproject, 24,283 household as of 2022 will have proper and effective management of storm water drainage, and the local people will not have to suffer from floods during monsoon. Overall, the 'with subproject alternative' will bring about improved public health and living environment that will contribute to improved quality of life in the project area. Improved drainage facilities will create an enabling environment for local economic development and improve social services such that communities within the sphere of influence of the project area will benefit from; thus, contributing to the overall local economic development of the TCMC.

B. Alternatives Relative to Planning and Design

66. Storm water drains has to be laid in the project area for every streets and hence, there are no such alternatives proposed in the design of Storm water drain. However, one of its component including construction of a storm water pump house has been shifted from the CRZ area (St Mary's colony) to a non CRZ area (Loorthammal puram), where an existing pump house has been planned to revamp.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

67. The potential environmental impacts of the proposed storm water drain project, and its components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

68. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design impacts** include impacts arising from investment program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iii) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(iv) **O&M impacts** include impacts arising from the operation and maintenance activities of the storm water drain and its components.

69. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

70. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

71. The ADB Rapid Environmental Assessment Checklist in http://www.adb.org/documents/adb-environmental-assessment-guidelines has been used to screen the project for environmental impacts and to determine the scope of the IEE.

72. In the case of this project (i) most of the individual elements involve straight forward construction and operation techniques, so impacts will be mainly localized and not greatly significant; (ii) negative impacts associated with storm water drain facilities are already considered in the design; (iii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iv) being mostly located in an urban/ semi urban area, will not cause direct impact on biodiversity values. In case bedrock/hard rock is encountered, then the blasting proposed shall be "controlled blasting" following necessary precautionary measures including usage of appropriate quantities of explosives.Hence the nearby structures and properties are unlikely to be affected and impacts related to controlled blasting such as dust generation, increased noise levels and vibrations would be mitigated. The project will be in properties held by the TCMC and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impacts – Design and Location:

73. **Design of the Proposed Components.** Technical design of the (i) storm water drain network, and (ii) storm water pumping stations, follows the relevant standards and provides a robust system, which is easy to operate, sustainable, efficient and economically viable. Project includes following design considerations.

(i) **Prevention of flooding**. Rainfall data of 30 years are collected and based on that the required size of tertiary storm water drains for 36.367km were calculated for the 1 in 2 year design rainfall (32.77 mm/hr) which corresponds to a 1 hour rain with a 2-year return period.

(ii) **Groundwater recharge and silt control.** Groundwater recharge pits/ structures are provided at every 90m in the storm water design. Silt control measures (Catch pits at every 10m interval) are provided.

(iii) **Sediment Control**. For control of sediments, it is proposed to construct a sediment trap at the confluence point of the drain with the water body so that the sediments are deposited in the silt trap and settle over there which can be removed periodically

(iv) **Prevention of solid waste dumping into drains.** Tertiary storm water drains will be constructed as box type drain in RCC with a cover on top, which will curtail dumping of solid waste in drains.

(v) **Safety in maintenance.** Inspection chambers will be provided at an interval of 10m to facilitate maintenance activities by machinery

(vi) **Traffic Loads and People access to micro drains.** tertiary storm water drains shall be constructed as box type drain in RCC with a cover on top, which can also take traffic loads

74. **Outfall drains**. This subproject only includes provision of 36.4 km of tertiary / collector drains in high priority areas of the town where flooding and water logging is prevelant during the rains. This subproject is planned as part of overall storm water drainage system improvement undertaken by the TCMC in four phases under various externally aided (the World Bank funded TNSUDP) and government funded projects (AMRUT and Smart City projects, etc.,). As described in the project description section, the drain network to be constructed under this subproject will be connected at 11 locations in three secondary / primary drains for further conveyance of collected run off and ultimate discharge into Bay of Bengal. These primary drains include SBI drain (2 locations), Meelavittan drain (8 locations), and at one location, it is connected to Buckle canal. Buckle canal one of the large canals in Thoothukudi and serves large part of the town and carryiies considerable flows and discharges into the Bay of Bengal. Project area is in the catchment of buckle canal.

75. The other two drains - Meelavittan drain and SBI drain are being constructed under Smart City Project. While Meelavittan drain will discharge into Buckle canal for further discharge into the sea, SBI drain will directly discharge into the sea. Works of both these drains are in advanced stages and nearing completion (scheduled to be completed by June 2022).

76. These components are not constructed in anticipation of ADB project nor any rehabilitation or augmentation proposed under ADB project for these components. However, the sustainability of ADB project depends on these two drains which are being constructed under other projects. From the review it is observed that :

(i) The TCMC has undertaken overall storm water drainage system improvement in the town based on a detailed project report prepared for the purpose. An hydraulic and flood model study was conducted. The drain network proposed under this subproject is part of the overall system. Meelavittan drain and SBI drain were designed duly considering the discharge from the subproject area, and therefore these drains are adequate.
(ii) Construction of Meelavittan drain and SBI drain (Figure 2) is nearing completion, and mostly likely to be completed and ready for operation by June 2022. This proposed subproject is currently in prepraton stage, and bids are likely to be invited in June 2022 after approval of detailed design report. Construction is likely to start in November 2022 and complete by November 2023. Therefore, as per the schedules, two primary drains will be under operation much before completion of drain works under this subproject. TCMC to ensure timely completion.
(iii) Given the nature of works, the primary drains works do not fall under the ambit of EIA Notification, 2006, and therefore do not require EIA study or environmental clearance (EC).TCMC may examine the CRZ clearance requirement for ongoing SBI drain works and obtain clearance as required. As per TCMC, no other clearances are required, and contractors obtained necessary labor license to conduct works. Public grieances related to construction activities of overall drainage project, such as, storage of construction materials on the road side, dust pollution, lack of proper safety and traffic signage are received by TCMC. These aspects are duly considered in this subproject, and included in EMP.

77. **Storm water pumping station**. For one of the outfall at Loorthammal puram, it is proposed to augment the existing pumping station. Storm water pumping station will require an uninterrupted power supply for operation. Disruption in power supply will lead to the process upset and result in the stagnation of storm water. Following measures are integrated into design and contracts to ensure efficient operation:

(i) Ensuring continuous uninterrupted power supply, including a back-up facility (such as a generator)
(ii) Providing operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility
(iii) Necessary training to TCMC staff dealing with the pumping station

78. **Noise from pumping operations.** The operation of pumps and motors and diesel generators is a major source of the noise. As the pumping station at Lourthammal puram is located in the residential area, the noise generated from the pumping station shall have negative impact to the surroundings. High noise levels can affect the health of operators and staff at the facilities, and therefore, noise levels need to be maintained within and outside the plant at acceptable levels. The internal noise level in a room measured at a distance of 1m from these pump sources typically will be in the range from 80 dB (A) to 100 dB (A).

(i) Procure good quality latest technology vertical turbine pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1 m (refer tender specification for make)
(ii) Use acoustic enclosures – manufacturer specified, for all pumps, motors
(iii) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures
(iv) Provide sound mufflers for ventilators in the plant rooms soundproof doors

(v) Provide earplugs to workers.

79. **Energy Efficiency**. To optimize the power consumption, it is proposed to use low noise and energy-efficient pumping systems.

80. **Tree cutting at selected project sites.** It is estimated to cut/remove 195 trees located adjacent to the micro drains, which belong to species such as *Ficus religiosa* (Arasu), *Azadirachta indica* (Veppam), and *Delonix regia* (Mayil- konnai). Adequate precaution will be taken during implementation to minimise the tree cutting. Tree transplantation option shall be explored to minimize the loss of trees. However, when tree cutting is unavoidable, a note with necessary details of the project, trees & photos and justification for tree cutting needs to be submitted to the Revenue Divisional Officer, Thoothukudi District for obtaining tree cutting permission.

81. **Compensatory Plantation.** Plant and maintain 10 trees for each tree that is removed. Trees shall be planted in the Ambedkar Nagar dumping site, which is owned by TCMC

Table 24: List of Species for Compensatory Tree Plantation

Scientific Name	Family	Local Name
Actinodaphne hookeri	Laurancaea	Thali
Adenanthera pavonia	Mimosaceae	Anai kundumani
Adina cordifolia	Rubiaceae	Manja kadambai
Aegle marmelos	Rutacea	Vilvam
Ailanthus excelsa	Simarubaceae	Perumarautta
Albizzia amara	Mimosaceae	Usil
Alstonia scholaris	Apacynaceae	Elilappalai
Anogeissus latifolia	Combretacea	Vekkali
Anthocephalus cadamba	Rubiaceae	Vellakadambu
Azadirachta indica	Meliaceae	Veppam
Bambusa arundinocia	Poaceae	Mullumungil
Bauhinia purpurea	Caesalpiniaceae	Mandarai
Bauhinia recemosa	Caesalpiniaceae	Athi
Bridelia retusa	Euphorbiaceae	Mullu-vengai
Caesalpinia bounducella	Caesalpiniaceae	Kazhichi-kai
Calophyllum inophyllum	Guttiferae	Punnai
Cassia fistula	Caesalpinaceae	Arakkuvadam
Celiba pentandra	Bombacaceae	Ulagamaram
Clerodendrum serratum	Verbenaceae	Chiru tekku
Dalbergia sissoo	Papilionaceae	Sisoo
Delonix regia	Caesalpinaceae	Mayil-konnai
Dendrocalamus strictus	Poaceae	Bamboo
Diosphyros melanoxylon	Ebenaceae	Ebony karuunthumbi
Ficus benghalensis	Moraceae	Alamaram
Ficus hispida	Moraceae	Peiathi
Guazuma tomentosa	Sterculiaceae	Kattu Utharaksham
Lawsonia inermis	Lythraceae	Marudani
Mallotus philippensis	*Euphorbiaceae*	Kapila
Melia azardirachta	*Meliaceae*	Vepa
Mimusops elangi	*Sapotaceae*	Magizham
Saraca indica	*Caesapiniaceae*	Asokan
Soymida febrifuga	*Meliaceae*	Semmaram
Terminalia arjuna	*Combretaceae*	Vellai-maruthu

82. **Utilities.** The site preparation for construction (including grubbing. trenching works etc.) may result in loss or relocation of certain utilities and amenities namely telephone lines, electric

poles, and wires, water, and sewer lines, if exists within the proposed project locations may require to be shifted. People dependent upon these utilities and amenities may experience inconvenience and economic loss. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with the TCMC will

(i) Will inform local communities in advance of any expected disruptions in utility services that will affect them.
(ii) identify the locations and operators of these utilities to prevent unnecessary disruption of services during the construction phase; and
(iii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services

83. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites that are to be considered will not promote instability and destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposal near water bodies.

84. **Site selection of sources of materials**. Significant quantities of coarse aggregate and fine aggregate will be required for construction works. The contractor should procure these materials only from the approved quarries. The contractor should, to the maximum extent possible, procure material from existing quarries, and the creation of new quarry areas should be avoided as far as possible. If new quarries are required then the contractor will be responsible for obtaining all permissions and clearances, including environmental clearance for mining. The contractor should factor the time required for obtaining clearances including the conduct of EIA if required under the law. It will be the construction contractor's responsibility to verify the suitability and legal status of all material sources and to obtain the approval of the Department of Geology and Mining and local revenue administration, as required.

85. **Social and Cultural Resources** – **Chance Finds**. Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in project sites construction of drains and pumping station. As per the desktop review and the assessment of the secondary information, there are no archeologically or historically recognized sites or places close to project sites or within the project area. Therefore it is not likely that the project sites contains any archaeological or historical remains, and risk of uncovering them is very low. Nevertheless, TCMC and the contractor will follow chance find protocol to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved:

(i) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work
(ii) Stop work immediately to allow further investigation if any finds are suspected;
(iii) Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

86. **Impacts on Biological Environment.** The project is unlikely to change or influence biological environment, flora and fauna of the region as most of the area falls under the urban/ semi urban category. Project area is away from the Gulf of Mannar marine national park and outside the eco sensitive zone. Therefore there is no interefence or impact of project on these sensitive areas. The requirement of the trees, herbs and shrubs cleared for the purpose is

minimal. The project is expected to improve the overall drainage and flood system within the project area. This in turn will contribute positively to biodiversity of the region. Project will improve the microclimatic conditions in long-term and can contribute to mitigating the climate change impacts. Project is unlikely to cases any structural changes in long run, such as change in the topography, geology, soil, temperature and vegetation, and combination of any of these components.

B. Construction Impacts

87. All construction activities will be confined to the sites of proposed drainage alignments, and the interference with the public and community around is marginal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to trench excavations especially in narrow roads, dust, access impediment to houses and businesses, disposal of construction waste, etc. These are all general impacts of construction in urban/ semi urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

88. **Non-Compliance with Environmental Legislation.** This issue will arise when there is a lack of awareness among subproject staff and management of environmental safeguard requirements, compliance with the requirements, conditions specified in the IEE Report (Chapter 3 - Policy, Legal and Administrative Framework), approval status, and consent.

