Initial Environmental Examination

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IND: Infrastructure Development Investment Program for Tourism (IDIPT) Tranche 4
— Improvement works in Government Museum (Egmore museum), Chennai, Chennai District.

Package No. IDIPT/TN/T4/NCB/11/2017

Prepared by the Department of Tourism and Culture Government of Tamil Nadu for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 15 December 2017)

Currency unit	–	Indian rupee (₹)
₹1.00	=	$0.0156
$1.00	=	₹64.2650

ABBREVIATIONS

ADB	-	Asian Development Bank
CAC	-	common air contaminants
CFE	-	consent for establishment
CFO	-	Consent for operation
CRZ	-	Coastal Regulation Zone
DOT	-	Department of Tourism
PMSC	-	Project Management and Supervision Consultant
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
GoI	-	Government of India
IEE	-	Initial Environmental Examination
NGO	-	non-government organization
NOC	-	No Objection Certificate
PIU	-	Project Implementation Unit
PMSC	-	Project Management Consultant
PMU	-	Project Management Unit
RCC	-	Reinforced Cement Concrete
ROW	-	right-of-way
SPS	-	Safeguard Policy Statement

NOTE

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

Background. The India Infrastructure Development Investment Program for Tourism (the Investment Program) envisages environmentally and culturally sustainable and socially inclusive tourism development in the project states of Himachal Pradesh, Punjab, Tamil Nadu and Uttarakhand, delivered through a multi-tranche financing facility (MFF) modality. Project 2 includes the states of Uttarakhand and Tamil Nadu. The Egmore Museum Started in 1851, is the second oldest museum of India is located in the center of the city in Chennai, Tamil Nadu. It is also one of the main tourist destination in Chennai with attracts more tourists as well as public. The proposed subject under tranche IV is more beneficiary to the people of Chennai and the tourists.

Chennai is the capital of Tamil Nadu located on the Coromandel Coast off the Bay of Bengal. Chennai is among the most visited Indian cities by foreign tourists. It was ranked 43rd most visited city in the world for year 2015. It is one of the biggest cultural, economic and educational centers in South India. it is the fifth-largest city and fourth-most populous urban agglomeration in India. Chennai is nicknamed "The Detroit of India" Chennai was added to the UNESCO with Creative Cities Network (UCCN) list for its rich musical tradition.

Executing and implementing agencies - The executing agency is the Department of Tourism & Culture, Government of Tamil Nadu. Project Management Unit (PMU) is set up at Chennai to coordinate the overall execution. The implementing agency is Project Implementation Unit (PIU) set up at Chennai by state government department, Department of Museum. To support the PIU, Project Management and Supervision Consultant (PMSC) have been placed. The asset owner is the Department of Museum

Categorization –Museum subproject package IDIPT/TN/T4/NCB/11/2017 is classified as environmental category B per ADB SPS as no significant impacts are envisioned. Accordingly, this Initial Environmental Examination (IEE) has been prepared to assess the environmental impacts and provide mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

Subproject Scope – The key activities in this subproject is Revitalization of the Museum Premises by attempting for Transformation just a Museum into a Museum Plaza on the principles of upgradation.

Proposed subproject - The primary objective of this sub-project is to provide better upgradation to the existing infrastructure/proposed infrastructure for the tourists and the public to retain the glory of the history of the Museum. The following components are to be executed Implementation of a visitor's plaza, Development of a cultural hub, Upgradation of toilets and provision of child care center, Development of a single family of multi lingual signage which is congruous to the historic setting and helps in site interpretation. Provision of drinking water facilities, stone seating, dust bins, light poles etc. Provision of bitumen roads for fire trucks. Provision of stone pavers with tactile flooring, Provision of utility ducts for storm water and cable management, Provision of Security System with modern gadgets like CCTV Surveillance System, Vehicle under chassis scanning system with auto saving of vehicle number & Landscaping.

Description of Environment: Chennai is located on the south eastern coast of India in the north–eastern part of Tamil Nadu on a flat coastal plain known as the eastern coastal, plains. Its average elevation is around 6.7 meters and its highest point is 60 m. Two major rivers flow through Chennai, the Cooum River through the center, and the Adyar River to the south. A third

river, the Koshatalaiyar, travels through the northern fringes of the city before draining into the Bay of Bengal, at Ennore. The estuary of this river is heavily polluted with effluents released by the industries in the region. Adyar and Cooum rivers are heavily polluted with effluents and waste from domestic and commercial sources. The Cooum is so heavily polluted it is regarded as the city's eyesore. A protected estuary on the Adyar forms a natural habitat for several species of birds and animals. The Buckingham Canal, 4 km inland, runs parallel to the coast, linking the two rivers. The Otteri Nullah, an east–west stream, runs through north Chennai and meets the Buckingham Canal at Basin Bridge. Several lakes of varying size are located on the western fringes of the city. Some areas of the city have the problem of excess iron content in groundwater. Chennai's soil is mostly clay, shale and sandstone. The ground water table in Chennai is at 4-5m below ground in most of the areas,

The selection of components is consistent with the subproject selection criteria outlined in the Environmental Assessment and Review Framework (EARF) aimed at enhancing protection of these sites and enhancing their environmental quality. Subprojects are consistent with defined management plans designed to protect environmentally sensitive and cultural locations. Management plans guided subproject design and location; therefore, all proposed facilities in natural areas are located outside sensitive areas and sited in designated tourist development zones.

Environmental Management. An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

Impacts are readily mitigated through careful siting, specific selection criteria for procuring contractors with demonstrated experience; execution of proven mitigation measures during the design; and adoption of good engineering practices during construction and implementation. A detailed monitoring plan prepared as part of this IEE will further mitigate negative environmental impacts during implementation.

Potential induced impacts are addressed through the following: (i) awareness- building of local management plans at proposed sites specifically addressing the need to regulate tourism related development and planning in the area through coordination with related Government Departments and local land use committees; and (ii) project-supported environmental awareness campaigns in surrounding communities to encourage participatory sustainable development consistent with eco-tourism principles and in compliance with the state's tourism policy ecotourism aspects.

The Investment Program includes upfront and on-going supervision and training assistance for environmental monitoring reporting in project management structures. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the project management unit (PMU) supplemented with the technical expertise of a Safeguards Specialist as part of the Project Management and Supervision Consultants (PMSC). Further, the environmental monitoring plans provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

Project 2 includes additional environmental awareness-building to raise conservation values consistent with management plans and Tamil Nadu's environmental and tourism policies (which emphasize ecotourism) amongst local communities and local governments in order to ensure future sustainable development in and around these locations.

Consultation, Disclosure and Grievance Redress. Public consultations were done in the preparation of the project and IEE. Ongoing consultations will occur throughout the project implementation period. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. The PMU, PIU and PMSC will be responsible for environmental monitoring. The PIU, with support from the PMSC will submit semi-annual monitoring reports to the PMU. The PMU will consolidate the semi-annual reports in assistance of PMSC and will send it to ADB. ADB will post the environmental monitoring reports on its website.

Conclusion. The proposed subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation of application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category B is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS 2009 or Government of India EIA Notification 2006.

Figure A: Sub Project Location

I. INTRODUCTION

A. Background

1. The proposed Tranche IV (the Project) targets enhanced economic growth and provision of livelihood opportunities for local communities through tourism infrastructure development with a focus on preservation and development of natural and cultural heritage and incidental services. The Project supports the states of Uttarakhand and Tamil Nadu to develop the tourism sector as a key driver for economic growth.

2. The Project aims to enhance contribution of the tourism industry to sustainable and inclusive economic growth for each participating state. Increased visits of domestic and international tourists to tourist destinations within each participating state would be the outcome of the Project.

3. Background. The India Infrastructure Development Investment Program for Tourism (the Investment Program) envisages environmentally and culturally sustainable and socially inclusive tourism development in the project states of Himachal Pradesh, Punjab, Tamil Nadu and Uttarakhand, delivered through a multi-tranche financing facility (MFF) modality. Project 2 includes the states of Uttarakhand and Tamil Nadu. The Egmore Museum is the second oldest museum of India is located in the center of the city in Chennai, Tamil Nadu. It is also one of the main tourist destination in Chennai with attracts more tourists as well as public. The proposed subject under tranche IV is more beneficiary to the people of Chennai and the tourists.

4. The original Madras was derived from Madraspattinam and the name Madras is changed to Chennai in 1996. The Portuguese first arrived in 1522 and built a port. In 1612, the Dutch established themselves near Pullicat, north of Chennai. On 20 August 1639 Francis Day of the East India Company along with the Nayak of Kalahasti Damarla Chennappa Nayakudu, A year later, the Company built Fort St. George, the first major English settlement in India. In 1746, Fort St. George and Madras were captured by the French. The British regained control in 1749 and strengthened the town's fortress wall to withstand further attacks from the French. By the 18th century, the British had conquered most of the region around Tamil Nadu and the northern modern–day states of Andhra Pradesh and Karnataka, establishing the Madras Presidency with Madras as the capital

5. Chennai is a hub for educational institutions and some of them are as University of Madras, IIT Madras, Madras Institute of Technology, Madras Medical College, Madras Veterinary College, Madras Christian College. Chennai is located on the south eastern coast of India in the north–eastern part of Tamil Nadu on a flat coastal plain known as the eastern coastal, plains. Its average elevation is around 6.7 meters (m) and its highest point is 60 m. Two major rivers flow through Chennai, the Cooum River through the Center and the Adyar River to the south. A third river, the Koshatalaiyar, travels through the northern fringes of the city before draining into the Bay of Bengal, at Ennore. The estuary of this river is heavily polluted with effluents released by the industries in the region Adyar and Cooum rivers are heavily polluted with effluents and waste from domestic and commercial sources, the Cooum being so heavily polluted it is regarded as the city's eyesore. A protected estuary on the Adyar forms a natural habitat for several species of birds and animals. The Buckingham Canal, 4 kilometers (km) inland, runs parallel to the coast, linking the two rivers. The Otteri Nullah, an east–west stream, runs through north Chennai and meets the Buckingham Canal at Basin Bridge. Several lakes of varying size are located on the western fringes of the city. Some areas of the city have the problem of excess iron content in groundwater. Chennai's soil is

mostly clay, shale and sandstone The ground water table in Chennai is at 4-5 m below ground in most of the areas.

(i) **Air**: The city is connected to major hubs across Asia, Europe, and North America through more than 30 national and international carriers.
(ii) **Rail:** Chennai hosts the headquarters of the Southern Railway. The city has four main railway terminals. Chennai Central, Chennai Egmore, Chennai Beach and Tambaram. Chennai Central station, the city's largest, provides access to other major cities as well as many other smaller towns across India.
(iii) **Sea:** The city is served by two major ports, Chennai Port, one of the largest artificial ports in India, and Ennore Port. The Chennai port is the largest in Bay of Bengal, with an annual cargo tonnage of 6.146 crore, and second largest containerize hub in India. The port handles transportation of automobiles, motorcycles and general industrial cargo.
(iv) **Road:** Chennai is one of the cities in India that is connected by the Golden Quadrilateral system of National Highways. It is connected to other Indian cities by four major National Highways (NH) that originate in the city.

6. **Executing and implementing agencies**. The executing agency is the Department of Tourism & Culture, Government of Tamil Nadu. Project Management Unit (PMU) is set up in Chennai to coordinate the overall execution. The implementing agency is Project Implementation Unit (PIU) set up in Chennai by the state government department, Department of Museum. To support the PIU, Project Management and Supervision Consultant (PMSC) have been placed. The asset owner is the Department of Museum.

7. **Proposed subproject**. The primary objective of this sub-project is to upgrade the existing infrastructure for the public and to retain the Museum's former glory. The following components are as follows: (i) Implementation of a visitor's plaza, (ii) Development of a cultural hub, (iii) Upgrading of toilets and provision of child care center, (iv) Development of a single family of multi lingual signage which is congruous to the historic setting and helps in site interpretation, (v) Provision of drinking water facilities, stone seating, dust bins, light poles etc., (vi) Provision of bitumen roads for fire trucks, (vii) Provision of stone pavers with tactile flooring, (viii) Provision of utility ducts for storm water and cable management, and (ix) Provision of Security System with modern gadgets like CCTV Surveillance System, Vehicle under chassis scanning system with auto saving of vehicle number & Landscaping.

Considering the historical significance of the place and the influx of visitors and tourists, coupled with expected enhanced revenue to the tourism sector, it calls for adequate infrastructure facilities and amenities to meet the requirement of the public as well as towards enhanced tourism environment. In this regard, the project also aims to revitalize the city by providing adequate infrastructure using a sustainable model for the sake of citizens and tourists who frequent the place. The subproject also aims to help educate visitors about the historical structures, culture and the values of city to help protect and maintain the value of the property. The subproject will provide complete facilities to further entice tourists to the area, to help promote economic betterment of local communities through self-employment opportunities. The sub project will assist design and implement capacity building measures for the community and the stakeholders.

8. The IEE was based on a careful review of subproject site plans and reports defined management plans; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations/ discussions with stakeholders. An environmental management plan (EMP) outlining the specific environmental measures to be adhered to during

implementation of the subproject has been prepared. Subprojects will provide needed environmental and tourist infrastructure to improve the environmental management and quality of the sites towards preserving their ecological and cultural integrity. The subproject will conform to all Government regulations, policies, and standards, as well as Asian Development Bank's Safeguard Policy Statement (2009).

9. **Categorization**. Egmore Museum subproject package IDIPT/TN/T4/NCB/11/2017 is classified as environmental category B per ADB SPS as no significant impacts are envisioned. Accordingly, this Initial Environmental Examination (IEE) has been prepared to assess the environmental impacts and provide mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

10. Under the EIA Notification, 2006 promulgated under Environment (Protection) Act 1986 of the MOEF, Government of India, all developmental projects and activities listed under the schedule of the Notification are broadly categorized in to two categories - Category A and Category B, based on the spatial extent of potential impacts on human health and natural and manmade resources.

11. All projects or activities under Category 'A' in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, shall require prior environmental clearance from the Central Government in the Ministry of Environment and Forests (MOEF) on the recommendations of an Expert Appraisal Committee (EAC) to be constituted by the Central Government for the purposes of this Notification.

12. All projects or activities under Category 'B' in the Schedule, including expansion and modernization of existing projects or activities as specified in sub paragraph (ii) of paragraph 2, or change in product mix as specified in sub paragraph (iii) of paragraph 2, but excluding those which fulfill the General Conditions (GC) stipulated in the Schedule, will require prior environmental clearance from the State/Union territory Environment Impact Assessment Authority (SEIAA). The SEIAA shall base its decision on the recommendations of a State or Union territory level Expert Appraisal Committee (SEAC) as to be constituted for in this Notification. In the absence of a duly constituted SEIAA or SEAC, a Category 'B' project shall be treated as a Category 'A' project.

13. **Purpose of the IEE**. The IEE was based on a careful review of subproject site plans, detailed design and reports, defined management plans, field visits, stakeholder consultations/discussions and secondary data to characterize the environment and identify potential impacts. The adverse environmental impacts for this contract package are primarily related to the "Improvement works in Government Museum (Egmore museum) in Chennai ". Therefore, as per the Asian Development Bank's (ADB) Environmental Assessment Guidelines (SPS 2009), the sub-project components are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to location, design, construction, operation, and maintenance. The REA checklist is attached as Appendix 3 with this report.

II. DESCRIPTION OF THE SUBPROJECT

A. Existing Condition and Need of the Subproject

14. **Location**. The Egmore Museum is located in the center of the city in Chennai. Chennai is the capital of Tamil Nadu located on the Coromandel Coast off the Bay of Bengal.

Figure 1. Site Map

15. Brief History. The original Madras was derived from Madraspattinam and the name Madras is changed to Chennai in 1996. The Portuguese first arrived in 1522 and built a port. In 1612, the Dutch established themselves near Pullicat, north of Chennai. On 20 August 1639 Francis Day of the East India Company along with the Nayak of Kalahasti Damarla Chennappa Nayakudu, A year later, the Company built Fort St. George, the first major English settlement in India.

16. In 1746, Fort St. George and Madras were captured by the French. The British regained control in 1749 and strengthened the town's fortress wall to withstand further attacks from the French. By the 18th century, the British had conquered most of the region around Tamil Nadu and the northern modern–day states of Andhra Pradesh and Karnataka, establishing the Madras Presidency with Madras as the capital.

17. Chennai is a hub for educational institutions and some of them are as University of Madras, IIT Madras, Madras Institute of Technology, Madras Medical College, Madras Veterinary College, Madras Christian College. Chennai is located on the south eastern coast of India in the north–eastern part of Tamil Nadu on a flat coastal plain known as the eastern coastal, plains. Its average elevation is around 6.7 meters and its highest point is 60 m. Two major rivers flow through Chennai, the Cooum River through the Center and the Adyar River to

the south. A third river, the Koshatalaiyar, travels through the northern fringes of the city before draining into the Bay of Bengal, at Ennore. The estuary of this river is heavily polluted with effluents released by the industries in the region Adyar and Cooum rivers are heavily polluted with effluents and waste from domestic and commercial sources, the Cooum being so heavily polluted it is regarded as the city's eyesore. A protected estuary on the Adyar forms a natural habitat for several species of birds and animals. The Buckingham Canal, 4 km inland, runs parallel to the coast, linking the two rivers. The Otteri Nullah, an east–west stream, runs through north Chennai and meets the Buckingham Canal at Basin Bridge. Several lakes of varying size are located on the western fringes of the city.

