

Section 7. Terms of Reference

Project Design and Management Consultant (PDMC)

I. PURPOSE AND OBJECTIVES

1. The Government of Tripura (GoT), has applied for financial assistance through the Department of Economic Affairs, Ministry of Finance, Government of India (hereinafter referred as the Borrower) under the project readiness financing (PRF) facility from the Asian Development Bank–ADB (the “Bank”) in the form of a “loan” toward the cost of “India: Project Readiness Financing Loan for Infrastructure Development of Industrial Estates in Tripura” (hereinafter referred as PRF Project). The purpose of the PRF loan is to prepare investment ready integrated industrial infrastructure development projects in and around 15 industrial estates in six (6) districts of Tripura.¹⁰ The main outcome under the PRF would be:

- (i) preparation of integrated/ holistic planning, industrial strategy, infrastructure planning, investment planning and promotion, and identification of anchor investors;
- (ii) improved readiness of prioritized projects in the identified industrial estates or areas (amongst 15 industrial estates, including synergy with key economic/border trade/ tourist centers), leading to increased external/donor investments in infrastructure projects; and
- (iii) faster and more efficient development of infrastructure projects, better management of infrastructure assets, and strengthened capacity of industrial development agencies to deliver integrated industrial infrastructure services.

2. The key objectives towards preparation of investment-ready infrastructure projects through PRF are:

- (i) industrial strategic planning, infrastructure planning, investment planning and promotion support, and prioritization of subprojects;
- (ii) facilitate improved project readiness, through feasibility studies, detailed project reports (DPRs), and other project preparation activities; and
- (iii) strengthen industrial development planning and processing framework/ mechanism, including institutional capacity development of relevant GoT agencies, to plan, develop, implement, and manage projects, and sustainability of investments.

II. SCOPE OF THE PRF PROJECT

3. The PRF facility will support the state government in: (i) integrated/ holistic planning, preparation of industrial strategy, infrastructure planning, investment planning and promotion, developing project packaging with prioritized subprojects, identification of anchor investors, and institutional review and preparation for outlining institutional and/or sector reform actions, including initiation of institutional capacity development activities that would be further detailed and implemented through separate sector development program, including sector development program processing support; and (ii) preparation of investment-ready projects with reviews/ feasibility studies/ detailed engineering designs with due diligences, and institutional capacity strengthening from the perspective of technical/ on-the-job capacity building etc., to plan, develop, implement, and manage projects, and sustainability of investments, including ensuing loan/ project processing support.

¹⁰ The 15 industrial estates are: (i) Bodhjunnagar Industrial Complex; (ii) R. K. Nagar Industrial Area; (iii) Sonamukhi Industrial Estate; (iv) Dukli Industrial Estate; (v) Lalchhari Industrial Estate; (vi) Dewanpassa Industrial Estate; (vii) Kumarghat Industrial Estate; (viii) Jalefa Industrial Estate; (ix) Sarasima Industrial Estate; (x) Nagichera Industrial Estate; (xi) Santirbazar Industrial Estate; (xii) Badharghat Industrial Estate; (xiii) Dhajanagar Industrial Estate; (xiv) A. D. Nagar Industrial Estate; and (xv) Dharmanagar Industrial Estate.

4. The consultants recruited under the PRF, in close coordination with executing agency (EA)–Department of Industries & Commerce (DoI&C), Government of Tripura, and implementing agency (IA)–Tripura Industrial Development Corporation Limited (TIDCL), and ADB, will support the EA/ IA in delivery of following PRF Project outputs:

- (a) **Output 1: Sector strategy and investment plans prepared.** Output 1 will help:
 - (i) strengthen the industrial planning/ preparing industrial strategy and promotion requirements;
 - (ii) prepare investment plans and action plans; and
 - (iii) prioritize key subproject and infrastructure components.
- (b) **Output 2: Feasibility study, detailed engineering designs, and due diligence of priority subprojects completed.** Output 2 will focus on:
 - (i) feasibility studies and preparation of detailed engineering designs;¹¹
 - (ii) social and environmental due diligence;
 - (iii) economic and financial analyses;
 - (iv) gender equality and social inclusion;
 - (v) climate and disaster resilience;¹²
 - (vi) procurement risk/ capacity assessment; strategic procurement planning, contract modalities, procurement plan, contract management plan(s); bid documents, tendering and bid processing.¹³
- (c) **Output 3: Institutional capacity development strengthened.** This will include capacity building of Industries Department and TIDCL on financial, technical, safeguards, gender equality and social inclusion, and procurement aspects and supporting in sector analysis and developing the institutional strengthening and capacity development component. It will:
 - (i) review institutional capacities and current operation and maintenance (O&M) practices;
 - (ii) outline reform actions and scope to arrive at industrial development planning and processing framework/ mechanism under sector development program;
 - (iii) outline scope of institutional strengthening component of the ensuing project(s) for sustainability of assets; and
 - (iv) support planning, design, implementation, and management of PRF outputs, and ensuing project(s).

III. BACKGROUND AND RATIONALE

5. Tripura is primarily an agrarian State, having favorable climatic conditions for cultivation of various fruit and horticultural crops. It is rich in natural resources such as natural gas, rubber, bamboo, tea, and medicinal plants. In addition, it acts as a gateway between Northeast India and Bangladesh, with an 856-km international border with Bangladesh, offering good potential for international trade. About 39% of gross state domestic product in 2019–2020 is accounted by the primary sector, while tertiary sector accounts for about 45%, and about 14% accounted for by the secondary sector of which only 23% is manufacturing and remaining 77% is utilities

¹¹ The detailed project reports will meet the national standards, codes, and/or best practices include detailed cost estimates, good for construction drawings, and necessary supporting documentation in formats accepted by ADB for each selected subproject.

¹² Includes due diligence in a comprehensive manner of existing DPRs separately prepared in the state, if any.

¹³ Procurement Risk Framework–Guidance Note on Procurement (June 2018, as amended from time to time); Strategic Procurement Planning–Guidance Note on Procurement (June 2018, as amended from time to time); Contract Management–Guidance Note on Procurement (June 2018, as amended from time to time); relevant and latest applicable SBD(s) (with required addendum wording for HS COVID-19 Plan) and related user guide(s), and RFQ/ SRFP issued by ADB; etc.

and construction.¹⁴ Tripura has been connected to rest of India through development of broad-gauge railway and national highway network. These developments have created an opportunity for the state to bring in industrial development to harness its natural resources. Despite being a resource rich state, Tripura has limited capacity of value addition and monetization to address the challenges of industrial backwardness. Better connectivity network and upcoming cross-border infrastructure projects are taking care of geographical isolation and now there is a need to improve the contribution of manufacturing sector, increase employment in industry sector, reduce dependence on agriculture and create opportunities to develop cross-border synergies and integration.

6. The state government vision for the state is that manufacturing sector employment, as a proportion of total employment, will be increased from 1.79% (Census of India, 2011) to 4.5% in 2030.¹⁵ The state has established rubber, food and bamboo parks to support existing and potential investors.¹⁶ It is felt that industrial cluster development has the potential to promote manufacturing growth and accordingly, a number of industrial estates and export promotion industrial park have been planned to provide impetus for manufacturing. Tripura Industrial Development Corporation Limited (TIDCL) has planned development of 15 industrial estates with the objective of industrial promotion, entrepreneurship development, and overall employment generation.¹⁷ Tripura Industrial Investment Promotion Incentive (Amendment) Scheme, 2017 under state industrial policy added thrust sector industries that also covers tourism industry activities.¹⁸ ADB's Northeast Economic Corridor (NEEC) study report also recommended interventions for improved industrial development in Tripura through integrated approach of planning and design, and identified needs for integration of industrial infrastructure development with logistic parks, transportation and trade facilitation at various locations in Tripura.¹⁹

7. While, the Bodhjunnagar and R. K. Nagar near Agartala are two of the larger industrial estates/ areas that have been provided with basic infrastructure facilities by TIDCL, based on a gap analysis of all the 15 industrial estates by TIDCL, the infrastructure components to be further covered are expected to be such as, road connectivity, boundary walls, electricity connectivity, water supply network, gas lines, industrial sheds, solid waste management plants, effluent treatment plants, telecom network, CCTV cameras and private security; and other administrative facilities like, guest house, fire station, police station, etc. In addition, opportunities for improved industrial development in Tripura through integrated approach for holistic planning and design stages of work under PRF project preparation need to be considered for integration with upcoming proposals such as multi-modal logistic parks, transportation and trade facilitation, etc., at various locations in Tripura, and as identified in NEEC Study Report. The NEEC Study recommended interventions to boost and transform economic growth in Tripura cover integrated spatial and industrial development activities at growth nodes or centers for urban/ industrial development, major roads (international/ gateway connectivity), priority industrial processing sectors (also included, service sector industries of information technology–IT/ hospitality and tourism, including medical tourism), pre-processing/ primary collection center and aggregation point, processing units, integrated packhouse/ cold storage, integrated industrial parks, border centers integrated with land transport gateway/ integrated check post–ICP, etc.

¹⁴ Government of Tripura, Directorate of Economics & Statistics Planning (Statistics) Department. 2020. [Economic Review of Tripura 2019–2020](#). Agartala.

¹⁵ [Tripura Infographic June 2021](#) by India Brand Equity Foundation.

¹⁶ [India Brand Equity Foundation](#). 2021.

¹⁷ Industrial estate locations are: (i) Bodhjunnagar Industrial Complex; (ii) R. K. Nagar Industrial Area; (iii) Sonamukhi; (iv) Dukli; (v) Lalchhari; (vi) Dewanpassa; (vii) Kumarghat; (viii) Jalefa; (ix) Sarasima; (x) Nagichera; (xi) Santirbazar; (xii) Badharghat; (xiii) Dhajanagar; (xiv) A. D. Nagar; and (xv) Dharmanagar.

¹⁸ [Tripura Industrial Investment Promotion Incentive \(Amendment\) Scheme, 2017](#) vide Notification No.F.DI/TIS/SUBSIDY/4-2(21)/2017/9381-488 of 14th June 2019, Department of Industries & Commerce, GoT, Agartala; [Tripura Industrial Investment Promotion Incentives Scheme, 2017](#); and [Industrial Policy of Government of Tripura](#).

¹⁹ Draft final report of *Northeast Economic Corridor study* has been submitted to the Government of India.

8. This PRF for the Government of Tripura would be supported and implemented through the procurement of a proposed consulting services package, herein after referred to as “project design and management consultant (PDMC)” that would be financed under the PRF loan during the estimated eighteen months (1.5 years) of duration for PRF from CY 2021 to CY 2022. The duration of assignment for the PDMC would be 12 months (presently envisaged). The PDMC consulting firm is tentatively expected to be mobilized from **February 2022**, and will be further confirmed during contract negotiation process. The PDMC consulting firm is to be recruited to support GoT in delivering the above-stated three outputs in integrated industrial sector of Tripura. Figure 1 illustrates the indicative flow chart of the work process for overall PRF assignments.

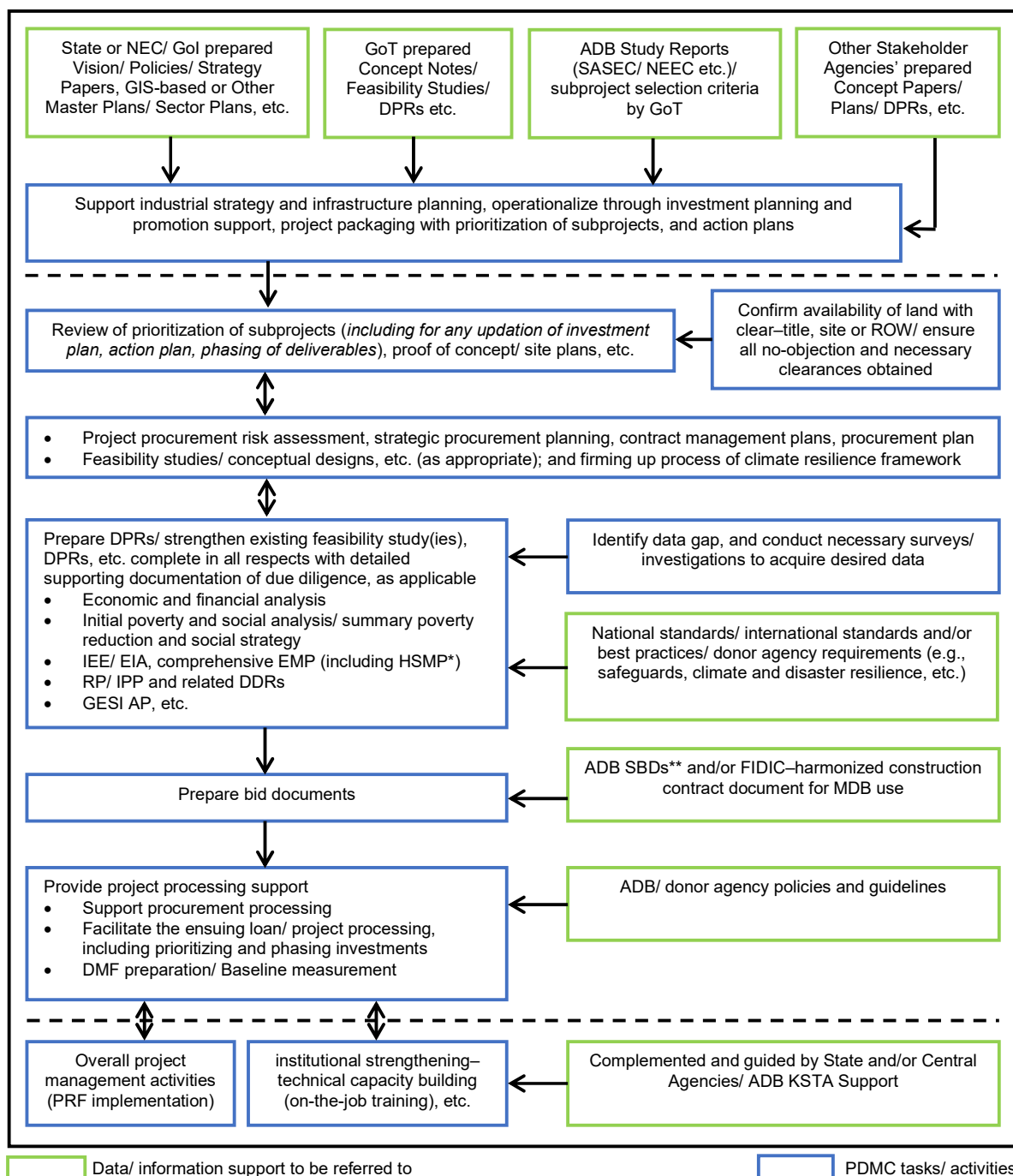
9. For the proposed PDMC consulting services package, a qualified and experienced national consulting firm is proposed to be procured on quality- and cost-based selection (QCBS) method with quality-cost ratio of 80:20, to ensure high quality of technical outputs by following the ADB Procurement Policy: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time); and the ADB Guidance Note on Procurement–Consulting Services Administered by ADB Borrowers (June 2018, as amended from time to time).

10. The PDMC will work in close coordination with the designated personnel of the following stakeholders for the consulting activities/tasks:

- EA–DoI&C, GoT, and IA–TIDCL;
- a project management unit (PMU) is established with Director, DoI&C as the Project Director. The PMU-TIDCL is constituted with members from DoI&C and TIDCL; including any designated sector-specific project working groups formed under DoI&C or PMU-TIDCL;
- other stakeholder authorities, such as, Urban Development Department (UDD)/ Tripura Urban Planning and Development Authority (TUDA), Department of Tourism (DoT)/ Tripura Tourism Development Corporation Limited (TTDCL)–for leveraging synergies of urban and tourism planning, and infrastructure based on land use-transport sectoral relationship with industrial development, as these agencies are also involved in an ongoing ADB PRF Project in Tripura; Public Health Engineering Department (PHED); Public Works Department (PWD); Fire Services Department; Land Department; Tripura State Pollution Control Board (TSPCB, where required); respective district administration/urban local bodies (ULBs)/ Village Panchayats (VPs); etc., as applicable;²⁰
- any existing consultants, proposed/procurement-in-pipeline consulting firm(s) and/or individual consultants as sector experts, appointed by the state separately, related to the integrated industrial sector works either through government funds or under the PRF;
- central agencies–North Eastern Council (NEC), Ministry of Development of North Eastern Region (MDONER), Department of Promotion of Industry and Internal Trade (DPIIT) under Ministry of Commerce and Industry, including National Industrial Corridor Development Corporation Limited (NICDCL), Ministry of Micro, Small & Medium Enterprises (MoMSME) etc., of Government of India (GoI), as applicable;²¹ and
- Asian Development Bank (ADB) designated staff and TA consultants/TA consulting firm at Project Development Unit, India Resident Mission.

²⁰ADB PRF Project Loan 6037-IND: Tripura Urban and Tourism Development Project.

²¹The outcome of the project may be monitored by the MoMSME. [NITI Aayog (NE States Division) comments vide letter of NITI UO No. 13(93)/2020-1&M(1), 2 June 2020.]

Figure 1: Indicative Flow Chart of Work Process for Overall PRF Assignments

* Updated as site-specific health and safety management plan (SSHSM) with site-specific health and safety COVID-19 plan (HS COVID-19 Plan). ** Addendum wording for HS COVID-19 Plan.

ADB = Asian Development Bank, DDR = due diligence report, DMF = design and monitoring framework, DPR = detailed project report, EIA = environmental impact assessment, EMP = environmental management plan, FIDIC = International Federation of Consulting Engineers, GESI AP = gender equality and social inclusion action plan, GIS = geographic information system, GoI = Government of India, GoT = Government of Tripura, HSMP = health and safety management plan, IEE = initial environmental examination, IPP = indigenous peoples plan, KSTA = knowledge support technical assistance, MDB = multilateral development bank, NEC = North Eastern Council, NEEC = North East Economic Corridor, PDMC = project design and management consultant, PRF = project readiness financing, ROW = right of way, RP = resettlement plan, SASEC = South Asia Subregional Economic Cooperation, SBD = standard bidding document.