89. Mitigation measures include (i) capacity building for the project implementation team (PIU, CMSC and the Contractors); and (ii) ensuring that necessary permit and registration are obtained

90. **Erosion and Land surface disturbance.** Excavation and digging of trenches during construction has the potential to cause erosion thereby causing soil erosion, silt runoff and unsettling of street surfaces. Unorganized disposal of the excavated earth can disturb the street surface and decrease the aesthetic and economic values of the area. The activity will be a discomfort to the road users and inhabitants.

91. Mitigation measures include during construction, precautionary measures will be taken; proper backfilling trenches will be done. Temporary access, diversions, and signboards for pedestrians will be provided. The exposed soil will be stabilized and revegetated to prevent further soil erosion. The contractor must procure quarry/ construction materials from the authorised vendors, who has obtained all the necessary valid permissions/ clearances from the Government agencies/ department.

92. **Impacts on Air Quality.** Dust will be generated from inadequately managed or haphazard: (i) earthworks such as clearing, grubbing, excavations, and drilling; (ii) demolition works; (iii) stockpiling of natural aggregates, excavated materials and spoils; (iii) transport, loading and unloading of natural aggregates; (iv) movement of construction-associated vehicles; (v) on-site rock crushing and concrete mixing; and (vi) burning of firewood for cooking and heating in work and labour camps. The impacts are thus indirect in nature, local to regional in extent, medium in magnitude and short term in duration

93. Mitigation measures include:

(i) confining earthworks according to excavation segmentation plan that should be part of site-specific environmental management plan (SEMP);

(ii) watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, or as necessary;
(iii) if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces;
(iv) during demolition or dismantling of portions of road pavements, watering of exterior surfaces, unpaved ground in the immediate vicinity and demolition debris;
(v) place signage at active work sites in populated areas;
(vi) requiring trucks delivering aggregates and cement to have tarpaulin cover
(vii) limiting speed of construction vehicles on access roads and work sites to a maximum of 30 km/h;
(viii) prohibit burning firewood in work and labour camps (promote liquefied petroleum gas for cooking purposes and electric heater for heating purposes);
(ix) use of vehicles complying with Bharat Stage VI norms; and
(x) Prohibit open burning of solid waste.

94. **Noise.** Noise-emitting construction activities include earthworks, concrete mixing, demolition works, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise impact will be higher in areas where noise-sensitive institutions such as health care and educational facilities are situated. The impact is thus direct in nature, local in extent, medium in magnitude and short term in duration.

95. Mitigation measures include:

(i) using equipment that emits the least noise, well-maintained and with efficient mufflers;
(ii) restricting noisy activities to daytime and avoid using noisy equipment at night work;
(iii) limit engine idling to a maximum of one minute;
(iv) spread out the schedule of material, spoil and waste transport; and
(v) Minimizing drop heights when loading and unloading coarse aggregates.

96. **Impacts on Water Resources.** Construction materials such as sand, gravel and cement should be stored at the sites. Excavation works for the drainage system may also produce significant volume of excavated soils that will be temporarily piled along the road sides. If poorly managed, these materials and soil sediments may flow down the drains or road sides and may eventually cause siltation of nearby receiving bodies of water. Poor sanitation at camp sites may also produce liquid and solid wastes that may pollute receiving bodies of water in the area. Polluted water bodies will be harmful to aquatic life and people that depend upon such contaminated sources. The impact is thus direct in nature, local to regional in extent, medium in magnitude and short term in duration.

97. Mitigation measures include:

(i) excess spoils will be disposed per the Spoil Management Plan attached in **Appendix 4**

(ii) locating temporary storage areas on flat grounds and away from main surface drainage routes;

(iii) shielding temporary storage areas with sandbags and

(iv) Providing adequate water supply and sanitation facilities at work sites.

98. For management and final disposal of solid wastes following mitigation, measures that will be applied are

(i) collection of recyclable solid wastes and supply to scrap vendors

(ii) Ensure all the camp wastes and construction wastes are placed in the designated waste collection pits away from nearby water bodies.

(iii) establishment of separate bounded areas for the collection and storage of all the toxic material wastes, including batteries, oil filters, Mobil, burnt oils, etc. at the construction site

(iv) Collection of biodegradable wastes in separate containers and transfer to municipal waste disposal system located at Ambedkar nagar.

(v) Application of various waste disposal systems for diverse wastes produced on site as per consultations with CMSC and PIU.

99. **Impacts on the quality of groundwater resource**. The construction of the drainage system unlikely to have impact to groundwater resource. Wastewater and solid waste generated from the construction areas and workers accommodation and camps etc will be properly collected treated and disposed properly to avoid any contamination of groundwater.

100. **Impacts on flora and fauna**. Haphazard site clearing, parking, and movement of construction vehicles and equipment stockpiling, will result in disturbance to the land in the subproject area. However, the subproject area does not include any healthy biodiversity or forest areas within or its surroundings, hence the impacts to flora and fauna will be minimal/ negligible. For the removal of 195 trees, suitable compensatory measure including plantation of 1950 trees (at 1:10 ratio to compensate the tree loss) shall be planted in the Ambedkar waste disposal site (see below figure). The impact is thus direct in nature, local in extent, low in magnitude and short term in duration.

Ambedkar Nagar Dumping Site – location for compensatory plantation

101. **Traffic disturbance**. During construction, few disturbances will occur. Mitigation measures include installing clear signages and markers to direct traffic movement in sites.

102. **Impacts on physical, cultural resources**. The subproject will not encroach into, or be near physical, and cultural resources.

103. **Impacts on the Socioeconomic, Environment and Resources**. The impacts will result from excavation works, stockpiling, the operation of construction vehicles and equipment, and accidental damage to utilities (e.g., electric supply poles, open drains, and water taps or hoses). Nuisance and safety hazards are the indirect impacts. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration.

104. Mitigation measures include:

(i) prepare a traffic management plan in consultation with local authorities;

(ii) where traffic congestion will likely occur, place traffic flagmen during working hours;

(iii) provide compensation to affected people;

(iv) manage to stockpile;

(v) manage pumped water from excavations either to drains or drums for later use;

(vi) relocate the affected power supply poles, and

(vii) Advise the concerned authority during accidental damage to utilities.

105. **Community Health and Safety Hazards**. Communities will be moderately exposed to threats due to impacts on air and water quality, ambient noise level; mobility of people, goods, and services; accesses to properties, economic activities, and social services; service disruptions, etc. Construction workers may potentially bring communicable diseases in the community. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration

106. Mitigation measures include:

(i) contractor's implementation of SEMP;

(ii) Contractor's implementation of community health and safety plan following international best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities[6]. As a minimum and whichever is applicable, the community health and safety plan shall ensure the following:

a. implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning;

b. restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community;

c. removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small

[6] World Bank Group. IFC. 2007. Environmental Health and Safety Guidelines – Construction and Decommissioning

confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; and

d. implement measure to prevent proliferation of vectors of diseases at work sites;

(iii) Implement necessary structural safety and site safety measures to prevent collapse of trenches, and damage / structural failure / collapse of adajacant buildings, boundary walls and other structures; provide proper braces, struts, anchors as required in the trench and for protecting the adjoining structures; avoid placing of material, equipment, waste, close to the trench edges

(iv) adequate space and lighting, temporary fences, reflectorized barriers and signage's at active work sites

(v) contractor's preparedness in emergency response;

(vi) adequate dissemination of GRM and contractor's observance and implementation of GRM

107. **Workers' Health and Safety Hazards**. Workers will be exposed to the crosscutting threats of the impacts above during construction. Inadequate supply of safe and potable water and inadequate sanitation facilities; poor sanitation practices on site; poor labour camp conditions; the handling and operation of construction equipment; handling of hazardous substances; exposure to extreme weather and non-observance of health and safety measures pose additional threats to the health and safety of construction workers. Construction workers may be potentially exposed to communicable and transmittable diseases in the community and the workforce. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration.

108. Mitigation measures include implementation of international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities. As minimum and whichever are applicable, the occupational health and safety plan shall ensure the following:

(i) Communication and Training

a. Training of all workers on occupational health and safety prior to construction works;

b. Conduct of orientation to visitors on health and safety procedures at work sites;

c. Signage's strategically installed to identify all areas at work sites, including hazard or danger areas;

d. Proper labelling of equipment and containers at construction and storage sites; and

e. Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; fire fighting equipment; and communication with nearest fire brigade station;

(ii) Physical Hazards

a. Use of personal protective equipment by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;

b. Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;

c. Use of bracing or trench shoring on deep excavation works; provide proper measures to protect adjoining buildings, boundary walls and structures against possible displacement, which may endanger lives of works and community members.

d. Adequate lighting in dark working areas and areas with night works;

e. Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only; and

f. Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators

(iii) General Facility Design and Operation

a. Regular checking of integrity of workplace structures to avoid collapse or failure;

b. Ensuring workplace can withstand severe weather conditions;

c. Fire precautions and fire fighting equipment installed;

d. First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents;

e. Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;

f. Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and

g. Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur;

(iv) **COVID-19**. WHO has declared COVID-19 as a pandemic which has affected entire world including India. In view of the prevailing COVID-19 pandemic, the contractors and workers would need to take additional measures to avoid the spread of the disease and shall follow various guidelines/guidance notes issued by the national/state government, WHO, ILO, World Bank/IFC from time to time. As described in these guidelines, the Contractors shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to TCMC and CMSC for approval. A brief guidance on “To Do” List prepared from these documents is provided in **Appendix 10**

C. Impacts, Issues, Concerns and Mitigation Measures during Operation.

109. **Nuisance due to siltation and accumulation of wastes in the drains**. Discharge of wastewater and improper disposal of solid waste from households and roadsides may clog the drains in the medium or longer term. This may result to accumulation of putrescible organic materials causing odor nuisance to the community and pollution to the receiving water bodies.

This may also attract vectors of communicable diseases such as pests and rodents in the drainage system that could affect public health

110. Mitigation measures include the TCMC's: (i) strict instruction or directive to households and commercial establishments not to discharge septic wastes and grey water into the storm water drain system; (ii) strict promotion and enforcement of good waste management practices at household level; and (iii) regular monitoring and cleaning of the silt traps, drains, and siltation or sedimentation chambers (or similar structures) at the outfalls, to prevent entry or accumulation of silt and solid wastes inside these drains and siltation chambers.

111. **Community hazards due to destroyed or removed drainage cover**. The design of the drainage system suggests that no drainage will be constructed without cover. Once constructed, there is a possibility that the covers may be damaged or removed in the medium or long term. The situation exposes the drainage as hazard to people, animals and vehicles in the area, especially at night.

112. Mitigation measure is for the TCMC to conduct regular inspection of the drainage alignments and ensure that all drainage covers are intact. In case of damage or loss of drainage cover, the municipality shall provide replacement of this cover to avoid occurrence of accidents.

113. **Contamination of surface runoff/drain water in project area**. At present there is no sewerage system in the subproject areas, and sullage and in some cases septic tank's partially treated effluent is discharges into road side drains and vacant areas. Direct wastewater discharges to strowm water drain may cause nuisance and increase health riks to the locals and also pollute the receiving waters. There are no industries in the area, therefore there is no risk of industrial effluent discharge into storm water drains.

114. **Impact on groundwater.** Rainwater harvesting will have positive impact, as it will increase groundwater recharge. However, the risk of contaminated drain water intrusion polluting the groundwater needs to be mitigated by effectively preventing wastewater discharge into stormwater drains.

115. Mitigation measures.Thoothukudi City Municipal Corporation has proposed a new sewerage scheme to cover the newly added areas (including subproject area) and previously omitted areas of Thoothukudi City Municipal Corporation. Until sewerage system is developed, TCMC will ensure that no untreated sewage is discharged into open dains, by encouraging and supporting households for on-site sanitation and disposal facilities under the ongoing government programs.

116. Disaster management and Emergency Response. The Revenue Department of the State is the Nodal Department for controlling, monitoring and directing measures for organizing rescue, relief and rehabilitation. All other concerned line departments, municipal corporations, extends cooperation to the response management of the disaster whenever it occurs. Control rooms at the State level as well as district control rooms are activated as required to deal with any disaster. At state level, Tamil Nadu State Disaster Management Authority (TNSDMA) is established to plan, coordinate and monitor the disaster management at state level. District Disaster Management Authorities (DDMA), headed by respective District Collectors, established in each district to perform similar functions at the district level in coordination with TNSDMA. District disaster management plans are prepared for each district. DDMA prepared and implements the District Disaster Management Plan and plays the role of an anchor, monitors the disaster preparedness throughout the year and particularly review non-disaster activities and preparedness of the departments to handle situations. DDMA assesses the situation and gives directions to the departments for handling of any disaster situation. It can call for outside support, if necessary, and keeps the TNSDMA informed about the handling of the situation. Meetings are held

periodically during the year to ensure that alertness and preparedness levels are maintained within the district. The state and district disaster management plans follows the Sendai Frame work for Disaster Risk Reduction 2015-2020.