18. The Museum is maintained and administered by the Department of Museum of the Government of Tamil Nadu.

19. Existing Conditions - The existing infrastructure in the Museum is inadequate to cater to the needs of the increasing arrivals of tourist as well as the local visitors. It is therefore necessary to improve the basic amenities to the visitors.

20. The Government Museum of Chennai is one of the most popular sightseeing pots in the city. Though initially it was set up in an edifice on the College Road, Nungambakkam, in 1851, later on, in 1854, it was shifted to the present locale in Egmore. Today, it proudly stands as the second oldest museum-after the Indian Museum of Kolkata which was set up in 1814-and is also one of the leading museums in South Asia. It is mainly affluent in archaeological and numismatic collections and also has a vast collection of Roman antiquities, outside of Europe. Some of the edifices in the campus of the museum are over 100 years old. The Museum grounds comprises of six buildings and 46 galleries, covering the total area of about 16.25 acres.

21. **Proposed Subproject** The sub-project aims to: (i) improve and construct the tourist facilities at these sites with high historic, religious & cultural values using technology and craftsmanship without compromising the original architecture/ structure/ site/ area/ region, (ii) improve and enhance movement in the facilities by providing pilgrims/ visitors with facilities such as on-site signage/ descriptive panels, street lights, and the like to facilitiate the flow of people and, consequently, enhance the value of the sites. The following facility interventions are expected to improve and uplift tourism in the project sites:

(i) Implementation of a visitor’s plaza which inculcates the visitors on the history of the museum.
(ii) Development of a cultural hub that will allow the hosting of various cultural events and temporary exhibitions.
(iii) Upgrade of toilets and provision of child care center to match international standards.
(iv) Development of a single family of multi lingual signage which is congruous to the historic setting and helps in site interpretation.
(v) Provision of drinking water facilities, stone seating, dust bins, light poles etc. which are heritage sensitive in nature.
(vi) Provision of bitumen roads for fire trucks. Provision of stone pavers with tactile flooring.
(vii) Provision of utility ducts for storm water and cable management.
(viii) Provision of Security System with modern gadgets like CCTV Surveillance System, Vehicle under chassis scanning system with auto saving of vehicle number, etc.;

and
(ix) Landscaping of the premises.

22. All sites for subproject are owned by government thus no land acquisition or NOC is required. The sites are not within or adjacent to any protected area. Location map of proposed site is shown in Figure 1. All pre-construction, construction, and operation activities that are likely to cause environmental impacts were identified, and evaluated to assess their magnitude, duration, and potential receptors in consultation with the stakeholders. Consultations were held with the government representatives of Department of Museum and local communities. Accordingly, an EMP has been prepared for each component to mitigate any adverse impacts that may occur during implementation of the project.

23. The design, material and scale will be compatible to the local architectural, physical, cultural and landscaping elements. Preference will also be given to the use of local material and labor as best as possible.

B. Implementation Schedule

24. Preliminary design of the subproject has been done by the Project Management and Supervision Consultant (PMSC) team and will be finalized during detailed design stage. It is estimated that construction period will cover 18 months.

25. The final detailed implementation schedule will be provided in the updated IEE once the detailed design phase is completed.

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 project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

27. Screening and Categorization. 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 impact 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

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 - The IEE will be put in an accessible place (e.g., local government offices, libraries, community cum tourist reception centers, etc.), and a summary translated into Tamil for the project affected people and other stakeholders shall also be disclosed. The following safeguard documents will be put up in ADB website so that the affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:

(i) For environmental category A projects, a draft EIA report at least 120 days before Board consideration;

(ii) Final or updated EIA and/or IEE upon receipt; and

(iii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

30. During the design, construction, and operation of the project the pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the **World bank Environmental, Health, and Safety (EHS) Guidelines -General EHS Guidelines: Occupational, Health and safety** (www.ifc.org/ifcext/enviro.nsf/Content/ Environmental guidelines) and EHS Guidelines for water & sanitation will be followed (http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE)

31. Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. Preventive and protective measures should be introduced according to the following order of priority:

(i). Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc;

(ii). Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc;

(iii). Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.

(iv). Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE

(v). Comply with: Child Labour (Prohibition and Regulation) Amendment Act, 2016; Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 as amended from time to time from appropriate authorities; Trade Unions Act, 1926; The Building and Other Construction Workers (Regulation of Employment and

conditions of Service Act) 1996 and the Cess Act of 1996; The Factories Act, 1948; and Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act 2013.

32. During the design, construction, and operation of the project, the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards, such as the World Bank Group's Environment, Health and Safety Guidelines.

A comparison on noise level requirements between the WB EHS guidelines and the NAAQS under the Air (Prevention and Control of Pollution) Act, 1981 of GOI as given in table B shows that the required levels are equal for residential, institutional and educational areas. The NAAQS requirements for commercial areas are more stringent while the WB EHS requirement for daytime noise in industrial area is more stringent.

Table A3.1: Ambient Noise level standards of WB EHS Vs. the GOI NAAQS

Receptor	WB EHS		GOI NAAQS	
	Daytime	Nighttime	Daytime	Nighttime
	7:00-22:00	22:00-7:00	6:00-22.00	22:00-6:00
Residential	55	45	55	45
Institutional; educational			None	None
Industrial	70	70	75	70
Commercial			65	55
Silence Zone	None	None	50	40

B. National and State Laws

33. Implementation of the subproject will be governed by the national and State of Tamil Nadu environmental acts, rules, regulations, and standards. These regulations impose restrictions on activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether national, state or municipal/local. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

34. The realm of environmental regulations and mandatory requirements for the proposed subproject is shown in Table 1. The EIA Notification (2006) by the Government of India Ministry of Environment, Forests and Climate Change(MOEFCC) specifies the mandatory environmental clearance requirements. Accordingly, all projects and activities are broadly categorized in to two categories1 - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health and natural and man-made resources.

[1] All projects or activities included as Category A in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, will require prior environmental clearance from the Central Government in the Ministry of Environment and Forests, Climate Change (MOEFCC) on the recommendations of an Expert Appraisal Committee (EAC) to be constituted by the Central Government for the purposes of this Notification. All projects or activities included as Category B in the Schedule, including expansion and modernization of existing projects or activities as specified in sub paragraph (ii) of paragraph 2, or change in product mix as specified in sub paragraph (iii) of paragraph 2, but excluding those which fulfil the General Conditions (GC) stipulated in the Schedule, will require prior environmental clearance from the State/Union territory Environment Impact Assessment Authority (SEIAA). The SEIAA will base its decision on the recommendations of a State or Union territory level Expert Appraisal Committee (SEAC) as to be constituted for in this Notification. In addition, GC of the Notification specifies that any project or activity specified in Category B will be treated as Category A, if

35. It may be noted that Prima facie applicable laws, notifications, policies etc. those may be relevant in the context of the implementation of the proposed sub-project activities are briefly presented below. During the course Initial Environmental Examination, the applicability of these laws, regulations, policies etc. has been verified and their applicability matrix has been presented below.

36. The IEE has been prepared considering the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013 (Act 30 of 2013), Government of India and ADB's Policies for Social and Environmental Safeguards. The Department of Tourism and Department of Museum will ensure compliance of legal and regulatory framework during the project cycle. Further, during project execution influx of workmen from other states is anticipated and considering the large number of workmen to be engaged in various activities, the applicable Acts those are binding on the contractor has been briefed below.

Table 1: Applicability of Acts and Rules

	Acts and Rules	**Year**	**Compliance Criteria**
1	Environment (Protection) Act	1986	This act is applicable all environmental Notifications, rules and schedules issued under this act.
2	Environment Impact Assessment Notification	2006	As per the Notification, Projects categorized as A and B need prior Environmental clearance from the Central and State Expert Appraisal Committee respectively. But, this Sub-project does not come under the purview of the above categories hence this Notification is not applicable.
3	Forest Conservation Act	1927 and 1980	This Act will be applicable in case the proposed project road is passing through the Forest Areas which requires the diversion of forest land to the non-forestry purposes. This is not applicable as there is no forest land involved for the project development. Permission and clearance for cutting and transportation of trees will be required from Divisional Forest Officers, which is not applicable for this sub-project.
4	Wild Life (Protection) Act	1972	This act will be applicable in case the project road traverses through wildlife protected areas for which permission will be sought from National Board for wildlife. This is not applicable as there is no wildlife protected area is involved for the project development.
5	Coastal Regulation Zone (CRZ) Notification	1991 and 2011	Under the Environment Protection Act, 1986 a notification was issued in February 1991, for regulation of activities in the coastal area by the Ministry of Environment and Forests (MoEF). As per the notification, the coastal land up to 500m from the High Tide Line (HTL) and a stage of

located in whole or in part within 10 km from the boundary of (i) protected Areas notified under the Wild Life Protection) Act, 1972, (ii) critically polluted areas as notified by the Central Pollution Control Board from time to time, (iii) notified eco-sensitive areas, and (iv) inter-State boundaries and international boundaries.

	Acts and Rules	Year	Compliance Criteria
			100m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations, is called the CRZ. Government of Tamil Nadu have prepared Coastal Zone Management Plan Maps for its entire coastal stretches of Tamil Nadu on the basis of CRZ Notification 1991. The activities in CRZ areas have been regulated based on the above approved Coastal Zone Management Plan maps till date. CRZ-III-Areas that are relatively undisturbed and those do not belong to either CRZ-I or II which include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built-up. The Subproject does not come under the Coastal Regulation zone. Hence the act will not applicable. Regulations: a) The area up to 200m from the HTL is be earmarked as 'No Development Zone'. No construction shall be permitted in this zone except for repairs of existing authorized structures not exceeding existing FSI, existing plinth area and existing density. However, the following uses may be permissible in this zone-agriculture, horticulture, gardens, pastures, parks, play fields, forestry and salt manufacture from sea water. b) Development of vacant plots between 200 and 500m of High Tide Line in designated areas of CRZ-III with prior approval of Ministry of Environment and forests permitted for construction of hotels/beach resorts for temporary occupation of tourists / visitors. c) Construction/ reconstruction of dwelling units between 200m and 500m of the High Tidal Line permitted so long as it is within the ambit of traditional rights and customary uses such as existing fishing villages and gothans. Building permission for such Construction/reconstruction will be subject to the conditions that the total member of dwelling unit shall not be more than twice the number of existing units; total area covered on all floors shall not exceed 9 meters and construction shall not be more than 2 floors (ground floor plus one floor). d) Reconstruction/alteration of an existing authorized building permitted subject to (1) to (3) above. The subproject does not come under the purview of CRZ regulations.
6	Water (Prevention and	1974	The Sub-projects require consent to establish

	Acts and Rules	Year	Compliance Criteria
	Control of Pollution) Act		from the State Pollution Control Board if it involves discharge waste water from labor camps which is applicable during construction phase of the project. But, it is being ensured that no discharges will be there to any inland water bodies or sea/ocean, hence this Act will not be applicable. Moreover, the excreta from the toilets will be collected in sewer line wherever possible for remaining places septic tanks/soak pits were used ensuring no discharges to water bodies.
7	Air (Prevention and Control of Pollution) Act	1981	The project requires consent to establish from the State Pollution Control Board if it involves operation and Diesel Generator Sets. This act will be applicable to the project during construction phase of projects as use of DG sets is being envisaged.
8	Noise Pollution Regulation and Control Act	1990	The project requires consent to establish from the State Pollution Control Board if the noise level from the construction machinery and the vehicles are above the standards. This act will apply to the project especially during the construction phase if such machineries will be used which is unlikely.
9	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013 (Act 30 of 2013), GoI	2013	This act will be applicable in case land is being acquired for the project road.This act will not be applicable as no land acquisition is required for the project development. The project is being developed on existing Museum owned land.
10	Ancient Monuments and Archaeological Sites and Remains Act	1958	This act is applicable is case of any chance finds during construction phase of the project which may be remains/ monuments which are deemed to be protected by ASI or the State Directorate of Archaeology. This act will not be applicable as no archaeological sites are affected because of the project development. However, provision has been made so that chance found ancient properties are protected.(Please Confirm to this act)
11	The Hazardous Wastes (Management, Handling and Tran boundary movement) Rules	1989 2003 2008	These rules will be applicable if contractors during construction phase will store and handle hazardous material such HSD and paints etc. But, the EMP spells out that all such materials will be procured from licensed depots and consumed immediately so storage is ruled out
12	The Explosives Act (and Rules)	1884	This Act specifies regulations regarding the use of explosives and precautionary measures while blasting and quarrying. Provisions of these rules are not applicable to this project as materials will be procured from 3rd party licensed holders.

37. Further, for sand, soil and stone quarrying, prior permission is to be obtained from the state

authorities for the purpose. However, considering the project profile, it is preferred to procure materials from the licensed third-party owners.

38. However, considering the kind and quantum of activities, it is envisaged that no borrow areas and quarry sites will be established as a part of activity / sub project. Raw materials will be procured from licensed quarry owners. Similarly, no crusher sites will be opened by the contractor. Also, no borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for the civil works shall be the sole responsibility of the Contractor.

39. The contractor need to use diesel generator sets for which the permission will be required under Air Act 1981.

40. No fuel storage is envisaged in this project and for construction purposes, the fuel shall be procured from the existing fuel outlets.

41. For labor accommodation, no labor camp will be established and for accommodation of labors nearby construction sites rented houses will be engaged by the contractor.

42. Considering the workforce to be mobilized during construction phase, the Contractor is expected to acquaint with all the latest applicable/binding Acts as listed in Appendix 2.

43. The table above indicates that the proposed subproject does not need to go through a full scale environmental assessment process; as the scale of impacts and categorization of the subproject components will not require consent/clearances from competent authorities. Therefore, any further approvals or clearances from the Government of India or GoTN are not envisaged. The ADB guidelines stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of project preparation. For this, the ADB guidelines categorizes the proposed components into categories (A, B, or C) to determine the level of environmental assessment required to address the potential impacts. The subproject has been categorized as B. Accordingly, this IEE has been prepared to address the potential impacts, in line with the recommended IEE content and structure for Category B projects.

IV. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Physical Environment

44. Chennai has three rivers and many lakes spread across the city. Urbanization has led to the shrinkage of water bodies and wetlands. The quantity of wetlands in the city has decreased from 650 to only 27. The Chennai River Restoration Trust set up by the government is currently working on the restoration of the Adyar river. The Environmentalist Foundation of India is a volunteering group working towards wildlife conservation and habitat restoration. The southern stretch of Chennai's coast from Tiruvanmiyur to Neelangarai is favored by the endangered Olive Ridley sea turtles to lay eggs every winter. A large number of cattle egrets, pond herons and other water birds can be seen in the rivers of Cooum and Adyar. About 75,000 birds migrate to Chennai every year. Marshy wetlands such as Pallikaranai also play host to a number of migratory birds during the monsoon and winter. Over 300 species of birds have been recorded in the city and its neighborhood by members of Madras Naturalists' Society since its inception in 1978. Guindy National Park is a protected area within the city limits. Wildlife conservation and research activities take place at Arignar Anna Zoological Park including Olive ridley sea turtle conservation. Madras Crocodile Bank Trust is a herpetology research station, located 40 kilometers south of Chennai. It

is India's leading institution for hereto faunal conservation and the first crocodile breeding center in Asia. The city's tree cover is estimated to be around 64.06 sq km. The most dominant tree species is the copper pod, followed by Indian beech and Neem. A total of 121 species of trees belonging to 94 genera and 42 families are found in the city.

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45. The Egmore Museum is located in the center of the city in Chennai. Chennai is the capital of Tamil Nadu located on the Coromandel Coast off the Bay of Bengal.. The subproject site is in the possession of the Department of Museum and thus the site does not require any land acquisition.

1. Climate

46. Chennai has a tropical wet and dry climate. The city lies on the thermal equator and is also on the coast, which prevents extreme variation in seasonal temperature. The hottest part of the year is late May to early June, known regionally as "fire star" with maximum temperatures around 35–40 °C (95–104 °F). The coolest part of the year is January, with minimum temperatures around 19–25 °C (66–77 °F). The lowest recorded temperature was 13.9 °C (57.0 °F) on 11 December 1895 and 29 January 1905. The highest recorded temperature was 45 °C (113 °F) on 31 May 2003. The average annual rainfall is about 140 cm (55 in).

The city gets most of its seasonal rainfall from the north–east monsoon winds, from mid–October to mid–December. Cyclones in the Bay of Bengal sometimes hit the city. The highest annual rainfall recorded is 257 cm (101 in) in 2005. Prevailing winds in Chennai are usually south-westerly between April and October and north-easterly during the rest of the year. Historically, Chennai has relied on the annual rains of the monsoon season to replenish water reservoirs, as no major rivers flow through the area. Chennai has a water table at 2 metres for 60% of the year.

2. Geographical features

47. Chennai is located at 13.04°N 80.17°E on the southeast coast of India and in the northeast corner of Tamil Nadu. It is located on a flat coastal plain known as the Eastern Coastal Plains. The city has an average elevation of 6 metres (20 ft), its highest point being 60 m (200 ft).Chennai is classified as being in Seismic Zone III, indicating a moderate risk of damage from earthquakes. Owing to the neotectonics zone the city falls in, the city is considered a potential geothermal energy site.

3. Accessibility

48. Chennai has good connectivity due to its different modes of transport.

(i) **Air**: The city is connected to major hubs across Asia, Europe, and North America through more than 30 national and international carriers.