IV. SCOPE OF PDMC SERVICES

11. The PDMC consulting firm recruited under the PRF would support the EA–DoI&C, GoT, and IA–TIDCL, to implement and manage the PRF loan for integrated industrial infrastructure development projects in and around 15 industrial estates in six (6) districts of Tripura. The scope of services of the PDMC assignment will include the delivery of PRF objectives outlined in the scope of the PRF Project, including the review of the existing and ongoing work under the PRF project. Under the above-stated scope, the detailed tasks of PDMC consulting firm include, but would not be limited to the following:

Project Preparation and Design Tasks

- (i) identifying stakeholders and facilitate the EA/ IA in conducting all stakeholder consultations (at state-/regional-/central agencies-level such as DoI&C, GoT/ TIDCL, NEC/ MDoNER, DPIIT/ NICDCL, MoMSME, UDD/ TUDA, DoT/ TTDCL, etc., including any of their existing/proposed consulting firms/individual consultants; ADB-level, including ADB TA consultants/TA consulting firm; and with industrial and border trade units/ Micro, Small and Medium Enterprises (MSMEs), any project affected persons, excluded and vulnerable groups, etc.) to understand various perspectives, and generate preliminary planning and design inputs/ validate draft proposed interventions and/or planning and design outputs; and undertake overall project management activities under PRF through a management information system developed/ managed at project management unit (PMU) at TIDCL, covering project performance monitoring system and financial management system aspects;²²
- (ii) review and validate the infrastructure gaps, exclusionary screening/ prioritization of subprojects (*including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation*), proof of concept/ site plans, development of key indicators, etc., prior to undertaking detailed engineering design stage of work (confirm availability of land with clear-title, site or right-of-way/ ensure all no-objection and necessary clearances obtained for encumbrances free prioritized subproject sites available), prepare the revised list of prioritized subprojects with draft phasing of deliverables (feasibility studies/ DPRs/ bid documents, etc.), and thereafter finalize the list of prioritized subprojects based on result of feasibility studies along with revised phasing of deliverables (DPRs/ bid documents, etc.), while facilitating GoT to ensure convergence of projects identified for funding under the proposed external aided project with the existing central sector/ centrally sponsored schemes under implementation in the state, and ensure that there should not be any financial liability on the central government towards recurring expenditure after the completion of the project;
- (iii) for prioritized subprojects/ work components in and around industrial estates, undertake geo-referencing of cadastral sheets and updation of the existing geographical information system (GIS)-based mapping database of industrial estate layouts [existing plotting layout, built-up area layout/ form of existing buildings/ boundary walls/ gateways, and other administrative/ common infrastructure facilities, etc., any natural features (e.g. open greens, primary drains, ponds, wetlands, etc.), along with utility mapping [(including alongside roads/ parking, storm water drainage measures, water supply system, effluent/ wastewater management system/ septage management system, solid waste

²²The intent of stakeholder consultations is to gather unique perspectives and values of each stakeholder group, which would help planners, designers, and managers, to create investments that are more relevant, in demand, and transformative, and contribute towards making areas of intervention resilient, with implementation over short-term/ medium-term/ long-term development strategies. It also provides opportunity to communicate early, garner public support through trust- and consensus-building, and often to avoid project delays. Ultimately, it would contribute to enhanced community awareness to maximize project impact, and to secure strong commitment from governments to reform, users to pay for quality services to be delivered and sustained.

management (including, plastic waste, industrial waste–hazardous or non-hazardous waste, etc.), piped gas lines and related infrastructure, electrical and power systems infrastructure, telecom network, etc.]; including integration of features with any existing GIS-based base maps/ database of urban footprints abutting prioritized subprojects/ work components in and around industrial estates, and further updation of GIS-based base maps of the prioritized industrial estates or areas based on the PDMC's proposed planning and design–layouts/ networks; and if any, additional areas are to be covered in proposed growth nodes/ centers (industrial/ urban/ border towns requiring trade facilitation support) under the GIS-based base maps, adopt digitization of any existing city-level/ area-level maps and/or land parcel/ plot layout map(s), undertake geo-referencing of cadastral sheets overlayed with open-source imagery of appropriate resolution and/or scaled mapping output(s) of a physical/ topographical survey for the site location(s)/ alignment(s) of prioritized subprojects, to prepare/ update such GIS-based base maps;²³

- (iv) conduct feasibility studies/conceptual design (including any revisions), etc. (as appropriate) for prioritized potential subprojects, prior to preparation of DPRs for finalized list of prioritized subprojects, including identification of any data gaps from any existing information made available by the GoT through DoI&C/ PMU-TIDCL, including concerned stakeholder agencies, information arranged through ADB, etc., and undertake efforts to acquire data to bridge any such data gap through undertaking necessary surveys, investigations and studies, if any, that is required for satisfactory completion of project preparatory and design activities under PRF, and which would be useful for subsequent implementation through the ensuing loan(s)/project(s);
- (v) integrate the planning and design of major cross-sector infrastructure work components of water supply, robust road/ parking areas (considering outer access roads/ internal roads within industrial estates or areas, including non-processing areas) based on respective passenger- and freight-traffic/ load capacity movement along with stormwater drainage integration, effluent/ wastewater management, industrial waste and municipal solid waste (MSW) management, and electrical and power systems, w.r.t. layout/ structural elements of all the common infrastructure and community facility's planning and design components covering–road connectivity/ industrial plot access integration, industrial estate or area premises' boundary walls (with entry and exit gates, including for non-processing areas), integration through separate or unified ducting for industrial plot-level electricity connectivity/ water supply network connectivity/ effluent or wastewater network connectivity, including piped gas lines and related infrastructure layout with industrial plot-level connectivity, layout and built-form control for industrial sheds, spatial planning and distribution/ connectivity of site for industrial waste and MSW management (treatment, storage and disposal facility–TSDF/ plants and/or safe containment system)/ effluent or wastewater treatment plants/ septage management plants in non-processing areas for onsite treatment/ electrical and powers systems infrastructure/ telecom network/ parking areas (including loading/ unloading areas and freight parking), industrial estate or area premises safety and security through CCTV cameras and private security; and other administrative facilities like, administrative block, guest house, fire station, police station, public toilets,

²³ Any existing outputs like, GIS-based base maps for all industrial estates/plans/database and potential planning proposals with broad cost estimates and investment phasing, etc., as available, would be provided by the government as an input to PDMC assignment. Also, ADB has undertaken a separate North East Economic Corridor (NEEC) Study that would be made available to the consulting firm. Any data gaps, if observed by the PMU-TIDCL etc., and PDMC, which is required to undertake the PRF Project (apart from any existing government vision, policy and/or strategy papers, master plans, sector plans, study reports, etc., with regards to integrated industrial/ urban sectors as available), the PDMC consulting firm's scope of services includes any such necessary efforts to be duly made to facilitate satisfactory completion of the PDMC assignment and PRF Project.

landscaping with signage/ site signs, etc., as felt required, including social/ commercial/ residential use infrastructure for communities in non-processing areas, etc.; with due consideration to adoption of concept of crime prevention through environmental design or CPTED, preparation and adoption of suggested guideline design for surrounding industrial built-form/ urban form in non-processing areas suggested guideline to be adopted by tenants of industrial plots and industrial estate administration, consider diversity/ equity/ inclusion along with integration of existing/ proposed master planning interventions of land use mix/ economic-mix/ housing mix with social justice for communities in non-processing areas, include in planning and design the responsive elements of gender equality and social inclusion with potential interventions for EWCDT—elderly, women, children, differently-abled, and transgender facilities, consider adaptive reuse of older industrial use spaces, promotion of biodiversity and housing/ occupational health / safety and security standards, adopt mitigation measures as part of climate change adaptation through potential of increased use of renewable energy (with net metering)/ reduction in fuel or energy use/ improving energy efficiency/ sequestration of carbon through sinks, etc.;

- (vi) undertake climate research on technologies, innovative solutions and national/international best practices, etc., and a rapid climate risk assessment using the preliminary climate (and disaster) risk screening checklist for prioritized subprojects to establish the climate resiliency of the industrial infrastructure plans and feasibility studies, particularly site selection and designs; and as required based on risk-level assessed, undertake detailed climate risk and adaptation assessment or CRA (*formerly climate resilient and vulnerability assessment or CRVA*), prepare climate resilience framework with risk avoidance/ minimization and climate mitigation and/or adaptation measures for adoption in detailed engineering designs/ climate proofing projects towards building climate and disaster resilience, and report compliance of climate resilience measures in such designs, through “disaster-secure engineering,” “structural norms/ non-structural measures,” etc., incorporated at subproject/ project-level.²⁴ Review for future proofing of investments against vulnerability risks from climate change and communicable disease/ epidemics like, coronavirus disease (COVID-19) pandemic, wherein (a) the Consultants shall make a high-level review of the proposed investments and recommend resilience measures against vulnerability from climate risks/ climate change impacts and disaster risks, and communicable disease/ epidemic or pandemic; and (b) such review shall essentially include the disruptions and resultant loss of business from risks of climate change like, continuous droughts, rapid floods, extremely high temperature, and long lockdown and social distancing needs arising from pandemic, improved emergency services and healthcare infrastructure/ medical facility linkages to meet eventualities of pandemics, monitoring systems for surveillance of people and business affected by pandemics, and temporary compensation measures for loss of revenue. Collect and review data of gender-differentiated climate change and disaster impacts, when arriving at climate resilient framework, while ensuring that infrastructure should also be resilient against humanmade risks;²⁵
- (vii) review, and ensure that all the available surveys and data collected are correct (amend, if required) and meets the national/international best practices of methods of surveying and data collection;

²⁴ ADB. 2014. *Climate Risk Management in ADB Projects*. Manila; ADB. 2020. *Principles of Climate Risk Management for Climate Proofing Projects*. ADB Sustainable Development Working Paper Series No. 69, July 2020. Manila; etc.

²⁵ ADB. 2016. *Guidelines for Climate Proofing Investment in the Water Sector: Water Supply and Sanitation*. Manila; ADB. 2015. *Economic Analysis of Climate-Proofing Investment Projects*. Manila; ADB. 2011. *Guidelines for Climate Proofing Investment in the Transport Sector: Road Infrastructure Projects*. Manila; etc.

- (viii) undertake field surveys (site reconnaissance surveys, topographical surveys, geotechnical investigations, including any hydrological/ hydraulic and geological surveys as felt required, and any other engineering/socio-economic/inventory of loss/ demand surveys/ industry or trade surveys/ willingness-to-pay surveys, etc.) and studies to establish a firm basis for design and planning of subproject components. The PDMC may need to hire surveyors based on the nature and scale of surveys that will be required. PDMC shall take prior approval of the terms of reference (TOR) and budget for surveys/investigations/ studies, whether conducted in-house or through third party for this PDMC assignment under PRF. Conduct stakeholder consultations;²⁶
- (ix) identify the utilities to be replaced/removed/rehabilitated/upgraded, and prepare recommendations with a detailed implementation plan, detailed designs for utility placement either through unified ducting or separate dry and wet utilities' ducting options, as feasible, and whether affecting or affected by the subproject work components under proposed investments in the ensuing project(s), along with necessary cost estimates for prioritized subproject sites;
- (i) undertake due diligence w.r.t. the detailed engineering design/any other design work recommended for finalized list of prioritized subprojects;²⁷
- (ii) strengthen/integrate any existing concepts, detailed engineering designs/any other designs and DPRs developed by the Client/concerned stakeholder authorities for any earlier identified subprojects under integrated industrial sector, to ensure the designs are prepared according to the national standards/international standards or best practices (whether the design prepared is at the stage of concept-/and/or at DPR stage), including service delivery towards meeting national benchmarks/service-level agreements (SLAs), and duly incorporating the aspects or factors of resilience to climate risks/ climate change impacts and disaster risks (as per national standards/international standards or best practices, including ADB's South Asia Department framework and practice, etc.).²⁸ Also, follow provisions made in the PRF project administration manual (PAM), and in

²⁶ DoI&C, GoT may consider leveraging knowledge resources of the DMIDC, which is the nodal body of Government of India for setting-up of industrial/ investment nodes in the country. DMIC Development Corporation Limited (DMICDCL) was established in 2011, and was transformed into National Industrial Corridor Development Corporation Limited (NICDCL) in February 2020 to operationalize industrial corridors and act as a knowledge partner for National Industrial Corridor Development Implementation Trust (NICDIT) and provide advisory services to states.

²⁷ Due diligence will cover economic, financial, social and environmental safeguards, technical, etc., aspects of the prioritized subprojects for ensuing loan(s)/project(s). Further, it includes providing support to strengthen/ integrate existing DPRs prepared by the government, when finalizing the comprehensive DPRs.

²⁸ For example, may refer to the Siting Guidelines for Industries, Environmental Guidelines of Industries, Environment (Siting for Industrial Project) Rules, 1999, Hazardous Waste Management Guidelines, etc., by Ministry of Environment and Forests (MoEF), Government of India (GOI), including National Waste Management Council suggested guideline on Industrial Waste Management, 1990, and may refer for integrated/ holistic planning to the Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines, 2014, Ministry of Urban Development (MOUD), GOI; may refer for inclusive and sustainable industrial development to the International Guidelines for Industrial Parks, November 2019, United Nations Industrial Development Organization (UNIDO), and Guidelines for Sustainable Development of Industrial Areas (SIA), Version 1.0, October 2015, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH-Sustainable Industrial Areas Working Group; Handbook of Service Level Benchmarking, 2008, MOUD, GOI; Codes/ Manuals/ Guidelines/ Advisory Notes (as applicable) of Bureau of Indian Standards (BIS, including its Industrial Services) and its National Building Code (NBC), Indian Roads Congress (IRC), and Central Public Health and Environmental Engineering Organisation (CPHEEO) under MOUD, GOI; Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Guidelines, June 2015, MOUD, GOI; Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI has promulgated Energy Conservation and Building Code, 2017, and runs other national flagship programs on standards and labelling, energy efficiency in large industry, energy efficiency in small and medium industry (including MSMEs), etc. [Note: Erstwhile MOUD is now known as Ministry of Housing and Urban Affairs (MOHUA), and MoEF as Ministry of Environment, Forest and Climate Change (MoEF&CC)]; ADB. 2014. *Climate Risk Management in ADB Projects*. Manila; etc.

any other governing/guidance documents of ADB, including those approved by ADB for the PRF Project;

(iii) for the finalized list of prioritized subprojects:

- finalize the detailed engineering designs/any other design works, technical specifications, item rate analyses, detailed schedule of quantities and cost estimates in the comprehensive DPRs that meet all the prescribed national standards/international best practices, including service delivery towards meeting national benchmarks/SLAs, and duly incorporate any recommended risk avoidance/minimization measures, and adaptation and/or mitigation measures to address factors for resilience to climate risks/ climate change impacts and disaster risks, not only for new infrastructure to be built, but also for enhancing resilience of or “climate proofing” the existing infrastructure, while ensuring outcomes for the project and key performance indicators get included in the DPR to ensure effective and efficient service delivery, and sustainability of assets;
- ensure that the synergy of raw material aggregation, single industry- or multi-product mix-/ ancillary industry- or cluster-based industrial development etc., vis-à-vis the spatial siting of prioritized industrial estates or areas and related industrial infrastructure proposed to be created in and around therein, does not intend/ in any manner lead to potential conflict or issues w.r.t.—the compatibility of surrounding land use(s) and living environment considering factors such as wind direction; any detrimental impacts on downstream flow of water resource(s); above surface/ surface/ below surface contamination; issues like air pollution/ noise pollution/ odour, etc.—and if any such compatibility concerns or issues are felt that they may-/ expected to arise, provide for in planning and design the best feasible adaptation and/or mitigation measures to keep any of their impacts to a minimal-/ acceptable-level of national standards and/or international best practices, as applicable;
- in addition, the detailed engineering designs/any other design works should be prepared: (i) using integrated planning approach that adopts smart growth planning principles, considers aspects of diversity/ equity/ inclusion and is complemented by gender mainstreaming in planning and decision-making/ GESI aspects/ gender-responsive design features in integrated industrial sector, while keeping in mind the future needs, potential impacts of such proposed investments in physical development terms—both on the direction of induced industrial growth/ urban growth of a town/city and on the surrounding land use(s) of subproject sites in terms of “environmental protection-economic development-equity and social justice,” viable new technologies—for enhancing efficiency of service delivery and effective coverage; (ii) adopting nature-based solutions or low-impact development/green infrastructure principles integrated with or without waste to energy recovery systems for any planning and design work outputs compatible with natural ecosystems/ bio-diversity, such as bio-digesters/ bio-swales or bio-retention ponds, constructed wetlands, etc., including any water body conservation/ beautification as part of innovative use of public open spaces and to facilitate ground water recharge, etc., as feasible towards eco-system based adaptation and facilitating in generation of green jobs;²⁹ and (iii) ensuring universal

²⁹ Green jobs include jobs that reduce waste and pollution, and benefit the environment, while paying decent wages and benefits that can support a family; and green jobs are normally considered in the industry of waste recycling or recovery/ composting with or without waste-to-energy recovery systems, landfills/ incineration/ plasma gasification or vitrification plant integrated with waste-to-energy recovery systems, wastewater/ septage management based on biotreatment principles of bioremediation and/or phytoremediation integrated with or without waste-to-energy

access towards achieving a barrier-free built-environment, gender-sensitive urban design promoted by crime prevention through environmental design–CPTED, etc., while adopting planning and implementation of vision zero strategy for progressive improvement in safety of physical access and commuting on urban roads, etc., which would apart from saved lives due to increased road safety, facilitate in achieving better economic use of development resources and enhanced human productivity as well; and

- prepare comprehensive DPRs, strengthen/ integrate existing DPR work components as part of comprehensive DPRs, and bid documents complete in all respects with bid-level drawings, and good for construction drawings to arrive at investment ready subprojects;
- (iv) assist in investment planning, financial due diligence and financial management planning; and PRF implementation planning along with project performance monitoring system, including prioritizing and phasing investments finally based on the progress on reforms implementation in relevant institutions w.r.t. the prioritized industrial estates or areas identified for ensuing infrastructure investment project(s) in a sequential manner;
- (v) undertake due diligences of economic and financial analysis of subprojects/projects, and provide a comparison with the economic internal rate of return (EIRR) and financial internal rate of return (FIRR) done at the time of appraisal, including any impacts of midstream changes during the PRF period for reviewing/ updating financial analysis and evaluation/ financial management assessment*, including preparation of a project Financial Management Manual (including procedures manual on project specific actions to be developed for implementation by the EA in the ensuing project) for the ensuing project and assess capacity of the EA/ IA's IT systems for accounting and reporting of project activities; while ensuring that financial analysis be consistent with ADB technical guidance note on Financial Analysis and Evaluation, and be consistent with project and entity financial analysis, with due consideration to project and entity risks For financial management assessment, identify the risks and actions proposed in the earlier financial analysis and evaluation/ financial management assessment, and then see if the EA/ IA has implemented those actions to ascertain the responsiveness of the EA/ IA and accordingly update;³⁰
- (x) prepare and submit bid-level working drawings for use at bidding process stage of work; and good for construction drawings before the end of PRF period and prior to any commencement of construction works of the ensuing loan/ project;

Project Safeguard Related Tasks

- (xi) undertake necessary surveys and investigations for social, poverty and gender analyses, assessment of gender equality and social inclusion (GESI) aspects, and design of GESI action plan (GESI AP) required for project preparation and design activities, duly including in its advice/ recommendations for the potential EWCDT—elderly, women, children, differently-abled, and transgender facilities, and other gender and socially inclusive approaches that can be incorporated in the design of the ensuing project; including initial poverty and social analysis/ summary poverty reduction and social strategy (SPRSS), resettlement plan (RP) documentation and related due diligence reports (DDRs)/ Indigenous Peoples

recovery systems, stormwater management based on natural filtration principles, public transit, green building industry, industry for renewable energy and energy efficiency, etc.