117. Disaster Management in Municipal Corporation Area. Thoothukudi District Disaster Management 2020, formulated by District Administration provides overall framework for disaster management in the district. The Plan identifies following types of hazards in the district: cyclones, tsunami, flood, earthquake, fire accidents, drought, industrial hazard and man made hazards. Thoothukudi City Municipal Corporation as an integral part, and TCMC plays very important role in disaster management within its jurisdiction and works under the overall coordination of District Collector, DDMA. District disaster management plan identifies the highlights the responsibilities of urban local bodies, and TCMC is a member of district disaster management committee. It also provided prevention and mitigation plan. The TCMC defined roles and responsibilities of all departments within its jurisdiction in disaster management.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

118. The active participation of stakeholders including local community, /, Non-Governmental Organization (NGOs)/ Community Based Organization (CBOs) etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

119. Most of the main stakeholders have already been identified and consulted during the preparation of this IEE, and any others that are identified during the project implementation will be brought into the process in the future. Primary stakeholders of the subproject are the residents, owners/ tenants of the commercial establishments who live and work near sites where facilities will be built (storm water drain network and pumping stations), government and utility agencies responsible for the provision of various services in the project area. Secondary stakeholders are the NGOs working in the area, community representatives, and the beneficiary community in general, government agencies, TNUIFSL, Government of Tamil Nadu and the ADB.

B. Public Consultation

120. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

a. Consultation during Project Preparation

121. Focus-group discussions with other stakeholders were conducted during project preparation, and information on likely issues and the proposed mitigation and monitoring measures provided, to learn their views and concerns. A socio economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted.

122. On 18th October 2021 a stakeholder consultation was held in the project area. The DPR consultants made a detailed presentation about the proposed project. Considering the COVID-19 pandemic situation, the necessary precautions such as thermal screening, mask, sanitizer for the participants were undertaken

123. During the meeting, the public participants are very much interested and welcomed the storm water drain project to their area. They assured full-cooperation while implementing the storm water drain project. Attendance sheet for the meeting is enclosed in the **Appendix 5**.

124. The PPTA safeguard consultants and TNUIFSL officials have conducted joint site visit for environmental and social screening on 23rd February 2022 an FGD was carried out. 26 persons comprises of 23 males and 3 females were participated in the FGD. In general, the local people welcomed the project and explained their experience with the floods and resultant impacts, inundation, health impacts, impact to the structures, water supply, transport & access etc. Given the purpose of this subproject, in future, more female participation shall be ensured by advanced notices and encouraging women for participation.


FGD conducted on 23rd February 2022 at Ramnagar, Thoothukudi

125. It was observed that people are willing to extend their cooperation as the proposed project will provide storm water drain facility, which will enhance the basic infrastructure service levels and overall living standard of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have an impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Project team explained proposed EMP to manage and to mitigate the anticipated impacts.

b. Consultation during construction

126. Prior to start of construction, CMSC and PIU (TCMC) will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work as and when required. Focus group meetings will be conducted to discuss and plan construction work (mainly drain laying work) and create awareness with local communities about the construction activities including controlled blasting (if required) to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. Project information and construction schedule will be provided to the public. A constant communication will be established with the affected communities to redress the environmental issues that are likely to surface during construction phase. Contractor will provide prior public information (in Tamil and English) about the construction work in the area once in 7 days prior to the start of work and again a day before the start of work via pamphlets. At the work sites, public information boards will also be provided to disseminate project related information.

C. Information Disclosure

127. Executive summary of the IEE will be translated in Tamil and made available at the offices of PIU (TCMC) and CMSC and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Tamil will be placed in the official website of the TNUIFSL and TCMC after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

128. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU will issue notification on the start date of implementation in local newspapers. A board showing the details of the project will be displayed at the construction sites for the information of general public.

129. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction as required while complying with the guidelines issued by the government for the current COVID-19 pandemic conditions. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

VIII. GRIEVANCE REDRESS MECHANISM

130. A common GRM will be in place to redress social, environmental or any other project related grievances. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and Project Management Unit (PMU), Thoothukudi City Municipal Corporation (PIU) and CMSC will ensure that their grievances are addressed.

131. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaints register in TCMC or PIU offices. PIU Safeguards officer will have the responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party.

132. GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A multi-tier grievance redress mechanism is conceived, with two phase's viz., one at project level and another, beyond project level. For the project level GRM, a Grievance Redress Committee(GRC) will be established in PIU; Safeguards officer, supported by the social, gender and environmental safeguards specialist of Construction Management and Supervision Consultant (CMSC) will be responsible for creating awareness among affected communities and help them through the process of grievance redress, recording and registering grievances of non-literate affected persons.

133. GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. Documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

134. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the CMSC and PIU will resolve the issue on site, and any issue that is not resolved at this level will be dealt at PIU head level for immediate resolution. Should the PIU fail to resolve any grievance within the stipulated time period; the unresolved grievances will be taken up at TCMC level. In the event that certain grievances cannot be resolved even at TCMC level., particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc., they will be referred to the Grievance Redress Committee (GRC) headed by the District Collector. Any issue which requires higher than district level inter-departmental coordination or grievance redress will be referred to the State level Steering Committee.

135. GRC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-failing which the grievance will be addressed by the state-level Steering Committee. The Steering Committee will resolve escalated/unresolved grievances received.

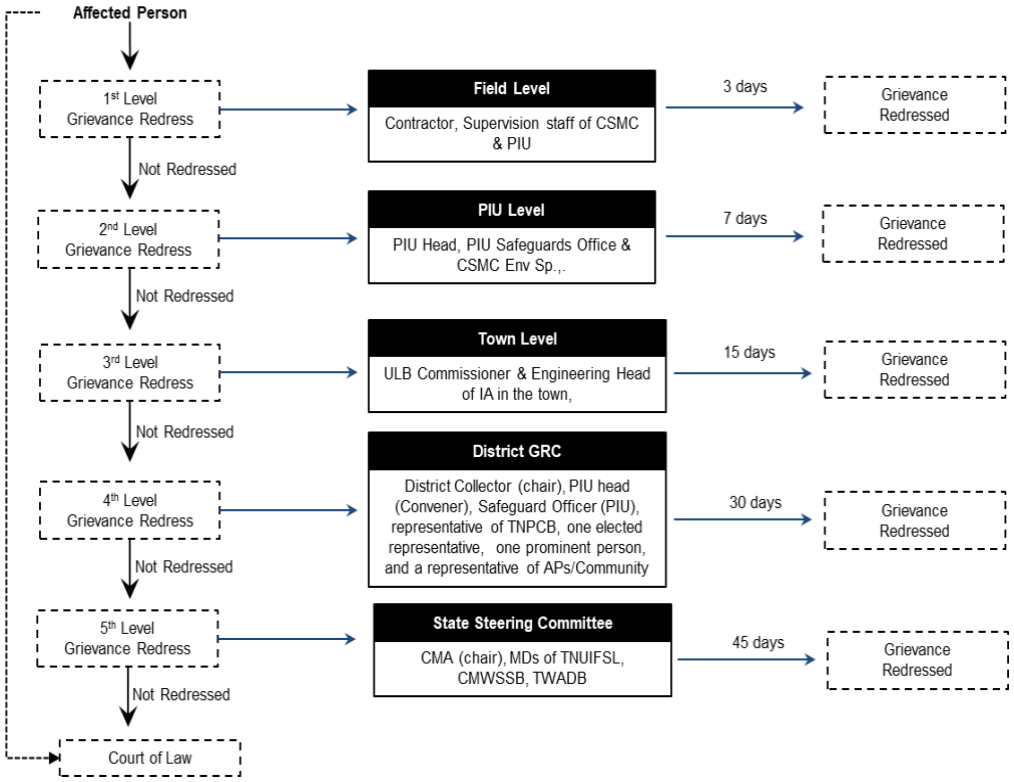
136. **Composition of Grievance Redress Committee.** GRC will be headed by the District Collector, and members include: PIU head, Safeguards Officer of PIU, representative of TNPCB (as a supporting arbitrator to explain and justify the compliance of the norms and rules of TNPCB to the affected in respect of pollution if any), one elected representative / prominent citizen from the area, and a representative of affected community. GRC must have a women member.

137. **State level steering committee** will include Commissioner of Municipal Administration as chair, member include managing directors of TNUIFSL, CMWSSB, TWAD Board and others as necessary.

138. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collector will be (i) all locations or sites within the district where subproject facilities are proposed, or (ii) their areas of influence within the District. The SC will have jurisdictional authority across the state (i.e., areas of influence of subproject facilities beyond district boundaries, if any).

139. The multi-tier GRM for the project is outlined below (Figure 5), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ULBs shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

Figure 10: Proposed TNUFIP Grievance Redress Mechanism



140. **Recordkeeping.** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and

the date these were effected and final outcome will be kept by PIU (with the support of CMSC) and submitted to PMU.

141. **Information dissemination methods of the GRM.** The PIU, assisted by CMSC will be responsible for information dissemination to affected persons and general public in the project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. Whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU, offices, CCMC notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in **Appendix 6**.

142. **Periodic review and documentation of lessons learned.** The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

143. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement cost estimates.

144. **Country legal procedure.** An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

145. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

146. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

147. The EMP will guide the environmentaly-sound construction of the subproject and ensure efficient lines of communication between TNUIFSL (PMU), TCMC (PIU), CMSC, and contractor. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

148. The contractor will be required to submit to PIU, for review and approval, a Site Environmental Management Plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to approval of SEMP.

149. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents to ensure compliance to the conditions set out in this document.

150. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEMP; and (ii) implement any corrective or preventive actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and SEMP. The contractor shall allocate budget for compliance with these SEMP measures, requirements and actions.

151. The Contractors shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to TCMC and CMSC for approval. A brief guidance on “To Do” List prepared from these documents is provided in **Appendix 10**

152. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 25: Environmental Impacts and Mitigation Measures