(ii) **Rail:** Chennai hosts the headquarters of the Southern Railway. The city has four main railway terminals. Chennai Central, Chennai Egmore, Chennai Beach and Tambaram. Chennai Central station, the city's largest, provides access to other major cities as well as many other smaller towns across India.

(iii) **Sea :** The city is served by two major ports, Chennai Port, one of the largest artificial ports in India, and Ennore Port. The Chennai port is the largest in Bay of Bengal, with an annual cargo tonnage of 6.146 crore, and second largest containerize hub in India. The port handles transportation of automobiles, motorcycles and general industrial cargo.

(iv) **Road :** Chennai is one of the cities in India that is connected by the Golden Quadrilateral system of National Highways. It is connected to other Indian cities by four major National Highways (NH) that originate in the city.

4. Geomorphology

49. The Chennai sector mainly consists of crystalline rocks of Precambrian age which extend right up to the coast to the south of Chennai city. At places these form isolated inselbergs and tor complexes. The regional topographic profile for Chennai sector shows a broad amplitude topographic high in the central part of Chennai sector. The coastal zone is also conspicuously convex in shape in Chennai sector.

5. Soil

50. The Chennai comprises mostly clay, shale and sandstone. The city is classified into three regions based on geology, sandy areas, clayey areas and hard-rock areas. Sandy areas are found along the river banks and the coasts. Clayey regions cover most of the city. Hard rock areas are Guindy, Velachery, Adambakkam and a part of Saidapet.. In sandy areas such as Tiruvanmiyur, Adyar, Kottivakkam, Santhome, George Town, Tondiarpet and the rest of coastal Chennai, rainwater run-off percolates very quickly. In clayey and hard rock areas, rainwater percolates slowly, but it is held by the soil for a longer time. The city's clayey areas include T. Nagar, West Mambalam, Anna Nagar, Perambur and Virugambakkam.

6. Hydrogeology

51. Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely i) the Archaean crystalline rocks ii) consolidated Gondwana and Tertiary sediments and iii) the Recent Alluvium. The Archaean crystalline rocks of the district comprise chiefly of charnockites, gneisses and the associated basic and ultra-basic intrusive. A map showing the hydrogeology of the district is given as Plate–II. The crystalline rocks are weathered and jointed/fractured. The degree and depth of weathering varies from place to place and the thickness of weathered mantle varies from less than a meter to about 12 m in this district.

52. Water quality are generally highly alkaline and the water is not fit for drinking and domestic purposes in many places. The characteristic and availability of water has been greatly affected due to rapid industrialization, heavy road transportation, over - population, indiscriminate usage and disposal of water. Parameters shows drastic variations because of seasonal changes also. The variations in the parameters in the post monsoon are observed.

7. Natural Disaster / Hazard

53. According to GSHAP data, the state of Tamil Nadu falls mostly in a region of low seismic hazard with the exception of western border areas that lie in a low to moderate hazard zone. Puducherry lies in a low hazard region. As per the 2002 Bureau of Indian Standards (BIS) map, Tamil Nadu and Puducherry fall in Zones II and III. Historically, parts of this region have experienced seismic activity in the M5.0 range.

8. Ambient Air and Noise Quality

54. The air environment of the sub project areas is generally found to be good and is free from pollution. The ambient air quality is perceived to be within acceptable standards. However, in absence of baseline ambient air quality data, it has been proposed to conduct pre-construction phase air quality monitoring and twice every year subsequently for the entire construction period. Impacts on air quality (if any) during construction stage are due to operation of various construction equipment and transport vehicles. Consequently, although emissions of common air contaminants (CAC) and fugitive dust may be elevated in proximity to the active work sites, this impact will be of short-term and localized to the immediate vicinity of the project site.

55. Greenhouse gas (GHG) emissions may increase as a result of project activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, land filling of residual wastes). Given the subproject's relatively minor contribution to CAC and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible during construction.

56. Most of the sub project area is in a quiet environment. Noise intensive industrial operations are not observed in the project influence area. Present ambient noise levels, both in the day and night time, are perceived to be well within permissible levels. However, in absence of baseline ambient air quality data, it has been proposed to conduct pre-construction phase air quality monitoring and twice every year subsequently for the entire construction period.

57. Noise levels in the immediate proximity of most work sites are expected to increase during construction. The duration of this exposure will be relatively brief. This exposure represents temporary, localized, adverse residual effect of low to moderate significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction. Noise levels associated with the subproject operations will be largely imperceptible as civil works will be confined in relatively small sites within the district proper.

58. Since the subproject will be built in existing infrastructure, it will not conflict with existing or planned land use. However, traffic management concerns will occur spatially during construction. Site-specific mitigation measures will be implemented during construction to address temporary disruptions to land use, limitations on access to roads, sidewalk closures, traffic delays and detours, parking modifications, and increased volumes of construction–related traffic. There should be improved traffic movement along the access routes once construction is completed. During operations of the improved infrastructure and services, added residential developments, commercial and business facilities and increased densities are expected to develop and enhance the subproject area. This can be considered a long-term cumulative benefit of the subproject. (Refer Environmental Management plan for Sub-project Specific impacts and their mitigation measures).

59. No adverse residual effects to human health will occur as a result of subproject construction or operation. While exposure to elevated noise levels and fugitive dust and CAC emissions will occur in proximity to subproject work sites during construction, due to their short term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health. The subproject operations will benefit the general public by contributing to the long-term improvement of tourism in Tamil Nadu and livelihood opportunities to the local people.

B. Socio-economic and Cultural Environment

1. Trade and Commerce

60. Industrialization in the city dates back to the 16th century, when textile mills manufactured goods which were exported to British during its war with France. According to Forbes magazine, Chennai is one of the fastest growing cities in the world and is rated in the "Forbes-Top 10 Fastest Growing Cities in the World". It is ranked 4th in hosting the maximum number of Fortune 500 companies of India, next only to Mumbai, Delhi and Kolkata. It also is home to 24 Indian companies having a net worth of more than US$1 billion. As of 2012, the city has about 34,260 identified companies in its 15 zones, of which 5,196 companies have a paid-up the capital of over ₹50 lakh.

61. Chennai has a diversified economic base anchored by the automobile, software services, hardware manufacturing, health care and financial services industries. According to the Confederation of Indian Industry, Chennai is estimated to grow to a US$100–billion economy, 2.5 times its present size, by the year 2025. As of 2012, with 1 lakh crore investment in the pipeline over 5 years, the city is poised for major industrial investment. Chennai is classified as a global city by GaWC, with a ranking of Beta based on the extent of global reach and financial influence.

62. The city is base to around 40% of India's automobile industry and 45% of auto components industry. A large number of automotive companies including Royal enfield, Hyundai, Renault, Robert Bosch, Nissan Motors, Ashok Leyland, Yamaha Motor, Daimler AG, Caterpillar Inc., Komatsu Limited, Bharat Benz, Ford, BMW and Mitsubishi have manufacturing plants in Chennai. The Heavy Vehicles Factory at Avadi produces military vehicles, including India's main battle tank: Arjun MBT. The Integral Coach Factory manufactures railway coaches and other rolling stock for Indian Railways. The Ambattur–Padi industrial zone houses many textile manufacturers, and a special economic zone for apparel and footwear manufacturing has been set up in the southern suburbs of the city. Chennai contributes more than 50% of India's leather exports.

63. Many software and software services companies have development centers in Chennai, which contributed 14% of India's total software exports of ₹14,42,140 lakh during 2006–07, making it the second largest Indian city software exporter following Bangalore. The Tidel Park in Chennai was billed as Asia's largest IT park when it was built. Major software companies have their offices set up here, with some of them making Chennai their largest base.

2. Administration

64. Chennai city is governed by the Greater Chennai Corporation (formerly "Corporation of Madras"), which was established in 1688. It is the oldest surviving municipal corporation in India and the second oldest surviving corporation in the world. The jurisdiction of the Chennai Corporation was expanded from 174 km2 to an area of 426 km2 dividing into three regions—North, South and Central, which covers 200 wards. The corporation is headed by a mayor. The Mayor and councilors of the city are elected through a popular vote by the residents.

65. The Chennai Metropolitan Development Authority (CMDA) is the nodal agency responsible for planning and development of Chennai Metropolitan Area, which is spread over an area of 1,189 km2 covering the Chennai district and parts of Tiruvallur and Kanchipuram districts. The larger suburbs are governed by town municipalities

and the smaller ones are governed by town councils called panchayats. Under the gamut of the CMDA are 5 parliamentary and 28 assembly constituencies

66. Chennai, as the capital of the state of Tamil Nadu, houses the state executive and legislative headquarters primarily in the Secretariat Buildings in the Fort St George campus. The Madras High Court, is the highest judicial authority in the state, whose jurisdiction extends across Tamil Nadu and Puducherry. Chennai has three parliamentary constituencies—Chennai North, Chennai Central and Chennai South—and elects 24 Members of the Legislative Assembly (MLAs) to the state legislature.

3. Area Population

67. Chennai has an estimated population of 4.9 million, with an area that has grown from 176 square kilometers to 426 square kilometers after a 2011 expansion. The urban agglomeration, which includes the city and suburbs, has a population estimated at 9 million.

4. Languages

68. In addition to the Tamil language, There are many spoken languages within this one city, with the most common languages being Hindi, English, Telugu, Malayalam and Urdu. Not only is there an abundance of different languages spoken in this region – there is also a variety of religions. Most people of faith within Chennai follow one of these religions: Hinduism, Buddhism, Islam, Christianity, Jainism, Sikhism and Zoroastrianism.

5. Sanitation and Sewage Disposal

69. The current sewerage system for disposal of sullage is through existing underground sewerage system

70. **Disposal of Solid Waste Management.** Outsourced and transported through lorries of the Greater Chennai Corporation.

71. **Water Supply Arrangements.** Existing well, Bore well and water connections of Metro water, Chennai.

C. Site Details

72. The site is free from encumbrances and is freely available with the Government of Tamil Nadu. Further, there is no necessity of any utility shifting and cutting of trees. The DSC has carried out a field visit and has interacted with the Museum officials.

Table 2: Site Details

	Description	Yes / No
1	Protected area	No
2	Archaeological site	No
3	Forest area	No
4	CRZ area	No

Notes: Protected Area includes wildlife sanctuary, bird sanctuary, or national park; CRZ=Coastal Regulation Zone.

V. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

73. The assessment for each of the subprojects has been carried out for potential impacts during the following stages of the project planning and implementation:

(i) Location impacts. Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities;
(ii) Design impacts. Impacts arising from project design, including the technology used, scale of operations, discharge standards, etc.;
(iii) Construction impacts. Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.; and
(iv) O&M impacts. Impacts associated with the operation and maintenance of the infrastructure built in the project.

74. The proposal envisages medium scale construction activity onsite. This would result in some environmental impacts typical to building construction activity.

(i) Requisite permissions will be obtained before commencement of construction works on site. Identity cards and vehicle permits shall be provided by the contractor for all such movement to and from the site.
(ii) Other impacts related to construction activities such as generation of dust and noise, removal of construction debris and demolition wastes are anticipated. These shall be minimized and addressed by adopting safe engineering practices and appropriate building design. Caution will be exercised in planning for safe construction and operations phase to minimize disturbance to the adjoining existing activities.
(iii) Relocation of an existing manhole on site and fire hydrant shall be required at the time of execution of works.
(iv) Provision for water for construction will be made through tankers or through Bore wells so as not to burden the existing Municipal water demand.

75. Land Acquisition and Resettlement. The proposed subproject locations are within the lands available with the Museum Department of Tamil Nadu. There are no impacts anticipated on land acquisition or resettlement due to the proposed subproject components.

76. The locations considered for the subproject are within the areas designated for tourism support infrastructure development as part of developing Tamil Nadu's conservation, heritage, natural and cultural attractions, and are outside areas demarcated for habitat protection and conservation. The proposed infrastructure will not impact any environmentally-sensitive or protected areas. Rather, it will enhance the tourism experience and livelihood of the local people in total. The public, government and local bodies are very much keen into taking up these proposed works. This proposal suggests areas which do not trigger impacts. No non-titled street vendors are in the area. No displacement or shifting of non-titled street vendors will take place in the identified sites for subproject.

77. Design Consideration to Avoid Environmental Impacts. The following are design considerations to avoid environmental impacts:

(i) Incorporation of adequate drainage provisions;

(ii) Adoption of design compatible with the natural environment and suitable selection of materials to enhance the aesthetic appeal and blend with the natural surroundings.
(iii) Straight lines and simple geometry in the proposed Landscape and architectural features.
(iv) Use of subtle colors and simple ornamentation in the structures.
(v) Natural tree species in the proposed Landscape
(vi) Use of local stone in the proposed walkways and built structures thus maintaining a rustic architectural character.

A. Assessment of Environmental Impacts

78. Determination of Area of Influence. The primary impact areas are (i) sites for proposed project components; (ii) main routes/intersections which will be traversed by construction vehicles; and (ii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire town area outside of the delineated primary impact area; and (ii) entire Kanchipuram district in terms of over-all environmental improvement.

79. In the case of this subproject the components will involve straight forward construction and operation, and impacts will be mainly localized, short in duration and expected only during construction period.

B. Pre-construction Impacts and Mitigation Measures

80. **Consents, permits, clearances, no objection certificate (NOC), etc**. Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works.

81. **Mitigation measures**. The following will be conducted during detailed design phase:

(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works.
(ii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc.
(iii) Include in detailed design drawings and documents all conditions and provisions if necessary

82. **Erosion control.** Most of the impacts will occur due to excavation and earth movements during construction phase. Prior to commencement of civil works, the contractor will be required to:

(i) Develop an erosion control and re-vegetation plan to minimize soil loss and reduce sedimentation to protect water quality;
(ii) Minimize the potential for erosion by balancing cuts and fills to the extent feasible;
(iii) Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure); and
(iv) Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize vegetation removal. Stage construction to limit the exposed area at any one time.

83. **Utilities**. Interruption of services (water supply, toilets, bathing areas, etc.) will be scheduled and intermittently related to localized construction activities. To mitigate impacts, PIU/PMSC will:

(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase.
(ii) Require contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.
(iii) Require contractor to obtain from the PIU and/or PMSC the list of affected utilities and operators; and
(iv) If relocations are necessary, contractor along with PIU/PMSC will coordinate with the providers/line agencies to relocate the utility.

84. **Social and cultural resources**. There is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. Although no such sites have been identified. For this subproject, excavation will occur in and around existing sites, ROWs and specified government land so no risk is foreseen to these structures. Nevertheless, the PIU/PMSC will:

(i) Consult Archaeological Survey of India and/or State Department of Archaeology to obtain an expert assessment of the archaeological potential of the site;
(ii) Consider alternatives if the site is found to be of medium or high risk;
(iii) Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and
(iv) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved.

85. **Sites for construction work camps and areas for stockpile, storage and disposal**. The contractor will be required to meet the following criteria for the sites:

(i) Will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems, etc.;
(ii) Residential areas will not be considered so as 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);
(iii) Disposal will not be allowed near sensitive areas which will inconvenience the community; and
(iv) The construction camp, storage of fuel and lubricants should be avoided at the river bank. Any construction camp site will be finalized in consultation with PMSC and PIU.

86. **Sources of construction materials**. Significant amounts of gravel, sand, and cement will be required for this subproject. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. The contractor will be required to:

(i) Use quarry sites and sources permitted by government;
(ii) Verify suitability of all material sources and obtain approval from PIU/PMSC;

(iii) If additional quarries are required after construction has started, obtain written approval from PIU/PMSC; and
(iv) Submit to PIU/PMSC on a monthly basis documentation of sources of materials.

87. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of PIU/PMSC. If additional quarries are required after construction is started, then the contractor obtains written approval of PIU.

88. **Access**. Hauling of construction materials and operation of equipment on-site can cause traffic problems and conflicts in ROWs. Construction traffic will access most work areas from the existing roads therefore potential impacts will be of short-duration, localized and can be mitigated. The contractor will need to adopt the following mitigation measures:

(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites.
(ii) Schedule transport and hauling activities during non-peak hours.
(iii) Locate entry and exit points in areas where there is low potential for traffic congestion.
(iv) Keep the site free from all unnecessary obstructions.
(v) Drive vehicles in a considerate manner.
(vi) Coordinate with the Traffic Police Department for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours.
(vii) Notify affected sensitive receptors by providing sign boards with information about the nature and duration of construction works and contact numbers for concerns/complaints.
(viii) Provide free access to households and businesses/shops along the ROWs during the construction phase.

89. Summary of pre-construction activities is presented in Table 3. The responsibilities, monitoring program and costs are provided in detail in the EMP. The contractor is required to update the information during detailed design phase. Sample waste/spoils management plan, traffic management plan, etc. are attached as Appendixes 3 and 4.