³⁰ ADB. 2019. *Financial Analysis and Evaluation: Technical Guidance Note*. Manila; ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila; ADB. 2015. *Financial Management Assessment: Financial Management Technical Guidance Note*. Manila; ADB. 2014. *Preparing and Presenting Cost Estimates for Projects and Programs Financed by the ADB: Financial Management Technical Guidance Note*. Manila; ADB. 2008. *Financial Due Diligence: A Methodology Note*. Manila; etc.

plan (IPP), due diligence reports prior to commencement of construction works, etc., for the proposed investments, as per state/national/international/ donor agency requirements;³¹ and in case of livelihood impacts, the resettlement plan will include initiatives to conduct a needs assessment for livelihood regeneration measures;³²

- (xii) prepare comprehensive environmental management plan (EMP, including health and safety management plan–HSMP³³), initial environmental examination (IEE)/ environmental impact assessment (EIA); fostering innovation and technology use in planning and design for integrated industrial development, including potential resource reuse; and/or other such documentation as may be required to access ADB/ donor funding³⁴, duly incorporating national standards/ benchmarks, and/or international standards and best practices in planning and design, as feasible, for a subproject context;³⁵
- (xiii) measures will be included in the contracting documents to encourage hiring of local population during implementation. In consultation with various stakeholders, support Client in setting-up of a communication strategy and a grievance redress mechanism (GRM) at EA-/ IA-level to redress all concerns related to the PRF, and which could be continued for the ensuing loan/project;³⁶
- (xiv) establish an effective monitoring and reporting system based on sex-disaggregated data (including beneficiary data, and which comply with privacy considerations) to be recorded as collected through public consultations and obtained from Client implementation team, field staff, contractors and other stakeholder authorities, on people who participated in training, including on trainers, and through GESI AP implementation progress during the PRF implementation and also during ensuing project(s) implementation (as per indicators and targets set at outcome and output levels in DMF prepared) so as to be informed with result achievement-levels against measured baseline data in the project completion report as well, whenever due;

Procurement Related Tasks

³¹ ADB. 2012. *Handbook on Poverty and Social Analysis: A Working Document*. Manila; ADB. 2012. *Guidelines for Gender Mainstreaming Categories of ADB Projects*. Manila; etc.

³² ADB. 2009. *Safeguard Policy Statement (Policy Paper, June 2009)*. Manila.

³³ HSMP updated as site-specific health and safety management plan (SSHSMP), which takes into account COVID-19 related health and safety risks (i.e., with HS COVID-19 Plan) should be developed in accordance with the Borrower's policy, legislation and regulatory requirements on COVID-19 prevention and control, and should be approved by the Employer prior to mobilization of site work, with information to ADB. In the absence thereof, the HS COVID-19 Plan should be updated in accordance with international good practice guidelines [ADB Sustainable Development and Climate Change Department (SDCC) Good Practice Advisory Note: *Protecting the Safety and Wellbeing of Workers and Communities from COVID-19 Risks in ADB-funded Projects*, 21 July 2020, as amended from time to time].

³⁴ All reports shall be prepared in ADB accepted formats and shall comply with the ADB approval requirements.

³⁵ The intent is to arrive at innovative interventions/ solutions through a comprehensive DPR that adopts (i) smart growth principles complemented by diversity/ equity/ inclusion and gender mainstreaming in planning, while considering gender equality and social inclusion aspects/ gender-responsive design features; and (ii) are-environment-friendly (adopts in design-low impact development/ green infrastructure/ resource conservation principles etc.), accessible (adopts in design-universal access/ barrier free-friendly built-environment concepts/ planning and implementation of vision zero strategy, etc.), climate resilient (including climate proofing of existing infrastructure), economically viable/ financially sound and ensures operational sustainability of assets as envisaged considering subproject life-cycle period, etc.

³⁶ Grievance is defined as any comments/suggestions, non-contentious questions/clarifications regarding the project, issues/concerns that resulted to non-performance of obligations of any of the parties involved in project processes including safeguards. The grievance redress mechanism (GRM) is anchored on the five principles of: (i) transparency; (ii) social inclusiveness; (iii) being simple and accessible; (iv) having anonymity and security; and (v) institutional capacity building to guide in facilitating and resolving concerns and grievances. PDMC to facilitate the PMU to issue notifications to establish respective grievance redressal committees (GRCs) at various levels [industrial estate-/ PMU-TIDCL/ state-level] with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

- (xv) undertake (a) project procurement risk/ capacity assessment; and (b) strategic procurement planning (SPP) study, conduct SPP Workshop and discuss/ assess contract management support required and prepare Contract Management Plan(s) during pre-contract award stage for finalized subproject contract packages for the ensuing project (proportional to complexity, risk, and value of the contract; and due consideration to whether large subprojects have an individual Contract Management Plan and/or one Contract Management Plan can cover a group of similar contract packages of a similar size for smaller contract packages, etc.), arrive at Procurement Strategy in SPP Study, and submit SPP Report and resultant Procurement Plan prepared in consultation with the Client and ADB. The Procurement Plan prepared in ADB format (including any subsequent review/ updation of the same, as felt required during PRF implementation) for the identified subproject contract packages as prioritized for implementation by Client would illustrate appropriate details of suitable contract modalities, such as contract package name/ description/ estimated value, procurement method, review mechanism [prior review/post review (sampling)], bidding procedure, etc., and would be developed based on the procurement strategy arrived at in SPP Study, different contracting options that recommend most appropriate contracting modality(ies) in structured consultation with the Client and ADB, duly based on the scope of work components for each subproject, and taking into account the institutional capacities of PMU-TIDCL, including concerned stakeholder authorities to undertake procurement of investment-ready subprojects;
- (xvi) prepare draft bid documents for the individual contract packages identified in the Procurement Plan as per latest appropriate standard bidding document (SBD with required addendum wording for HS COVID-19 Plan) and related user guide, and request for quotation (RFQ)/ standard request for proposal (SRFP) issued by ADB for works, goods and plant, non-consulting/ consulting services' contracts and finalize the bid documents or proposal as per comments received. This would also include transaction advisory support for any public-private partnership-PPP projects/ subprojects with bid documentation of functional and performance-based standards under integrated industrial/ urban/ tourism/ transport sectors to be prepared. Support the Client in procurement processing and procurement management, including but not limited to support in the preparation/ any elaboration of the technical and price bid evaluation reports, of contracts for selection of Contractors for subproject contract packages. This support would also include facilitating Client towards the prior review process of ADB on the draft bidding documents or proposal, together with a description of the advertising procedures to be followed for the bidding and the draft IFB for each type of contract (works, goods and plant, non-consulting and consulting services) and/or towards the post review (sampling) process of ADB, as stipulated in the Procurement Plan, i.e., complete support from IFB to the contract signing stage for each awarded contract package. Ensure bid documents/ contracts to comply with measures as set out in the IEE/ EIA (as applicable), EMP, and RP (to the extent they may cause impacts to affected people) as well as corrective action plans;
- (xvii) ensure that draft/finalized bid documents shall include technical specifications, bid-level working drawings (watermarked "for tender purpose only"), bill of quantities (BOQs), comprehensive EMP[including HSMP updated as site-specific health and safety management plan (SSHSM) with site-specific health and safety COVID-19 plan (HS COVID-19 Plan)]/ GESI AP or any other documents required by the ADB, including performance targets specified as per subproject component's sectoral national standards/benchmarks and/or international standards/best practices context applicability and as decided by the government;
- (xviii) assist Client for administrative/management approvals (such as management approvals/administrative sanctions/technical sanctions) by the oversight body

project steering committee (PSC)/DoI&C/ PMU-TIDCL, etc., as applicable, for starting the procurement process. All procurement under the PRF will follow ADB Procurement Policy: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time); Procurement Regulations for ADB Borrowers: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time), and the accompanying ADB Guidance Notes on Procurement (June 2018, as amended from time to time); and latest appropriate SBD (with required addendum wording for HS COVID-19 Plan) and related user guide, and RFQ/ SRFP issued by ADB for each type of contract (works, goods and plant, and non-consulting/ consulting services), as applicable;

- (xix) develop/adopt a quality management system towards implementation of PRF Project and prepare a detailed quality assurance plan (QAP)/quality management plan (QMP) for all field studies, including all necessary surveys/investigations, studies, analyses, design and documentation activities, etc., and such draft detailed QAP/QMP document must be discussed and finalized with Client/concerned stakeholder authorities immediately upon the award of the Contract and submit it as part of the inception report; and prepare/review over time for any modification, a quality assurance and quality control (QAQC) manual under PRF Project for adoption during subproject contract execution in the ensuing loan/ project;

Institutional Strengthening Related Tasks

- (xx) towards institutional strengthening support:
- facilitate to establish institutional mechanism in place and processes for investment ready infrastructure projects:
 - review measures for technical capacity building, and strengthening organizational effectiveness for concerned stakeholder agencies to-plan, develop, implement, and manage infrastructure projects, including project related capacities for stronger monitoring (with monitoring reports) and evaluation; with the intent to deliver infrastructure services at desirable levels of national standards/ service level benchmarks, any other service level agreements, and towards meeting relevant sustainable development goals, while ensuring sustainability of assets through adoption of desired operations and maintenance practices, means of revenue generation/ cost recovery mechanisms, etc., to sustainably manage industrial parks or complexes/ areas/ estates;
 - review of capacities for asset creation/development of infrastructure, including tariff-/ fare-/ user fee or user charges-level policy or structure based on “user pays” principle, and own source revenue generation/cost-recovery mechanisms in place and/or required to ensure sustainability of assets;
 - review and implementation of outlined reforms and initiatives for institutional strengthening component to ensure the sustainability of assets, through:
 - governance performance framework/ requirements (technical-service delivery/financial);
 - value capture financing–VCF;
 - achieving the strategic/operational objectives and key results-measured through service level national infrastructure development sector benchmarks/standards and key performance indicators during the ensuing loan/project implementation; and
 - skills development, with potential for involvement of private sector/ nongovernment organizations/ community-based

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- organizations in certain infrastructure services (e.g., septage management service, solid waste recycling, etc.);
 - review of procurement management system;
 - review of public finance, budgetary allocation and expenditure, to assess the borrowing capacity;
 - administration and financial management system;
 - internal control processes; and
 - fund flow mechanism;
 - initiate/ continue the technical capacity building process under institutional strengthening in coordination with EA/ IA through on-the-job training sessions (the draft implementation of the institutional strengthening/ capacity building programs outlined separately under the PRF would be undertaken);
 - develop comprehensive feedback mechanism for training participants, as well as end-user experience, to be recorded, monitored, appraised and evaluated; including development of knowledge materials and knowledge database/ repository for the integrated industrial sector in Tripura;
 - explore possible synergy with integrated command and control centre–ICCC under Smart Cities Mission/ incident command system–ICS at district- or state-level with existing or proposed disaster management plan(s) supported by information technology–IT-enabled/ information and communication technology–ICT-based solutions—for effective communication and access to emergency rescue and relief services (including, medical facilities/ health-care services, testing centers or laboratories, containment-/ quarantine-/ isolation-facilities, etc.)/ industrial infrastructure monitoring-utilization-management, during any disaster or pandemic (such as, COVID-19) etc., through its connectivity to any proposed administration block facility in each industrial estate or area; and
 - explore for use of technology/ innovation in infrastructure service delivery, including considering impacts of COVID-19 pandemic;³⁷
 - (xxi) prepare a Project Performance Monitoring System (PPMS to be established within three-months of consulting firm's mobilization) at PMU-TIDCL for Benefit Monitoring and Evaluation (BME) on a project by basis that shall include baseline data and targets/ performance measures/ performance indicators agreed upon with the Client. This BME shall provide descriptions and procedures for BME data to be collected before, during and after project implementation:
 - the Consultant shall include a separate chapter on PPMS in the main volume of feasibility studies and DPRs or shall submit a separate report on PPMS at respective stages outlining the collection of required base line data (before and after implementation of project) like, inventory and conditions of physical infrastructure, socio-economic data (e.g. poverty, education, health services, employment, connectivity, trade/ business, transportation, agriculture, industry, etc.), environmental condition data, etc., as necessary;
 - all the above-mentioned baseline data have to be collected before (existing conditions) by the PDMC at project preparation and design stage; and after implementation of project (improved conditions) for each subproject by the construction supervision consultants;

³⁷Advanced technologies are an important component for new and existing assets and can help to improve data availability, to monitor infrastructure use, performance, and safety.

- considering all the aspects as mentioned above, the Consultants have to prepare a comprehensive PPMS report to be utilized by the Client for Project Performance Monitoring and Evaluation purposes;
- (xxii) set-up a financial management system (FMS), integrated with PPMS, and prepare a project Financial Management Manual for the ensuing project and assess capacity of the EA/ IA's IT systems for accounting and reporting of project activities, to build institutional capacity based on Financial Management Manual during PRF implementation and to be continued during the ensuing loan(s)/ project(s);
- (xxiii) facilitate Client in documentation management and retaining all documentation with respect to each contract where prior review/post review (sampling) is required[to be maintained by the Client for at least one (1)-year after the PRF closing date]. This documentation generally includes the bid proposals, the original signed contract, the evaluation report (including the analysis of the respective bids or proposals), and recommendations for award, for examination by ADB or by its consultants;
- (xxiv) facilitate Client in the ensuing loan/project processing stage of work by undertaking as needed financial management assessment, due diligences of economic and financial analyses, project financial management manual, project procurement risk/ capacity assessment, environmental assessment and review framework, initial poverty and social analysis/SPRSS assessment, RP documentation and related DDRs/ IPP, GESI AP, and assessment for resilience to climate risks/ climate change impacts and disaster risks, including developing a DMF and undertaking baseline data measurement, as per relevant ADB–guidelines/accepted formats and meeting ADB approval requirements, and including prioritizing and phasing investments in the identified and prioritized industrial estates or areas for ensuing infrastructure investment project;³⁸
- (xxv) facilitate Client in preparing terms of reference for third party supervision and quality audit consultant–SQAC; and
- (xxvi) provide any other specialist services requested by Client during the PRF period at mutually agreed conditions, which may be required in implementation of cross-sector infrastructure development projects.

Note: All project documents prepared by the Consultant shall be in the prescribed ADB formats, and meeting ADB approval requirements.

12. The PDMC consulting firm will establish its office in Agartala to execute and manage the said consulting services contract. However, the mobilization of the required staff of PDMC consulting firm will be discussed and agreed upon at the stage of contract negotiation process, and would require approval of the Client before actual mobilization. In addition:

- (i) Due to the outbreak of COVID-19, the commencement and completion dates and other implementation arrangements for this assignment are to be considered as indicative only. The final dates and implementation arrangements will be agreed with the first-ranked firm at contract negotiations taking into consideration the prevailing situation with COVID-19 at that time.
- (ii) The consultant should follow Health and Safety Measures as below (equally applicable for non-consulting services):
 - For their own health and safety, the consultant(s) should follow the regulations and guidance on COVID-19 health and safety prevention and controls issued by the Client's government, or international good practices in the absence of national provisions.
 - The Client/ Firm must, where possible, replace field inputs requiring travel and attendance of meetings with video and teleconferencing. Consultants

³⁸ADB. 2020. *Guidelines for Preparing a Design and Monitoring Framework*. Manila.

who are required to visit the project site should be briefed on the approved site-specific health and safety management plan (which should be updated to include COVID-19 specific elements) prior to entering the site and comply with the provisions of it.

- The consultant is responsible for their own health and safety in relation to the consulting services assignment and shall comply with the country specific requirements and regulations in relation to COVID-19.

13. The PDMC shall execute the consulting assignment by following broad chronological order as below:

- (i) first (a) identify the infrastructure gaps, review of exclusionary screening/ prioritization of subprojects (*including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation*), proof of concept/ site plans, development of key indicators, etc., prior to undertaking detailed engineering design stage of work (confirm availability of land with clear-title, site or right-of-way/ ensure all no-objection and necessary clearances obtained for encumbrances free prioritized subproject sites available);and (b) prepare the revised list of prioritized subprojects with draft phasing of deliverables (feasibility studies/ DPRs/ bid documents, etc.), including subproject work components in consultation with the Client and present the same for facilitating decision-making by the government;
- (ii) for prioritized potential subprojects, undertake:(a) the feasibility studies/conceptual design, etc. (as appropriate)and thereafter finalize the list of prioritized subprojects based on result of feasibility studies along with revised phasing of deliverables (DPRs/ bid documents, etc.); and (b) detailed engineering design stage of work, to prepare comprehensive DPR along with the respective bid document, complete in all respects, with procurement processing and procurement management support duly provided before the completion of PRF period; and
- (iii) while, the consulting work of necessary tasks/ activities for institutional capacity development strengthening, overall project management services for the PDMC assignment, facilitating PMU-TIDCL for the ensuing loan/project processing, etc., would continue concurrently during the period of assignment under the PRF.