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
A	**Pre-construction Activities**				
1	Consents, permits, clearances, No Objection Certificate (NOC), etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and work stoppage	• Obtain all of the necessary consents, permits, clearance, NOCs, etc. before the start of civil works. • Include in detailed design drawings and documents all conditions and provisions if necessary	PIU and CMSC	Project cost
2	Existing Utilities	Disruption of services	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction • Require construction contractors to prepare a contingency and spoil management plan	PIU and CMSC	Project cost
3	Storm Runoff	Beside storm water, silts and wastewater from other sources may enter the proposed storm drain and may pollute the drain and the receiving water bodies. Chances of disposal of solid waste by the local into the drains resulting clogging of drains and polluting the receiving water bodies	The design to consider the following • Provision of cover slab in the design to avoid the illegal entry of waste water and solid waste disposal • The inlet design to ensure that only storm or rainwater flows into the drainage system • Prevent households from connecting outlets of septic tanks and grey water to the drainage lines • Provide siltation or sedimentation chambers (or similar structures) at the outfalls of the drainage system to prevent solid wastes or silts from flowing directly to the receiving water body • Position the outfall enough to have space for the provision of siltation or sedimentation ponds (or similar structures), including accessibility during maintenance phase	PIU and CMSC	Project cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
4	Construction work camps, stockpile areas, storage areas, and disposal areas	Disruption to traffic flow and sensitive receptors (Schools, Hospitals, Temple etc.)	• Determine locations before award of construction contracts	PIU and CMSC	Project cost
5	Waste generation	Generation of solid waste, wastewater from labour camp and other construction waste may cause pollution	• Follow the principle of "Reduce, Reuse, Recycle, and Recover" • Prohibition of unwanted littering and discharge of waste • Solid waste is either managed in a pit (or) disposed in TCMC dumping area	PIU and CMSC	Project cost
6	Sources of materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, resulting water logging, and water pollution	• Prepare list of quarry sites and approved sources of materials	PIU and CMSC	Project cost
7	Road Crossing for Vehicular traffic	Though the subproject area does not experience heavy traffic load, if not properly designed, traffic load may damage the drains	• Provision of Road Slab Culvert with proper design	PIU and CMSC	Project cost
8	EMP Implementation Training	Impact to the environment, workers, and community	• Contractor team should be trained on EMP implementation, spoils management, standard operating procedures (SOP), health and safety, Labour Act	PIU and CMSC	Project cost
9	Storm water Drainage operations	Impact to the environment, workers, and community due to accidents or accidental discharge of domestic wastewater into the drainage system	• Development of O&M manual that is comprehensive and includes measures to prevent discharge of domestic wastewater to the storm water drainage system and accidents due to the drainage canals	PIU and CMSC	Project cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
10	Submission of updated Environmental Management Plan (EMP) / SEP; EMP implementation and reporting	Unsatisfactory compliance to EMP	• Appoint Environmental Health and Safety (EHS) Supervisor to ensure EMP implementation. • Submission of updated EMP/ SEMP. • Submission of following plans with SEMP: o Construction Waste Management Plan (covering spoils, debris, and other waste material generated from construction activity) o Traffic management plan o Occupational and Community Health and Safety Plan, including COVID-19 control and prevention plan o Controlled blasting plan (for hard rock removal/cutting, if necessary) o Chance find protocol o Temporary labour camp management plan • Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs	Contractor	Contractor cost
11	Temporary economic impacts	Disruption to vendors, hawkers on ROW during storm water drain laying works	• Contractor is required to provide notice to the shop owners of the need to shift kiosk/wares displayed on ROW as soon as the work plan is ready, with minimum 7 working days. • No works can be commenced unless 100% shifted in sections ready for implementation.	Contactor/ PIU and CMSC	Contractor cost
12	Chance finds	Damage / disturbance to artifacts	• Construction contractors to follow these measures in conducting any excavation work o Create awareness among the workers, supervisors and engineers about the chance finds during excavation work	Contactor/ PIU and CMSC	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			○ Stop work immediately to allow further investigation if any finds are suspected; ○ Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.		
B	**Construction Activities**				
a)	**Physical Characteristics**				
13	Topography landforms, geology, and soils	Sand, gravel or crushed stone will be required for this subproject. Extraction of natural aggregate materials may cause localized changes in topography and landforms (if on land) or river morphology and hydrology (if on the river)	• Utilize readily available sources with environmental clearance and license • Borrow areas and quarries comply with environmental requirements • Coordinate with local authorities for quarrying from rivers (especially Sand). Alternative sources should be identified.	Contractor	Contractor cost
14	Water Quality	Trenching and excavation, run-off from stockpiled materials and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall, which may cause siltation and reduction in the quality of adjacent water bodies	• Preparation of Spoils Management Plan (See **Appendix 4** for sample) • Reuse excess spoils and materials • Disposal site in designated areas. • Earthworks during dry season • Stockyards at least 300m away from watercourses. • Fuel storage area away from water drainage • Take precautions to minimize the overuse of water • Prevent discharge of wastewater into water sources. • Ensure safe water diversion • No obstruction in flowing water.	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
15	Air quality	Work at the dry season transporting construction materials may increase dust, carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons into the atmosphere	• Use of physical controls, sprays, covers, compaction, screening, enclosure, windbreaks, binders and road surfacing • Cover delivery trucks during transportation • Construction vehicle's speed limited to 30kph. • Use of vehicles complying with BS IV or BS 4 emission norms • Prohibition of open burning of solid waste. • Minimize stockpile height	Contractor	Contractor cost
16	Acoustic environment	Temporary increase in noise level and vibrations by excavation equipment, and the transportation of materials, equipment and people. However, the proposed subproject drainage line will follow Road ROW alignment	• Prepare work schedule with community consultation and local administration • Overtime work restricted low noise generating equipment. • Minimize drop heights • No horns unless necessary • Use modern vehicles and machinery with low noise emissions • Maintain low noise levels • Warning signs on noise hazard areas. Workers must wear earplugs. • Identify vibration risk to nearby structures. Take caution working in such areas.	Contractor	Contractor cost
17	Aesthetics	Interference with the existing condition of the area and creation of unsightly or offensive conditions	• Prepare a debris disposal plan. • Minimize stockpile size • Clear wastes regularly • Avoid stockpiling of excess spoils. • Cover delivery trucks during transportation. • Clean roads. • Use screening enclosure shade cloth, temporary walls • Clean site regularly.	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			• Follow the principle of "Reduce, Reuse, Recycle, and Recover"		
b)	**Biological Characteristics**				
18	Biodiversity	There are no protected areas in or around project area. However as per the site inventory, 195 trees will be removed	• 1950 trees will be planted in the TCMC dumping site located at Ambedkar nagar (10 trees to be planted for every tree removed) • The storm water drain may be modified In order to save few more trees. However the change in the alignment should be done in consultation with the CMSC and the PIU	Contractor	Contractor cost
c)	**Socioeconomic Characteristics**				
19	Existing provisions for pedestrians and other forms of transport	The road closure is not anticipated. Hauling of construction materials and operation of equipment on-site can cause traffic problems. Similarly, at few stretches the drains are proposed to be constructed along the highway, this may obstruct the traffic flow to some extent. However, the proposed subproject's drain will follow the existing road ROW	• Prepare suitable transportation routes • Safe passage for vehicles and pedestrians through provision of either wooden bridge or metal sheets. • Schedule material deliveries on low traffic. • Erect and maintain barricades if required • Inform through display board about nature, duration of construction and contact for complaints • Complete the work quickly nearby institution, place of worship, business, hospitals, and schools. • Consult with business and institutions for work schedules. • Restore damaged properties and utilities	Contractor	Contractor cost
20	Socioeconomic status	Staffing will be required during construction. This can result in an increase in local revenue.	• Engage the local workforce. • Secure construction materials from local market.	Contractor	Contractor cost
21	Other amenities for community welfare	Civil works may result in an impact to the sensitive	• Identify location and nature of existing infrastructure before excavation	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		receptors such as residents, businesses, and the communities. Excavation may also damage infrastructure located alongside the roads	• Minimize repeated disturbance to locals by integrating other forms of infrastructures. • Inform local about nature, duration and possible impacts of the construction and integrate their concerns • Promptly relocate infrastructure materials • Take prior permission from local authority for water use • Restore damaged properties and utilities to pre- work conditions.		
22	Community health and safety	Construction works will impede the access of residents and business in limited cases	• Implementation of WB EHS Guidelines on Construction and Decommissioning • Restrict work force in designated areas. • Implement necessary structural safety and site safety measures to prevent collapse of trenches, and damage / structural failure / collapse of adajacant buildings, boundary walls and other structures; provide proper braces, struts, anchors as required in the trench and for protecting the adjoining structures; avoid placing of material, equipment, waste, close to the trench edges • Identify stockyard areas in consultation with local administration • Work on private land requires written permission of landowners and CSMC. • Prefer small mechanical excavator for trenching • Construct gender friendly toilets for workers • Prohibit alcohol and drugs on site • Prevent excessive noise;	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			• Code of conduct for workers includes restricting workers in designated areas, no open defecation, no littering, no firewood collection, no fire except designated places, no trespassing, no residence at construction sites, and no obligation to potentially dangerous work • Maintain a complaint logbook in workers camp and take action promptly of complaints		
23	COVID 19 response	Spread of infection which causes serious symptoms like difficulty in breathing, chest pain and loss of speech or movement. If not treated it will lead to death	• Taking cognizance of situation at time of mobilisation, the Contractors shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to TCMC and CMSC for approval. • The preparation of C-R&MP shall consider guidance of Government of India, World Health Organisation, International Labour Organisation, International Financial Corporation and World Bank's interim guidance note etc. The key points on COVID Response and Management measures is at **Appendix 10**. • The contractors shall submit a weekly monitoring and progress report to TCMC and CMSC.	Contractor	Contractor cost
24	Workers Health & Safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in urban/ semi urban areas .	• Use of bracing or trench shoring on deep excavation works; provide proper measures to protect adjoining buildings, boundary walls and structures against possible displacement, which may endanger lives of works and community members.	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		Workers need to be mindful of the occupational hazards which can arise from working at height and excavation works	• Train all site personnel on environmental health and safety • Exclude public from worksites • Use of personal protective equipment by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly; • Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear; • Adequate lighting in dark working areas and areas with night works; • Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only; and • Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators • Document procedures to be followed for site activities • Regular checking of integrity of workplace structures to avoid collapse or failure;		

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			• Ensuring workplace can withstand severe weather conditions; • Fire precautions and fire fighting equipment installed; • First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents; • Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only; • Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and • Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur; • Maintain accident reports and records. • Make first aid kits readily available • Maintain hygienic accommodation in work camps. • Ensure uncontaminated water for drinking, cooking and washing, • Assure clean eating areas • Make sure sanitation facilities are readily available • Provide medical insurance coverage for workers;		

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			• Provide orientation for guest visitors; • Ensure that visitors do not enter hazard areas unescorted; • Require workers to wear high visibility clothes; • Ensure moving equipment is outfitted with audible backup alarms; • Chemical and material storage areas need to be marked clearly; • Earplugs enforced in noisy environment		
d)	**Historical, Cultural, and Archaeological Characteristics**				
25	Physical and cultural heritage	There are no protected archaeological, monuments or architectural sites of significance listed by ASI, local authority and UNESCO.	• Stop work immediately to allow further investigation if any findings are suspected	Contractor	Contractor cost
e)	**Others**				
26	Submission of EMP implementation Report	Unsatisfactory compliance to EMP	• Appointment of EHS supervisor • Timely monitoring reports with field photographs	Contractor	Contractor cost
27	Post Construction Activities	Damage due to debris, spoils, excess construction materials	• Remove spoils wreckage, rubbish, or temporary structures no longer required; • All excavated roads shall be reinstated to original condition; • All disrupted utilities should be restored; • All affected structures rehabilitated /compensated; • The construction camp needs to clear of spills; e.g. oil, paint, etc. and other pollutants after dismantling; • All hardened surfaces shall be ripped; all imported materials shall be removed and all temporary services shall be cancelled;	Contractor	Contractor cost

Sl.no	Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
			• Request CMSC/PIU in writing that worksites and camps are vacated and restored to pre-project conditions.		
28	Environmental legislation compliance	Lack of awareness among contractors about legislations and IEE/EMP requirements	• Strengthen capacity of Contractors and project staffs; • Ensure compliance with the EMP requirements	Contractor	Contractor cost
	Operation phase		•		
29	Storm Water drains operation	Community Safety Entry of waste water from buildings or households – contamination of surface and groundwater Solid Waste disposal to the drains resulting to water pollution and clogging.	• Conduct regular inspection of the drains, inspection chambers, silt traps etc., ensure that all drainage covers are intact. In case of damage or loss of drainage cover, the municipality shall provide replacement of this cover to avoid occurrence of accidents • Prepare and implement maintenance plan. • Provision of regular monitoring. • Ensure that no untreated wastewater or sewage discharged into drains; ensure that household/community on-site sanitation facilities are available • Develop separate sewerage system in subproject area to collect, treat and dispose wastewater generated in the area	TCMC	TCMC funds

Table 26: Environmental Monitoring Plan

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Pre –construction and Construction Stage					
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures during controlled blasting. Site inspection checklist to review implementation is appended at **Appendix 7**	Weekly during construction	Supervising staff and safeguards specialists of CMSC	Staff and consultant costs are part of incremental administration costs
Ambient air quality	4 locations (4 monitoring locations 50 m downwind direction near storm water drain and pumping station work sites);	PM_{10}, $PM_{2.5}$ NO_2, SO_2, CO	Once before start of construction Quarterly yearly (4 times) during construction (3 year construction period	Contractor	Cost for implementation of monitoring measures responsibility of contractor (52 samples x 5000 per sample = 260,000)
Ambient noise	4 locations (4 monitoring locations near storm water drain and pumping station work sites);	Day time and night time noise levels	Once before start of construction Quarterly yearly (4 times) during construction (3 year construction period)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (52 samples x 1500 per sample = 78,000)

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Tree plantation	TCMC Solid waste dumping site located at Ambedkar nagar	Survival rate of the plant species	Quarterly	Contractor	Cost for compensatory plantation 1950 (trees) x 1200 (plantation cost per tree sapling including 3 years maintenance) = Rs 23,40,000
COVID 19	Construction camps/ labour camps and working areas	Common symptoms including Fever, Dry cough and Tiredness.S	Daily	Contractors	As per the COVID Response and Management Plan (C-R&MP) prepared by the contractor under the guidance of CMSC
Operation Stage					
Storm water discharge quality at outfall	10 outfall locations	BOD, TSS, COD, total coliform, E-coli and Heavy metals	Twice a year for 5 years	Contractor (during the DLP) and TCMC	Cost for implementation of monitoring measures responsibility of contractor (10 x 5 = 50 samples x Rs.6500/- per sample = Rs.3,25,000)

B. Implementation Arrangements

153. The Municipal and Water Supply Department (MAWS) acting through TNUIFSL will be the executing agency. A program steering committee, headed by Principal Secretary, MAWS, GOTN, will provide overall guidance and strategic directions to the program. A Project Management Unit (PMU) for TNUFIP, headed by the Managing Director, TNUIFSL acting as Program Director has been established within TNUIFSL for overall management, planning, implementing, monitoring, reporting, and coordinating TNUFIP.The CMA will act as the Deputy Program Director in the PMU. The project ULBs, represented by respective Municipal Commissioners, will be the implementing agencies for works in cities/towns and will establish Project Implementing Units (PIUs) headed by a municipal engineer as full-time Project Manager. PIUs will comprise of dedicated staff responsible for overseeing implementation of projects on a day-to-day basis. The PIUs will be supported by a Construction Management and Supervision Consultant (CMSC) recruited by TNUIFSL. For the institutional capacity, public awareness, and urban governance component, CMA acting through its Commissioner, will establish a PIU and appoint a governance improvement and awareness consultant (GIAC) responsible for supporting these activities.