Table 3: Summary of Pre-Construction Mitigation Measures

Parameters	Mitigation Measures
Consents, permits, clearances, no objection certificate (NOC), etc.	• Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works. • Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. • Include in detailed design drawings and documents all conditions and provisions if necessary
Erosion control	• Develop an erosion control and re-vegetation plan to minimize soil loss and reduce sedimentation to protect water quality. • Minimize the potential for erosion by balancing cuts and fills to the extent feasible. • Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure). • Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize

Parameters	Mitigation Measures
	vegetation removal. Stage construction to limit the exposed area at any one time.
Utilities	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase. • Require contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. • Obtain from the Project Implementation Unit (PIU) and/or Project Management and Supervision Consultant (PMSC) the list of affected utilities and operators; • Prepare a contingency plan to include actions to be done in case of unintentional interruption of services. • If relocations are necessary, contractor will coordinate with the providers to relocate the utility.
Social and Cultural Resources	• Consult Archaeological Survey of India or State Department of Archaeology to obtain an expert assessment of the archaeological potential of the site. • Consider alternatives if the site is found to be of medium or high risk. • Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available. • Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.
Sites for construction work camps, areas for stockpile, storage and disposal	• Will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems, etc. • Residential areas will not be considered so as 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). • Disposal will not be allowed near sensitive areas which will inconvenience the community. • The construction camp, storage of fuel and lubricants should be avoided at the river bank. The construction camp site for intake well should be finalized in consultation with PMSC and PIU.
Sources of construction materials	• Use quarry sites and sources permitted by government. • Verify suitability of all material sources and obtain approval from PIU/PMSC. • If additional quarries are required after construction has started, obtain written approval from PIU/PMSC. • Submit to PMSC on a monthly basis documentation of sources of materials.
Access	• Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. • Schedule transport and hauling activities during non-peak hours. • Locate entry and exit points in areas where there is low potential for traffic congestion. • Keep the site free from all unnecessary obstructions. • Drive vehicles in a considerate manner. • Coordinate with the Traffic Police Department for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours. • Notify affected sensitive receptors by providing sign boards with information about the nature and duration of construction works and contact numbers for concerns/complaints.

Parameters	Mitigation Measures
	• Provide free access to households and businesses/shops along ROWs during the construction phase.

C. Anticipated Construction Impacts and Mitigation Measures

90. The impacts during the construction of the sub project components are generic to the construction activities and not expected to be significant. The EMP specifies the necessary mitigation measures to be strictly followed by the contractor and supervised by the PMSC. Key impacts during construction are envisaged on the following aspects: (i) transportation of materials, (ii) dust generation, air and noise from construction activities, (iii) handling of construction materials at site and, (iv) adoption of safety measures during construction.

91. Construction Schedule and Method. Per preliminary design, construction activities will cover approximately 18 months. The exact implementation schedule will be updated during detailed design phase and will be reflected in this IEE.

92. The infrastructure will be constructed manually according to design specifications. Trenches will be dug by backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed nearby. Demolished materials will be reused to the maximum extent possible. Materials will be brought to site by trucks and will be stored on unused areas within the temple complexes and nearby vacant areas. Any excavated road will be reinstated. The working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Night works may be considered in commercial areas and high day-time traffic as per prevailing conditions at the time of construction.

93. There is sufficient space for a staging area, construction equipment, and stockpiling of materials. However, the contractor will need to remove all construction and demolition wastes on a daily basis.

94. Although construction of these project components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject sites in built-up areas where there are a variety of human activities, will result to impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are short-term, site-specific and within relatively small areas.

95. **Erosion Hazards**. The sites are in the built-up area of the town therefore risk of erosion is low, limited during construction activities and not expected to have any negative impact on the drainage and hydrology of the area. Runoff will produce a highly variable discharge in terms of volume and quality, and in most instances, will have no discernible environmental impact. The contractor will be required to:

(i) Save topsoil removed during excavation and use to reclaim disturbed areas, as soon as it is possible to do so.
(ii) Use dust abatement such as water spraying to minimize windblown erosion.
(iii) Provide temporary stabilization of disturbed/excavated areas that are not actively under construction.
(iv) Apply erosion controls (e.g., silt traps) along the drainage leading to the water bodies.
(v) Maintain vegetative cover within road ROWs to prevent erosion and periodically monitor ROWs to assess erosion.

(vi) Clean and maintain catch basins, drainage ditches, and culverts regularly.
(vii) Conduct routine site inspections to assess the effectiveness of and the maintenance requirements for erosion and sediment control systems.

96. **Impacts on Water Quality**. Excavated materials may end up in drainages and water bodies adjacent to the subproject sites, particularly during monsoon season. Other risks of water pollution may be caused by: (i) poorly managed construction sediments, wastes and hazardous substances; and (ii) poor sanitation practices of construction workers. The contractor will be required to:

(i) Schedule civil works during non-monsoon season, to the maximum extent possible.
(ii) Ensure drainages and water bodies within the construction zones are kept free of obstructions.
(iii) Keep loose soil material and stockpiles out of drains, flow-lines and watercourses.
(iv) Avoid stockpiling of excavated and construction materials (sand, gravel, cement, etc.) unless covered by tarpaulins or plastic sheets.
(v) Re-use/utilize, to maximum extent possible, excavated materials.
(vi) Dispose any residuals at identified disposal site (PIU/PMSC will identify approved sites).
(vii) Dispose waste oil and lubricants generated as per provisions of Hazardous Waste (Management and Handling) Rules, 1989.
(viii) Develop a spill prevention and containment plan, educate workers about the plan, and have the necessary materials on site prior to and during construction.
(ix) Refuel equipment within the designated refuelling containment area away from drainages, nallahs, or any water body.
(x) Inspect all vehicles daily for fluid leaks before leaving the vehicle staging area, and repair any leaks before the vehicle resumes operation.

97. **Impacts on Air Quality**. There is potential for increased dust particularly during summer/dry season due to stockpiling of excavated materials. Emissions from vehicles transporting workers, construction materials and debris/materials to be disposed may cause increased in air pollutants within the construction zone. These are inherent impacts which are site-specific, low magnitude, short in duration and can be easily mitigated. The contractor will be required to:

(i) Conduct regular water spraying on earth piles, trenches and sand piles.
(ii) Conduct regular visual inspection along alignments and construction zones to ensure no excessive dust emissions.
(iii) Spreading crushed gravel over backfilled surfaces if re-surfacing of disturbed areas cannot be done immediately.
(iv) Maintain construction vehicles and obtain “pollution under control” certificate from TNSPCB.
(v) Obtain consent for establishment (CFE) and consent for operation (CFO) for hot mix plants, crushers, diesel generators, etc., if to be used in the project.

98. **Noise and Vibration Impacts**. Noise and vibration-emitting construction activities include earthworks, rock crushing, concrete mixing, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise and vibration impacts will be high in areas where noise-sensitive institutions such as health care and educational facilities are situated. These impacts will be temporary, short-term, intermittent, and

expected to be in the range of 80 to 100 dB(A) as per Table 4 (typical noise levels of principal construction equipment).

Table 4: Typical Noise Levels of Principal Construction Equipment

Clearing		**Structure Construction**	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
EXCAVATION and EARTH MOVING		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
GRADING AND COMPACTING		LANPMSCAPING AND CLEAN-UP	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
PAVING		Front end loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Source: U.S. Environmental Protection Agency. Noise from Construction Equipment and Operations. Building Equipment and Home Appliances. NJID. 300.1. December 31. 1971

99. The contractor will be required to:

(i) Limit construction activities in temple complexes and other important sites to daytime only.
(ii) Plan activities in consultation with the PIU/PMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance.
(iii) Minimize noise from construction equipment by using vehicle silencers and fitting jackhammers with noise-reducing mufflers.
(iv) Avoid loud random noise from sirens, air compression, etc.
(v) Require drivers that horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach.
(vi) If specific noise complaints are received during construction, the contractor may be required to implement one or more of the following noise mitigation measures, as directed by the project manager:
(vii) Locate stationary construction equipment as far from nearby noise-sensitive properties as possible.
(viii) Shut off idling equipment.
(ix) Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
(x) Notify nearby residents whenever extremely noisy work will be occurring.

(xi) Follow Noise Pollution (Regulation and Control) Rules, day time ambient noise levels should not exceed 65 dB(A) in commercial areas, 55 dB(A) in residential areas, and 50 dB(A) in silence zone.[2]
(xii) Ensure vehicles comply with Government of India noise limits for vehicles. The test method to be followed shall be IS:3028-1998.

100. **Impacts on Flora and Fauna**. As per preliminary design, tree-cutting is not required. This will be reassessed during detailed design phase. There are no protected areas in the direct and indirect impact zones and no diverse ecological biodiversity is found within project area. Therefore, no mitigation measures are required from construction works. To safeguard the interest of this facility and because of its recreation value for the tourists, it is proposed to take adequate noise and sound insulation features in the proposed building to prevent the internal noise from reaching outside and causing any disturbance. This is also recommended to prevent disturbance to resident visitors at the adjoining hotel and guest house accommodation. In general, the contractor will be required to:

(i) Conduct site induction and environmental awareness.
(ii) Limit activities within the work area.
(iii) Replant trees in the area using minimum ratio of 2 new trees for every 1 tree cut, if any. Replacement species must be approved by District Forest Department.
(iv) Provide sound barriers towards the Aviary site and restrict noisy activities in day time only and use silencers/mufflers in noise producing equipment.
(v) Impacts on Physical and Cultural Resources. There may be inconvenience to tourists, residents, businesses, and other road users due to construction activities in the temple complexes and slower flow of traffic in areas with narrow roads. This potential impact is site-specific, short-term and can be mitigated. The contractor will be required to:
(vi) Ensure no damage to structures/properties near construction zone.
(vii) Provide walkways and metal sheets where required to maintain access of people and vehicles.
(viii) Provide sign boards to inform nature and duration of construction works and contact numbers for concerns/complaints.
(ix) Increase the workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
(x) Implement good housekeeping. Remove wastes immediately. Prohibit stockpiling of materials that may obstruct/slow down pedestrians and/or vehicle movement.
(xi) Ensure workers will not use nearby/adjacent areas as toilet facility.
(xii) Coordinate with PMSC for transportation routes and schedule. Schedule transport and hauling activities during non-peak hours. Communicate road detours via visible boards, advertising, pamphlets, etc.
(xiii) Ensure heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites.
(xiv) Provide instructions on event of chance finds for archaeological and/or ethno-botanical resources. Works must be stopped immediately until such time chance finds are cleared by experts.

101. **Impact due to Waste Generation**. Demolished structures will be reused to the maximum

[2] Day time shall mean from 6.00 am to 10.00 pm. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by TNSPCB. Mixed categories of areas may be declared as one of the above-mentioned categories by TNSPCB.

extent possible. Construction activities will produce excess excavated soils, excess construction materials, and solid wastes (such as removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items). These impacts are negative but short-term and reversible by mitigation measures. The contractor will need to adopt the following mitigation measures:

(i) Prepare and implement a waste management plan.
(ii) Manage solid waste according to the following hierarchy: reuse, recycling and disposal. Include in waste management plan designated/approved disposal areas.
(iii) Coordinate with Municipal Authorities for beneficial uses of excavated soils/silts/sediments or immediately dispose to designated areas.
(iv) Recover used oil and lubricants and reuse; or remove from the sites.
(v) Avoid stockpiling and remove immediately all excavated soils, excess construction materials, and solid waste (removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items).
(vi) Prohibit disposal of any material or wastes (including human waste) into drainage, nallah, or watercourse.

102. Impacts on Occupational Health and Safety. Residential accommodation for workers is not proposed. Workers need to be mindful of occupational hazards which can arise from excavation works in high-traffic and busy areas. Exposure to work-related chemical, physical, biological and social hazard is typically intermittent and of short duration, but is likely to reoccur. Potential impacts are negative and long-term but reversible by mitigation measures. Overall, the contractor should comply with IFC Environmental, Health and Safety (EHS) Guidelines on Occupational Health and Safety (this can be downloaded from (http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES). The contractor will be required to:

(i) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
(ii) Develop comprehensive site-specific health and safety (H&S) plan. The overall objective is to provide guidance to contractors on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project.
(iii) Include in H&S plan measures such as: (i) type of hazards during excavation works; (ii) corresponding personal protective equipment for each identified hazard; (iii) H&S training for all site personnel; (iv) procedures to be followed for all site activities; and (v) documentation of work-related accidents.
(iv) Provide H&S orientation training to all new workers to ensure that they are apprised of the rules of work at the site, personal protective protection, and preventing injury to fellow workers.
(v) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site as well as at construction camps.
(vi) Provide medical insurance coverage for workers.
(vii) Secure construction zone from unauthorized intrusion and accident risks.
(viii) Provide supplies of potable drinking water.
(ix) Provide clean eating areas where workers are not exposed to hazardous or noxious substances.

(x) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted.
(xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas.
(xii) Ensure moving equipment is outfitted with audible back-up alarms.
(xiii) Mark and provide sign boards in the construction zone, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.

103. **Impacts on Socio-Economic Activities**. Manpower will be required during the 18 months construction phase. This can help generate contractual employment and increase in local revenue. Thus, potential impact is positive and long-term. As per preliminary design, land acquisition and closure of roads are not required. However, construction activities may impede access of residents and customers to shops. The potential impacts are negative and moderate but short-term and temporary. The contractor will need to adopt the following mitigation measures:

(i) Leave space for access between mounds of soil.
(ii) Provide walkways and metal sheets where required to maintain access to shops/businesses along trenches.
(iii) Consult businesses and institutions regarding operating hours and factoring this in to work schedules.
(iv) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.
(v) Employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available.

104. **Summary of Mitigation Measures during Construction**. Table 5 provides summary of mitigation measures to be considered by the contractor during construction phase. The detailed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related implementation arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators are provided in the EMP.

Table 5: Summary of Mitigation Measures during Construction Phase

Potential Impact	Mitigation Measures
Erosion hazards	• Save topsoil removed during excavation and use to reclaim disturbed areas, as soon as it is possible to do so. • Use dust abatement such as water spraying to minimize windblown erosion. • Provide temporary stabilization of disturbed/excavated areas that are not actively under construction. • Apply erosion controls (e.g., silt traps) along the drainage leading to the water bodies. • Maintain vegetative cover within road right-of-ways (ROWs) to prevent erosion and periodically monitor ROWs to assess erosion. • Clean and maintain catch basins, drainage ditches, and culverts regularly. • Conduct routine site inspections to assess the effectiveness of and the maintenance requirements for erosion and sediment control systems.
Impacts on water quality	• Schedule civil works during non-monsoon season, to the maximum extent possible.

Potential Impact	Mitigation Measures
	• Ensure drainages and water bodies within the construction zones are kept free of obstructions. • Keep loose soil material and stockpiles out of drains, flow-lines and watercourses. • Avoid stockpiling of excavated and construction materials (sand, gravel, cement, etc.) unless covered by tarpaulins or plastic sheets. • Re-use/utilize, to maximum extent possible, excavated materials. • Dispose any residuals at identified disposal site (PIU/PMSC will identify approved sites). • Dispose waste oil and lubricants generated as per provisions of Hazardous Waste (Management and Handling) Rules, 1989. • Develop a spill prevention and containment plan, educate workers about the plan, and have the necessary materials on site prior to and during construction. • Refuel equipment within the designated refuelling containment area away from drainages, nallahs, or any water body. • Inspect all vehicles daily for fluid leaks before leaving the vehicle staging area, and repair any leaks before the vehicle resumes operation.
Impacts on air quality	• Conduct regular water spraying on earth piles, trenches and sand piles. • Conduct regular visual inspection along alignments and construction zones to ensure no excessive dust emissions. • Spreading crushed gravel over backfilled surfaces if re-surfacing of disturbed ROWs cannot be done immediately. • Maintain construction vehicles and obtain “pollution under control” certificate from TNSPCB. • Obtain CFE and CFO for hot mix plants, crushers, diesel generators, etc., if to be used in the project.
Noise and vibrations impacts	• Limit construction activities in temple complexes and other important sites to daytime only. • Plan activities in consultation with the PIU/PMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. • Minimize noise from construction equipment by using vehicle silencers and fitting jackhammers with noise-reducing mufflers. • Avoid loud random noise from sirens, air compression, etc. • Require drivers that horns not be used unless it is necessary to warn other road users or animals of the vehicle’s approach. • If specific noise complaints are received during construction, the contractor may be required to implement one or more of the following noise mitigation measures, as directed by the project manager: (i) locate stationary construction equipment as far from nearby noise-sensitive properties as possible; (ii) shut off idling equipment; (iii) reschedule construction operations to avoid periods of noise annoyance identified in the complaint; and/or (iv) notify nearby residents whenever extremely noisy work will be occurring. • Follow Noise Pollution (Regulation and Control) Rules, day time ambient noise levels should not exceed 65 dB(A) in commercial areas, 55 dB(A) in residential areas, and 50 dB(A) in silence zone.3 • Ensure vehicles comply with Government of India noise limits for vehicles. The test method to be followed shall be IS:3028-1998.

[3] Day time shall mean from 6.00 am to 10.00 pm. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by BSPCB. Mixed categories of areas may be declared as one of the above mentioned categories by BSPCB.