14. While undertaking the specific tasks for “detailed engineering design” stage of work under the PRF Project, the PDMC firm shall *inter alia*, consider the following aspects:

A. Physical Infrastructure (Water Supply System, Effluent/ Wastewater Management System and Septage Management, Stormwater Drainage System, Solid Waste Management, and Electrical and Power Systems)

The objective is to (i) improve water supply, (ii) effluent/ wastewater/ management and septage management,(iii)storm water drainage (including integration with any water bodies), (iv) industrial waste and MSW management, and (v) electrical and power systems infrastructure-related services in and around the industrial estates or areas for the prioritized subprojects covered under the PRF in the State of Tripura, in order to meet both the present and future demand requirements, duly considering impacts of pandemics such as COVID-19 and resultant need for robust planning for deep uncertainty for above-stated infrastructure services, with all these services extended to full coverage of the industrial plots/ tenants and any resident population coverage in the non-processing areas/ any surrounding communities not yet serviced, as feasible. This is envisaged to entail:

- (a) the improvement, rehabilitation of existing facilities and/or construction of new facilities to ensure the adequacy of water supply and other services commensurate with the projected demand requirements from existing and

potential customers, including the firefighting water demand applicable for the industrial estates or areas, including in non-processing areas; along with the poorer section of the community residing around industrial estates or areas, including in non-processing areas and currently not serviced in integrated industrial sector;

- (b) the organizational improvement and restructuring of management and organization structure for optimal efficiency in delivering the services to all existing and potential consumers in the most cost-effective manner;
- (c) the maximum possible outsourcing of operations and maintenance services to efficiently deliver the improvements in (a) and (b) above; and
- (d) the PRF Project will contribute to environmentally balanced and sustainable industrial development in the identified priority industrial estates or areas, in line with balanced regional economic development and sustainability. The development model shall integrate and take account of the natural resources and terrain with integrated industrial/ urban planning, infrastructure planning, design and construction, and service requirements. The underlying principles shall include:
 - i. water-sensitive urban design (WSUD), so that the integrated industrial/ urban infrastructure is planned, designed and constructed with the water cycle of the catchment/watershed in mind, to help sustainable management of the water environment;
 - ii. north eastern regional perspective, so that the planning and development of each industrial node/ urban growth centre or border centre is integrated with its local, regional and economic growth in international border trade, and the shared use of its resources and infrastructure services;
 - iii. integrated urban water management (IUWM);
 - iv. low-impact development/green infrastructure principles, as feasible; and
 - v. factors or measures for resilience to climate risks/ climate change impacts and disaster risks embedded in design, towards building climate and disaster resilience, tertiary treatment of wastewater to reuse for industrial water demand, including understandings obtained through wastewater-based epidemiology–WBE and to meet provisions for adequate or potentially higher - water, sanitation and health–WASH requirements to be addressed during pandemics, whether as centralized or decentralised solutions (as appropriate) for investment that address “new normal” or be integral to “next normal” conditions.

The specific tasks contained in the detailed scope of work are intended to serve as minimum requirements for the Consultant to undertake the project study/review and design work for the assignment. Additional tasks that add to a greater understanding of key issues may be addressed, as appropriate. To implement the objectives of the proposed assignment, the work of “detailed engineering design” stage for prioritized subprojects/ work components in and around industrial estates under integrated industrial sector should be organized under the following tasks:

Task-1: Survey of Project Towns

- (a) **Defining the Boundary of Planning Area.** In consultation with the DoI&C/ TIDCL, the PDMC will identify the geographic boundary of the industrial estates or areas, including the potential future growth area and the drainage outfall area outside the boundary of industrial estates or areas (including non-processing areas) to be covered in the project. Any land use map available with TUDA/ GIS-based base maps available with PMU-TIDCL indicating boundaries/ industrial plot layouts/ utilities mapped will form the baseline for the PDMC’s integrated planning purposes, with geo-referencing of cadastral sheets overlaid to be undertaken. Additional areas, if any, are to be covered in proposed growth

nodes/ centers (industrial/ urban/ border towns requiring trade facilitation support) under the GIS-based base maps, adopt digitization of any existing city-level/ area-level maps and/or land parcel/ plot layout map(s), undertake geo-referencing of cadastral sheets overlaid with open-source imagery of appropriate resolution and/or scaled mapping output(s) of a physical/ topographical survey for the site location(s)/ alignment(s) of prioritized subprojects, to prepare/ update such GIS-based base maps using Consultant's own ArcGIS or QGIS.³⁹

- (b) **Collect present infrastructure and service data.** Conduct a reconnaissance survey; articulate and accurately identify conditions in the existing water supply, effluent/ wastewater management and septage management, storm water drainage (including integration with any water bodies), industrial waste and MSW management, and electrical and power systems infrastructure-related services will provide an effective base from which to define the direction for overall improvements; and evaluate alternative development scenarios. The following surveys will help to identify the infrastructure augmentation and service delivery enhancement needs of industrial tenants/ residents (population coverage in the non-processing areas/ any surrounding communities not yet serviced, as feasible) of respective prioritized subprojects in and around industrial estates or areas, as applicable:
- i. review of existing plans and demographic data: The Consultant should obtain and review the existing plans as available related to: (i) industrial planning/ urban land use planning; (ii) water supply; (iii) effluent/ wastewater management and septage management; (iii) storm water drainage (including integration with any water bodies)(including integration with any water bodies); (iv) industrial waste and MSW management; and electrical and power systems infrastructure-related improvements;
 - ii. data on industrial units/ MSMEs socio-economic characteristics, property ownership, growth character, special characteristics like, international border trade, connectivity, power availability, natural gas availability, etc.;
 - iii. infrastructure inventory: The Consultant will prepare a detailed inventory of existing infrastructure. This shall include details of:

Water Supply System

- water resources available/ source augmentation needs, raw and treated water quality, treatment plants, iron removal plants, storage (overhead/ underground) and pumping systems, metering, and inventory of loss;
- water network details with approximate age profile, type and class of pipes laid;
- service connections and service levels;
- current O&M organization, staffing, maintenance data for at least two (2)-calendar years;
- financial data comprising of annual capital and O&M budgets, current expenditure trend, prevailing tariffs, revenue billing and collection details;
- list of ongoing capital and maintenance works (plan and non-plan); and
- any other available information relevant to the study shall be

³⁹QGIS (previously known as Quantum GIS) is a free and open-source cross-platform desktop geographic information system (GIS) application that supports viewing, editing, and analysis of geospatial data.

compiled from primary and secondary sources and site visits. Any inconsistency or deficiency in the information shall be noted. The PDMC should compile and integrate the existing water supply infrastructure database into the GIS-based base map of respective prioritized subprojects in and around industrial estates or areas, including subproject site location/ alignment (within processing and non-processing areas).

Effluent/ Wastewater Management and Septage Management

- effluent/ wastewater management systems available/ functional in and around industrial estates or areas, including any septage management systems available for communities in non-processing areas/ any surrounding communities, including effluent/ wastewater or sewage treatment plants, treated effluent quality, storage and pumping systems, etc.;
- coverage of individual toilets and details of community and public toilets in non-processing areas/ surrounding communities;
- for industrial estates or areas, is there any existing integration of wastewater/ sewage treatment resultant treated effluent to be further treated through tertiary treatment at the industrial estates or areas itself to reuse such treated water for managing the industrial water demand;
- for communities, if the current practice of treatment of wastewater is through sewage treatment plants or septage management plants (including vehicles, equipment etc.), leach pits, septic tanks, direct discharge into open drains, water bodies etc.;
- available facilities and methodology for desilting of leach-pits or septic tanks, both public and private;
- current method of disposal, if any, for treated effluent/ wastewater and septage, including residual solids;
- any waste-to energy recovery systems available/ functional/ in-pipeline
- prevailing policies like, scheduled desludging/emptying policies and standard operating procedures/management models (e.g., performance-linked annuity model of private sector participation/ non-government organisation/ civil society that operates at a certain collection frequency, etc.) for septage management, if any, considered as best practices; and tariffs for public and private suction tanks or tractor trolleys and trucks based on collection and conveyance capacities, with break-up of labour for desilting, transport and disposal costs; any incentives, etc.;
- details of existing septage treatment plants, if any;
- current O&M organization, staffing, maintenance data for at least two (2)-calendar years;
- financial data comprising of annual capital and O&M budgets, current expenditure trend, any taxes collected as part of property tax or other cess, etc., as the case may be towards wastewater or septage collection/conveyance/treatment/disposal, including revenue billing and collection details;
- list of ongoing capital and maintenance works (plan and non-plan); and
- any other available information relevant to the study shall be compiled from primary and secondary sources and site visits. Any inconsistency or deficiency in the information shall be noted. The

PDMC should compile and integrate the existing effluent/ wastewater management and septage management-related infrastructure database into the GIS-based base map of respective prioritized subprojects in and around industrial estates or areas, including subproject site location/ alignment (within processing and non-processing areas).

Stormwater Drainage System

- details of existing collection network (onsite/ offsite), outfalls and pumping systems, if any;
- details of any integration with water bodies (existing holding tanks/retention ponds/reservoirs/ streams/ rivers, etc.), either local community owned or government owned belonging to irrigation department/district administration/Dol&C/ municipal body etc., including alongside roads in industrial/ surrounding non-processing and habitation areas;
- service levels as available in regard to coverage during past two(2)-calendar years; including details of water logging frequency and incidents during the past decade, i.e., (10)-calendar years or longer duration, as feasible based on data available, or at least during the past two(2)-calendar years;
- current maintenance organization, staffing, maintenance data for at least two (2)-calendar years;
- any prevailing policies or practices in adoption, both for public or private sector/with any incentives, like on mandating or encouraging integrated onsite stormwater drainage management/water conservation through rainwater harvesting tanks (at surface/ underground/above ground), adoption of low-impact development/ green infrastructure principles in design, integrated roadside storm water drainage systems (conventional/environment-friendly) of adequate capacities, etc.;
- financial data comprising of annual capital and O&M budgets, current expenditure trend, prevailing taxes either as part of property tax or cess, etc., as the case may be for storm water drainage management, including revenue billing and collection details;
- list of ongoing capital and maintenance works (plan and non-plan); and
- any other available information relevant to the study shall be compiled from primary and secondary sources and site visits. Any inconsistency or deficiency in the information shall be noted. The PDMC should compile and integrate the existing storm water drainage infrastructure and landslip protection works database into the GIS-based base map of respective prioritized subprojects in and around industrial estates or areas, including subproject site location/ alignment (within processing and non-processing areas).

Solid Waste Management

- provision and coverage of industrial waste segregation and collection, including hazardous and non-hazardous waste, and with appropriate treatment, storage and disposal facility (TSDF/ plants) and/or special/ safe containment system;
- coverage of municipal community waste bins in habitation areas (including those in employment zones/ commercial areas/ open spaces/ thoroughfares, etc.), handcarts/ wheel barrows and/or

tricycles with waste bins, tools/ equipment/ personnel protective equipment (PPE) or gears for municipal solid waste (MSW) collection; and solid waste collection vehicles with bins (smaller-capacity)/ collection and conveyance trucks (large-capacity) with transportation frequency/ trips per day/ waste load per trip per vehicle, etc., and street cleaning vehicles (including street sweeping frequency and efficacy, solid waste traps on storm water drains/ storm sewers, streams, etc.);

- distribution of waste transfer stations and/or waste storage depots for temporary storage till the waste is transported, if any, along with waste compression or compaction or bailing equipment under public utility and/or private facilities—with/ without material resource center (e.g., material recovery facility and/or material recycling facility for reuse/ onward treatment and disposal through processing/ decentralized processing/ co-processing);
- current levels of waste generation (by waste generating source/ landuse zone) and average waste generated per capita, town-level waste characteristics (bio-degradable or compostable/ non-bio-degradable/ combustible/ inert waste with percentage of waste item types)/ chemical characteristics on dry-weight basis/ waste composition, and waste diversion rate in respective towns where industrial estates or areas are located, and use the average per capita waste generation rate to arrive at MSW generation for the communities in the non-processing area/ surrounding communities;
- current methods of MSW treatment and disposal and their details—a dumping ground/ ordinary landfill site or a scientifically-laid sanitary landfill site (present waste composition as disposed in landfill, including residual solid waste disposal through landfill), incinerator, mechanical compost plant, vermi-compost plant, etc., with/ without integration to waste-to-energy recovery mechanisms, including any critical problems/ issues, such as any existing landfill not prepared scientifically/ lining issues/ leachate contamination to soil and/or water resource, land availability/ any regional issues, etc.;
- current practice of MSW collection—whether door-to-door collection and/or from community waste bins, collection frequency, etc.;
- service levels as available in regard to solid waste management;
- prevailing policies and practices, in integrated industrial/ urban sector like, waste segregation-at-source, safe collection of industrial waste/ bio-medical waste, adoption of principles of waste hierarchy—avoid or refuse/ reduce/ reuse/ repurpose/ recycle or recover/ treat/ dispose, and waste diversion, if any, considered as best practices, use of technology/ existing technical capacities; and user fee and/or tipping fee paid to any concessionaire, for municipal waste management collection, transport, treatment, and disposal costs, and for any industrial waste-related TSDF/ plants/ containment systems; any other overall industrial waste and MSW management costs such as for staff/ land/ building/ transportation/ processing/ treatment/ storage/ disposal, etc.; any incentives, etc., for life-cycle cost assessment;
- current organization (for industrial waste/ MSW management), overall staffing, conservancy staff and equipment deployment, operational/ maintenance data for industrial waste and MSW

management component for at least two (2)-calendar years;

- financial data comprising of annual capital and O&M budgets, current expenditure trend, any taxes collected as part of property tax or other cess, etc., as the case may be towards industrial waste and MSW solid waste management–segregation/ collection/ conveyance/ treatment/ storage/ disposal, etc., including revenue billing and collection details, expenditure on public awareness sessions/ Swachhta Abhiyaans, etc.;
- list of ongoing capital and maintenance works (plan and non-plan) on industrial waste and MSW management; and
- any other available information relevant to the study shall be compiled from primary and secondary sources and site visits. Any inconsistency or deficiency in the information shall be noted. The PDMC should compile and integrate the existing industrial waste and MSW management-related infrastructure database (both public and private) into the GIS-based base map of respective prioritized subprojects in and around industrial estates or areas, including subproject site location (within processing and non-processing areas).

Electrical and Power Systems Infrastructure

- current power supply mechanism–availability from national/ regional grid, state generation and state utility supply and/or independent power producer–IPP, and captive power (thermal–coal-/ gas-based, diesel generator sets, renewable energy systems, etc.);
- current power supply distribution mechanism for connectivity in and around industrial estates or areas, including in non-processing areas for social or institutional/ commercial/ residential use; and related electrical and power systems infrastructure–electricity sub-stations, high-tension (HT) lines for high-voltage power supply and/or low-tension (LT) lines for low-voltage three-phase and single-phase power supply, transformers, junction-boxes, smart power generators/ renewable energy generation, smart meters, etc.
- service levels as available in regard to electrical connectivity coverage and electricity demand and power supply management during past decade, i.e., (10)-calendar years, as feasible based on data available, or at least during the past two(2)-calendar years; status of power problems/ unscheduled cuts affecting productivity, level of use of diesel generator (DG) sets and the affect on overall production costs and air pollution, etc.;
- prevailing policies and practices in planning and design for industrial use connections, industrial electricity usage/ demand assessment, and power supply (allocation and management) for existing industries and trade units/ MSMEs, and proposed industrial development projects; any requirement for power-back up systems based on current industrial electricity demand-supply management; any incentives, etc., for life-cycle cost assessment;
- current organization (for industrial electricity usage/ demand and power supply management), overall staffing, equipment deployment, operational/ maintenance data for electricity demand and power supply management, and power systems infrastructure for at least two (2)-calendar years;
- financial data comprising of annual capital and O&M budgets,

current expenditure trend, electricity tariff and/or cess/ surcharge etc., revenue billing and collection details; expenditure on public awareness sessions on use of renewable energy with net metering/ energy efficiency etc., including any incentives/ subsidies/ loans, etc.;

- list of ongoing capital and maintenance works (plan and non-plan) on electrical and power systems infrastructure; and
- any other available information relevant to the study shall be compiled from primary and secondary sources and site visits. Any inconsistency or deficiency in the information shall be noted. The PDMC should compile and integrate the existing electrical and power systems infrastructure database into the GIS-based base map of respective prioritized subprojects in and around industrial estates or areas, including subproject site location/ alignment (within processing and non-processing areas).

(c) **Strategy Planning.** Based on the above data collection, (a) identify the infrastructure gaps, undertake review of exclusionary screening/ prioritization of subprojects and industrial strategy prepared (*including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation*), proof of concept/ site plans, development of key indicators, etc., prior to undertaking detailed engineering design stage of work (confirm availability of land with clear-title, site or right-of-way/ ensure all no-objection and necessary clearances obtained for encumbrances free prioritized subproject sites available); and (b) prepare the revised list of prioritized subprojects with draft phasing of deliverables (feasibility studies/ DPRs/ bid documents, etc.), including subproject work components in consultation with the Client and present the same for facilitating decision-making by the government, prior to undertaking of onward works commencing with feasibility studies for prioritized subprojects.

(d) **Confirming critical topographical survey data.** The GIS-based base maps made available by Client would cover all the industrial estates or areas. The geo-referencing of cadastral sheets overlayed is however, to be undertaken by PDMC, with geo-referenced coordinates and ground elevations, including validation/verification of all critical elevations adopted in the hydraulic design of relevant infrastructure components. The Consultant shall also undertake topographical and block levelling surveys of all infrastructure components under prioritized subprojects covering: (i) water supply facilities, such as water source, intake/ diversion weir, transmission mains and distribution networks, water treatment plants, pumping stations, balancing reservoirs, etc.; (ii) effluent/ wastewater and septage management facilities, such as effluent/ wastewater or sewage treatment plants, septage management plants, pumping stations, coverage of public toilets, disposal arrangements like, leach pits, septic tanks, etc., including existing methods of septage collection, conveyance, treatment and disposal; (iii) existing storm water drainage facilities, identifying blackspots with frequent water logging incidents including outfall arrangements; (iv) industrial waste and MSW management methods and facilities, for collection, transfer and transportation, waste diversion/ resource recovery/ recycling facility, treatment and disposal, including TSDF/ plants/ safe containment systems; which may fall outside the industrial estates or areas' or municipal boundary and may not have been covered by the existing GIS-based base maps. Such coverage shall be ensured in the base maps prepared/ updated by the PDMC, including for any additional areas, as stated earlier.

The PDMC is to become familiar with the hydraulic drainage model it intends to use for its data requirements. The hydraulic model will require the physical features of the project towns to be documented in a manner suitable to the

models. A comprehensive detailed field survey tied to a common benchmark is required. This includes a cadastral map of each prioritized industrial estate or area, including non-processing area (along with respective town) and/or subproject site location/ alignment with enough spot levels to be able to draw contour lines at 5 m intervals across the prioritized industrial estate or area, including non-processing area/ respective town (where required) and/or 1 m intervals along prioritized subproject site location/ alignment, as applicable.

Maps and benchmarks of the study area are to be collected from the Survey of India (SOI map of 1:50,000 scale). Where available, existing aerial survey/ satellite imagery are also to be collected from appropriate sources. Local planning area maps are to be collected from PMU-TIDCL along with any relevant data from respective town's municipal authorities and from agencies, like UDD/ TUDA, DoT/ TTDCL, PHED, PWD, etc., as the case may be. A reconnaissance survey is to be undertaken to verify the collected data and to confirm the topographic details. Total Station Survey is to be used to capture surface levels and the physical details of structures in the affected areas of subproject site location(s)/ alignment(s) in and around prioritized industrial estates or areas. The data is to be collected and digitized into the Consultant's own ArcGIS or QGIS. The data is to be verified by field survey/ ground truthing survey resulting in a cadastral and/or topographic map/plan of each prioritized industrial estate or area, including non-processing area and/or prioritized subproject site location/ alignment. All structures likely to impact on the water supply, wastewater/septage management, stormwater drainage and landslip protection works, and solid waste management systems under the prioritized subprojects are to be identified.