154. The implementing agency for this subproject is Thoothukudi City Municipal Corporation (TCMC). A Project Implementation Unit (PIU) will be established in TCMC headed by full-time a Project Manager (a senior official of TCMC) and comprising dedicated full-time staff from engineering and other departments of TCMC. PIU under the TCMC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject. A Construction, Management and Supervision Consultant (CMSC) will be appointed to assist PIU in day-to-day implementation of the subproject.

155. **Safeguards Compliance Responsibilities.** Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL will have overall responsibility of safeguard compliance with ADB SPS 2009. ESS Managers report to Head, project division. At PIU level, a Safeguards Officer (SO) will be appointed, who will coordinate monitoring and implementation of safeguards on behalf of TCMC. Safeguard experts available at CMSC will monitor implementation of safeguards. The Contractor should appoint Environmental Health and Safety (EHS) Supervisor to ensure EMP implementation; submission of updated EMP/ SEMP; timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs.

156. **PMU Safeguard Responsibilities.** Key tasks and responsibilities of the PMU for this subproject include the following:

157. **DPR finalization and Bidding stage:**

(i) Ensure that all design related measures of the EMP are included designs;
(ii) Ensure that EMP is included in bidding documents and civil works contracts including requirement for EHS supervisor with the contractor;
(iii) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards;
(iv) Ensure that staff required for implementation of EMP (EHS officer) is included in the bid requirements;
(v) Ensure that EMP cost is included in the project cost;
(vi) Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of subproject are in place, to the extent possible.

158. **Construction stage:**

(i) Prior to start of construction:
   a. Ensure that all necessary clearances/permissions/licences, including that of contractor's are in place prior to start of construction.
   b. Provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIUs and contractors.

(ii) Oversee and provide guidance to the PIU to properly carry out the environmental monitoring as per the EMP.

(iii) Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained.

(iv) Consolidate quarterly environmental monitoring reports from PIU and submit semi-annual environmental monitoring reports to ADB.

(v) Oversee site closures to ensure that all work/facility sites are restored properly prior to issuing work completion certificate to the contractor.

159. **Operation stage.** Ensure that all clearances as required for operation of project are in place prior to operation.

160. **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU for this subproject include the following:

161. **DPR finalization and Bidding stage:**

(i) Include design related measures of the EMP in the project design and DPR;

(ii) Include EMP in the bidding documents and civil works contracts, including requirement of staff (EHS supervisor) with contractor for EMP implementation;

(iii) Provide necessary budget in the project as IEE for EMP Implementation;

(iv) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards including:
   a. Labour welfare measures and provision of amenities
   b. prohibition of child labour as defined in national legislation for construction and maintenance activities;
   c. equal pay for equal work of equal value regardless of gender, ethnicity, or caste;
   d. elimination of forced labour;
   e. The requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

(v) In the pre-bid meeting, provide insight into EMP measures, and overall compliance requirements to the bidders;

(vi) Obtain necessary clearance/ permissions as required for implementation of subproject.

162. **Construction stage:**

(i) Identify regulatory clearance requirements and obtain all necessary clearances prior to start of construction; ensure construction work by contractor is conducted in compliance with all government rules and regulations including pollution control, labour welfare and safety etc.;

(ii) Prior to start of construction organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring,

and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
(iii) Ensure contractor compliance with staff resources as per the IEE/EMP/Bid;
(iv) Guide contractor on updating EMP / preparing Site Environmental Management Plan at the start of the project;
(v) Update IEE and EMP; ensure that IEE reflects the final design being implemented by contractor;
(vi) Conduct public consultation and information disclosure as necessary
(vii) Take necessary action for obtaining rights of way;
(viii) Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan;
(ix) Supervise ambient environmental monitoring by contractors;
(x) Take corrective actions when necessary to ensure no environmental impacts
(xi) Submit quarterly environmental monitoring reports to PMU;
(xii) Conduct continuous public consultation and awareness;
(xiii) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP;
(xiv) Monitor Contractor's compliance with the measures set forth in the EMP and any corrective or preventative actions set forth in a safeguards monitoring report that the PMU will prepare from time to time;
(xv) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts;
(xvi) Inform PMU promptly in case if any significant impacts surfaces, which were not identified in the IEE and develop necessary corrective actions as necessary and ensure implementation by the contractors; include all such impacts and suggested actions in the Quarterly Environmental Monitoring Reports;
(xvii) Implementation grievance redress system, and undertake appropriate actions to redress the complaints; ensure that complaints/grievances are addressed in a timely manner and resolutions are properly documented;
(xviii) Review and approve monthly progress reports submitted by Contractor on EMP compliance;
(xix) Prepare quarterly environmental monitoring reports and submit to PMU /TNUIFSL
(xx) Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB.

163. **Operation stage**
(i) Obtain necessary clearances as required for operation of project prior to operation.
(ii) Conduct environmental management and monitoring activities as per the EMP.

164. **Contractor's Responsibilities:**

a. Bidding stage
(i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.,);
(ii) Understand the regulatory compliance requirements related to labour welfare, safety, environment etc.

165. **Construction stage:**
(i) Mobilize EHS Supervisor prior to start of work;
(ii) Prepare SEMP and submit to PIU;

(iii) Ensure that all regulatory clearances (both project related and contractor related) are in place prior start of the construction work;
(iv) Confirm with PIU availability of Rights of Way at all storm water drain sites prior to start of work.
(v) Prepare and submit:
  a. Construction waste management (CWM) and also Demolition waste management plan (sample is in **Appendix 4**)
  b. Traffic management (TM) plan (sample is **Appendix 7**).
  c. OHS Plan, pollution control plan, dust emergency response plan
(vi) Implement the mitigation measures as per the EMP including CWM and TM Plans;
(vii) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material borrow areas, etc.,
(viii) Implement EMP and ensure compliance with all the mitigation and enhancement measures;
(ix) Conduct environmental monitoring (air, noise, water etc.,) as per the EMP
(x) Undertake immediate action as suggested by PIU to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
(xi) Submit monthly progress reports on EMP implementation to PIU;
(xii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU and CMSC;
(xiii) Comply with applicable government rules and regulations.

C. Training Needs

166. The following **Table 27** presents the outline of capacity building program to ensure EMP implementation. These capacity building and trainings will be conducted at the offices of PMU and PIU by the environmental safeguards specialist of PMU/PIU and their consultants, which are part of project implementation set-up, and therefore no separate or additional costs are envisaged. Adequate costs are already considered in project's capacity building program. The detailed program and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the PMU.

Table 27: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Tamil Nadu applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH and S, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project At PMU (combined program for all PIU)	Included in the overall program cost

Description	Target Participants and Venue	Cost and Source of Funds
2. EMP implementation (1/2 day) - EMP mitigation and monitoring measures -Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol - Asbestos pipe/ sheet protocol - Traffic management plan - Waste management plan - Site clean-up and restoration - Controlled blasting	All PIU staff, contractor staff and consultants involved in the subproject At PIU	To be conducted by PIU office; part of project implementation cost
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction - Health & safety measures during coronavirus disease (COVID-19) pandemic	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	Contractors' EHS officer to conduct program, with guidance of CMSC

D. Monitoring and Reporting

167. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU and CMSC that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU and CMSC will review, and approve the report and permit commencement of works.

168. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. Safeguards Officer from PMU and Environmental Health and Safety Supervisor (EHS) in PIU will monitor, review and advise contractors for corrective actions if necessary. Quarterly Environmental Monitoring Report summarizing compliance and corrective measures, if any, taken will be prepared by CMSC /PIU and submitted to PMU. During operation, PIU will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU annual report.

169. Based on PIU's Quarterly monitoring reports and oversight visits to subproject work sites, PMU will submit Environmental Monitoring Reports (Report format is at **Appendix 8**) to ADB, semi-annually during construction and annually during operation, until the project completion report (PCR) is issued by ADB. ADB will publicly disclose EMRs on its website following SPS 2009, and Access to Information Policy, 2018. Once concurrence from the ADB is received the report will be disclosed on TNUIFSL, PMU and TCMC websites.

170. ADB will review project performance against the TNUFIP commitments as agreed in the legal documents (loan and project agreements, etc.). The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

E. Environmental Management Plan Implementation Cost

171. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

Table 28: Cost Estimates to Implement the Environmental Management Plan

	Particulars	Stages	Unit	Total Number	Rate (Rs)	Cost (Rs)	Source of fund
A.	**Mitigation Measures**						
1	Provision for tree cutting and compensatory plantation measures (1: 10 ratio replantation)	Construction	Per tree	1950	1,200	23,40,000	Project costs (PIU)
2	Preparation of plans traffic management plan, waste (spoils) management plan etc.,), traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump sum	-	-	2,50,000	Civil works contract
3	Safety barricading	Construction	Lump sum	Lump sum	-	2,00,000	Civil works contract
4	Drainage network infrastructures	Operation	Quarterly	20	25000	5,00,000	O&M cost
5	Community and occupational health and safety	Operation	Half yearly	10	25000	2,50,000	O&M cost
	Subtotal (A)					**35,40,000**	
B.	**Monitoring Measures**						
1	Air quality monitoring	Pre – construction	per sample	4	5000	20,000	
2	Noise levels monitoring	Pre – construction	Per sample	4	1500	6,000	
3	Air quality monitoring	Construction	per sample	48	5000	2,40,000	
4	Noise levels monitoring	Construction	Per sample	48	1500	72,000	
5	Storm water discharge quality at outfall	Operation	Per sample	20	6500	3,25,000	
	Subtotal (B)					**6,63,000**	
C.	**Capacity Building**						

1.	Training on EMP implementation	Pre-construction				-	Part of PIU and PMU , consultant tasks
2.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite				-	Civil works contractor cost
	Subtotal (C)					**--**	
	Total (A+B+C)				₹	**42,03,000**	

X. CONCLUSION AND RECOMMENDATIONS

172. The IEE indicates that the proposed subproject, and its components, is not located within or adjacent to environmentally or eco sensitive areas, hence implementation of the subproject is not an environmentally critical task. The extent of adverse impacts is expected to be local, confined within the projects' main area of influence, quarry or borrow sites, waste disposal sites, and the approach roads to and from these sites. With mitigation measures in place and ensuring that the bulk of earthworks are completed before the onset of the monsoon season, the potential adverse impacts during construction would be site-specific.

173. Subproject works are confined to urban area where there are no environmentally sensitive areas. Although subproject area is coastal, none of the works are located in coastal regulation zone. Project area is 6 km away from the boundary of nearest protected area, the Gulf of Mannar marine national park, and it is also outside (1-2 km) the ecosensitive zone created around the national park as buffer. Therefore there is no interefernce with sensitive areas.

174. This subproject only includes provision of 36.4 km of tertiary / collector drains and will be connected at 11 locations in three secondary / primary drains for further conveyance of collected run off and ultimate discharge into Bay of Bengal. These primary drains include SBI drain (2 locations), Meelavittan drain (8 locations), and at one location, it is connected to Buckle canal. Meelavittan drain and SBI drain are being constructed under Smart City Project and have adequate design capacity to carry runoff from subproject area. Works are in advanced stages, and are likely to be completed by June 2022, while the drains under this subproject will be completed by Novemeber 2023.

175. The few adverse impacts of moderate magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction activities). These will not be sufficient to threaten or weaken the surrounding resources. Mitigation measures, integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are well known to Contractors. Hence, the suggested mitigation measures in the EMP would not be difficult to implement.

176. After construction, the storm water drainage system prevents seasonal flooding in the project area. No adverse environmental impacts are expected. TCMC will (i) implement regular monitoring of the drainage system in order to ensure that it is functioning well, and (ii) undertake regular maintenance activities such as drainage cleaning to ensure that no clogging occurs.

177. Based on the above findings, this subproject can be classified as Category B as per ADB SPS 2009, and no further additional studies or detailed EIA needs to be undertaken.