Potential Impact	Mitigation Measures
	• Provide sound barriers towards the Aviary site and restrict noisy activities in day time only
Impacts on flora and fauna	• Conduct site induction and environmental awareness. • Limit activities within the work area. • Replant trees in the area using minimum ratio of 2 new trees for every 1 tree cut, if any. Replacement species must be approved by District Forest Department • Provide sound barriers towards the Aviary site and restrict noisy activities in day time only and use silencers/mufflers in noise producing equipment.
Impacts on physical resources	• Ensure no damage to structures/properties near construction zone. • Provide walkways and metal sheets where required to maintain access of people and vehicles. • Provide sign boards to inform nature and duration of construction works and contact numbers for concerns/complaints. • Increase the workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; • Implement good housekeeping. Remove wastes immediately. Prohibit stockpiling of materials that may obstruct/slow down pedestrians and/or vehicle movement. • Ensure workers will not use nearby/adjacent areas as toilet facility. • Coordinate with PIU/PMSC for transportation routes and schedule. Schedule transport and hauling activities during non-peak hours. Communicate road detours via visible boards, advertising, pamphlets, etc. • Ensure heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. • Provide instructions on event of chance finds for archaeological and/or ethno-botanical resources. Works must be stopped immediately until such time chance finds are cleared by experts.
Impacts on waste generation	• Prepare and implement a waste management plan. Manage solid waste according to the following hierarchy: reuse, recycling and disposal. Include in waste management plan designated/approved disposal areas. • Coordinate with Municipal Authorities for beneficial uses of excavated soils/silts/sediments or immediately dispose to designated areas. • Recover used oil and lubricants and reuse; or remove from the sites. • Avoid stockpiling and remove immediately all excavated soils, excess construction materials, and solid waste (removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items). • Prohibit disposal of any material or wastes (including human waste) into drainage, nallah, or watercourse.
Impacts on occupational health and safety	• Comply with IFC EHS Guidelines on Occupational Health and Safety • Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Develop comprehensive site-specific health and safety (H&S) plan. The overall objective is to provide guidance to contractors on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project. • Include in H&S plan measures such as: (i) type of hazards during excavation works; (ii) corresponding personal protective equipment for each identified hazard; (iii) H&S training for all site personnel; (iv) procedures to be followed for all site activities; and (v) documentation of work-related accidents.

Potential Impact	Mitigation Measures
	• Provide H&S orientation training to all new workers to ensure that they are apprised of the rules of work at the site, personal protective protection, and preventing injury to fellow workers. • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site as well as at construction camps. • Provide medical insurance coverage for workers. • Secure construction zone from unauthorized intrusion and accident risks. • Provide supplies of potable drinking water. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances. • Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted. • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas. • Ensure moving equipment is outfitted with audible back-up alarms. • Mark and provide sign boards in the construction zone, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.
Impacts on socio-economic activities	• Leave space for access between mounds of soil. • Provide walkways and metal sheets where required to maintain access to shops/businesses along trenches. • Consult businesses and institutions regarding operating hours and factoring this in to work schedules. • Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. • Employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available. • “Mobility Plan” has to be chalked out in consultation with the District Administration prior to start of work.

105. The construction related impacts due to proposed subproject components are generic to construction activities, and are typical of building and other construction projects. The potential impacts that are associated with construction activities can be mitigated to standard levels without difficulty through incorporation or application of the recommended mitigation measures and procedures.

D. Post-Construction Impacts and Mitigation Measures

106. Site clean-up is necessary after construction activities. The contractor will be required to:

(i) Backfill any excavation and trenches, preferably with excess excavation material generated during the construction phase.
(ii) Use removed topsoil to reclaim disturbed areas.
(iii) Re-establish the original grade and drainage pattern to the extent practicable.
(iv) Stabilize all areas of disturbed vegetation using weed-free native shrubs, grasses, and trees.
(v) Restore access roads, staging areas, and temporary work areas.
(vi) Restore roadside vegetation.

(vii) Remove all tools, equipment, barricades, signs, surplus materials, debris, and rubbish. Demolish buildings/structures not required for O&M. Dispose in designated disposal sites.
(viii) Monitor success of re-vegetation and tree re-planting. Replace all plants determined to be in an unhealthy condition.
(ix) Request in writing from PIU/PMSC that construction zones have been restored.

E. Anticipated Operations and Maintenance Impacts and Mitigation Measures

107. Impacts on environmental conditions associated with the operations and maintenance (O&M) of the subproject components pertain to impacts related to increased tourists in the areas resulting to increased vehicular movement along the roads, increased demands for services, and increased solid waste generation. These impacts can be mitigated by:

(i) Increased vehicular movement along the roads - speed restrictions, provision of appropriate road signage and well-located rest points for pedestrians shall minimize impacts on safety of the people.
(ii) Increase demands for services – addressed through the subproject design.
(iii) Increase solid waste generation – Municipal Corporation to put in place solid waste management programs.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. ADB Disclosure Policy

108. Public consultation[4] was undertaken as per ADB SPS requirements. All the five principles of information dissemination, information solicitation, integration, coordination and engagement into dialogue were incorporated during the task. A framework of different environmental impacts likely from the project was prepared based on opinions of all those consulted, especially at the micro level, by setting up dialogues with the local people and fishermen from whom information on site facts and prevailing conditions were collected.

109. As per ADB safeguard requirement, public consultation is to be carried out before and after impact identification. Public consultation was therefore carried out twice, once at the time of start of work with the key stakeholders particularly with wild life authorities and NGOs, and secondly to discuss mitigating measures and get concurrence of stakeholders.

B. Process for Consultation Followed

110. During project preparation, consultations have been held with the Museum staffs, TN Department of Tourism and culture, tourists of and District administration, District Municipal Administration, local community representatives, tourism officers, and tourist guides/photographers regarding issues pertaining to the selection of subprojects and identification of key issues including addressing the current gaps in provision of basic services and improvement of tourist infrastructure. Records of the consultations are provided in Appendix 1.

[4] Meaningful consultation will: (i) be carried out on an ongoing basis throughout the project cycle; (ii) involve timely disclosure of relevant information. Affected peoples and stakeholders will have access to relevant project information prior to any decision-making that will affect them; (iii) be conducted free of intimidation or coercion; and (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups.

C. Plan for Continued Public Participation

111. To ensure continued public participation, provisions to ensure regular and continued stakeholder participation, at all stages during the project design and implementation is proposed. A grievance redressal committee will be set up within the PIU to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the subproject locations, an extensive project awareness campaigns will be carried out.

112. The implementing agency will submit to ADB the following documents for disclosure on ADB's website: (i) The final IEE; (ii) A new or updated IEE and corrective action plan prepared during project implementation, if any; and (iii) the environmental monitoring reports.

113. For the benefit of the community the Summary IEE will be translated in the local language (Tamil) and made available at: (i) Office of the PMU; and, (ii) Office of the District Collectors at the Chennai, Chennai district. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the PMU/PIU as well as the district library at Museum, Chennaim District, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the PMU/PIU, on a written request and payment for the same to the Project Director. Electronic version of the IEE will be placed in the official website of the Tourism Department and the website of ADB after approval of the documents by Government and ADB. The PMU will issue Notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates, etc. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public.

114. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness.

VII. GRIEVANCE REDRESS MECHANISM

115. The executing agency will establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance. The project-specific grievance redress mechanism (GRM) is not intended to bypass the government's own redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people and is scaled to the risks and impacts of the Project.

116. The PMU and PIUs will make the public aware of the GRM through public awareness campaigns. Grievances can be filed in writing using the Complaint Register and Complaint Forms (Appendix 5) or by phone with any member of the PMU or PIU. The contact phone number of the PIUs and the PMU will serve as a hotline for complaints and will be publicized through the media and placed on notice boards outside their offices and at construction sites. The safeguard documents made available to the public in an accessible version will include information on the GRM and will be widely disseminated throughout the corridor by the safeguards officers in the

PMU and PIUs with support from the NGO engaged to implement the Community Awareness Program.

117. The PIUs will convene Grievance Redress Committees (GRC) within one week of the voiced grievance at the project level consisting of members of local government, NGOs, project staff, and representatives of the affected people. Decisions on the grievance are to be made within 15 days voiced grievances. If the grievance cannot be solved, the PMU is notified to further advice on the situation with higher government and legal bodies.

118. The GRC will ensure rights of vulnerable and poor are included. The grievance mechanism will be scaled to the risks and adverse impacts of the Project. It will address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. The mechanism developed will be in a manner that it shall not impede access to the existing judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

119. The PMU officers will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued, and the decisions carried out. All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the PMU.

120. The safeguard monitoring reports will include the following aspects pertaining to progress on grievances:

(i) Number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and
(ii) Lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, Date of hearing, decisions, remarks, actions taken to resolve issues, and status of Grievance (i.e., open, closed, pending).

121. The affected person/aggrieved party can give their grievance verbally or in written to the local grievances committee. Grievances of affected person will first be brought to the attention of the PIU who can resolve the issue at site level. If the matter is not solved within 7 days period by the PIU, it will be brought to the GRC constituted for the purpose in PIU. This GRC shall discuss the issue in its monthly meeting and resolve the issues within one month of time after receiving the grievance. If the matter is not resolved by GRC at PIU level within stipulated time, it shall be referred to GRC at PMU level by Executive Engineer of PIU.

122. GRC at PMU shall discuss the issue and try to resolve it and inform the PIU accordingly. If the matter is not resolved by the GRC at PMU level within one month of time, the aggrieved person/party can bring the matter to The Court of Law. The PIU shall keep records of all grievances received including contact details of complainant, date of receiving the complaint, nature of grievance, agreed corrective actions and the date these were affected and final outcome. The grievance redress process is shown below.

A. Composition and Functions of Grievance Redress Committee

123. Local Grievance Committee (LGC). In this LGC has worked with NGO, SHG, Line Agency, Special invitee.

124. GRC at PIU. In each PIU there shall be one GRC, which will include Project Manager (PIU), District Tourist Officer of Department of Tourism of Government. of Tamil Nadu, Community Development Officer of PIU, nominated representative of District Magistrate and nominated representative committee shall be headed by Project Manager (PIU). The committee will meet at least once in every month. Agenda of meeting shall be circulated to all the members and affected persons/aggrieved party along with venue, date and time; informed in written at least 7 days in advance of meeting. The matters shall remain with GRC at PIU level for one month and if grievance is not resolved within this time period, the matter shall be referred to GRC at PMU.

125. GRC within Environmental and Social Management Cell (ESMC) at PMU. There shall be one GRC in PMU. The matters not resolved by the GRC at PIU level within one month shall come under GRC at PMU. GRC at PMU will include Community Development Expert of PMU, Safeguard Specialist of PMU and Additional Project Director (APD) of PMU. The Committee shall be headed by APD of PMU. This committee shall look the matters, which are referred to and not resolved by GRC at PIU level. If the matter is not resolved by the GRC at PMU level within one month of time, the aggrieved person/party can bring the matter to The Executive Committee/State Level Empowered Committee (SLEC). Sample Grievance Redress Form is attached as Appendix 6.

B. Approach to Grievance Redress Committee

126. Affected person/aggrieved party can approach to GRC for redress of his/their grievances through any of the following modes:

(i) **Web based:** A separate corner will be developed at the program website so that public / community/ affected person can register their complaint in the online column.

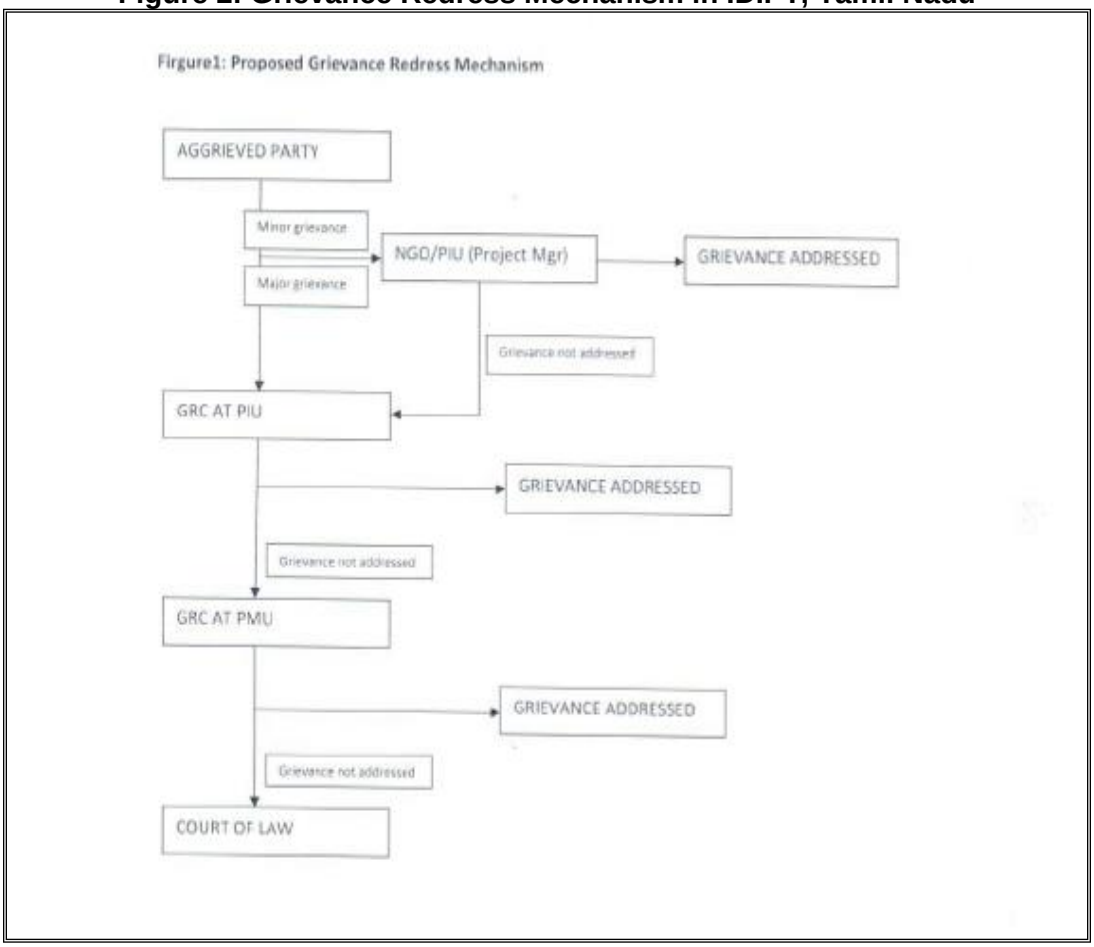
(ii) **Telecom based:** A toll free no. Will be issued by the PMU/ PIU so that general public can register their complaint through telephone / mobile phone to the PIU/PMU office.

C. Accountability Mechanism

127. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[5]

[5] Accountability Mechanism. http://www.adb.org/Accountability-Mechanism/default.asp.

Figure 2: Grievance Redress Mechanism in IDIPT, Tamil Nadu



Note: LGC -NGO, SHG, Line Agency, Representative of Gram Panchayat, Special invitee GRC – PM, CDO, Engineer, DFO, DTO, SDM GRC in Environment and Social Management Cell (ESMC) –PMU (APD, SS, CDS, FS), PMSC (EE, CDE)

VIII. ENVIRONMENTAL MANAGEMENT PLAN

128. The purpose of the environmental management plan (EMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with (Table 5).

129. A copy of the EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

130. The contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring

reports that PMU and PIU will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

A. Responsibilities for Environmental Management Plan Implementation

131. The following agencies will be responsible for EMP Implementation:

(i) Department of Tourism & Culture, Government of Tamil Nadu is the executing agency responsible for overall management, coordination, and execution of all activities funded under the loan;
(ii) PIU, Chennai will be the Implementing Agency (IA) responsible for coordinating procurement and construction of the project. PIU through its Project Management Unit (PMU) at Chennai will be implementing the project;
(iii) The Project Management and Supervision Consultant (PMSC) assists PMU in managing the project including procurement and assures technical quality of design and construction;
(iv) The Project Management and Supervision Consultant (PMSC) will prepare the DPR of the project and will carry out construction supervision during project implementation. Their responsibility will also include EMP implementation supervision;
(v) A Project Implementation Unit (PIU) shall be established in Chennai. This PIU will look into progress and coordination of day to day construction works with the assistance of PMSC; and
(vi) The contractor will be responsible for execution of all construction works. The contractor will work under the guidance of the PIU Chennai and PMSC. The environmental related mitigation measures will also be implemented by the contractor.

132. The contractor's conformity with contract procedures and specifications during construction will be carefully monitored by the PIU. Safeguard Specialists are deputed in PMU, and PMSC who will monitor the environmental performance of contractors. Terms of References of Safeguards Specialists are given in boxes below:

Box 1: Terms of Reference of Safeguards Specialist – PMU
• Review the IEE document and ensure adequacy under Safeguard Policy Statement, 2009 and identify any areas for improvement. • Ensure that the project design and specification adequately reflect the IEE, co-ordinate the obtaining of requisite environmental clearances for the project • Monitor construction activities to ensure that identified and appropriate control measures are effective and in compliance with the IEE and advise PIU for compliance with statutory requirements. • Develop training programme for the PMU/PIUs staff, the contractors and others involved in the project implementation, in collaboration with the Environmental Specialist of the PMSC • Review and approve the Contractor's Implementation Plan for the environmental measures, as per IEE. • Liaise with the Contractors and Consultants on the implementation of the Environmental management measures proposed in the IEE

Box 1: Terms of Reference of Safeguards Specialist – PMU

- Liaise with the various Government agencies on environmental and other regulatory matters
- Continuously interact with the NGOs and Community groups to be involved in the project
- Establish dialogue with the affected communities and ensure that the environmental concerns and suggestions are incorporated and implemented in the project.
- Review the environmental performance of the project through an assessment of the periodic environmental monitoring reports submitted by the PMSC; provide a summary of the same to the Project Director, and initiate necessary follow-up actions
- Provide support and assistance to the Government Agencies and the Asian Development Bank to supervise the implementation of the IEE during the construction as well as operation stage of the project
- Document the good practices in the project on incorporation and integration of environmental issues into engineering design and on implementing measures in the construction, and dissemination of the same

Box 2: Terms of Reference of Safeguards Specialist (Environment) of PMSC

- Review the IEE document and ensure adequacy under ADB SPS, 2009.
- Interact on a regular basis with the sector specialists of the PMSC and integrate environmentally sound practices into the detailed design of project components.
- Advise PMU/PIU for compliance with statutory clearances.
- Work out the site specific mitigation measures for components as required and integrate the same into contractual provisions.
- Develop, organize and deliver environmental training programmes and workshops for the staff of the PIU and Contractors and in accordance to the Capacity Building Programme as specified in the IEE.
- Preparation of Activity Plans as identified in IEE (these include Site Management Plans, Waste Management Plans, Sludge Management and Disposal Plans, Occupational Safety Plans etc.).
- Supervise the implementation of the Environmental provisions by the Contractors.
- Review and approve site specific environmental enhancement/mitigation designs worked out by the Contractor. Hold regular consultation meetings with the Environmental specialist of the PMU
- Review the Contractors' Environmental Implementation Plans to ensure compliance with the IEE.
- Develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE.
- Prepare and submit regular environmental monitoring and implementation progress reports.
- Assist Environmental Specialist of the PMU to prepare good practice dissemination notes based on the experience gained from site supervision.