A final set of maps/ plans must be prepared displaying the above information, including surveyed surface levels, the proposed water supply system, effluent/ wastewater management and septage management, stormwater drainage, industrial waste and MSW management, and electrical and power systems, and all service areas including covering the non-processing areas/ surrounding communities. The maps to the scale of 1:1000 should contain surface level contours at 5 m intervals across the prioritized industrial estate or area, including non-processing area/ respective town (where required) and/or maps to the scale of 1:200 should contain surface level contours 1 m intervals along prioritized subproject site location/ alignment, as applicable.

- (e) **Geo-Technical Surveys/ Investigations.** The Consultant shall organize and undertake standard geo-technical surveys to investigate and determine the soil strata, foundation requirements, sub-surface water levels, trench cutting requirements, etc., for the prioritized subprojects; and the number of samples shall be in accordance to relevant Indian national standards. For the purpose of bidding, the number of locations for geo-technical surveys shall be a minimum of fifteen (15)-sites per prioritized industrial estate or area, including non-processing area and shall cover, the water and effluent/ wastewater and septage treatment plant sites, industrial waste and MSW treatment and disposal sites (including TSDF/ plants/ containment systems), all pumping stations and waste transfer stations, reservoirs, electric sub-station, etc., and at least 10-sites per prioritized industrial estate or area, including non-processing area for covering the transmission and distribution systems, drainage, HT/ LT lines, etc.
- (f) **Geographic Information System.** The PDMC is required to prepare/ develop/ update a prioritized industrial estate or area, including non-processing area-specific and/or prioritized subproject site location(s)/ alignment(s)-specific GIS-baseline maps/plans using the Consultant's own ArcGIS or QGIS. The PDMC must engage an expert in GIS practice for this part of the consulting services. The GIS-based outputs will, in effect, become a repository of much of the data collected by the Consultants. All the collected spatial data, or spatially-related data, must be geo-referenced using the standard spatial referencing system. In addition, and as applicable, the data must also be referenced to a common

benchmark for each prioritized industrial estate or area, including non-processing area. If necessary, these benchmarks are to be established. The data that is to be collected and loaded into the GIS-database, is all that data required by the project/ subproject.

Task-2: Water Supply Improvements

(a) **Planning and Design Scope.** Considerable effort is expected to be expended in developing prioritized industrial estate or area, including non-processing area specific water supply improvement plans based on any existing water supply master plans that, when designed and constructed, will lead to the sustained delivery of continuous pressurized water services that meet industrial and surrounding urban communities' social and environmental expectations. This part of scope of study will be undertaken in several stages, and as far as is practical, these stages are expected to run in parallel:

- Stage-1 of Source Identification Report: The content of Source Identification Report shall consist of the guidelines provided at Section 3.2 of CPHEEO Manual;⁴⁰
- Stage-2 of Pre-Feasibility Report: The content of Pre-Feasibility Report shall confirm to the guidelines provided in Section 3.3 of CPHEEO Manual; and
- Stage-3 of Detailed Project Report: The content of Feasibility Report shall consist of the guidelines provided at Section 3.4 of CPHEEO Manual.

The study is to place emphasis on the practical operation of the planned water supply system. It is not enough to plan conventional normative piped water network systems, which often result in substantial variations during implementation due to topographical needs, onsite obstructions, land availability and restricted work sites and geo-technical issues. Practical influences include the hydraulic requirements, the topography, the layouts (of prioritized industrial estate or area, including non-processing area, and respective town, where required), road networks, the density of property development (Industrial/ surrounding urban communities), the location of the water extraction point, intake/ diversion weirs, water treatment plant, reservoirs, etc., and maintainability of the assets. Factors such as employment size of industrial and trade units/ MSMEs (including when integrated with employment size of multimodal logistics park/ special economic zone/ integrated check post, IT park etc.) and population size in non-processing areas/ surrounding urban communities, topography, groundwater level as well as the locations of pumping stations and the treatment plant must be considered. In addition to capacity augmentation of drinking water infrastructure facilities, there is a significant need for investments in retrofitting the existing infrastructure to cover the backlog maintenance. The study is expected to address each of these and how they impacted the design and operation of the planned water system.

These terms of reference for water supply infrastructure include a planning methodology, which is to be followed by the PDMC. The degree of success of the planned water system will reflect the experience and the detailed attention that is to be carefully applied to each aspect of the system, as outlined in these terms of reference. The Consultant shall employ a concerted effort to develop an integrated water management solution, which is resilient to climate changes and delivers services in an optimum manner to provide an effective, efficient, and sustainable service in each prioritized industrial estate or area, including non-processing area.

The technical specifications for undertaking the planning and design for water

⁴⁰Section numbers refer to respective sections in the CPHEEO, Manual on Water Supply and Treatment, 1990.

supply systems shall conform to the Indian national standards and are summarized in Annexure 1.

- (b) **Water Supply Infrastructure Design.** Prepare the design of the selected water supply component of prioritized industrial estate or area, including non-processing area-specific proposal, including any intakes, intake/ diversion weirs, desilting tanks, transmission and distribution systems (new/ replacement), water treatment plants, pumping stations, reservoirs (overhead/ underground), any water supply zones, metering, etc. As part of this, the Consultant will:
- i. review the current design/service parameters, suggest any changes it considers appropriate, and conduct hydraulic analyses of proposed system designs, to determine their compliance with the agreed parameters;
 - ii. undertake the assessment of water needs, available resources, and the capacity of existing systems, and advise on any improvements necessary to achieve and sustain the agreed design and service standards. This may include source and system augmentation, rehabilitation and extension, etc.;
 - iii. identify suitable water sources (surface water and groundwater), confirm quality and quantity of water available;
 - iv. design of intakes and/or infiltration galleries to maximize their efficiency, and minimize the effects of siltation, climate change impacts and their maintenance requirements;
 - v. design the water treatment systems duly evaluating latest technologies most appropriate for the local needs, institutional capacity, environment, sustainability, and operation and maintenance capacities, etc.;
 - vi. design water transmission main including pipe trenching, laying, thrust blocks, pressure testing, access for cleaning/repair (including air/scour, flow control, pressure regulating valves), pumping, power supply, water quality monitoring;
 - vii. design the water distribution systems including pipe trenching, laying, pressure testing, access for cleaning/repair (including air/scour valves), pumping, power supply, water quality monitoring, industrial fire-fighting capacity, including non-processing area/ surrounding communities-related household/communal water points or stand posts, household/ social or institutional/ commercial use related collection and storage capacity;
 - viii. design various instrumentation systems for effective and efficient supervisory control, data acquisition—SCADA and monitoring of asset and operational performance, service delivery monitoring and sustainable maintenance management;
 - ix. plan for road cutting and restoration (making good the same at each road crust-layer levels with proper compaction, and maintaining the same road surface level as before, as a best practice) and managing the excavated soils and all related social and environmental safeguards, and shifting of utilities, removal of construction debris, and permits for undertaking various works;
 - x. prepare the detailed engineering designs, bid-level working drawings, and good for construction drawings for the proposed works;
 - xi. assess requirements for effective, efficient, and sustainable operations and maintenance of the assets created (preventive and routine maintenance), including all commercial service requirements like, meter reading, billing, revenue collection, customer contact management, etc., with all necessary needs of staffing, transport, administration, consumables, etc., complete in all respects;

- xii. while designing and adopting particular technology, consideration should be given for the life-cycle costs of the proposed systems, the financial and technical capacities of the respective local bodies to operate and maintain proposed system;
 - xiii. incorporate successful regional, national and international experiences in water supply systems and strategies in comparable situations (from technical perspective, the State of Tripura is located in the Himalayan region/north eastern region of India), especially in the field of water demand management to optimize the system, water resource(s) and equitable water use;
 - xiv. prepare the required technical specifications, bills of quantities (BOQs), cost estimates, and bid documents (complete in all respects, following ADB accepted formats and meeting ADB approval requirements);
 - xv. be available for technical support to Client and UDD/ TUDA and PHED to undertake field visits, etc., during implementation, if required.
 - xvi. as required, assist Client in bid process management, including evaluation of bids;
 - xvii. provide on-the-job training and mentoring to the designated DoI&C/ PMU-TIDCL Engineers on the design and procurement of water supply subproject component, use of relevant software, suitable technologies, etc.; and
 - xviii. conduct any other tasks needed for successful completion of the water supply infrastructure-related consulting services' objectives.
- (c) **Hydraulic Modelling.** The PDMC shall undertake hydraulic modelling of the water pumping transmission, pumping, storage(overhead/ underground), and distribution network. The purpose of the hydraulic modelling is to determine the required diameters of water pipelines for the design flows, and to also determine the performance of the pipes laid at peak flows. The performance of entire pumping, storage, and distribution system shall be demonstrated on an extended period simulation for at least 72 hours of continuous flow regime.
- [Note:** Maps and plans are expected to be produced along with the reports for all sectoral infrastructure outputs under the PDMC assignment. Among other things these maps (standalone layers and composite layered/ overlaid outputs) and plans must be produced from the Consultant's own ArcGIS or QGIS and must show the longitudinal sections of all transmission and distribution pipelines, layouts of treatment plants and any zone wise distribution systems etc., complete in all respects. These GIS-maps and database output editable files prepared/ updated by the Consultant will be transferred to the Client's own GIS-mapping and database system as part of the PDMC assignment.]

Task-3: Effluent/ Wastewater Management and Septage Management

- (a) **Planning and Design Scope.** The scope of this component comprises firstly, preparation of a effluent/ wastewater management and septage management plan for exploring and developing a sustainable system of potential tertiary treatment of treated wastewater or sewage effluent for reuse as part of industrial water demand, effluent/ wastewater management, and septage management (in non-processing areas/ surrounding urban communities) with septage collection, conveyance, treatment and safe disposal among the prioritized subprojects or respective towns (where required). Considerable effort is expected to be expended in developing such effluent/ wastewater management and septage management plans that, when designed, procured and constructed, will lead to the sustained delivery of effluent/ wastewater management and septage management services that meet industrial and surrounding urban communities' social and environmental expectations.

A second stage of this project will be the detailed engineering design, which would also result in arriving at parameters/ guidelines/ manual to be considered during subsequent construction of the planned effluent/ wastewater management and septage management interventions and special emphasis will be placed on: (i) the quality of construction; and (ii) the ongoing operations and maintenance of the constructed assets as well as procured goods/ plants (including, equipment, vehicles, etc., for septage management). To the extent possible this consultancy is to reflect these two-future components in their design, bid documents, and other supporting documentation.

This part of scope of study will be undertaken in several stages as follows. As far as is practical these stages are expected to run in parallel:

- Stage 1: GIS Establishment Report
- Stage 2: Identification Report
- Stage 3: Pre-Feasibility Report
- Stage 4: Feasibility Report.

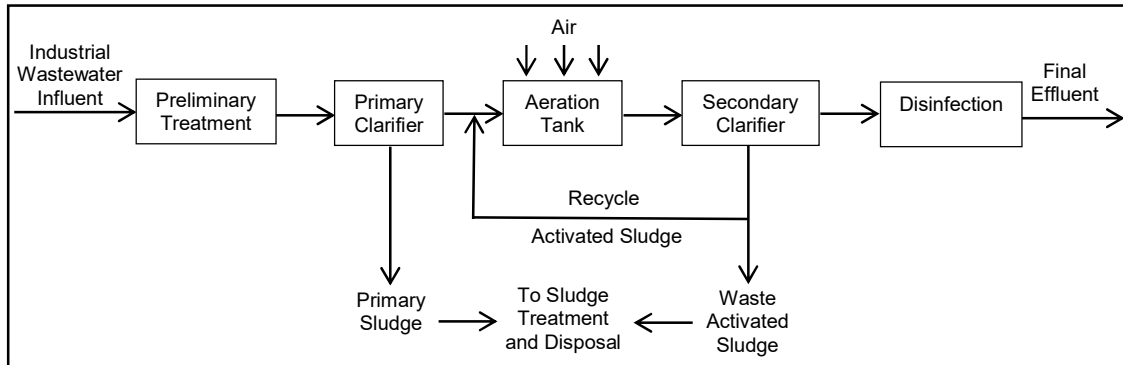
The study is to place emphasis on the practical operation of the planned effluent/ wastewater management and septage management interventions. Practical influences include the hydraulic and biological loads, the topography, the layouts (of prioritized industrial estate or area, including non-processing area, and respective town, where required), road networks, the density of property development (Industrial/ surrounding urban communities), the location of the effluent/ wastewater treatment plant and septage treatment plant, and maintainability of the effluent/ wastewater management and septage management assets. Factors such as employment size of industrial and trade units/ MSMEs (including when integrated with employment size of multimodal logistics park/ special economic zone/ integrated check post, IT park etc.) and population size in non-processing areas/ surrounding urban communities, topography, groundwater level as well as the locations of any pumping stations and the effluent/ wastewater treatment plant and septage treatment plant must be considered.

The study is expected to address each of these and how they impacted the design and operation of the planned effluent/ wastewater management and septage management interventions.

These terms of reference include a planning methodology which is to be followed. The degree of success of the planned effluent/ wastewater management and septage management interventions will reflect the experience and the detailed attention that is to be carefully applied to each aspect of the effluent/ wastewater management and septage management system as outlined in these terms of reference. This is not just a conventional detailed project report but a concerted effort to develop a model effluent/ wastewater management and septage management system where different effluent/ wastewater and / septage collection and treatment systems are used in an optimum manner to provide an effective, efficient and sustainable solution for each prioritized industrial estate or area, including non-processing area.

- (b) **Effluent Treatment Plant.** The effluent treatment plant (ETP) is a process design for treating the industrial wastewater for its reuse or safe disposal to the environment, as per Indian national standards stipulated in CPHEEO Manual. The terminologies used in ETP are: (i) influent–untreated industrial wastewater; (ii) effluent–treated industrial wastewater; and (iii) sludge–solid part separated from industrial wastewater by ETP. The design and size of the ETP depends on: (i) quantity and quality of the industrial discharge; (ii) land availability; and (iii) monetary considerations for construction, and O&M. Further, the land area dimension depends on: (i) quality of industrial wastewater to be treated; (ii) flow rate, and (iii) type of biological treatment to be used. In case of scarcity of land, common effluent treatment plant (CETP) is preferred over provision of an ETP.

The ETP process follows four levels of treatment—preliminary, primary, secondary, and tertiary or advanced treatment using disinfection prior to final effluent discharge as indicated below.



Permissible national standards in India for treated final effluent for disposal to inland surface water for few key characteristics is summarized below:

S. No.	Characteristics	Permissible Limits (For disposal to inland surface water)
1	pH value	5.5 to 9.0
2	Total Suspended Solids (TSS)	Less than 100 mg/l
3	Oil and Grease	Less than 10 mg/l
4	Biochemical Oxygen Demand (BOD)	Less than 30 mg/l
5	Chemical Oxygen Demand (COD)	Less than 250 mg/l

mg/l = milligram per litre

- (c) **Common Effluent Treatment Plant.** The CETPs are treatment systems specifically designed for collective treatment of effluent generated from small-scale industrial facilities in an industrial cluster. Individual ETPs generally face problems from lack of space, resources, capital cost, and specialized manpower for O&M, which are especially exacerbated for small-scale industrial facilities. These problems are reduced by collective treatment of effluent from a large number of small-scale facilities at a single site where the effluent undergoes similar treatment to what it would be subjected to individually. This helps in terms of land conservation, better treatment at one location, easy operation and maintenance, and shared expenses. CETPs are designed to collect and treat effluent from a multitude of facilities, which can also require CETPs to deal with varying qualities and quantities of effluent.

The PDMC shall undertake consultation with TSPCB, and refer inspection and monitoring reports conducted by Central Pollution Control Board/ TSPCB on performance of existing ETPs/ CETPs.

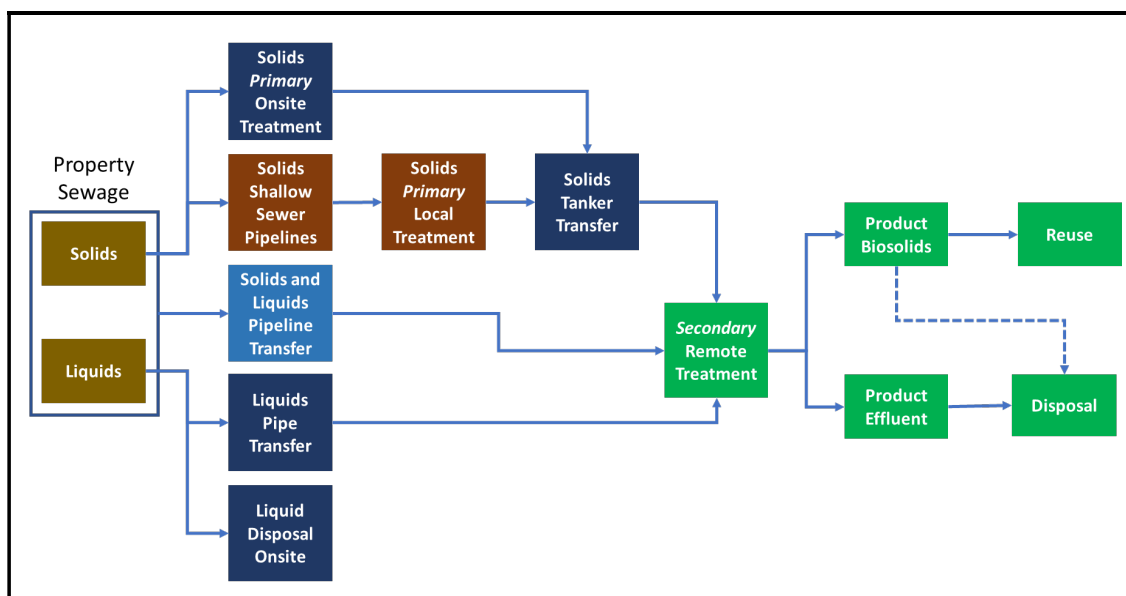
- (d) **Sewerage Systems.** The sewerage systems are to use contemporary sewerage practices to collect and treat sewage and dispose of the resulting effluent and bio-solids in accordance with Indian national standards and guidelines. This consultancy is required to examine the options for providing the sewerage services and using diligence and expertise to prepare a preliminary design, and a detailed project report addressing the recommended sewerage implementation solution.

One important aspect of this task is that the Consultant is expected to carefully study the options for sewer network in the prioritized industrial estates or areas, including non-processing areas/ surrounding communities, and recommend solutions that are practical and workable. Experience and lessons learned from other sewerage projects in India and other countries in the region/other

international best practices are expected to guide the preliminary design, as much as theory and the blind application of national guidelines.