178. This IEE shall be updated based on the final detailed design and shall consider the following recommendations:

a. The design of the storm water drainage system will ensure that only storm water or rainwater will be flowing through the drains once they become operational. The final detailed design shall ensure the following

    i. Inlets to the drainage system be positioned away from outlets of septic tanks and grey water lines of households or commercial establishments. This will avoid the situation where the drainage system will be used as discharge point of septic and household wastes that could pollute the receiving water bodies; and

    ii. Silt traps are integrated in the design to avoid heavy siltation in the drainage system during monsoon season that could eventually affect the receiving water bodies at the outfalls of the drainage system

b. The design of the outfalls will ensure the following

   i. Siltation or sedimentation chambers (or similar structures) be constructed at the outfalls with sizes depending on the peak volume flow. This will avoid heavy siltation and pollution of the receiving water bodies;

   ii. Position the outfalls at locations enough to provide space for the construction of siltation or sedimentation chambers (or similar structures); and

   iii. Position the outfalls and siltation or sedimentation chambers (or similar structures) at locations that will be accessible for maintenance and cleaning during the operation phase

179. As per ADB SPS 2009, this project is classified as environmental category B and does not require further Environmental Impact Assessment. This draft IEE is prepared based on preliminary desgns, and therefore requires to be updated during the detailed design phase and submitted to ADB for approval and disclosure. IEE will also need to be updated during implementation by CMSC in discussion with PIU to reflect any changes, amendments and will be reviewed and approved by ADB. IEE shall be part of tender and contract documents. The final IEE report will incorporate results of any changes and additional baseline monitoring as required (e.g., air, noise, surface water quality).

180. IEE also identifies that completion of works of two primary drains (Meelavittan drain and SBI drain) in implementation by TCMC under Smart City Project is necessary to function the tertiary drains proposed under this subproject. It must be ensured that works are completed on time. TCMC may examine the CRZ clearance requirement for ongoing SBI drain works and obtain clearance as required.

Appendix 1: Rapid Environmental Assessment Checklist

Rapid Environmental Assessment (REA) Checklist

Urban Development

Instructions:
(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country /Project Title:	IND: Tamil Nadu Urban Flagship Investment Program (TNUFIP-Tranche 3) Providing Storm Water Drains to Priority Areas in Thoothukudi City Municipal Corporation
Sector Division:	Urban Development and Water Division

Screening Questions	Yes	No	Remarks
A. Project Siting			
Is the project area…			
□ Densely populated?	Yes		The proposed storm water drain project will be implemented within the TCMC area (ward number 2, 6, 7, 13 and 14). The population as per census 2011 is 26,970.
□ Heavy with development activities?	Yes		The presence of Thoothukudi Port, SIPCOT industrial area, Thermal Power plant and other commercial establishments provides more jobs opportunities which attracts more labours and their families to settle in TCMC area.
□ Adjacent to or within any environmentally sensitive areas?		No	Project area is 6 km away from the boundary of nearest protected area, the Gulf of Mannar marine national park, and it is also outside (1-2 km) the ecosensitive zone created around the national park as buffer
□ Cultural heritage site		No	There are no cultural heritage sites available within or in the vicinity of the project area.
□ Protected Area		No	Not applicable
□ Wetland		No	Not applicable
□ Mangrove		No	Not applicable
□ Estuarine		No	Not applicable
□ Buffer zone of protected area		No	Not applicable
□ Special area for protecting Biodiversity		No	Not applicable
□ Bay		No	Not applicable

Screening Questions	Yes	No	Remarks
B. Potential Environmental Impacts Will the Project cause…			
Impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		No	No such impact is envisaged. This storm water project is designed without any intervention of other services and has logical disposal arrangements.
Deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed.		No	The proposed project falls under the storm water drain construction for the locations where it was badly hit by the flooding and stagnation of rainwater during monsoon.
degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)		No	No such impact is anticipated.
dislocation or involuntary resettlement of people		No	This project does not involve resettlement.
degradation of cultural property, and loss of cultural wetlands and wild lands, coastal zones, watersheds, and forests)		No	No such impact is anticipated.
occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their wetlands and wild lands, coastal zones, watersheds and forests)		No	No such impact is anticipated.
water resource problems (e.g., depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters		No	Does not arise as the proposed project is to improve the water quality of the receiving water bodies through proposed drains. Groundwater quality will improve through rainwater harvesting structures.
air pollution due to urban emissions		No	Air pollution due to dust is suppressed by sprinkling water during construction. Emissions from vehicles / machineries will be controlled by periodical checking to comply with TNPCB standards.
social conflicts between construction workers from other areas and local workers		No	No such impact is anticipated; Local communities in the vicinity of the project area would be employed as much as possible.
road blocking and temporary flooding due to land excavation during rainy season	Yes		Complete roadblocks are not envisaged; however, in narrow roads, traffic may be diverted but access will be ensured for pedestrians. All necessary precautions will be taken to prevent flooding during construction; flooding is unlikely as work will mostly be conducted during dry season.

Screening Questions	Yes	No	Remarks
noise and dust from construction activities	Yes		Micro drains will be constructed along the roadsides and hence noise generating activities will be minimal and temporary. Dust generation is possible during excavation. However, the entire excavation area is continuously wet during the entire excavation period and dust is supressed at the source itself.
traffic disturbances due to construction material transport and wastes	Yes		Proper planning, such as selection of routes and scheduling to avoid peak traffic hours, will be carried out in consultation with concerned authorities.
temporary silt runoff due to construction	Yes		The deposited silt from the road will be removed and disposed along with the excavated soil. Earthworks will not be conducted during rains;
hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation		No	Not applicable.
water depletion and/or degradation		No	Not applicable.
overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization		No	Not applicable.
contamination of surface and ground waters due to improper waste disposal		No	Does not arise as waste generated will be disposed daily to designated disposal locations.
pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems		No	Not applicable.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title : **IND: Tamil Nadu Urban Flagship Investment Program (TNUFIP-Tranche 3) Providing Storm Water Drains to Priority Areas in Thoothukudi City Municipal Corporation**
Sector : **SAUW**
Subsector : **Urban Development and Water Division**
Division/ Department

Screening Questions		Score	Remarks[7]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	The project area is affected by severe floods in the year 2015 and 2021 and hence the project on storm water drain has been proposed
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Yes, being a storm water drain project, the hydro meteorological parameters are considered during the drain network designing
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	Yes, the life of project may get affected due to the weather conditions. However, it is designed as per the CPHEEO norms for better stability and endurance
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	No, climate change will not have much impact on the maintenance. However routine maintenance including de-silting the drain prior to monsoon, clearing of vegetation along the drain, immediate repairing of damaged structures is anticipated
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	1	Yes, the life of project may get affected due to the weather conditions.

Options for answers and corresponding score are provided below:

Response	Score

[7] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result **of Initial Screening (Low, Medium, High):** Medium

Other Comments: The proposed storm water drain project, will prevent flooding and stagnation of rainwater, which is a major issue faced by the local community in TCMC during the monsoon season.

Prepared by: Thoothukudi City Municipal Corporation (TCMC)

Appendix 2: Salient Features of Major Labor Laws for Construction Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labor (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting 2,500/- per month or above up to Rs.3,500/-
Per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

Appendix 3: Avifauna in the Thoothukudi District

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S.N.	Common Name	Scientific Name	IUCN Red List Categorization (Version 2017-3)	Wildlife Protection Act Schedule	Migratory Status
1.	Common Myna	*Acridotheres tristis*	LC	IV	Resident
2.	Common Kingfisher	*Alcedo atthis*	LC	IV	Resident
3.	White-breasted Waterhen	*Amaurornis phoenicurus*	LC	IV	Resident
4.	Indian Spot-billed Duck	*Anas poecilorhyncha*	LC	IV	Resident
5.	Asian Openbill	*Anastomus oscitans*	LC	IV	Resident
6.	Oriental Darter	*Anhinga melanogaster*	NT	IV	Resident
7.	Great White Egret	*Ardea alba*	LC	IV	Resident
8.	Grey Heron	*Ardea cinerea*	LC	IV	Resident
9.	Intermediate Egret	*Ardea intermedia*	LC	IV	Resident
10.	Purple Heron	*Ardea purpurea*	LC	IV	Resident
11.	Indian Pond Heron	*Ardeola grayii*	LC	IV	Resident
12.	Cattle Egret	*Bubulcus ibis*	LC	IV	Resident
13.	Southern Coucal	*Centropus sinensis*	LC	IV	Resident
14.	Pied Kingfisher	*Ceryle rudis*	LC	IV	Resident
15.	Little Ringed Plover	*Charadrius dubius*	LC	IV	Resident
16.	Common Pigeon	*Columba livia*	LC	NE	Resident
17.	Indian Robin	*Copsychus fulicatus*	LC	IV	Resident
18.	Indian Roller	*Coracias benghalensis*	LC	IV	Resident
19.	House Crow	*Corvus splendens*	LC	V	Resident
20.	Black Drongo	*Dicrurus macrocercus*	LC	IV	Resident
21.	Little Egret	*Egretta garzetta*	LC	IV	Resident
22.	Ashy-crowned Sparrow Lark	*Erempoterix griseus*	LC	IV	Resident
23.	Grey Francolin	*Francolinus pondicerianus*	LC	IV	Resident
24.	Eurasian Coot	*Fulica atra*	LC	IV	Resident
25.	White-throated Kingfisher	*Halcyon smyrnensis*	LC	IV	Resident
26.	Brahminy Kite	*Haliastur indus*	LC	I	Resident
27.	Black-winged Stilt	*Himantopus*	LC	IV	Winter Visitor
28.	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	IV	Resident
29.	Intermediate Egret	*Mesophoyx intermedia*	LC	IV	Resident
30.	Bronze-winged Jacana	*Metopidius indicus*	LC	IV	Resident
31.	Little Cormorant	*Microcarbo niger*	LC	IV	Resident
32.	Black Kite	*Milvus migrans*	LC	I	Resident
33.	White-browed Wagtail	*Motacilla maderaspatensis*	LC	IV	Resident
34.	Painted Stork	*Mycteria leucocephala*	NT	IV	Resident
35.	Cotton Pygmy-goose	*Nettapus coromandelianus*	LC	IV	Resident
36.	Black-crowned Night Heron	*Nycticorax*	LC	IV	Resident
37.	House Sparrow	*Passer domesticus*	LC	IV	Resident
38.	Indian Peafowl	*Pavo cristatus*	LC	I	Resident
39.	Spot-billed Pelican	*Pelecanus phillippensis*	NT	IV	Resident
40.	Indian Cormorant	*Phalacrocorax fuscicollis*	LC	IV	Resident
41.	Greater Flamingo	*Phoenicopterus roseus*	LC	IV	Winter Visitor
42.	Eurasian Spoonbill	*Platalea leucorodia*	LC	I	Resident
43.	Glossy Ibis	*Plegadis falceinellus*	LC	IV	Resident
44.	Purple Swamphen	*Porphyrio*	LC	IV	Resident

S.N.	Common Name	Scientific Name	IUCN Red List Categorization (Version 2017-3)	Wildlife Protection Act Schedule	Migratory Status
45.	Red-naped Ibis	*Pseudibis papillosa*	LC	IV	Resident
46.	Rose-ringed Parakeet	*Psittacula krameri*	LC	IV	Resident
47.	Red-vented Bulbul	*Pycnonotus cafer*	LC	IV	Resident
48.	Comb Duck	*Sarkidiornis melanotos*	LC	IV	Resident
49.	Pied Bushchat	*Saxicola caprata*	LC	IV	Resident
50.	Indian Robin	*Saxicoloides fulicatus*	LC	IV	Resident
51.	Eurasian Collared Dove	*Streptopelia decaocto*	LC	IV	Resident
52.	Laughing Dove	*Streptopelia senegalensis*	LC	IV	Resident
53.	Little Grebe	*Tachybaptus ruficollis*	LC	IV	Resident
54.	Black-headed Ibis	*Threskiornis melanocephalus*	NT	IV	Resident
55.	Jungle Babbler	*Turdoides striata*	LC	IV	Resident
56.	Red-wattled Lapwing	*Vanellus indicus*	LC	IV	Resident
57.	Yellow-wattled Lapwing	*Vanellus malabaricus*	LC	IV	Resident

Note: LC = Least Concern, NT = Near Threatened, IV = Schedule IV, I = Schedule I.