Box 3: Terms of Reference of Safeguards Specialist (Environment) of PMSC

Support and Advice the PMU and Consultants team in-

- Best Environmental Practices for responding to environmental issues involved with implementation of the projects on a sustainable basis
- Assistance and advice on institutional strengthening and capacity building at the PMU and PIU levels in regards to environmental practices.

Box 3: Terms of Reference of Safeguards Specialist (Environment) of PMSC
• Ensure that baseline surveys, environmental monitoring plans and programs, initial environmental examinations (IEE) as may be required are carried out. • Preparation of ADB procedure compliant environmental safeguard actions including impact assessment if any during the design stage • Management plan and mitigation measures • Oversight of implementation of environmental standards and safeguards as part of project implementation • Participate in preparation of Master Plan for additional sites and contribute to the environmental safeguards to the plan and sub components • Preparation of performance monitoring reports

133. Responsibility for updating IEE during detailed design. PMSC will be responsible for preparation of IEE and updating it time to time, when required during detailed design and implementation phase.

134. Responsibility for monitoring. During construction, PMSC's Environmental Specialist and the designated representative engineer of the PIU will monitor the contractor's environmental performance on day to day basis while PMSC expert will randomly monitor the performance for corrective measures if required. During the operation phase, monitoring will be the responsibility of the Municipal Authority and Department of Tourism.

135. Responsibility for Reporting. PIU in coordination with PMSC will submit monthly, quarterly and semi-annually monitoring report to PMU. On the basis of it PMU will submit to ADB semi-annual monitoring reports on implementation of the EMP and will permit ADB to field environmental review missions which will review in detail the environmental aspects of the project. Any major accidents having serious environmental consequences will be reported immediately. PMSC environmental expert will help in preparation and finalization of quarterly, semi-annual and annual progress reports. The sample environmental monitoring template is attached as Appendix 4.

B. Environmental Management Plan Tables

136. Tables 6 to 8 show the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and cost of implementation. This EMP will be included in the bid documents and will be further reviewed and updated during implementation.

Table 6: Pre-Construction Environmental Management Plan Table

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
Consents, permits, clearances, no objection certificate (NOC), etc.	Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works.	Consents, permits, clearance, NOCs, etc.	Project Management Unit (PMU)	Executing agency to report to ADB in environmental monitoring report (EMR)	check consent for establishments (CFEs), permits, clearance, prior to start of civil works	PMU
	Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc.	Records and communications	PMU	Executing agency to report to ADB in EMR	Acknowledge upon receipt Send report as specified in CFE, permits, etc.	PMU
	Include in detailed design drawings and documents all conditions and provisions if necessary	Detailed design documents and drawings	Contractor	PMU and PMSC PIU and Project Management and Supervision Consultant	Upon submission by contractor	Contractor
Establishment of baseline environmental conditions prior to start of civil works	Conduct documentation of location of components, areas for construction zone (camps, staging, storage, stockpiling, etc.) and surroundings (within direct impact zones). Include photos and GPS coordinates	Records	Contractor	PMU PIU and PMSC	to be included in updated Initial Environmental Examination (IEE) report	PMU
Erosion control	Develop an erosion control and re-vegetation plan to minimize soil loss and reduce sedimentation to protect water quality.	Erosion control and re-vegetation plan covering construction phase	Contractor	PMU, PIU and PMSC	to be included in updated IEE report	Contractor

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
	Minimize the potential for erosion by balancing cuts and fills to the extent feasible. Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure). Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize vegetation removal. Stage construction to limit the exposed area at any one time. Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize vegetation removal. Stage construction to limit the exposed area at any one time.					
Utilities	Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase. Require contractors to prepare a contingency plan to include	List and maps showing utilities to be shifted Contingency plan for services disruption	- PMSC to prepare preliminary list and maps of utilities to be shifted - During detailed design phase, contractor to (i)	PMU and PMSC PIU and PMSC	to be included in updated IEE report	PMSC – preliminary design stage Contractor – implementation stage

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
	actions to be done in case of unintentional interruption of services. Obtain from the PIU and/or PMSC the list of affected utilities and operators; If relocations are necessary, contractor will coordinate with the providers to relocate the utility.		prepare list and operators of utilities to be shifted; (ii) contingency plan			
Social and Cultural Resources	Consult Archaeological Survey of India (ASI) or TN State Archaeology Department to obtain an expert assessment of the archaeological potential of the site. Consider alternatives if the site is found to be of medium or high risk. Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available. Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.	Chance find protocol	- PMSC to consult ASI or TN State Archaeology Department - PMSC to develop protocol for chance finds	PMU	to be included in updated IEE report	PMSC

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
Sites for construction work camps, areas for stockpile, storage and disposal	Will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems, etc. Residential areas will not be considered so as 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). Disposal will not be allowed near sensitive areas which will inconvenience the community. The construction camp, storage of fuel and lubricants should be avoided at the river bank. The construction camp site for intake well should be finalized in consultation with PMSC and PIU.	List of pre-approved sites for construction work camps, areas for stockpile, storage and disposal Waste management plan	- PMSC to prepare list of potential sites PMSC to inspect sites proposed by contractor if not included in pre-approved sites	PMU PIU	to be included in updated IEE report	Contractor
Sources of construction materials	Use quarry sites and sources permitted by government. Verify suitability of all material sources and obtain approval from PIU. If additional quarries are required after construction has started, obtain written approval from PIU.	Permits issued to quarries/sources of materials	Contractor PMSC and PMSC to verify sources (including permits) if additional is requested by contractor	PMU PIU	Upon submission by contractor	Contractor

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
	Submit to PMSC on a monthly basis documentation of sources of materials.					
Access	Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. Schedule transport and hauling activities during non-peak hours. Locate entry and exit points in areas where there is low potential for traffic congestion. Keep the site free from all unnecessary obstructions. Drive vehicles in a considerate manner. Coordinate with the Traffic Police Department for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours. Notify affected sensitive receptors by providing sign boards with information about the nature and duration of construction works and contact numbers for concerns/complaints. Provide free access to households along the alignments of raw and clear	Traffic management plan	Contractor	PIU and PMSC	to be included in updated IEE report	Contractor

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
	water transmission routes during the construction phase.					
Occupational health and safety	Comply with IFC EHS Guidelines on Occupational Health and Safety Develop comprehensive site-specific health and safety (H&S) plan. The overall objective is to provide guidance to contractors on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project. Include in H&S plan measures such as: (i) type of hazards in the intake wells site; (ii) corresponding personal protective equipment for each identified hazard; (iii) H&S training for all site personnel; (iv) procedures to be followed for all site activities; and (v) documentation of work-related accidents. Provide medical insurance coverage for workers.	Health and safety (H&S) plan	Contractor	PMU and PMSC PIU and PMSC	to be included in updated IEE report	Contractor
Public consultations	Continue information dissemination, consultations, and involvement/participation of stakeholders during project implementation.	- Disclosure records - Consultations	PMU and PMSC PIU and PMSC Temple administrators Contractor	PMU and PMSC	- During updating of IEE Report - During preparation of	PMU Contractor to allocate funds to support

Parameters	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds to Implement Mitigation Measures
					site- and activity-specific plans as per EMP - Prior to start of construction - During construction	

Table 7: Environment Management Plan for Construction Phase

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
Erosion hazards	• Save topsoil removed during excavation and use to reclaim disturbed areas, as soon as it is possible to do so. • Use dust abatement such as water spraying to minimize windblown erosion. • Provide temporary stabilization of disturbed/excavated areas that are not actively under construction. • Apply erosion controls (e.g., silt traps) along the drainage leading to the water bodies. • Maintain vegetative cover within road ROWs to prevent erosion and periodically monitor ROWs to assess erosion. • Clean and maintain catch basins, drainage ditches, and culverts regularly.	Erosion control and re-vegetation plan	Contractor	PIU and PMSC PIU to submit EMP monitoring report to PMU	- daily visual inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent during monsoon season and if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	Contractor

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	• Conduct routine site inspections to assess the effectiveness of and the maintenance requirements for erosion and sediment control systems.					
Impacts on water quality	• Schedule construction activities during non-monsoon season, to the maximum extent possible.	Work schedule	Contractor	PIU and PMSC PIU to submit EMP monitoring report to PMU	- daily inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent during monsoon season and if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	
	• Ensure drainages and water bodies within the construction zones are kept free of obstructions.	Visual inspection				
	• Keep loose soil material and stockpiles out of drains and flow-lines.	Visual inspection				
	• Avoid stockpiling of excavated and construction materials (sand, gravel, cement, etc.) unless covered by tarpaulins or plastic sheets.	Visual inspection				
	• Re-use/utilize, to maximum extent possible, excavated materials.	condition in waste management plan				
	• Dispose any residuals at identified disposal site (PIU/PMSC will identify approved sites).	condition in waste management plan				
	• Dispose waste oil and lubricants generated as per provisions of Hazardous Waste (Management and Handling) Rules, 1989.	condition in waste management plan				

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	• Refuel equipment within the designated refuelling containment area away from drainages, nallahs, or water body.	condition in list of pre-approved sites for construction work camps, areas for stockpile, storage and disposal				
	• Inspect all vehicles daily for fluid leaks before leaving the vehicle staging area, and repair any leaks before the vehicle resumes operation.	Vehicle inspection report				
Impacts on air quality	• Conduct regular water spraying on stockpiles.	- Visual inspection - No complaints from sensitive receptors - Records	Contractor	PIU and PMSC	- daily inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent during dry season and if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	Contractor
	• Conduct regular visual inspection in the construction zones to ensure no excessive dust emissions.	Visual inspection				
	• Maintain construction vehicles and obtain “pollution under control” certificate from BSPCB.	PUC certificates				
	• Obtain CFE and CFO for hot mix plants, crushers, diesel generators, etc., if to be used in the project.	Consent to establish (CTE) and Consent to operate (CTO)				
	• Limit construction activities in temple complexes and	Work schedule	Contractor		- daily inspection by	Contractors

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
Noise and vibrations impacts	other important areas to daytime only. • Plan activities in consultation with PIU/PMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance.			PIU and PMSC	contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent during noise-generating activities and if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	
	• Minimize noise from construction equipment by using vehicle silencers and fitting jackhammers with noise-reducing mufflers.	Report on ambient noise level monitoring within direct impact zones				
	• Avoid loud random noise from sirens, air compression, etc.	zero incidence				
	• Require drivers that horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach.	feedback from receptors within direct and direct impact zone				
	• If specific noise complaints are received during construction, the contractor may be required to implement one or more of the following noise mitigation measures, as directed by the project manager: • Locate stationary construction equipment as far from nearby noise-sensitive properties, such as the hospital, as possible. • Shut off idling equipment. • Reschedule construction operations to avoid periods of	- Complaints addressed satisfactory - Grievance Redress Mechanicm (GRM) records				

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	noise annoyance identified in the complaint. • Notify nearby residents whenever extremely noisy work will be occurring.					
Impacts on flora and fauna	• Conduct site induction and environmental awareness.	Records	Contractor	PIU and PMSC	- daily inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	Contractor
	• Limit activities within the work area.	Barricades along excavation works				
	• Replant trees in the area using minimum ratio of 2 new trees for every 1 tree cut. Replacement species must be approved by Chief Wildlife Warden of Tamil Nadu State Forest Department. • Provide sound barriers towards existing aviary and restrict noisy activities during day time only.	-Number and species approved by Tamil Nadu State Forest Department -Sound barriers installed towards aviary				
Impacts on physical cultural resources	• Ensure no damage to structures/properties adjacent to construction zone.	- Visual inspection - any impact should be addressed by project resettlement plan	Contractor In coordination with PIU and PMSC for any structures within WTP site and construction zone	PIU and PMSC	- daily inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more	Contractor
	• Provide sign boards to inform nature and duration of construction works and contact numbers for concerns/complaints.	- no complaints received - photo-documentation				

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	• Increase the workforce in WTP components near the hospital and other sensitive receptors.	- Records of workers deployment - Work schedule			frequent if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	
	• Implement good housekeeping. Remove wastes immediately.	- Visual inspection - No stockpiled/ stored wastes				
	• Ensure workers will not use nearby/adjacent areas as toilet facility.	- No complaints received - Sanitation facilities for use of workers				
	• Coordinate with PIU/PMSC for transportation routes and schedule. Schedule transport and hauling activities during non-peak hours. Communicate road detours via visible boards, advertising, pamphlets, etc. • Ensure heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites.	- Approved routes in traffic management plan				
	• Provide instructions on event of chance finds for archaeological and/or ethno-botanical resources. Works must be stopped immediately until such time chance finds are cleared by experts.	condition in chance find protocol				
Impact due to waste generation	• Prepare and implement a waste management plan. Manage solid waste according to the following hierarchy: reuse, recycling and disposal. Include in	condition in waste management plan	Contractor	PIU and PMSC	- daily inspection by contractor supervisor and/or	Contractor

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	waste management plan designated/approved disposal areas. • Coordinate with PIU/PMSC for beneficial uses of excavated soils or immediately dispose to designated areas. • Recover used oil and lubricants and reuse; or remove from the site. • Avoid stockpiling and remove immediately all excavated soils, excess construction materials, and solid waste (removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items). • Prohibit disposal of any material or wastes (including human waste) into drainage, nallah, or watercourse.				environment specialist - weekly visual inspection by PMSC (more frequent if corrective action is required) - random inspection by PMU, PIU, PMSC and/or PMSC	
Impacts on occupational health and safety	• Comply with IFC Environmental, Health and Safety (EHS) Guidelines on Occupational Health and Safety (OHS)	- Visual inspection - Records	Contractor	PIU and PMSC	- daily inspection by contractor supervisor and/or environment specialist - weekly visual inspection by PMSC (more frequent if corrective action is required)	Contractor
	• Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.	- Visual inspection - Work schedule - Noise level monitoring in work area				
	• Provide H&S orientation training to all new workers to ensure that they are apprised of	- Records				

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	the rules of work at the site, personal protective protection, and preventing injury to fellow workers.	- Condition in Health and Safety (H&S) plan			- random inspection by PMU, PIU, PMSC and/or PMSC	
	• Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site as well as at construction camps.	- Visible first aid equipment and medical supplies - Condition in H&S plan				
	• Provide medical insurance coverage for workers.	Records				
	• Secure construction zone from unauthorized intrusion and accident risks.	- Area secured - Trenches barricaded				
	• Provide supplies of potable drinking water.	- Supply of water				
	• Provide clean eating areas where workers are not exposed to hazardous or noxious substances.	- Workers area				
	• Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted.	- Records - Condition in H&S plan				
	• Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas.	- Visual inspection - Condition in H&S plan				
	• Ensure moving equipment is outfitted with audible back-up alarms.	- Construction vehicles				

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
		- Condition in H&S plan				
	• Mark and provide sign boards in the construction zone, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.	- Visible and understandable sign boards in construction zone - H&S plan includes appropriate signs for each hazard present				
Impacts on socio-economic activities	• Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Visible and understandable sign boards in construction zone	Contractor	PIU and PMSC	- daily inspection by contractor supervisor - weekly visual inspection by PMSC (more frequent if corrective action is required) - random inspection by PMU, PIU, PMSC	Contractor
	• Employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available.	Employment records				

Table 8: Environmental Management Plan for Post-Construction Phase

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
Solid waste (debris, excavated soils, etc.)	• Backfill any excavation and trenches, preferably with excess excavation material generated during the construction phase.	Pre-existing condition Construction zone has been restored	Contractor	PIU and PMSC	- visual inspection by contractor supervisor and/or	Contractor

Potential Impact	Mitigation Measures	Parameter/ Indicator of Compliance	Responsible for Implementation	Responsible for Supervision	Frequency of Monitoring	Source of Funds
	• Use removed topsoil to reclaim disturbed areas. • Re-establish the original grade and drainage pattern to the extent practicable. • Stabilize all areas of disturbed vegetation using weed-free native shrubs, grasses, and trees. • Restore access roads, staging areas, and temporary work areas. • Restore roadside vegetation, if removed • Remove all tools, equipment, barricades, signs, surplus materials, debris, and rubbish. Demolish buildings/structures not required for O&M. Dispose in designated disposal sites. • Monitor success of re-vegetation and tree re-planting. Replace all plants determined to be in an unhealthy condition. • Request in writing from PIU/PMSC that construction zones have been restored.			PIU to submit EMP monitoring report to PMU	environment specialist	

Summary of Site- and Activity-Specific Plans as per EMP

137. Table 9 summarizes site and activity specific plans to be prepared as per EMP tables.

Table 9: Site- and Activity-Specific Plans/Programs as per EMP

To be Prepared During	Specific Plan/Program	Purpose	Responsible for Preparation	Responsible for Implementation
Detailed Design Phase	Environmental monitoring program as per detailed design	Indicate sampling locations, methodology and parameters	PMU/PIU and PMSC/PMSC	Contractor
Detailed Design Phase	Erosion control and re-vegetation plan	Mitigate impacts due to erosion	Contractor	Contractor
Detailed Design Phase	List and maps showing utilities to be shifted	Utilities shifting	PMSC during preliminary stage Contractor as per detailed design	Contractor
Detailed Design Phase	Contingency plan	Mitigate impacts due to interruption of services during utilities shifting	Contractor	Contractor
Detailed Design Phase	Chance find protocol	Address archaeological or historical finds	PMU and PMSC	Contractor
Detailed Design Phase	List of pre-approved sites	Location/s for work camps, areas for stockpile, storage and disposal	PIU and PMSC	Contractor
Detailed Design Phase	Waste management plan	Mitigate impacts due to waste generation	Contractor	Contractor
Detailed Design Phase	Traffic management plan	Mitigate impacts due to transport of materials and pipe laying works	Contractor	Contractor
Detailed Design Phase	H&S plan	Occupational health and safety	Contractor	Contractor

C. Environmental Monitoring Plan

138. Through integration of mitigation measures in project design, impacts are mostly insignificant, temporary in nature and can be properly avoided or mitigated by following proposed mitigation measures given in the EMP of this IEE report.