- (e) **Sewerage System Options.** For the non-processing areas/ surrounding communities either the septage management options shall be explored (as described later) or where terrain and density of property development would enable sufficient flows, the sewage is to be collected, transferred and treated before disposal. There are multiple options to provide this service and these are shown in the following table. This study is to examine the options which are listed in the table and illustrated in the subsequent figure. Further details on these options are provided later in this document.

Options	Process	Solids			Liquids		
		Onsite	Local	Remote	Onsite	Local	Remote
Option 1	Conventional			Y			Y
Option 2	Septic Tank (ST)	Y			Y		
Option 3	ST + Common Effluent	Y					Y
Option 4	Communal Septic Tank (CST)		Y		Y		
Option 5	CST + Common Effluent		Y				Y
Option 6	Flushed			Y			Y
Option 7	Public Toilets	Y			Y		



At no time are any solids or liquids resulting from the collection of sewage to be discharged into a drainage system, except where such a discharge is licenced by the appropriate environmental authority.

The purpose of a sewerage system is to (i) separate human waste from human activity; and (ii) safely and sustainably dispose-off the human waste. It is expected that a combination of options will be required to achieve this purpose, especially for any prioritized subproject sites with flat terrain. The governing factor will be the ability to transfer the solids and/or liquids to a treatment facility. This study is to carefully examine the optimum combination of options for providing a sewerage service to each prioritized industrial estates or areas, including non-processing areas/ surrounding communities. The most likely

scenario is that the more densely developed areas will be serviced by Option 1 while the more scattered and less densely developed areas will be serviced by Options 2 and 3. Options 4 and 5 could be used to service medium density areas.

- (f) **Septage Management Service.**⁴¹Where sufficient flows of sewage for sewerage network are explored and found not feasible, the wastewater/ septage is to be collected, transferred and treated before disposal. The two options for the wastewater/ septage collection under septage management are:

(i) **Individual Septic Tank**

Septic tank systems that are properly planned, designed, sited, installed, operated and maintained can collection and on-site primary treatment. Wastewater can be collected from household toilets or public/ community toilets. However, systems that are sited in densities that exceed the treatment capacity of the local soils and systems that are poorly designed, installed, operated or maintained will cause problems have adverse health impacts. Such circumstances are not permitted.

Septic tanks treat sewage to primary standard and produce sludge and effluent. The sludge is regularly removed by being pumped to a tanker. The effluent can be disposed onsite by discharging it to a soak pit; or by discharging it to a separate common effluent piped network (if permitted). The effluent may not be discharged to a street gutter.

Where individual septic tank is being considered it is necessary to determine the percolation rate for the soils in the vicinity of the septic tanks, and using the area of land of each property, determine the property's ability to continuously accept the effluent. If the ground beneath the property cannot continuously accept the effluent at a sufficient rate to avoid water logging, then the option of on-site disposal of the effluent is not permitted.

Septic tanks are to be designed in accordance with CPHEEO Manual.⁴² Package septic tanks may be proposed.

(ii) **Communal Septic Tank**

A communal septic tank is a large septic tank that receives wastewater flows from several properties. It is used where there is insufficient land for individual septic tanks. In other respects, the same arrangements that apply to individual septic tanks apply to communal septic tanks. One difference is that a communal septic tank is owned and operated by the municipal authority (or in non-processing areas, it may also be an industrial authority).

Other suitable options for septage management also to be studied in line with GoI, GoT policies and international best practices.

The next steps in the workflow for septage management post-a household's/user's access to toilet connected to a septic tank are as follows:

- Emptying and Transport: Desludging of septic tanks by suction machines and transportation by septage management vehicles to a Treatment Plant;

⁴¹Guidelines for Decentralized Wastewater Management, December 2012, MOUD, GoI; Advisory Note on Septage Urban Management in India, January 2013, under National Urban Sanitation Policy: Towards City Wide Sanitation, MOUD, GoI; National Policy on Faecal Sludge and Septage Management (FSSM), February 2017, MOUD, GoI; Septage Management: A Practitioner's Guide, 2017, MOUD, GoI and Centre for Science and Environment, New Delhi; Decentralized Wastewater and Faecal Sludge Management: Case Studies from India, Asian Development Bank Institute (ADBI) Case Study No. 2020-4 (September), Tokyo; etc.

⁴²Section 9.3.4 of CPHEEO Manual on Sewerage and Sewage Treatment Systems, Part A: Engineering, Third Edition, Revised and Updated, November 2013.

- Treatment: Treatment at centralized or decentralized treatment plants (these can be on-site integrated/ cluster-based);
- Disposal/ Reuse: Reuse of treated effluents for agricultural irrigation/ landscaping or other uses like, use by industrial estates or areas/ SEZ after their own onsite-tertiary treatment for reuse as industrial water demand management, or disposal at designated site; and reuse of residual sludge as fertilizer.

At no time are any solids or liquids resulting from the collection of wastewater/ emptying of septage to be discharged into a drainage system, except where such a discharge is licenced by the appropriate environmental authority.

Efficient faecal sludge and septage management operation entails streamlining all processes and components along the 'sanitation value chain for on-site sanitation systems' during planning, design, implementation, operation and monitoring. Successful septage management operations need active coordination and participation among relevant stakeholders—industrial estates or areas/ ULBs or VPs (as applicable), service providers, operators, ward councillors, residents/community groups/ nongovernment organizations, other state government authorities, funding agencies, etc.

These terms of reference used the following nomenclature for wastewater:

- Black water: wastewater from toilets containing human excreta and faecal matter;
- Grey water: wastewater from surface cleaning, sinks, washing machines, and bathrooms; and
- Sewage: both blackwater and greywater combined.

While, the blackwater may be treated through septage management system (e.g., a septage treatment plant located remotely or an on-site integrated/ cluster-based treatment system like, packaged treatment plans/ bio-digesters); the grey water can be treated through a bio-remediation system/ phyto-remediation system with reed plant, and such treated grey water can be then discharged into storm water drains/ storm sewers/ water bodies or reused for landscaping, etc.

The reports must refer to sectoral maps and plans and provide the rationale for the option selected, that supports the decision-making regarding the choice of septage management option.

- (g) **Sanitation safe disposal arrangements.** The sub-tasks for arriving at solutions for sanitation safe disposal arrangements would be:
- assess—(i) levels of water supply; (ii) existing sanitation arrangements and gaps in on-site sanitation facilities/arrangements; (iii) current practices of emptying faecal sludge; and (iv) likely volume of faecal sludge that may need to be emptied periodically, to propose a viable emptying frequency for faecal sludge from septic/holding tanks;
 - sampling and analysis of faecal sludge from septic tanks (or holding tanks);
 - quantification of wastewater and faecal sludge inflow into the river/low lying areas or other water bodies along with seasonal fluctuations;
 - preparation of septage management intervention matrix and elaboration of determining/ selection criteria, and clustering strategy, for provision of septage management intervention options and undertake an assessment to identify populations/areas that should be covered in a prioritized industrial estate or area, including non-processing areas (in conjunction with existing and/or proposed provisions in respective towns where these industrial estates or areas are located) by each option or a combination of options, as applicable: (i) full scale application; (ii) partial scale application; and (iii) as a gap filling solution;

- v. assess the adequacy of the capacities of the septage treatment plant (SeTP)/ faecal sludge treatment plant (FSTP) based on the current wastewater and faecal sludge generation levels and considering the expected growth in the towns. The design period for the facilities may be in line with Indian national standards, unless strong justification for revision is demonstrated;
- vi. evaluation of options for collection of wastewater and faecal sludge, with regard to technical feasibility, environmental and social impact, GESI aspects/ gender mainstreaming/ gender sensitization, financial and economic viability, climate resiliency, etc.;
- vii. assess, if SeTP and FSTP, are to be developed as separate facilities (co-located or separate sites) or whether facilities may be optimized to handle both wastewater and faecal sludge;
- viii. review the institutional and regulatory framework for faecal sludge management in Tripura State, with a focus on stopping overflow from septic tanks (or holding tanks) to public drains and/or river/other water bodies/low-lying areas, and/or roads; and propose a strategy and phased implementation plan (with indicative targets) in the prioritized industrial estates or areas, including non-processing areas, outlining options and drawing on experience from similar contexts, including any integration feasible with existing and/or proposed provisions in respective towns where these industrial estates or areas are located;
- ix. identify the requirements of the Faecal Sludge Management System in terms of volume and frequency of emptying, number and type of vehicles, community collection tanks, etc.;
- x. rapid evaluation of treatment technologies for SeTP/ FSTP based on life-cycle cost analysis, land requirements, flexibility to loading variations, ease of modular implementation, and recommend the appropriate technology for SeTP/ FSTP; and
- xi. assessment of site suitability for SeTP/ FSTP:
 - define the parameters for assessing the suitability of the sites identified by respective Industrial estates or areas/ ULBs or VPs (as applicable) for development of the SeTP and/or FSTP, which may include factors impacting the overall design of wastewater services—conveyance/travel distance, any requirement for pumping, and other site-specific factors;
 - rank the sites based on such assessment and prioritize them; assess the area of the land parcels required for development of the SeTP/FSTP within the sites identified;
- xii. ensure in design that the septage treatment plant adopts appropriate technology for treating septage and the disposed sludge and wastewater after treatment shall strictly comply with the norms as per the relevant legislation. It shall be the responsibility of the licensed operator of the treatment plant to ensure the compliance with treatment and discharge norms, and the reuse of the treated waste shall be permitted as per the prevailing standards and norms. The treatment will ideally ensure the maximum reuse of the end residual product, including treated effluent and treated sludge within the standards and norms;
- xiii. propose administrative/ regulatory/ technical/ health and safety mechanisms for compliance by concerned authorities and licensed operators (private sector participation/ non-government organisation/ civil society) involved in the septage management process, including any penalties for non-compliance, to facilitate industrial estates or areas/ ULBs or VPs (as applicable) in providing a septage service that is

- environmentally compliant and ensures operational sustainability (performance-linked annuity model/ cost recovery from independent user charges or as added an amount or as an added percentage over water tariff based on “user pays” principle, sale of reusable end residual biosolids or products, etc.); and
- xiv. prepare as part of O&M manual, the requirements for use on continuous basis on (i) database, reporting, and record keeping; (ii) public awareness and stakeholder arrangement; (iii) capacity building and training; (iv) helpline/ helpdesk and grievance redressal; and (v) monitoring of service level benchmarks.
- (h) **Sewage and Sludge Treatment Plants.**
- i. **Sewage Treatment Plants.** It is proposed to use an appropriate technology to comply to the Indian wastewater discharge standards as applicable on the date. Estimates for the following parameters are required:
- Biological Oxygen Demand at Five Days (BOD₅)
 - Total Suspended Solids (TSS)
 - Power (Potenz) of Hydrogen (pH)
 - Alkalinity
 - Temperature (T °C)
 - Total Kjeldahl Nitrogen (TKN)
 - Ammonia-Nitrogen (NH₃-N)
 - Total Phosphorous (TP).
- ii. **Sludge Treatment Facility.** It is likely that both primary and secondary sludge will be produced from the sewerage scheme. The treatment option selected will depend upon (i) the available land; (ii) the location of the land in relation to inhabited areas; and (iii) the future use of the sludge. These factors must be investigated before the sludge treatment option can be formulated.
- (i) **Hydraulic Modelling.** Hydraulic modelling of the piped sewerage network is to be undertaken. The purpose of the hydraulic modelling is to determine the required diameters and gradients of the sewerage pipelines for the design flows and to also determine the performance of the sewers at low flows. The minimum required velocity is to be maintained during all flow regimes.

Task-4: Improving Overall Drainage Systems

- (a) **Planning and Design Scope.** This part of study requires the calculation of the hydraulic loads followed by the hydraulic designs of the flooding and drainage systems for the prioritized industrial estates or areas in the project, including non-processing areas/ surrounding urban communities (where required). PDMC would prepare the stormwater drainage plan and detailed engineering design for identified stormwater drainage work components in the DPRs (including strengthening any existing DPRs) in necessary integration with the industrial/ urban roads component of each subproject for roadside storm water drainage systems (including any integration with water bodies), as part of support for the preparation of comprehensive DPRs, bid documents along with the necessary specifications and terms and conditions (technical/commercial) and bid-level working drawings for tender purposes, and for procurement processing support. Subsequently, the good for construction drawings would be prepared before the end of the assignment.

The respective flood control and drainage systems are to encompass the entire areas of the prioritized industrial estates or areas, including non-processing areas/ surrounding communities. Flood control options within the respective

towns (where prioritized industrial estates or areas, including non-processing areas are located) are to be examined while drainage waters are to be removed to outside of the prioritized industrial estates or areas, including non-processing areas/ surrounding communities or respective town limits to suitable disposal points. Ponding of water within the prioritized industrial estates or areas, including non-processing areas is to be avoided. While the study is focussed on the prioritized industrial estates or areas, including non-processing areas/ surrounding communities, where appropriate the drainage catchments upstream of the respective towns may also need to be included in the calculation of flood flows.

The flood control and drainage studies first require the calculation of the hydraulic load using rainfall runoff computational techniques. This is followed by the hydraulic design of the drainage systems, again using computational techniques. Flood control systems means developing options to create floodway within the towns to channel flood waters through the respective towns while minimizing flood damage and the hazard to life. The flood waters may arrive at the respective towns of the respective towns from upstream catchments and/or be generated from within the respective towns (depending upon the times of concentration). Structures such as flood storages and retarding basins are only to be considered as a last resort and the main intent is to concentrate and remove flood waters by providing unimpeded routes.

Conventional drainage systems are also to be proposed in keeping with Indian national standards and guidelines. Drainage solutions are required which (i) eliminate pond age even during short rainfall durations and low intensities; (ii) are robust and will continue to function under a range of conditions and loadings; (iii) are easy and affordable to maintain; and finally (iv) add to the amenity of these towns. The potential reuse of the drainage water is outside of the scope of this project. However, the adoption of international best practices, like low impact development/green infrastructure principles that also contribute towards water conservation/groundwater recharge, etc., shall be duly explored, and based on the input data obtained from topographical and geo-technical surveys/hydrologic and hydraulic modelling/rainfall data, etc., the necessary interventions shall be planned and designed for such environmental-friendly storm water drainage solutions, as feasible.

The study requires the diligent and expert assessment of the existing conditions and possible solutions for drainage system. The hydrologic and hydraulic modelling required must be undertaken by people with considerable experience in these two disciplines, and the modelling must be overlaid with knowledge of local ambient conditions. For example, existing drainage systems are used as rubbish dumps and while not desirable, this practice needs to be at least partially accommodated within the recommended solution in the shorter term, but needs to be remediated over the longer terms through necessary infrastructural provisions/awareness and incentive programs, etc. Recognition also needs to be given to the siltation of drainage systems that occurs over time and ongoing maintenance requirements.

Finally, the study also requires the identification of possible environmental and social impacts and associated mitigation measures of the proposed solutions. Typical technical specifications for planning and design of storm water drainage systems are provided at Annexure 2.

- (b) **Discussion Paper.** A number of references have been cited above. These references contain various planning and design criteria and evaluation options. A discussion paper is to be prepared which summarizes these references and the alternatives available and recommend a detailed solution methodology. The approach outlined in terms of reference is to form the base of the recommended solution methodology.

- (c) **Planning and Investigations.** The Consultant is to become familiar with the

recommended hydrologic model and hydraulic model and their respective data requirements and options. Both models require the physical features of the towns to be documented in a manner suitable to the models. In the case of the hydraulic model a comprehensive detailed field survey tied to a common benchmark is required. This includes roadside gutters, drainage channels, flood ways (often roads), bridges and culverts, surface water holding structures (such as retarding basins) and barriers (such as levees and walls), and creeks /rivers/other water bodies.

A reconnaissance survey is to be undertaken to verify the collected data and to confirm drainage details. Total Station Survey is to be used to capture surface levels and the physical details of structure which influence the flow of water through the respective towns. Details of any existing underground drainage system are to be collected from the industrial estates or areas/ ULBs/district administration.

The data is to be collected and digitized into a GIS, if not already available in the existing GIS-based base map. The data is to be verified by field survey resulting in a cadastral and/or topographic map/ plan of each prioritized industrial estate or area, including non-processing area, and/or prioritized subproject site location/ alignment. All structures which impede the passage of surface flows or areas where the passages of surface flows are choked resulting in impoundments are to be identified. Using this data, the existing drainage system and the surface levels are to be used to prepare a plan showing the flow of flood waters and drainage waters and an outline of the flooding and drainage pattern for the prioritized industrial estate or area, including non-processing area. Integrate it with respective town provisions broken up into a number of sub-catchments as appropriate with the main drainage system forming the backbone to which all the sub-catchments drain. The data may be held in suitable spatial mapping software including a GIS system such as, Consultant's own Arc GIS or QGIS and layers from drawing software such as Auto-CAD.

A final set of plans to the scale of 1:1000 must be prepared displaying the above information including surveyed surface levels, the drainage system, likely overland flow paths and sub-catchments. The maps should contain surface level contours at 5 m intervals across the prioritized industrial estate or area, including non-processing area/ respective town (where required) and/or 1 m intervals along prioritized subproject site location/ alignment, as applicable.

- (d) **Concept Design.** The Consultant is to prepare a concept design for the flood control and drainage. The following options must be examined:

Flood Control

- i. The diversion of flood water around the industrial estates or areas, including non-processing areas/ respective towns (where required).
- ii. The diversion of flood waters to nearby lakes, rivers and low-lying areas.
- iii. The directing of floodwaters through the industrial estates or areas/ respective towns (where required) along preferred floodways.
- iv. The creation of flood ways through the industrial estates or areas, including non-processing areas/ respective towns (where required).
- v. The regrading of roads and streets to enhance their hydraulic carrying capacity.
- vi. Maximizing the use and enhancing the hydraulic capacity of existing drainage channels.
- vii. The removal of floodway chokes.
- viii. The use of existing open space to slow the velocity of the flood waters.
- ix. The protection of vulnerable areas such as residential areas and economic weaker section—EWS/below poverty line—BPL areas around industrial estates or areas, including in non-processing areas.

- x. Protection of the sewerage system to minimize flood water contamination.
Drainage
- xi. The installation of an underground drainage system (options to be examined are the 1 in 1-year and 1 in 2-year events).
- xii. The capture of surface runoff and its direction to the underground drainage network.
- xiii. The use of underground storage to retard the captured runoff at strategic locations.
- xiv. The gradient of the pipes to ensuring scouring velocity is maintained at all locations and small paper and plastic rubbish will also be flushed through.
- xv. Secure access to the underground drainage system for maintenance purposes (all access chambers are to have lock down covers).
- xvi. Trade off the whole of life-cycle cost of pumping with the depth of the pipelines (subject to maximum depth).
- xvii. Maximum retention time in a wet well of four hours.
- xviii. The water table level and the likely ingress of groundwater.