Appendix 4: Sample Outline Spoils (Construction Waste) Management Plan

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The Volume of Spoil Generated (Site Specific, Date Wise), Site Disposed, Reuse / Disposal Details Should Be Documented Properly

Appendix 5: Public Consultation – Attendance sheet

தூத்துக்குடி மாநகராட்சி - THOOTHUKUDI MUNICIPAL CORPORATION -
ஒருங்கிணைந்த மழைநீர் வடிகால் திட்டம் - கட்டம் IV
REVISED DPR FOR INTEGRATED STORM WATER DRAINAGE SCHEME FOR THOOTHUKUDI
- PHASE IV FUNDED BY ADB

பயனாளிகள் கருத்துக்கேட்பு கூட்டம்

STAKEHOLDER CONSULTATION MEETING

தூத்துக்குடி மாநகராட்சி
THOOTHUKUDI CORPORATION

Date: 18.10.2021, 4 PM

Venue: Thoothukudi Corporation

வருகை பதிவேடு (ATTENDANCE SHEET)

Sl. No	பெயர்	முகவரி	Email & Phone No	கையெழுத்து
1	விஜயராமலிங்கம்	111 K/32 பொன்பேட்டை தெரு தூத்துக்குடி -		[illegible]
2	[illegible] R	[illegible] NAGAR 5th [illegible]		[illegible]
	P.S. ராஜசேகரன்.	27/313. [illegible]		P.S.Rajasekaran
	N. Ravinathan	33A/1 [illegible] puram Ext I, Thoothukudi.		[illegible]

Consultant: **M/s Struct House India Pvt. Ltd.**

தூத்துக்குடி மாநகராட்சி - THOOTHUKUDI MUNICIPAL CORPORATION -
ஒருங்கிணைந்த மழைநீர் வடிகால் திட்டம் - கட்டம் IV
REVISED DPR FOR INTEGRATED STORM WATER DRAINAGE SCHEME FOR THOOTHUKUDI
- PHASE IV FUNDED BY ADB

பயனாளிகள் கருத்துக்கேட்பு கூட்டம்

STAKEHOLDER CONSULTATION MEETING

தூத்துக்குடி மாநகராட்சி
THOOTHUKUDI CORPORATION

Date: 18.10.2021, 4 PM

Venue: Thoothukudi Corporation

வருகை பதிவேடு (ATTENDANCE SHEET)

Sl. No	பெயர்	முகவரி	Email & Phone No	கையெழுத்து
1	[illegible]	[illegible]		[illegible]
2	A. Senthil Arumugam	92G, Deverpuram road Thoothukudi - 628003		[illegible]
3	P. Prabakar	84/2, South Raja Street Tuticorin-1		[illegible]
4	R. Kodeeswaran	Secretary Indian Chamber of Commerce		[illegible]
5	Eugene	Manager - ICCI		[illegible]
6	P. SAKTHIVEL. D.R.O (RAJ)	2A/537 Main Road. [illegible]		[illegible]

Consultant: **M/s Struct House India Pvt. Ltd.**

Focused Group Discussion with Residents @ Ramnagar on 23.02.2022 around 11:00 am.

Rahmath Nagar - Ram Nagar

23/2/22

FGD WITH ADB, TNUIFSL, CORPORATION OFFICIALS & CONSULTANT

SL.NO	NAME	DESIGNATION	SIGNATURE
1	M. P KAMALKIDEEN	PUBLIC RAHAMATHNAGAR	
2	P. Paramasivan.	Public.	
3.	A.		
4	M.		
5.		4/290	
6.	B. MEENA	Ram Nagar	B.
7		Ram Nagar 3rd	
8	S.	Ram nagar	S.
9.	Murugan	Public	
10	S.		

FGD WITH ADB, TNUIFSL, CORPORATION OFFICIALS & CONSULTANT

SL.NO	NAME	DESIGNATION	SIGNATURE
11.		Public	
12	M. MOHAMED HUSSAIN	PUBLIC	
13		Public	
14.	M. MOTHIBACHA	Public. Rahmathnagar.	
15	V. Sivaraj	Public	
16.	G. Ramesh	Public	
17	R. S	Public	
18	R Sivagothy & T. Palanigam	"	
19.	M.		
20	S. Rajendran.	Public	Rajendran

FGD WITH ADB, TNUIFSL, CORPORATION OFFICIALS & CONSULTANT

SL.NO	NAME	DESIGNATION	SIGNATURE
21.	A. Mohammed Uvais	Public	[signature]
22	R. Sakthivel Murugan	4/230 Gandhi Nagar Muthu... Puthur Muthammal Colony	[signature]
23	N. [illegible]	4/87/1 Arunasamy Colony	[signature]
24	P. Ponpandi	4/71 Muthammal Colony 3rd Street	[signature]
25	A. Petchaimani	4/142/4 Ayyasamy Colony Main Road	[signature]
26.	A. Ponnusamy	4/52 Muthammal Colony [illegible]	[signature]

Appendix 6: Sample Grievance Registration Form

(To be available in Tamil and English)

The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration	Project Town Project:			
Contact information/personal details					
Name		Gender	* Male * Female	Age	
Home address					
Place					
Phone no.					
E-mail					
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
Mode of communication: Note/letter E-mail Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

Appendix 7: Sample Outline Traffic Management Plan

A. Principles for TMP around the Water Pipes Construction Sites

- One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
  - (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
  - (ii) protection of work crews from hazards associated with moving traffic;
  - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
  - (iv) maintenance of access to adjoining properties; and
  - (v) Addressing issues that may delay the project.

B. Operating Policies for TMP

- The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
  - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
  - (ii) Inhibit traffic movement as little as possible.
  - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
  - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
  - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
  - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
  - (vii) Keep the public well informed.
  - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

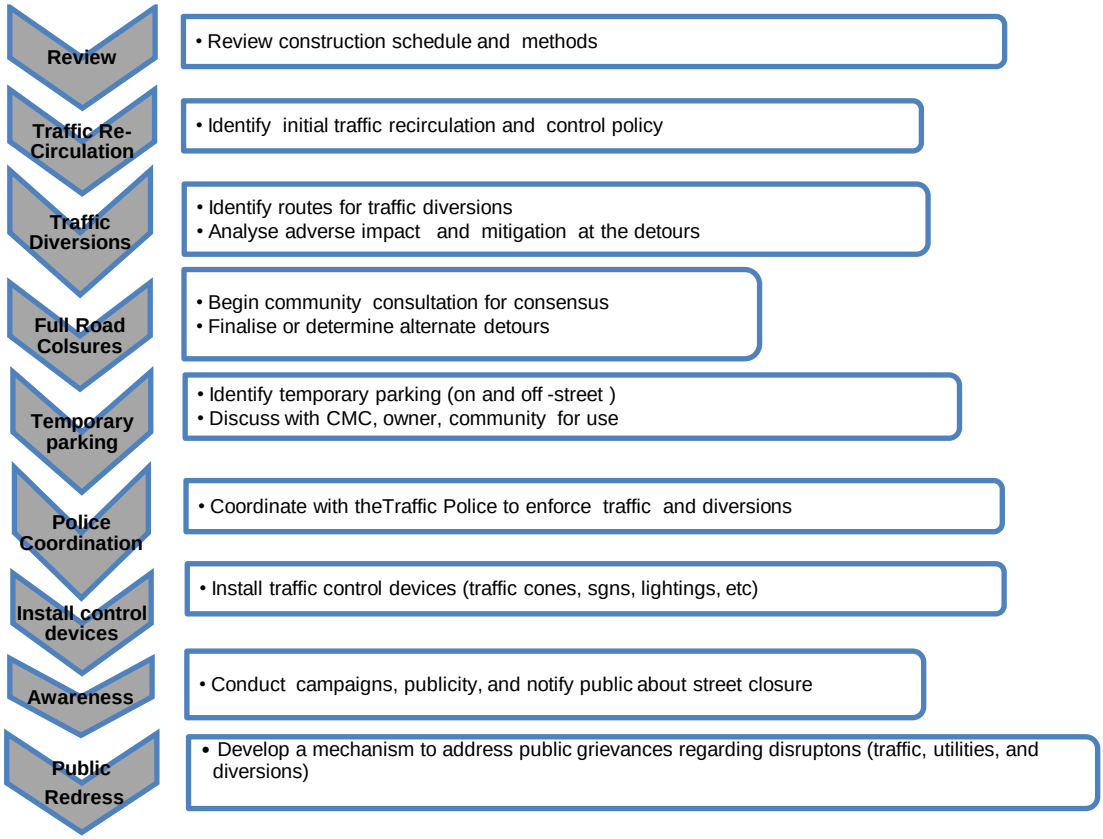
C. Analyze the impact due to street closure

- Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
  - (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
  - (ii) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
  - (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
  - (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
  - (v) considering how access will be provided to the worksite;
  - (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and

(vii) Developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

- If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A6.1: Policy Steps for the Traffic Management Plan



D. Public awareness and notifications

- As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

- The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for

this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

- The PIU will also conduct an awareness campaign to educate the public about the following issues:
  - (i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
  - (ii) defensive driving behaviour along the work zones; and
  - (iii) Reduced speeds enforced at the work zones and traffic diversions.

- It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

- The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:
  - (i) explain why the brochure was prepared, along with a brief description of the project;
  - (ii) advise the public to expect the unexpected;
  - (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
  - (iv) educate the public about the safe road user behaviour to emulate at the work zones;
  - (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
  - (vi) Indicate the office hours of relevant offices.

E. Install traffic control devices at the work zones and traffic diversion routes

- The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:
  - ❑ Signs
  - ❑ Pavement Markings
  - ❑ Channelizing Devices
  - ❑ Arrow Panels
  - ❑ Warning Lights
- Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

- **Figure A6.2 to Figure A6.6** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:
  - Work on shoulder or parking lane
  - Shoulder or parking lane closed on divided road
  - Work in Travel lane
  - Lane closure on road with low volume
  - Street closure with detour

- The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

- Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

- In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

Figure A6.2 and A6.3: Work on Shoulder or Parking Lane and Shoulder or Parking Lane Closed on Divided Road

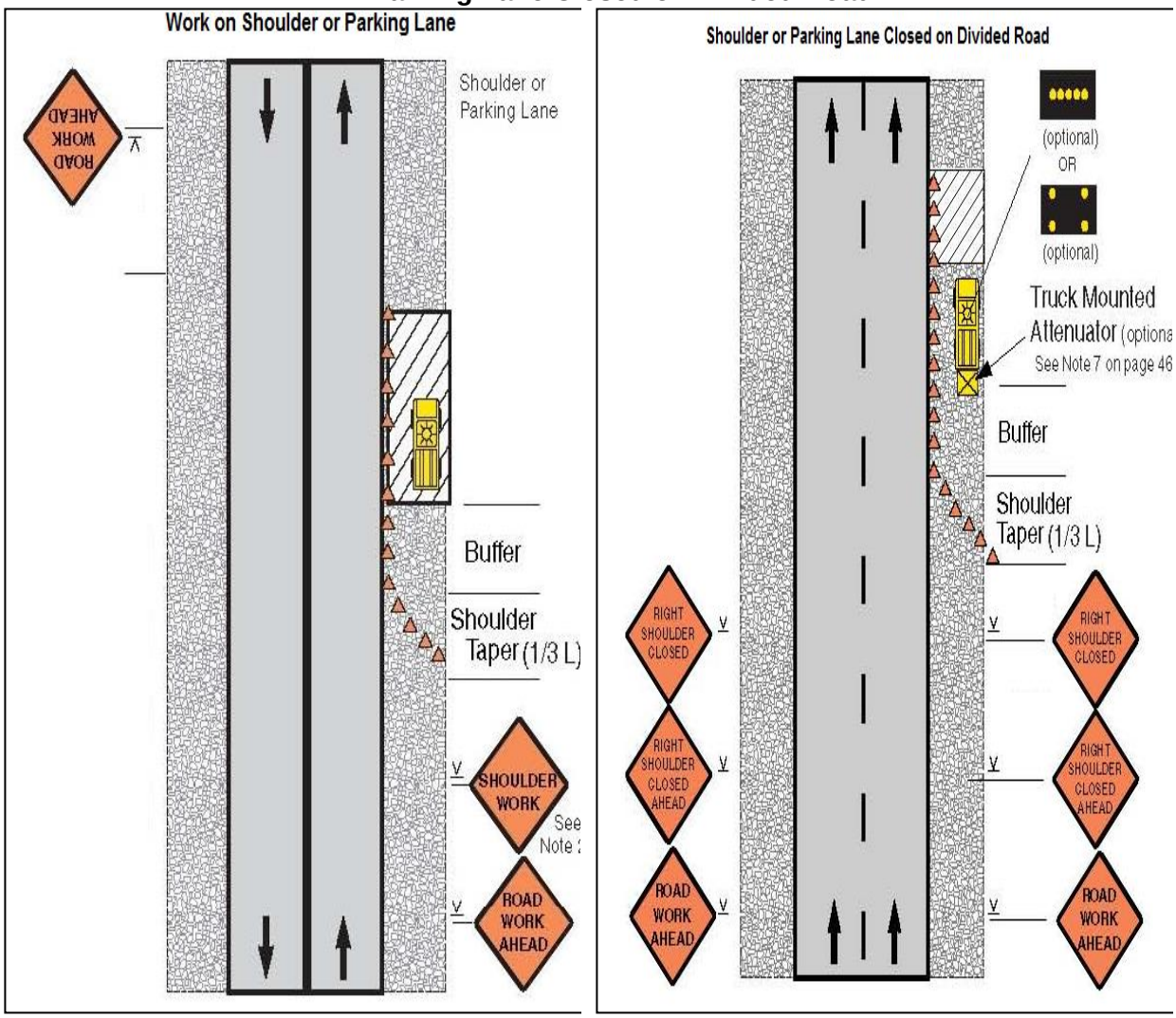


Figure A6.4 and A6.5: Work in Travel Lane and Lane Closure on Road with Low Volume