139. Table 10 provides the indicative environmental monitoring program which includes relevant environmental parameters, with a description of the sampling stations, frequency of monitoring, applicable standards, and responsibility. This will be updated during detailed design to ensure EMP and monitoring program is commensurate to the impacts of the subproject.

140. Environmental monitoring will be done during construction in three levels; namely monitoring development of project performance indicators done by the PMSC Environmental Specialist, monitoring implementation of mitigation measures done by the Contractor; and overall regulatory monitoring of the environmental issues done by the PMSC/PMU Environmental Specialist. The monitoring carried out by the contractor through the approved agency will be supervised by the Safeguard Specialist of the Project Management and Supervision Consultant . The Environmental Monitoring Plan for the project is presented in Table 16. The proposed monitoring of all relevant environmental parameters, with a description of the sampling stations, frequency of monitoring, applicable standards and responsible agencies are presented.

Table 10: Environmental Monitoring Plan

	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility
1	Debris /Construction materials disposal	Construction Stage	Safe disposal of construction wastes	Major construction sites	Random checks	Contractor
2	Dust suppression	Construction Stage	No. of tankers for water sprinkling, Timing of sprinkling, Location of sprinkling, Log Book	Major construction sites	Random checks	Contractor
2	Ambient Air Quality	Construction Stage	RPM, SPM, SO2, NOx, CO	Major construction sites	Once in a season (except monsoons) for the entire construction period	Contractor, to be monitored by an agency engaged with approval using and under NABL Accreditation norms
4	Water quality	Construction stage	TDS, TSS, pH, DO, BOD, COD, Faecal Coliform, Ammonia, Nitrogen	Locations to be decided during detailed design	Twice a year (pre-monsoon and post-monsoon) for the entire period of construction	Contractor, to be monitored by an agency engaged with approval using and under NABL Accreditation norms

	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility
5	Noise Levels	Construction and Operation Stage	Equivalent Day and Night Time Noise Levels	All Construction sites	Once in a season during construction stage	Contractor, to monitor through approved Monitoring Agency
6	Supply of PPE	Construction Stage	Provision of PPE on site, adequacy of equipment	All Construction sites	Continuous	Contractor
7	Establishing Medical facilities	Construction Stage	Access to health facilities for the construction workers	All Construction sites	Continuous	Contractor
8	Accident record	Construction Stage	No. of fatal accidents, No. of injuries, No. of disabilities	All construction sites	Continuous	Contractor
9	Post construction clearance of site	Post construction	Whether temporary locations for workers camp, site office, and other construction locations are restored to pre-project conditions	All Construction sites	Post construction	Contractor

D. Capacity Building

114. The Environmental Specialist of the PMSC will provide the basic training required for environmental awareness followed by specific aspects of Infrastructure Improvement Projects along with Environmental implications for projects. Specific modules customized for the available skill set will be devised after assessing the capabilities of the members of the Training Programme and the requirements of the project. The entire training would cover basic principles of environmental assessment and management; mitigation plans and programmes, implementation techniques, monitoring methods and tools. The proposed training program along with the frequency of sessions is presented in Table 10 below. This training program is intended for the entire destination and is not just specific to this package.

Table 11: Training Modules for Environmental Management (common for entire project)

Program	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
A. Pre-Construction Stage					
• Sensitization Workshop	• Introduction to Environment: • Basic Concept of environment • Environmental Regulations and Statutory requirements as per Government. of India and ADB	• Tourism/Forest/Roads/Culture Department Officials, Project Director and Environmental Specialist of the PMU/PIU	• Workshop	• ½ Working Day	• Environmental Specialist of the PMSC and PMU
B. Construction Stage					
• Module 1	• Roles and Responsibilities of officials/contractors/consultants towards protection of environment • Implementation Arrangements	• Engineers and staff of line depts. of GoTN, and PMU/PIU (including the Environmental Specialist)	• Lecture/Interactive Sessions	• ½ Working Day	• Safeguards Specialist of the PMSC and PMU
• Module 2	• Monitoring and Reporting System	• Engineers and staff of implementing agencies and PMU/ PIU (including ES)	• Lecture / Interactive Sessions	• ½ Working Day	• Safeguards Specialist of the PMSC and PMSC

Table 12: Training Modules for Environmental Management

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
A. Pre-Construction Stage					
Sensitization Workshop	Introduction to Environment: Basic Concept of Environmental Regulations, Guidelines, EIA Notification, process and methodology for IEE, EMPs and their use and Statutory requirements as per Government of India and ADB.	Tourism /HR&CE Department Officials, Project Director and Environmental Specialist of the PMU/PIU and PMSC	Lectures cum interaction & Workshop	½ Working Day	Environmental Specialist of the PMSC
Session I					
Module I	Introduction to Environment: Basic Concept of Environment Safeguards Regulations and Statutory	PMU/PIU (including the ES), PMSC and Engineering staff of the	Lecture	1 Working Day	Safeguards Specialist of the PMSC

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
	requirements as per Government of India and ADB guidelines on cultural resources, Environmental considerations in planning, design and implementing projects.	implementing Agencies			
Module II	Environmental components impacted in constructions and operation stages Activities causing pollution during Construction and Operation stages Environmental Management Environmental Provisions Implementation Arrangements Methodology of Assessment Good Engineering Practices to be integrated into Contract Documents.	PMU/PIU/PMSC (including the ES) and Engineering staff of Tourism Dept.	Workshop	¼ Working Day	Safeguards Specialist of the PMSC.
Module III	Implementation of EMPs: Basic features of an EMP, Planning, designing and execution of environmental mitigation and enhancement measures, monitoring and evaluation of environmental conditions – during construction and operation	PMU/PIU (including the ES) Engineering staff of Tourism/HR&CE Dept.	Lecture / Interactive sessions and site visits	2 Working Days	Safeguards Specialist of the PMSC with support from the conservation specialist of the PMSC.
Module IV	Improved co-ordination with other Departments: Statutory permissions – Procedural requirements co-operation and co- ordination with other Departments.	PMU/PIU (including the ES) Engineering staff of Tourism Dept. and PMSC	Lecture / Interactive sessions	1 Working Day	Safeguards Specialist of the PMSC.
Module V	Environmental principles of eco-tourism and training and awareness building	Local community groups, NGOs	Lecture / Interactive sessions	½ Working Day	Institutes such as the Wild Life Institute of India
B. Construction Stage					
Session II					

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
Module VI	Role during Construction Roles and Responsibilities of Officials / Contractors / Consultants towards protection of Environment Implementation Arrangements Monitoring Mechanisms	Engineers and Staff of Line Departments of the Government. of Tamil Nadu and PMU/PIU (including the ES)	Lecture / Interactive sessions	½ Working Day	Safeguards Specialist of the PMSC
Session III					
Module VI	Identification of birds species in Pong Wetland, habits of species, biology, ecology of important species, basic knowledge of reptiles of amphibians and fauna identification of plants, including medicinal plants orientation on wetland ecology, monitoring methods, use of instruments as binoculars, digital camera, GPS, etc.	Staff of Forest Department, Youth in the villages, periphery of the Wetland, and other NGOs in the District.	Site visits, Interactive sessions	5-7 working days	Institutes as the Wild Life Institute of India
Module VII	Skill up gradation on eco-tourism and nature guides dealing with tourists interpretational skills, micro planning, natural resources, management of self-help groups, etc.	Youth in the villages, periphery and other NGOs in the District	Site visits, Interactive sessions	5-7 Working Days	Tourism Department, and Institutes as the Wild Life Institute of India.
Module VIII	Monitoring Environmental Performance during Construction: Air, Water, Soil and Noise, tree survival Monitoring requirement and techniques, Evaluation and Review of results, Performance indicators and their applicability, possible corrective actions, reporting requirements and mechanisms	PIU/ PMSC/NGOs and community representatives	Lectures, Workshop and site visits	4 – 5 Working Days	Safeguards Specialist of the PMSC – During initial stage of Construction

E. Environmental Management Plan Implementation Cost

141. As part of good engineering practices in the project, there have been several measures as safety, signage, dust suppression, procurement of personal protective equipment, provision of drains, etc. and the costs for which will be included in the design costs of specific subprojects. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction are considered in the IEE budget.

142. This is a small construction project and it is not expected to cause much significant air, water and noise pollution. The main EMP cost will arise from monitoring of environmental parameters (air, water and noise) and training.

143. The costs of water sprinkling for dust suppression and providing personal protective equipment's to construction workers shall borne by contractor as part of conditions of contract. In addition, the sources of funds for Mitigation measures during construction stage including monitoring during construction stage are also to be borne by the contractor. These are deemed to be included as part of the contract price amount quoted by the contractor for the works. The costs of components for monitoring in operation stage and the capacity building costs are to be funded by the PMU. The EMP cost is given in the Table 11 below.

Table 13: Indicative Environmental Management Plan Budget

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Source of Fund
A. Monitoring Measures							
1	Air quality monitoring	Detailed design	Per sample	1	10,000	10,000	PMU
2	Noise Levels – silence zones	Detailed design	Per location	1	4,000	4,000	PMU
3	Ambient Air Quality	Construction	Per Sample	4	10,000	40,000	Contractor budget
4	Ambient Noise Quality	Construction	Per Sample	6	4,000	24,000	Contractor budget
Sub- Total (A)						78,000	
B.	Capacity Building – Training cost						
1	Sensitization Workshop	Pre-Construction	L.S			1,50,000	PMU
2	Training Session I	Construction	L.S			1,50,000	PMU
3	Training Session II	Construction	L.S			1,50,000	PMU
Sub -Total (B)						4,50,000	
Total (A+B) (₹)						5,28,000	

IX. FINDINGS AND RECOMMENDATIONS

144. The proposed components as part of the package are in line with the sub-project selection criteria for the program. The subproject conforms to all Government of India and ADB regulations, policies, and standards including all necessary government permits and clearances. The proposed subproject components involve Improvement works in Government Museum (Egmore museum), Chennai, Tamil Nadu. The selection of components in line with the subproject selection criteria laid down by ADB, and the recommendations of the Central Public Health and Environmental Engineering Organisation (CPHEEO) Sewerage Manual avoids any significant encroachment / direct impact on tourist attractions and the livelihood of the people in the area. Further, the siting of the components has been based on appropriate considerations to minimize

environmental impacts. The subproject will conform to all Government of India/Tamil Nadu and ADB regulations, policies, and standards including all necessary government permits and clearances.

145. The significance of the environmental impacts will be primarily due to the construction related activities. The resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. Further, the provision of environmental infrastructure, including access to sanitation and waste management facilities within the proposed facilities will enhance the environmental conditions and minimize the pollution related aesthetic quality near the Tourist information center & theatre, Cultural center, hostel building, Dormitory hall, Library & book shop and road.

146. The specific management measures laid down in the IEE will effectively address any adverse environmental impacts due to the sub-project. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the PMU supplemented with the technical expertise of a Safeguards Specialist as part of the PMSC Consultants. Further, the environmental monitoring plans provide adequate opportunity towards course correction to address any residual impacts during construction or operation stages.

X. CONCLUSIONS

147. The IEE carried out for the subproject shows that the proposed Improvement works in Government Museum (Egmore museum), Chennai, Chennai District, provide better facilities and comfort to the tourists with enhanced environmental benefits, and that any adverse environmental impact can be addressed through proper location, planning, and design of the proposed subproject; control of construction activity and mitigation measures. The EMP provides for mitigation of all identified impacts and the contract clauses for the environmental provisions will be part of the civil works contracts. Further, the proposed subproject elements have been consulted with the stakeholders and no significant issues requiring redressal in terms of environmental safeguards exist.

148. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009).

Appendix 1: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public participation is the involvement of people in the planning and decision-making process of the development in their built environment. The activity of community participation is based on the principle that the built environments work better if citizens are active and involved in its creation and management instead of being treated as passive consumers. the main purpose of the participation is to involve citizens in decision making, as a result, make it more likely that they will work within the established system when seeking solutions to the problems and also bringing together people who share common goals. we had discussion and consultations from stakeholders and public participants about the upgradation of the museum complex. PROJECT COMPONENTS proposed as discussed are:

➢ Implementation of a visitor's plaza which inculcates the visitors on the history of the museum.

➢ Development of a cultural hub that will allow the hosting of various cultural events and temporary exhibitions.

➢ Upgradation of toilets and provision of child care center to match international standards.

➢ Development of a single family of multi lingual signage which is congruous to the historic setting and helps in site interpretation.

➢ Provision of drinking water facilities, stone seating, dust bins, light poles etc. which are heritage sensitive in nature.

➢ Provision of bitumen roads for fire trucks.

➢ Provision of stone pavers with tactile flooring.

➢ Provision of utility ducts for storm water and cable management.

➢ Provision of Security System with modern gadgets like CCTV Surveillance System, Vehicle under chassis scanning system with auto saving of vehicle number, etc.

➢ Landscaping of the premises.

The discussion went on smoothly and participants were eager and contented with the upgrading the museum complex proposal and shared their comments of how beneficial it is to them.

Figure 3: Few snaps during the discussion:

Public Consultation Outcome: In connection with campus and landscape upgradation, an awareness meeting was organized on 24th February 2018 at the campus of the Government Museum Chennai.

Around 30 learned persons on all walks of life participated and really appreciated and welcomed the upgradation as it will enhance the appearance of the campus while minimizing the environmental issues like dust and humid, which is the menus for artefacts in tropical country like India.

ATTENDANCE OF THE PARTICIPANTS FOR THE PUBLIC CONSULTATION FOR THE TOURISM INFRASTRUCTURE DEVELOPMENT AT: Egmore Museum, Chennai.

Name of Sub-project: Improvement works in Government Museum (Egmore Museum).

Sr. No.	Name	Occupation	Contact Details	Signature
1	B. Jagadeeshwari	Teacher	9095335012	
2	M. Rekha	Teacher	9994552784	
3	J. Mani	(Ramapuram) Teacher (D.V.S)	9500934867	
4	Betti Brunette	—	+33614304282	
5	K. Ram Kumar	IT Profasion	9940175678	
6	K. Nithya sai	Students	9566032843	
7	K. CHITRA DEVI	S.P.M. Hr SS TEACHER	7845582971	
8	S. SIVASUBRAMANIAN	Inspector of Police	9884147383	
9	R. chitra	student	8760246306	R. chitra
10	V. Anusuya	M.College	8760246305	V. Anusuya.
11	P. surya	"	8760246305	P. Surya
12	J. Nivethitha	MCC College	7678194868	
13	A. Josephin Shamila	MCC college	8098578911	
14	P. Divya	MCC College	9790318295	
15	F. Maniya Thamizharasi	MOL College Andimadum	7373403523	

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ATTENDANCE OF THE PARTICIPANTS FOR THE PUBLIC CONSULTATION FOR THE TOURISM INFRASTRUCTURE DEVELOPMENT AT: Egmore Museum, Chennai.

Name of Sub-project: Improvement works in Government Museum (Egmore Museum).