The concept plan is to be prepared and presented in the form of a report, plans and a PowerPoint slide deck to the Client. A one-day workshop on the concept plan is to be organized with key stakeholders and the plan presented for each prioritized subproject town. The workshop is to permit discussion on key aspects of the plan and the feedback is to be documented for subsequent inclusion in the plan, where appropriate.

- (e) **Preliminary Design.** Following the approval of the concept plan a more detailed preliminary design is to be produced. The preliminary design should include a hydraulic design of the flood control system and the drainage systems using data from the rainfall runoff assessments and modelling. The preliminary design should include plans showing the proposed flood control and drainage works, longitudinal sections of the floodways and drainage pipelines, details of surface and underground structures, details of proposed modifications to existing infrastructure including roadways, details of flood diversion works, flood control works or flood retarding works, details of drainage water capture, etc. The design criteria and design rainfall events should also be included. The preliminary design should permit the construction and operations and maintenance costs to be estimated to +/- 15%.
- (f) **Performance Measures.** The three performance measures are:
 - i. Percentage of the town (by area) serviced by the drainage system: 100%;
 - ii. Number of reported drainage water ponding each year: 0; and
 - iii. The number of man-made flood choke points leading to an increase in flood levels: 0.

Task-5: Industrial Waste and Municipal Solid Waste Management

- (a) **Secondary Data Study and Institutional Interventions.** This entails:
 - i. based on information obtained through varied stakeholder consultations and secondary data collected undertake assessment of current situation of industrial waste and MSW management in and around industrial estates or areas, including non-process areas/ surrounding communities from technical/ engineering and institutional-level administrative/ management perspectives, identify field-level problems and issues pertaining to industrial waste and MSW management (both under public or private sector involvement), efforts already made by the State/ stakeholder authorities, marketability and investor study for waste recovery/ recycle/ reuse, etc.;

- ii. review of industrial waste (handling of non-hazardous and wastes) management systems that require proper segregation, collection, transfer/ transportation, and TSDF/ plants/ special or safe containment systems based on the raw material/ product processing (existing/ proposed) in industrial estates or areas of TIDCL; exploration of different affordable technological solutions, particularly in relation to plastic reuse and recycle, legacy waste management, decentralized but integrated waste system (material recovery facility and/or material recycling facility, etc.), specialized waste management requirements to handling of solid waste during extreme events (e.g., additional infectious medical waste during COVID-19 pandemic outbreak, etc.), including exploration of efficient and cost-effective waste segregation and collection systems based on secondary data review of the usability of technology vis-a vis technical capacity of municipal staff in respective towns in the state/ region/ India/ sub region to implement, with special focus to be given on O&M of such solid waste management systems;
 - iii. based on secondary data review, undertake assessment of available technologies in India/ region/ state or subregion for plastic reuse and recycle, legacy waste management, decentralized but integrated solutions e.g., material recovery facility and/or material recycling facility toward waste diversion, waste treatment and disposal with/ without waste-to-energy recovery at town-/ community-levels like, scientifically-laid landfill site, incinerator, mechanical composting/ vermi-composting/ biogas plant, plasma gasification or vitrification plant, etc., as feasible;
 - iv. collation of information on national/ international best practices and sensitizing stakeholders in the State on best practices adopted in India/ region or subregional context on collection, treatment and disposal of industrial waste and MSW management, including on community participation in solid waste management;
 - v. preparation of an outline framework or industrial waste and municipal solid waste management plan for industrial waste and MSW management-related infrastructure needs, industrial estate or area-specific action plans (5-years, with mid-term review between 2nd and 3rd year of short-term plan), and prioritized project-level investment plans, for graded interventions in industrial waste and MSW management plan to be implemented over immediate/ short term duration (2–5 years), medium term duration (>5–20 years) and long-term duration (>20–30 years);
 - vi. review of applicability of different institutional and regulatory mechanisms adopted in India/ region or subregion and state-specific institutional strengthening requirements recommended; and impart knowledge on technical capacity building measures/ on-the-job training for solid waste management along with management information system, including for private sector participation and community participation;
- (b) **Siting and Planning.** This would *inter alia* include, but not limited to:
- i. Identification of suitable sites/ locations for distribution of solid waste management infrastructure (improvements at existing facilities or proposals), especially the industrial waste management-related TSDF/ plants/ special or safe containment systems, and MSW treatment/ disposal sites considering the potential landuse suitability mapping analysis undertaken over the based maps of prioritized industrial estates or areas, including non-processing areas/ respective town-level (where required) base maps (e.g., for safe containment systems, sanitary landfill considering various parameters like, river/ lake or pond/ wetland, flood plain, ground water table, water supply well, unstable zone (high slope/ landslide- or landslip-prone/ seismic fault zone), critical habitat area,

buffer zone, airport, highway, habitation, public park, etc., along with due regulatory approval), etc.

- ii. The number of sites and industrial waste and MSW management equipment and vehicles required for investment, frequency of services, etc. would also be based on the employment size of industrial and trade units/ MSMEs (including when integrated with employment size of multimodal logistics park/ special economic zone/ integrated check post, IT park etc.), population size and development density in non-processing areas/ surrounding urban, the land availability for TSDF/ plants/ containment systems, landfill site/ waste treatment plant, waste transfer station and/or waste storage depot with/ without material recovery facility and/or material recycling facility, etc., current gap and proposed gap against the projected demand of above-stated population/ MSW service needs that is desired to be addressed; and necessary improvement requirements over the existing industrial waste and MSW management service and for TSDF/ plants/ containment systems, and landfill sites as a scientifically-laid sanitary landfill site, etc.
- iii. Further, to address impact of extreme events such as, COVID-19 pandemic outbreak, that has resulted in an additional infectious medical waste generation scenario, appropriate national/ international standards and/or best practices of such medical waste management, as they evolve from time to time, should be referred to for incorporation of planning and design provisions industrial waste and MSW management.⁴³

- (c) **Detailed Engineering Design.** Based on the information obtained through varied stakeholder consultations, necessary surveys/ analyses (i.e. various primary surveys/ geo-technical and/or hydrological investigations, and secondary data collection and analyses), the PDMC shall as part of a comprehensive DPR for each prioritized industrial estate or area, including in non-processing area, undertake the detailed engineering design stage of work for the industrial waste and MSW management component [including for tourism related activities, hotels, medical tourism-related hospitals, etc., covered as per Tripura Industrial Investment Promotion Incentive (Amendment) Scheme, 2017 vide Notification No. F.DI/TIS/ SUBSIDY/4-2(21)/2017/9381-488 of 14th June 2019, Department of Industries & Commerce, GoT], duly meeting the provisions of The Tripura Municipal Act, 1994 on public health, sanitation conservancy and solid waste management; Municipal Solid Waste Management Manual, 2016, CPHEEO, MOUD, GoI; Solid Waste Management Rules, 2016/ Plastic Waste Management Rules, 2016/ Construction and Demolition Waste Management Rules, 2016, MOEF&CC, GoI; Bio-Medical Waste Management Rules, 2016; Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, Industrial Waste Management by National Waste Management Council, 1990, etc. (as amended from time to time), in consultation with TSPCB; and other international standards/ best practices.

This will include as supporting documentation, the need for due consideration of design impacts, and the due diligence of—economic and financial analysis, including risk analysis, sensitivity analysis, cost-benefit analysis based on full life-cycle costs, etc., own source revenue generation for government/ concessionaire, through industrial waste and MSW management tariff-/ user fee or user charges-based revenues, conservancy tax of property tax, sale of recovered/ recyclable materials and processed waste for reuse/ onward treatment or disposal, any incentives/ tipping fee, etc., financial operability/ sustainability, impact on state finances and central budgetary support, etc.;

⁴³ADB. 2020. *Managing Infectious Medical Waste during the COVID-19 Pandemic*. A Brief Note (Document Type: Brochures and Flyers). Manila.

meeting the assessment requirements for environment and social safeguards, and necessary integrated gender sensitization/ gender mainstreaming/ GESI aspects/ gender-responsive design features and climate resilience requirements; arriving at and integration for sustainable O&M requirements, including electrical requirements for any treatment plants/ incinerators, and integration with other utilities (whether for functional purposes of such plants/ incinerators with/ without waste-to-energy recovery systems), etc.

Undertake detailed cost estimation under comprehensive DPR for each prioritized subproject town, wherein the PDMC should add a contingency cost of 15% over the industrial waste and MSW management component's detailed cost estimates, and prepare bid-level working drawings for tender purposes, and thereafter good for construction drawings.

- (d) **Performance Measures.** The DPR for each subproject should target the performance of the industrial waste and MSW management component to meet the national benchmarking of service indicators, either fully in the immediate/ short-term of project implementation, as feasible, or to meet the benchmark over the medium-term/ long-term of the planning horizon in a graded manner of desired improvements.

Through the management information system, the performance of the industrial waste and MSW management indicators would be regularly measured, monitored, appraised and evaluated for improvements of such quality metrics through implementation of performance improvement plans/ proposals to enhance the system performance. However, the planning and design requirements must target meeting at least the 100% benchmark in the immediate/ short term of project implementation for (i) household level coverage of solid waste management services; and (ii) extent of segregation of municipal solid waste (e.g., segregation-at-source, etc.); while, say for the progressive achievement of 80% benchmark for (iii) extent of municipal solid waste recovered, could be targeted over the long-term period of the planning horizon; etc.

Task-6: Electrical and Power Systems Infrastructure

- (a) **Demand Management.** Assess current power supply capacities available from national/ regional grid, state generation and state utility supply; and/or if there is any dependency on independent power producer–IPP, captive power (thermal–coal-/ gas-based, DG sets, renewable energy systems, etc.) to meet existing power demand of industries and trade units/ MSMEs, and proposed industrial development projects, as per applicable Indian national norms and standards, and identify infrastructure gaps. To meet any power supply pressure, alternative source of energy to be explored in the site to meet the industrial/ and social or institutional, commercial, and residential demand in non-processing areas for the prioritized industrial estates or areas.⁴⁴
- (b) **Site Planning and Detailed Engineering Design.** Electricity connectivity extensions/ segregation through HT/ LT powers lines are to be assessed based on spatial distribution requirements in the prioritized industrial estates or areas, including in non-processing areas/ surrounding urban communities. To ensure safety from HT power line, reduce disruption and for increasing life, infrastructure lines are to be well designed within the right-of-way (ROW) for infrastructure corridors with applicable buffer widths on either side, by allocating right of use as per regulations of each facility. Any requirement of new electric sub-stations, and/or for augmentation of loads capacity of existing electric sub-stations,

⁴⁴Refer vision and objectives of Strategic Plan for new and renewable energy sector for the period 2011-17, by of Ministry of New and Renewable Energy, GOI.

including transformers, etc., shall be duly assessed. Based on the data/ information obtained through topographical surveys/ geo-technical investigations/ climate resilience factors, etc, the site of electrical sub-stations would be selected at safe locations/ the detailed engineering design made safe with necessary mitigation measures. Where required, e.g., in any narrow streets in non-processing areas/ surrounding urban communities, the overhead street power lines shall be sheathed for protection to any accidental contact result in traumatic shock/ severe injury/ loss of life.

- (c) As part of the detailed engineering design exercise and comprehensive DPR, detailed cost estimates shall be prepared based on the life-cycle cost assessment. Prepare bid-level working drawings for tender purposes, and thereafter good for construction drawings. Provide technical specifications and experience criteria for the bid documents, information on construction material availability, and support in SPP study, procurement strategy, procurement plan, contract management plans, and procurement processing support for subproject work components of electrical and power system infrastructure for prioritized industrial estates or areas, including non-processing areas.
- (d) **Energy Efficiency.** It shall reduce energy consumption of infrastructural equipment through energy efficient street lighting, motor pumps etc. On-site power generation using various renewable energy technologies and other clean fuels can also be integrated in the planning and design system for decentralized power supply options. Use of smart power generators, smart meters, net metering, etc., be explored, promoted, and adopted. For the design of common infrastructure/ community facilities in and around industrial estates or areas, including non-processing areas energy efficient building designs should be adopted.⁴⁵ Further, as per National Mission on Sustainable Habitat (NMSH), for residential buildings 15% of the total external lighting load should be met through renewable energy and for commercial/ institutional/ industrial/ mixed use buildings, 5% of the total lighting load should be met through renewable energy sources (solar, wind, biomass, fuel-cells and so on).⁴⁶
 - (a) Based on the analysis of financial data comprising of annual capital and O&M budgets, current expenditure trend, electricity tariff and/or cess / surcharge etc., revenue billing and collection details; expenditure on public awareness sessions on use of renewable energy with net metering/ energy efficiency etc., including any incentives/ subsidies/ loans, etc., and life cycle cost assessment of prioritized subprojects, recommend appropriate implementation plan and financial operation plan for components of electrical and power systems infrastructure in the final report of the comprehensive DPR.
 - (b) Update the GIS-based base map, where required, with any existing/ proposed electrical and power systems infrastructure as part of utility mapping database.

Task-7: Safeguard and GESI Action Plan

- (a) **Environmental and Social Safeguards.** Prepare environmental and social safeguard documents in accordance with ADB's Safeguard Policy Statement (SPS, 2009) and the country's legal requirements. Assess government policies, experiences, institutions, and the legal framework for environmental assessment,

⁴⁵Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI has promulgated Energy Conservation and Building Code (ECBC), 2017, which provides minimum energy performance standards for energy efficient buildings, which can be referred while designing private and public buildings. The ECBC is currently a voluntary programme, with a number of States adopting it as a mandatory requirement. BEE runs other national flagship programs on standards and labelling, energy efficiency in large industry, energy efficiency in small and medium industry (including MSMEs), etc.

⁴⁶Report of the sub-committee for development of NMSH parameters for energy efficiency in Residential and Commercial Buildings.

involuntary resettlement and Indigenous People to address any gaps with ADB's SPS. First update, as needed (a) environmental assessment and review framework; (b) resettlement framework; and (c) Indigenous Peoples planning framework, if applicable, developed specifically for the project; and then (d) IEE/ EIA; (e) land acquisition and resettlement plan/only RP documentation and related DDRs, and/or (f) IPP documentation, as appropriate for each subproject. The aspects (c) and (f) may be combined with aspects (b) and (e) respectively, if potential impacts on Indigenous Peoples are confined to impacts related to land acquisition and resettlement. All safeguard documents are to be conducted in meaningful consultation with project affected persons and communities, and documented as part of the safeguard documents.

- (b) **Stakeholder Consultation.** The PDMC to conduct stakeholder consultations, including with local community (ies), and participatory planning exercises needs to be incorporated into the design of the subprojects. All proposed project design features, both hard and soft components, should be made in consultation with relevant stakeholders, including (but not limited to) the PMU-TIDCL, including UDD/ TUDA, DoT/ TTDCL, PHED,PWD, ULBs/ VPs, etc., and adequate consultation with local beneficiaries and nongovernment organizations may be undertaken, when deemed appropriate.
- (c) **Gender and Social Development.** The consultants will undertake/ update social and poverty analysis or assessments, and conduct gender analysis/ assess GESI aspects/ gender-responsive design features and design of GESI AP, including (i) identification of key issues to be addressed by the project, design and preparation of a town-specific GESI AP consistent with the project-level GESI AP; (ii) duly including in its advice/ recommendations, the potential EWCDT—elderly, women, children, differently-abled, and transgender facilities, and other gender and socially inclusive approaches that can be incorporated in the design of the ensuing project; and (iii) identification of resource needs for its implementation. Due diligence reports (DDR) need to be prepared.

Task-8: Subproject Viability, Resiliency, Design and Monitoring Framework

(a) Economic and Financial Analysis, and Climate Resilience.

- i. **Investment Planning.** Review the projected demand assessment prepared and agree on it. Review the investment plan prepared, and finalize/ update a realistic investment program for the next ten (10) years (for any raw and treated water production required, transmission, and distribution; effluent/ wastewater management and septage management; stormwater drainage system integrated with integrated industrial/ urban roads component and with any water bodies; industrial waste and MSW management; and electrical and power systems infrastructure) taking into account the agreed projected demand assessment. This should include improvements (e.g., reduction of non-revenue water–NRW) to the system to increase existing supply capability, prior to major capital works to increase production capacity; decentralized effluent/ wastewater management and septage management; storm water drainage component integrated with industrial/ urban roadside storm water drainage system and with water bodies; higher extent of industrial waste being safely disposed, and municipal waste recovered; and lower/ minimal occurrences and impacts on productivity/ costs on account of power cuts.

Based on the review of the investment plan, the PDMC should propose realistic financing plan by leveraging possible sources of finance including future loan funding from ADB. In particular, the Consultant should consider the potential to meet the O&M costs from internal cash generation from service revenues. As a policy, it shall be assumed that the cost of all property connections to achieve full coverage shall be

capitalized and financed under Project CAPEX.

Accounting:

- Analyze the financial reports of current operations by Doi&C/ TTDCL, PHED or municipal authorities;
- Identify and quantify all creditor liabilities, including debt;
- Document the inventory of physical assets and their value; and
- Compile a staff profile of current O&M staff.

- ii. **Economic Analysis.**⁴⁷ Recommend to (in line with the principle of sustainable commercial operations) a pricing policy for water supply services. This would be done in conjunction with and in justification of the assessment of projected water demand. In particular, the PDMC would consider how these policies also affect the poorer sections of the community in non-processing areas/ surrounding urban communities of prioritized industrial estates or areas, currently not receiving service and recommend measures to enhance the quality and quantity of service to them.

The consultant shall review the current tariff level and tariff structure for water supply, and recommend a basic tariff structure; recommend an implementation schedule for cost recovery strategy; recommend a subsidy mechanism (if applicable); and recommended tariff level and financing mechanism. Similarly, undertake economic analysis for other above-stated infrastructure services in the project.

- iii. **Financial Analysis.** Develop a long-term financial model for the water supply services. In particular, this would include the financing of and projected revenue from the proposed investment program.

This would include the utilization and estimation of forecast parameters (NRW, staffing numbers and ratio, organization structure and resources, unit operating costs, accounts receivables, etc.) using well run water supply and wastewater/ septage management operations as the benchmark. The PDMC would present a fully developed financial model and forecast for the agreed city investment plan, to demonstrate the economic and financial viability of the recommended option. Similarly, undertake financial analysis for other above-stated infrastructure services in the project.