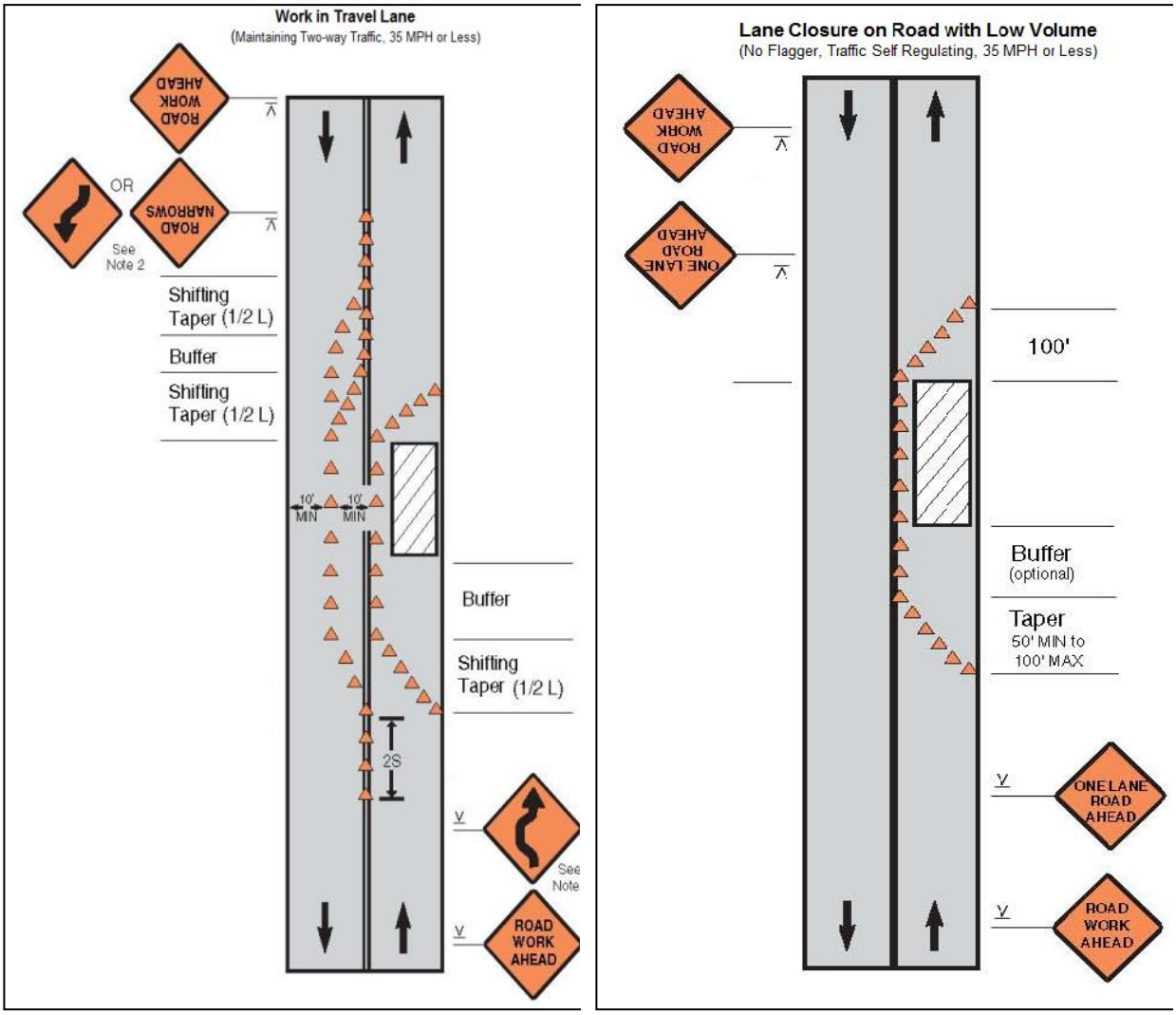
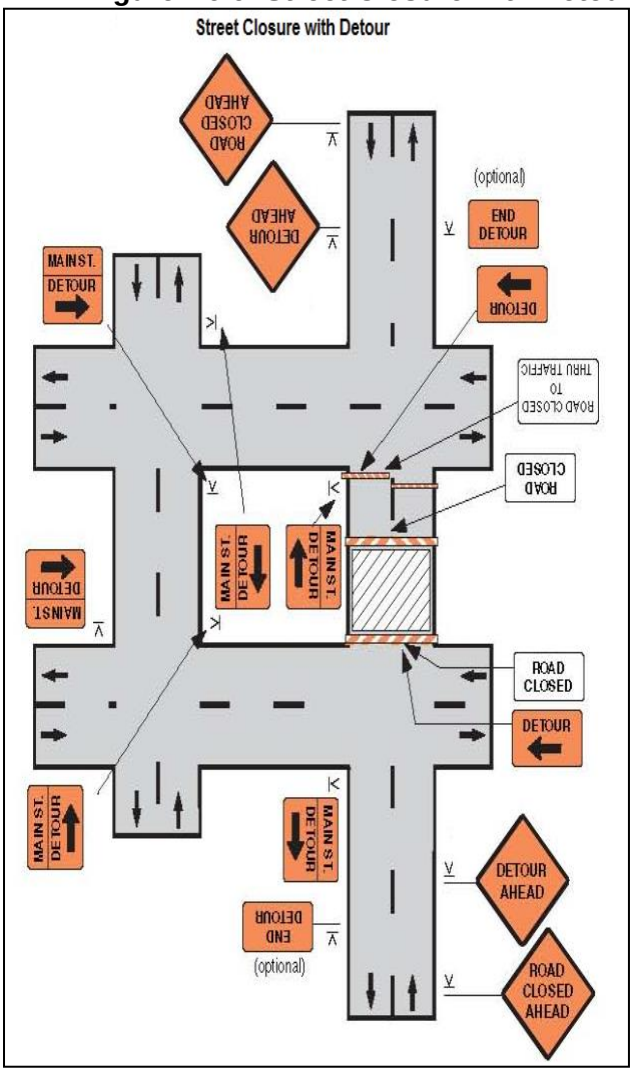


Figure A6.6: Street Closure with Detour



Appendix 8: Semi-Annual Environmental Monitoring Report Template

1. Introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status

- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[8]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[8] If on-going construction, include %physical progress and expected date of completion

2. Compliance Status With National/State/Local Statutory Environmental Requirements [9]

Package No.	Subproject Name	Statutory Environmental Requirements[10]	Status of Compliance[11]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[12]

3. Compliance Status With Environmental Loan Covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

4. Compliance Status With The Environmental Management Plan (Refer To EMP Tables In Approved IEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

[9] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

[10] Specify (environmental clearance? Permit/consent to establish? Forest clearance?Etc.)

[11] Specify if obtained, submitted and awaiting approval, application not yet submitted

[12] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including signed monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

  (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

  (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

  a. Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  b. Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
  c. Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
  d. Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
  e. Confirm spill kits on site and site procedure for handling emergencies.
  f. Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  g. Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
  h. Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  i. Provide information on barricades, signages, and on-site boards. Provide photographs.
  j. Provide information on
  k. Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)[13]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[13] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

5. Approach And Methodology For Environmental Monitoring Of The Project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

6. Monitoring Of Environmental Impacts On Project Surroundings(Ambient Air, Water Quality And Noise Levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

Appendix 9: Sample Environmental Site Inspection Report

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER:

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as and when required only	
Tarpaulins used to cover sand and other loose material when transported by vehicles	
After unloading , wheels and undercarriage of vehicles cleaned prior to leaving the site	
No AC pipes disturbed/removed during excavation	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying and backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided and public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	
Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc.)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard and safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	

Monitoring Items	Compliance
Toilet facility provided at the site	
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet and bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

_____

Sign off

_____ _____

Name **Name**
Position **Position**

Appendix 10: COVID-19 Health & Safety Plan / SOP

In response to COVID-19 outbreak, Ministry of Housing and Urban Affairs (MoHUA), Govt. of India, has defined the following Standard Operating Procedures (SOPs) and guidelines to ensure safety of construction site workers. SOP developed in line with the guidelines will be implemented during the execution of this project.

General Guidelines – Applicable to All

- All Protocol including Emergency Response will be laid out. Periodic tailgate sessions will be arranged to review site protocols in view of highly dynamic scenario ensuring social distancing norms. During these sessions, everyone including workers will be informed about the safety guidelines and important updates. Necessary arrangements for announcements shall be made at every site
- Mandatory Thermal Scanning of everyone entering and exiting a construction site will be done for fever with thermal scanners. If anyone leaves and re-enters the site during the shift, re-screening of the individual will be done prior to re-entry into the work site.
- Provision for hand wash & sanitizer (touch free recommended) will be made at all entry and exit points and common areas (including at distant locations like higher floors). Everyone will be required to wash & sanitize his/her hands before entering the site and using PPEs. Same procedure to be followed after removing PPEs and exiting the premise. Sufficient quantities of all the items should be available at the site.
- Mandatory use of PPEs (face mask, hand gloves and other as applicable) by everyone entering the premise. Re-usable PPEs should be thoroughly cleaned and should not be shared with others.
- There will be strict ban on Gutka, Tambaku, Paan etc. on site and spitting shall be strictly prohibited.
- Food should be consumed at designated areas only ensuring social distancing. Common sitting arrangements should be removed. Post lunch, waste should be disposed by individual in designated bins and area should remain clean.
- Areas with a probability of bigger gathering, for eg. cleaning area, toilets etc. should be identified and all arrangements should be made to ensure social distancing.
- Entire construction site including site office, labour camp, canteens, pathways, toilets, entry / exit gates will be disinfected on daily basis. Housekeeping team should be provided with necessary PPEs.
- There will be total Ban on non-essential visitors at sites (including from Head office staff, consultants etc.).
- Hospital/clinics in the nearby area, which are authorized to treat COVID-19 patients, should be identified and list should be available at Site all the time
- A doctor will be present periodically (at least once a week) at site on allotted time for any medical assistance.
- Appropriate signage at construction site spelling out safety practices in the language which is understood by all.

Guidelines for Workers

- On day 0, before resuming the work on site post lockdown period, mandatory medical check-up will be arranged for all workers. The workers coming from outside will be quarantined for a period of at least 15 days. Only medically fit workers will be deployed at site and medical assistance will be arranged for unfit workers. Medical checkup camp should be arranged every month.
- The labours staying at site will not be allowed to go outside. All the essential items will be made available to labours at site only. If necessary, the workers can go out wearing PPEs, after informing supervisor. Similarly, no outside labour will be allowed at site without following proper procedure and instructions.
- Start time on site will be staggered to avoid congestion at the entry gates. Number of workers working at a particular time / place will be reduced by making arrangements for different shifts / areas. Accordingly, additional staff such as security guards, supervisors etc. will be deployed.
- During attendance, training and other sessions, social distancing guidelines will be followed along with provision of no-touch attendance.
- Workers to avoid contact with sick people and avoid going to site if they are feeling sick, have fever, cough or shortness of breath. In such case, supervisor should be informed immediately. Workers with such symptoms should not come to site and should be placed in isolation and medical assistance will be provided on immediate basis.
- Workers should not shake hands when greeting others and while working on the site.
- Mandatorily wear face masks while working on site. While not wearing masks, cover your mouth and nose with tissues if you cough/sneeze or do so in the crook of your arm at your elbow.
- Avoid large gatherings or meetings of 10 people or more. Stay at least 6 feet away from others on job sites and in gatherings, meetings, and training sessions. Not more than 2/4 persons (depending on size) will be allowed to travel in lifts or hoists. Use of staircase for climbing should be encouraged.
- Workers should not share their belongings like food, water bottles, utensils, mobile phones etc. with others. The utensils should be washed properly post use at designated place.

Guidelines for Material, Tools, Machinery, Vehicles etc.

- At all point of time, easy access to parking should be ensured since public transit is limited.
- All vehicles and machinery entering the premise should be disinfected by spray mandatorily.
- All construction material arriving at site should be left idle for 3 days before use to ensure safe usage.
- Non-touch waste bin with disposable garbage bag should be installed for waste collection at all common access areas. Proper disposal of garbage should be ensured.
- Wipe down interiors and door handle of machines or construction vehicles, the handles of equipment and tools that are shared, with disinfectant prior to using.