Sr. No.	Name	Occupation	Contact Details	Signature
1	R. Sharvina	Vel Tech - AVADI	7449181186	
2	P. Muthukeemaran	VELTECH -AVADI	9500824328	
3	R. Guru Prasath	Veltech Avadi	9943249135	
4	W. HARI PRASAD	Vel Tech Avadi	9381065658	
5	ANZY BEEGAM.K	MEASI academy of Architecture	9567479374	
6	DEEKSHITHA.S	Measi academy of architecture	9486131951	
7	Dharshini.V	Measi academy	9445684318	
8	RAGHUL.S	TECHIE	9944787253	
9	Shivanand. Bansode	self	7775800035	
10	Je. Jeeithi	Anna university	8344508658	
11	S. Monisha	Anna University	7448722552	
12	Mari Selvam. V	Madha College	9840414525	
13	Sivasangari. A	Anna University	9976767157	
14	M. Venkatesh	Govt	9894211024	
15	E. Prasath	SN main - student	9514702163	

Appendix 2: CONTRACT CLAUSES TO BE INTEGRATED INTO BID DOCUMENTS

Improvement works in Government Museum (Egmore museum), Chennai.

1. Movement / Circulation Plan during Construction

For all construction activities in active tourist destinations, the Contractor will prior to initiation of construction activities, prepare and get approved by the Engineer, a construction plan including the staging, sequencing of construction activities, circulation plans to ensure smooth movement to pilgrims and tourists, including provision of alternative routes, etc. The plans will be disseminated at key entry points to these tourist locations.

2. Quarry and Borrowing

Considering the quantum of activities, it is envisaged that no borrow areas and quarry sites will be opened. Raw materials will be procured from licensed quarry owners. Similarly, no crusher sites will be opened by the contractor. Also, No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for the civil works shall be the sole responsibility of the Contractor.

3. Debris Disposal

Dismantled material shall be stacked, collected and disposed at suitable locations so that no pollution arises out of this. Those shall be neatly piled at points designated by the Engineer with all lifts and leads. Materials, which can be used or auctioned, shall be stored in neat piles at locations designated by Engineer with all lifts and leads.

The contractor will identify potential sites for disposal of hazardous construction debris and general construction wastes prior to start of construction and dismantling operations. The contractor will obtain approval on identified sites from the Engineer of Supervision Consultant and disposal will be only after consent letter from the Engineer.

4. Precautions for Protection of Environmental Resources

The Contractor will ensure that construction activities do not result in any contamination of land or water by polluting substances.

Unless otherwise provided in the specifications, the Contractor will ensure that no trees or shrubs or waterside vegetation are felled or harmed except those required to be cleared for execution of the works. The Contractor will protect trees and vegetation from damage to the satisfaction of the Engineer.

The Contractor will not use or permit the use of wood as a fuel for the execution of any part of the works and to the extent practicable, will ensure that fuels other than wood are used for cooking and heating in all camps and living accommodations. Any wood so used must be harvested legally, and the Contractor will provide the Engineer with copies of the relevant permits, if required.

The Contractor will take all precautions necessary to ensure that vegetation existing adjacent to the project site is not affected by fires arising from the execution of the contract. Should

a fire occur in the natural vegetation or plantation adjacent to the project site for any reason, the Contractor will immediately suppress it. Areas of forest, shrub, or plantation damaged by fire considered by the Engineer to have been initiated by the Contractor's staff or laborers will be replanted or otherwise restored.

The Contractor will confine operations to the dry season, use silt traps and dispose spoils in locations approved by the Engineer that will not promote instability and result in destruction of property, vegetation, irrigation and water supply. Disposal near wetlands, protected areas, and other areas that will inconvenience or deprive local residents of their livelihood will not be allowed. Acidic and saline spoils will not be spread into agricultural land.

The Contractor will consult with local residents and local government before locating project offices, sheds, and construction plant.

The Contractor will maintain ecological balance by preventing felling of trees, water pollution and defacing of natural landscaping.

In the conduct of cleaning activities and operation of equipment, the Contractor will utilize such practicable methods and devices as are reasonably available to control, prevent and otherwise minimize air/noise pollution.

5. Noise and Air Pollution

The Contractor will monitor the environmental parameters periodically as specified in the monitoring plan and report to the Engineer.

The Contractor will indemnify and keep indemnified the Employer from and against any liability for damages on account of noise or other disturbance created while carrying out the work, and from and against all claims, demands, proceedings, damages, costs, charges, and expenses, whatsoever, in regard or in relation to such liability.

6. Quality Assurance Plan / Manual

Post the signing of the contract and prior to commencement of civil works, the contractor shall produce the Quality Assurance Plan covering the following items:

(i) Names, roles, responsibilities of the key Personnel of the Contractor's staff responsible for overseeing each major activity;
(ii) Methodology and work plan for each subproject.

7. Utilities Diversion

For the utilities diversion and restoration, the lines Departments are to be consulted for planning and temporary diversion and final restoration.

8. Avoidance of Interference

The Contractor shall not interfere unnecessarily or improperly with the convenience of the public, or the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others.

The Contractor shall indemnify and hold the Employer harmless against and from all

damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes. Except as otherwise stated in these Conditions:

The Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;

The Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions; All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer.

The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings. The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it.

A. General

The Contractor will be responsible for implementation of environmental provisions outlined in the EMP, in addition to adhering to all environmental provisions in the applicable specifications for the works will be adhered to as part of good engineering practices.

The contractor might be using DG sets for which the permission will be required under Air act 1981.

No fuel storage takes place in this project and for construction purposes, the fuel shall be procured from the existing petrol bunks

For labor accommodation, no labor camp will be established and for accommodation of labors nearby construction sites, rented houses will be engaged by the contractor. Further, labor license from the District Labor commissioner shall be provided by the contractor.

All works undertaken towards protection of environmental resources as part of the EMP and as part of good engineering practices while adhering to relevant specifications will be deemed to be incidental to works being carried out and no separate payment will be made unless otherwise specified explicitly. The costs towards environmental management as per EMP unless otherwise provided as a separate head, will be deemed to be part of the BOQ of the project. The scope of works of the contractor towards the implementation of the environmental provisions will be as follows:

(i) Abide by all existing Environmental regulations and requirements of the Government of India , during implementation;

(ii) Compliance with all mitigation measures and monitoring requirements set out in the Environmental Management Plan (EMP);
(iii) Submission of a method statement detailing how the subproject EMP will be complied with. This will include methods and schedule of monitoring.
(iv) Monitoring of project environmental performance and periodic submission of monitoring reports.
(v) Compliance of all safety rules at work, and Provision of adequate health and safety measures such as water, food, sanitation, personal protective equipment, workers insurance, and medical facilities.

The detailed provisions for specific environmental issues will be as outlined in the EMP table on impacts and mitigation measures.

Occupational Health And Safety During Construction. The Contractor will, in accordance with the safety and health provisions specified in the EMP, provide workers with a safe and healthy working environment, in the work areas, through application of preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. The borrower/client will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by:

(i) Providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; Providing appropriate equipment to minimize risks and requiring and enforcing its use;
(ii) Training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment;
(iii) Documenting and reporting occupational accidents, diseases, and incidents; and
(iv) Having emergency prevention, preparedness, and response arrangements in place.

Goggles and gas masks shall be worn at the time of dismantling. Leather gloves shall be worn by the workers. Screens made of G.I. Sheets shall be placed wherever necessary to prevent the flying pieces from injuring the workers.

(i) The Contractor shall comply with all applicable safety regulations by taking care for the safety of all persons entitled to be on the Site, Use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons.
(ii) Provide fencing, lighting, guarding and watching of the Works until completion and taking over
(iii) Provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.

Clause for Nonconformity to EMP - Protection of the Environment. The Contractor shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report. Any lapse in implementing the same will attract the damage clause as detailed below:

(i) All lapse in obtaining clearances / permissions under statutory regulations and violations of any regulations with regard to eco-sensitive areas shall be treated as a major lapse.
(ii) Any complaints of public, within the scope of the Contractor, formally registered with the PMSC, PMSC or with the PIU and communicated to the Contractor, which

is not properly addressed within the time period intimated by the PMSC / PMSC, PIU shall be treated as a major lapse.

(iii) Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.

(iv) On observing any lapses, PMSC shall issue a notice to the Contractor, to rectify the same.

(v) Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.

(vi) If a major lapse is not rectified upon receiving the notice PMSC shall invoke reduction, in the subsequent interim payment certificate.

(vii) For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.

(viii) If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited.

Post Construction Clearance. On completion of work, wherever applicable, the Contractor will clear away and remove from the sites surplus materials, rubbish, scaffoldings, and temporary works of every kind and leave the whole of the sites and works in a clean condition to the satisfaction of the Engineer.

All temporary sedimentation and pollution control works, which are not provided in the Bill of Quantities, shall be deemed as incidental to the civil work and other items of work and as such no separate payment shall be made for the same.

Labour Welfare:

(i) The Contractor shall make arrangements for the engagement of all staff and labor, local or otherwise, and for their payment, housing, feeding and transport.

(ii) The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the State/Country.

(iii) The Contractor shall pay rates of wages, and observe conditions of labor, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by employers whose trade or industry is similar to that of the Contractor.

(iv) The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances, and any benefits as are subject to taxes under the Laws of the Country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.

(v) The Contractor shall comply with all the relevant labor Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

(vi) The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work. The Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel .No temporary dwelling units are envisaged to be built for the labor force

accommodation but rented premises will utilized for the same with all basic amenities. The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel.

(vii) In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

(viii) The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Accident records are to be maintained at site for the Engineer's vigilance.

(ix) The contractor shall acquire appropriate labour license and labour insurance as per the labour act.

(x) The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and shall be available for inspection by the Engineer during normal working hours.

(xi) The Contractor shall ensure that during continuance of the contract, the Contractor and his Sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, Notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or Notification that may be issued in this respect in future by the State or Central Government or the local authority.

The Water (Prevention and Control of Pollution) Act, 1974. This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water.

The Air (Prevention and Control of Pollution) Act, 1981. This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986. This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991. This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by Notification by the Central Government.

Labour Enactments. The Contractor and his Sub-contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, Notifications and bye laws of State or Central Government or local authority and any other labor law (including rules), regulations, bye laws that may be passed or Notification that may be issued under any labor law in future either by the State or the Central Government or the local authority.

The Contractor shall, if required by the Engineer, provide a return in detail of the employment of labor, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labor, employed by the Contractor on the Site, from time to time.

(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:

- Pension or family pension on retirement or death as the case may be.
- Deposit linked insurance on the death in harness of the worker.
- 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. Construction of Buildings, Roads, and Runways are 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 Rs.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 interstate 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, travelling 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.

(xvi) **The Factories Act, 1948**. The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

(xvii) **The Apprentices Act, 1961**.The Contractor shall duly comply with the provisions of the Apprentices Act, 1961, the rules made there under and the orders that may be issued from time to time under the said Act and the said Rules and on his failure or neglect to do so, he shall be subject to all liabilities and penalties provided by the said Act and the said Rules. ‘The Contractor shall, if required by the Engineer, provide a return in detail of the employment of labor, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the

several classes of labor, employed by the Contractor on the Site, from time to time.'
Safety and Welfare Provisions for labor to be employed by the Contractor.

All necessary personal safety equipment as considered adequate by the Engineer shall be available for use of persons employed on the Site and maintained in a condition suitable for immediate use; and the Contractor shall take adequate steps to ensure proper use of such equipment by those concerned All workmen at site shall be provided with safety helmets and yellow/orange jackets. Workmen required on site during night hours shall be provided with fluorescent yellow jackets with reflective lopes.

The Contractor shall provide all necessary fencing and lights to protect the public from accidents and shall be bound to bear the expenses of defending every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

(i) First Aid-At every workplace, there shall be maintained, in a readily accessible place, first aid appliances including an adequate supply of sterilized dressings and sterilized cotton wool as prescribed in the Factory Rules of the State in which the work is carried on. The appliances shall be kept in good order and, in large work places; these shall be placed under the charge of a responsible person who shall be readily available during working hours.

(ii) Accommodation for Labor: The Contractor shall during the progress of the work provide, erect and maintain necessary temporary living accommodation (in rented premises) and ancillary facilities for labor at his own expense to standards and scales approved by the Engineer.

(iii) Drinking Water: In every workplace, there shall be provided and maintained at suitable places easily accessible to labor, a sufficient supply of cold water fit for drinking. Where drinking water is obtained from an intermittent public water supply each workplace shall be provided with storage tanks where drinking water shall be stored.

(The Environment Management Plan is an integral part of the contract and the contractor has the responsibility to implement it under the supervision of the Environmental officer of the Construction Supervision Consultant. All actions taken by the Environmental officer shall be deemed to have the concurrence of the "Engineer" as defined in the contract data. All management measures of the Environment and Management plan are deemed to be incidental to the work unless otherwise provided in the BOQ. No separate payments shall be made for implementing these measures.)

Appendix 3: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

URBAN DEVELOPMENT

Instructions:
6. (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 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: Improvement works in Government Museum (Egmore museum), Chennai.
Sector Division: INRM

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
• Cultural heritage site		√	
• Protected Area		√	The Land is owned by Museum Department and located in the heart of the city in populated areas.
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	
B. Potential Environmental Impacts Will the Project cause…			
• Ecological disturbances arising from the establishment of a plant or facility complex in or near sensitive habitats?		√	During construction, no tree felling is being felt necessitated.
• Eventual degradation of water bodies due to discharge of wastes and other effluents from plant or facility complex?		√	No waterbody is located adjacent to the proposed construction site.
• Serious contamination of soil and groundwater?		√	This issue is not envisaged in the proposed sub-project activities.
• Aggravation of solid waste problems in the area?		√	Waste generated from demolition of the present structure will be disposed

			off in low lying areas and approved municipality dump yard. Liquid and solid waste generated at the site will be disposed off in compliance with CPCB stipulations.
• Public health risks from discharge of wastes and poor air quality; noise and foul odour from plant emissions?		√	No discharge of liquid waste is envisaged during the construction phase. Temporary air emission and higher noise level will be felt during the construction period and will be limited to 8/10 hours during operating daytime.
• Short-term construction impacts			
○ Soil erosion		√	No steep slopes involved in this subproject hence soil erosion of any kind is ruled out.
○ Deterioration of water quality		√	No discharge of waste water is involved in the subproject activity.
○ Deterioration of air quality	√		Temporary air emission will be experienced during the construction period which will be limited to 8/10 hours during operating period.
○ Noise and vibration from construction equipment	√		Higher noise level will be felt during the construction period and will be limited to 8/10 hours during operating period.
• dislocation or involuntary resettlement of people		√	Project will be erected on Museum owned land.
• Social conflicts arising from the influx of construction laborers from other areas?		√	Not envisaged as only local labor force will be preferably employed.
• Environmental degradation (e.g. erosion, soil and water contamination, loss of soil fertility, disruption of wildlife habitat) from intensification of agricultural land use to supply raw materials for plant operation; and modification of natural species diversity as a result of the transformation to monoculture practices?		√	

• Water pollution from discharge of liquid effluents?		√	No discharge of waste water is involved in the subproject activity.
• Air pollution from all plant operations?	√		Temporary air emission will be experienced during the construction period which will be limited to 8/10 hours during operating period .
• Gaseous and odour emissions to the atmosphere from processing operations?		√	Not envisaged from the subproject activity.
• Accidental release of potentially hazardous solvents, acidic and alkaline materials?	√		An emergency handling procedure will be in place to meet such contingencies.
• Uncontrolled in-migration with opening of roads to forest area and overloading of social infrastructure?		√	The subproject would accommodate only the tourists.
• Occupational health hazards due to fugitive dust, materials handling, noise, or other process operations?		√	An emergency handling and management plan comprising of EHS procedures will be in place to meet such contingencies.
• Disruption of transit patterns, creation of noise and congestion, and pedestrian hazards aggravated by heavy trucks?		√	The subproject is confined to a clear-cut boundary wall separating the location from it's surrounding.
• Disease transmission from inadequate waste disposal?		√	Adequate care will be taken so that waste is collected and disposed in a safe manner meeting the CPCB guidelines.

Appendix 4: **ENVIRONMENTAL MONITORING FORMAT**

A. Work Details

Table 1. Work Details and Risks

Locations	Sub-projects Components (Package No.)	Name of the contract	Listing of works under the package	Starting Date (land clearance) and schedule date of completion	What type of works continued at present	Progress Percentage	Expected changes from approved scope	Fulfilment of objectives- Type of remedial measure needed	Key assumptions and risks that affect attainment of the objective

B. Implementation of Environmental Management Plan

Table 2. Status of Environment, Forest and Other Clearances

City / Town	Work (Package No.)	Applicable Legislation / Type of Clearance	Clearance given by and date	Subject / Issue	Remarks / Action needed

Table 3: Compliance with Environmental Management Plan

Description of Impact	Mitigation Measures Proposed	Implantation Status	Detail/Remarks on Implementation	Monitoring methods and frequency	Monitoring conducted by	Monitoring Remarks (Excellent/Satisfactory/Partially Satisfactory/Below Satisfaction/Poor/ Very Poor)	Remarks and actions taken to improve implementation
Detailed Design							
Pre-construction							
Construction							

Table 4: Measurement of Pollutants

Components	Package/ Location	Period of monitoring	Parameters /Pollutants	Standard	Base line status	Monitoring Result during Project Implementation	Remarks
Noise							
Air Quality							
Water Quality							
Soil Quality							

Appendix 5: SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Local Language)

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 prefer to keep the information's remain confidential, please inform us by typing *(CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration	
Contact Information / Personal Details		
Name	Gender: _Male _Female	Age:
Home Address		
Village / Town		
District		
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)			
Verified thru:	Note/Letter	E-mail	Verbal/Telephonic
Reviewed by: (Names/Positions of Official(s) reviewing grievance)			
Action taken:			
Whether Action Taken Disclosed:	Yes	No	
Means of Disclosure:			