- iv. **Climate Change and Disaster Resilience.** The proposed infrastructure investments will incorporate rapid economic, environmental, social and climate change diagnostics for each prioritized industrial estate or area, including non-processing area, considering the factors for resilience to climate risks/ climate change impacts and disaster risks. This is envisaged to include, but not be limited to, the PDMC undertaking analyses of (i) the socio-economic context of industries and trade units/ MSMEs, urban growth centers/ border towns, including the respective town's geography, demography, urbanization processes and evolution, and existing master plans/development plans; (ii) primary economic growth drivers, including dominant economic activities and their evolution, the prioritized industrial estate of areas/ respective town's contribution to regional and national economic growth, including regional cross-border spillover effects, the business environment, and its overall competitiveness; (iii) competitiveness enablers of each prioritized industrial estate or area/ respective towns including management and governance (institutions, policies/regulations, level of losses and

⁴⁷ADB. 1999. *Guidelines for the Economic Analysis of Water Supply Projects*. Manila.

enforcement), industrial/ urban/regional planning, industrial neighbourhood development, economic development/trade facilitation infrastructure, land management, transportation systems/connectivity, integrated industrial/ urban infrastructure or utility service provision, quality of open/ green spaces and public realm, environmental resources conservation, and adaptive reuse of old industrial spaces; (iv) identification and initial analysis of climate risks/ climate change impacts and disaster risks on existing assets, future growth areas, and vulnerable communities with specific focus on those poor; and (v) identification and initial analysis of risk avoidance/ minimization and adaptation and/or mitigation measures required, including climate proofing of existing infrastructure in infrastructure development sectors and service delivery. This study phase will result in undertaking climate risk and adaptation assessment or CRA (*formerly climate risk and vulnerability assessment or CRVA*) by the Consultant that will summarize the results of the initial assessment, prior to arriving at a suitable Climate Resilience Framework for continued adoption in planning, infrastructure design, construction, operation and maintenance, etc. at subproject/project-level, in the following manner:⁴⁸

- To establish the climate resiliency of the reviewed and improved industrial infrastructure plans and feasibility studies to be undertaken, particularly site selection and designs, a rapid climate risk assessment using the preliminary climate (and disaster) risk screening checklist should be accomplished for each of the ensuing subprojects.
 - Based on the outcome of the checklist assessment ('medium' or 'high' risk), an initial climate change assessment (CCA) will be prepared during the subproject preparation stage.
 - Results and findings from the initial CCA will then be the basis of proposed climate change adaptation and/or mitigation plans, whose costs will determine the subproject's climate financing contribution.
 - The initial CCA will undergo further modification, based on a more detailed CRA (*formerly CRVA*).
- (b) **Detailed Project Report.** Consequent to approval of feasibility report/conceptual design report, the PDMC shall prepare a comprehensive detailed project report (DPR) for each prioritized industrial estate or area, including non-processing area. The DPR is to contain the following, but not limited to:
- i. **Executive Summary.** Summary of the salient features (water supply system, drainage features that influence effluent/ wastewater management and septage management, and storm water drainage component integrated with industrial/ urban roadside storm water drainage system and with water bodies, industrial waste and MSW management with required TSDF/ plants/ special or safe containment systems; and electrical and power systems infrastructure) of the prioritized industrial estate or area, including non-processing area, the recommended solutions, any significant planning and design/implementation impediments, the cost, and any significant environmental and/or social issues.
 - ii. **Introduction.** The background to the project, the study methodology, the study criteria and parameter values, and a map of the study area showing relevant study features.
 - iii. **Study Area.** Features of the study area influencing the recommended

⁴⁸ADB. 2014. *Climate Risk Management in ADB Projects*. Manila.

solution, decisions and trade-offs made, possible planning and design/implementation impediments, and social and environmental areas of significance. A map showing the proposed infrastructure distribution zones overlaid on a map of the prioritized industrial estate or area, including non-processing area/ respective town (where required), including land use and habitation areas is to be included covering the processing and non-processing areas.

- iv. **Existing Situation.** A description of (i) existing water supply system, problems being experienced (including prevailing service levels), and information on existing O&M organization, financial condition, cost-recovery mechanism, etc.; (ii) existing effluent/ wastewater management and septage management facilities, including any tertiary treatment facility for reuse of treated wastewater effluent for managing industrial water demand, problems being experienced (including prioritized industrial estate or area-wide/ respective town-wide, where, required, that may affect surrounding urban communities-level), and information on current disposal arrangements/sites, locations of the discharge of domestic or non-domestic wastewater, including commercial/industrial discharges are to be identified; (iii) existing drainage and storm water management, problems being experienced (including prioritized industrial estate or area-wide or respective town-wide (where required) local flooding and ponding, including in non-processing areas/ surrounding urban communities), and information on any historical flooding or drainage events, including locations of the discharge of domestic or non-domestic effluent/ wastewater, commercial and industrial discharges are to be identified; (iv) industrial waste and MSW management (segregation, collection, and TSDF/ plants/ special or safe containment systems; respective town-wide, where required, through status of MSW segregation, collection, transfer and transportation, waste diversion/ resource recovery, treatment and disposal); and (v) electrical and power systems infrastructure status, any siting/ buffer-width/ safeguard issues for any augmentation/ rehabilitation of load capacity, etc.; complete in all respects, and these must be included in the field reconnaissance, including integration within road right-of-way/any roadside utility provisions.
- v. **Proposed Project and Detailed Design.** The project design shall include (i) source sustainability study, method of extraction, design of intakes, pumping systems, treatment process and all related general layout, and process and instrumentation design, hydraulic design, hydraulic flow diagrams, hydraulic model for pumping, storage, transmission and distribution systems for water supply services; (ii) strategy for managing the effluent/ wastewater and septage management, offsite and onsite collection, transport, treatment and safe disposal of treated effluent, sludge and reuse potential (including for managing industrial water demand post-tertiary treatment), if any; (iii) a list of the rainfall data and its source and intensity-duration-frequency or IDF curves highlighting the design values, the flows for different rainfall events and the design values, proposed drainage patterns in plan form plus longitudinal cross-sections showing levels for sub-catchments and for the main drainage system, the features and measures of the roadside overland and underground proposed drainage systems, and locations where the flow/depth design criteria is exceeded for different rainfall events, including potential integration with water bodies; (iv) industrial waste and MSW management (segregation, collection, and TSDF/ plants/ special or safe containment systems; MSW mechanisms in non-processing areas/ surrounding urban communities for segregation-at-source, door-to-door and/or community-level collection, suitable sites for waste transfer

stations/ resource recovery and/or recycling facilities, treatment interventions through scientifically laid sanitary landfill-mechanical or vermi composting-incinerator-plasma gasification or vitrification plant, etc. with/ without waste-to-energy recovery systems; and (v) electrical and power systems demand management, and infrastructure augmentation and rehabilitation through HT/ LT lines, electrical sub-station, transformers, etc., with due safety and security measures provisioned-in; including the necessary integration within road right-of-way/any roadside utility provisions.

- vi. **Environmental, Social, and Gender Issues.** As required IEE/ EIA, RP and related DDRs/ IPP (as applicable), and a separate social impact assessment with gender analysis/ assessment of GESI aspects/ gender-responsive design features and GESI AP, (i) highlighting any areas of significance, which may require resolution before the project proceeds to the next stage; and (ii) duly including in its advice/ recommendations, the potential EWCDT—elderly, women, children, differently-abled, and transgender facilities, and other gender and socially inclusive approaches have been incorporated in the design of the ensuing project.
- vii. **Cost Estimation and Implementation Schedule.** The estimated capital and annual operating cost of the recommended solution is to be provided. Quality infrastructure investment should attain value for money, and remain affordable with respect to life-cycle costs, by taking into account the total cost over its life cycle (planning, design, finance, construction, O&M, and possible disposal), compared to the value of the asset, as well as its economic, environmental and social benefits.⁴⁹ A contingency of (i) 10% should be added to each estimate for water supply system; (ii) 30% should be added to each estimate for effluent/ wastewater management and septage management; (iii) 30% should be added to each estimate for stormwater drainage; (iv) 15% should be added to each estimate for industrial waste and MSW management; and (v) 15% should be added to each estimate for electrical and power systems infrastructure. A detailed implementation schedule showing dependencies should be included.
- viii. **Recommendations.** Any recommendations regarding the detailed design, construction or operations and maintenance of the recommended solution, especially those relating to physical (including climate resilience), environmental and/or social issues.
- ix. **Appendixes.**
 - Appendix A – Design Criteria
 - Appendix B – Drawings
 - Appendix C – All relevant technical and survey data.
- (c) **Design and Monitoring Framework.** As part of facilitating Client for the ensuing loan/project processing, the Consultants will develop a DMF at project-level outlining the impact, outcome, outputs, assumptions, risks and key activities with clear links to performance targets and indicators for each subproject, including support for baseline measurement.

Task-9: Final Report on Comprehensive DPR

Consolidating all the reports, the Consultant shall prepare the final report with an executive summary, implementation plan, and respective financial operating plans. The draft final report shall be delivered within 24-weeks (maximum typical duration available),

⁴⁹Infrastructure should be inclusive, enabling the economic participation and social inclusion of all. Economic and social impacts should be considered as an important component when assessing the quality of infrastructure investment, and should be managed systematically throughout the project life-cycle.

and the final report after incorporating final comments from Client shall be submitted by end of 26th-week (maximum typical duration available), since commencement of each comprehensive DPR as per phasing of deliverables. The comprehensive DPR would cover the integrated industrial infrastructure components, as applicable, and duly integrated with industrial/ urban roads component, and common infrastructure and community facilities, for each prioritized industrial estate or area, including in non-processing area.

The PDMC consulting firm shall submit a soft copy and 5 hard copies of each of the above reports. The Consultant should submit electronic copies of all database files developed as part of the project, including mapping and drawing files (SHP and DWG formats), data tables (XLSX). It is to be noted that all original design files for hydraulic models, mathematical analysis, Auto-CAD and GIS-baseline maps (complete layers/database)/plans/drawings, shall be submitted in original formats in editable form and not in PDF. These final GIS-maps and database output editable files prepared/ updated by the Consultant will be transferred to the Client's own GIS-mapping and database system as part of the PDMC assignment.

Task-9: Preparation of Bid Documents and Procurement Processing Support.

Apart from overall procurement risk/ capacity assessment and strategic procurement planning, the PDMC would support the PMU-TIDCL in preparation of bid documents (suitably as civil works, goods/ plants/ equipment, and any non-consulting/ consulting services contracts) for the above-stated Integrated industrial infrastructure components, and undertaking procurement processing and procurement/ contract management for the prioritized industrial estates or areas, including non-processing areas-related subproject work components.

B. Industrial Roads (Integrated with Urban Roads)

Engineering Studies and Detailed Design of Integrated Industrial/ Urban Roads

The engineering studies and detailed design is divided into three parts:

- (i) initial screening/pre-feasibility study of the tentative list of candidate roads/culverts/cross drainage structures, as applicable;
- (ii) feasibility studies of the shortlisted roads for final selection; and
- (iii) detailed design for selected road, culvert/ structure subproject components, as applicable.

The viability of the project shall be established taking into account the requirements with regard to rehabilitation, upgrading and improvement based on road/ highway design, pavement design, culvert/structure design, protection works and other improvement and safety measures, as necessary, quantities of various items of works and cost estimates vis-à-vis the economic analysis within the given time frame. The DPR would inter-alia include detailed road/ highway design (including industrial/ urban road access junctions), design of pavement and overlay, drainage studies and design (including integration with any separate drainage studies), design of any protection works, design of culvert/cross drainage structures, road safety audits, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for bidding for the project as per ADB Guidelines and latest appropriate SBDs (with required addendum wording for HS COVID-19 Plan); and refer related user guide, and RFQ/ SRFP for further clarity on preparation and evaluation of bid/ proposal document). Factors for resilience to climate risks/ climate change impacts and disaster risks such as, risk minimization/avoidance, adaptation and/or mitigation measures will be taken into consideration in the design of resilient all-weather roads and culverts/ structures, as applicable (as per national/international standards and/or best practices, including ADB's South Asia framework and practice).

The Consultants shall ensure detailed project preparation and design activities incorporating aspects of planning for universal access, value engineering, quality audit and safety audit requirement in design and implementation, including planning and implementation of vision zero strategy, gender-sensitive public realm design by promoting crime prevention through environmental design–CPTED, etc. The stakeholder consultations shall also be duly strengthened adopting the aspects of diversity/ equity/ inclusion in arriving at/finalizing inputs to be considered for design and implementation. The sensitivity of project components would largely depend on location (e.g., rainfall, topography/gradient, soil conditions/ sub-surface drainage conditions, site vegetation, etc.), traffic volume and stormwater drainage volume, system design and specifications, materials (including reuse of cleaned milled materials from existing road surfaces), safety plans and procedures, maintenance regime, and investments.

The Consultants will particularly take the following into account to design climate resilient all-weather roads and culverts/ structures, as applicable:

- i. Sites should be carefully selected with reference to existing local hazard maps or actual surveys.
- ii. Factors for resilience to climate risks/ climate change impacts and disaster risks such as, risk minimization/avoidance, adaptation and/or mitigation measures will be taken into consideration in the design of climate resilient all-weather roads integrated with culverts/ structures, through structural norms/non-structural measures.
- iii. The integrated industrial/ urban roads' subproject components will be designed and executed as seismic resistant structure in accordance with relevant national standards, as applicable.
- iv. The design and construction standards will be raised to appropriate level. The revised high flood levels of the rivers or the natural streams or drainage channels shall be considered, while designing facilities, as applicable. Geotechnical studies shall be undertaken for pavement design/ any protection works.
- v. Detailed engineering design for roads and culverts/ structures will address any shortages of good construction material and potential for reuse of cleaned material.
- vi. Climate financing. i.e., climate mitigation and climate adaptation cost will be estimated.

Task-I: Initial screening of the tentative list of candidate Urban Roads' subproject components

The Consultant will undertake a review and screening of the tentative list of candidate roads prepared by Client for integrated industrial/ urban roads component. The review and screening will be carried out through (i) review of all available reports and published information about the tentative list of candidate roads with any integrated culvert/cross drainage structure subproject components, as felt required and the project influence area, including review of information in any existing master plans/development plans, transport master plans/comprehensive mobility plans, etc., prepared in the State and any existing DPRs for detailed design/implementation-level integration purposes with the integrated industrial/ urban roads' subproject components; (ii) reconnaissance survey in the field; and (iii) discussions with the officials of Client and concerned stakeholder authorities. The Consultant may review the selection criterion to facilitate the preparation of a shortlist of candidate road and culvert/ structure subproject components in consultation with Client and concerned stakeholder authorities. Integrated industrial/ urban roads' subproject components in, or close to, national parks, wildlife sanctuaries, or any other environmentally sensitive areas should be avoided. Subproject components passing through populated areas requiring significant resettlement and land acquisition should also be avoided. Based on the review and initial screening, the Consultant will finalize a shortlist of candidate roads and culvert/structure subproject components in

consultation with Client and concerned stakeholder authorities for taking up any feasibility study for the final selection of the integrated industrial/ urban roads. Prepare draft bid documents for any non-consulting/ consulting services, as felt required (e.g., request for quotation–RFQ for surveys/ investigations, etc.; request for proposal–RFP for supporting studies, etc.), and finalize them in consultation with Client and concerned stakeholder authorities (including following ADB accepted formats and meeting ADB prior approval requirements for draft bid documents, as applicable), and provide procurement processing and procurement/ contract management support.

Task-II: Feasibility Study for Shortlisted candidate Integrated Industrial/ Urban Roads' subproject components

If required, the Consultant will undertake a feasibility study for the shortlisted candidate road and culvert/cross drainage structure subproject components, as applicable, for the final selection of the integrated industrial/ urban roads' subproject components.

The scope of services of any such feasibility study shall cover, but be not limited to, the following major tasks:

- i. review of all available reports and published information about the project road including requirements to address climate risks/ climate change impacts and disaster risks, and the project influence area;
- ii. detailed reconnaissance surveys and preliminary topographic surveys;
- iii. road inventory and condition surveys;
- iv. inventory of culverts/structures;
- v. preliminary material and geotechnical investigation;
- vi. identification of possible improvements in the existing alignment/ site network layout;
- vii. preliminary traffic studies including traffic surveys and demand forecasting;
- viii. preliminary environmental and social impact analyses;
- ix. preliminary proposals and design for upgradation of roads integrated with culverts/structures;
- x. strip plan indicating the scheme for carriageway widening, location of all existing utility services (both over- and underground) and the scheme for their relocation/rehabilitation/upgradation, trees to be felled and planted, and land acquisition/resettlement requirements, and duly illustrating their existing streetscape elements;
- xi. subproject component/project costing;
- xii. economic and financial analyses;
- xiii. criteria for selection of roads and pavement features for DPR; and
- xiv. reports, documents and drawings.

The Consultants are to follow the relevant portions of this TOR for the Task-II Feasibility Study corresponding to the scope of services. The detailed scope of services and the methodology for achieving the detailed design objectives are described in Task-III below.

Task-III: Detailed design for selected Urban Roads' subproject components

The following sections describe the scope of services to be undertaken for the detailed design of the urban roads' subproject components.

The scope of services for detailed design shall cover, but not be limited to, the following major tasks:

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- (i) review of all available reports and published information about the candidate road and culvert/ structure subproject components, as applicable, and the project influence area;
 - (ii) documentation on environmental, poverty and social impacts, including those related to cultural properties, Indigenous People natural habitats, involuntary resettlement, etc.;
 - (iii) undertake public consultation, including consultation with Communities located along the road, NGOs working in the area, other stakeholders and relevant government departments at different stages of assignment;
 - (iv) undertake detailed reconnaissance;
 - (v) identify possible improvements in the existing alignment/ site network layout;
 - (vi) review/conduct traffic studies including traffic surveys and axle load survey and demand forecasting, and pedestrian pathway audit;
 - (vii) undertake inventory and condition surveys for road, culvert/cross-drainage structures and stormwater drainage provisions;
 - (viii) carryout detailed topographical surveys using Total Station, GPS, etc.;
 - (ix) undertake pavement investigations;
 - (x) study sub-grade characteristics and strength: investigation of required sub-grade and sub-soil characteristics and strength for road and any embankment design, and sub-soil investigation;
 - (xi) identify sources of construction materials, including any potential reuse of cleaned-up existing milled/ recovered material; and locations for disposal of excess excavated earth/debris generated from existing materials scrapped/excavated that cannot be reused, and needs to be discarded and disposed-off properly in an environment-friendly manner;
 - (xii) adopt approach of inclusive planning for universal access, and conduct road safety audit to identify areas of major concern, including black spots, any blind spots/ traffic congestion stretches, and measures to be taken for improving detailed engineering design with respect to road safety, including safety of variety of non-motorized transport mode and their usage along with pedestrian circulation areas or movement pathways;
 - (xiii) prepare preliminary proposal for rehabilitation/widening, including shoulder composition, and cross-section details illustrating the proposed streetscape;
 - (xiv) undertake detailed design for rehabilitation/upgradation and widening of roads, including design for roads and culverts/ structures to address requirement for potential disaster risks (seismic and other parameters like, cross-drainage requirements/ flood-prone areas, etc.); to be resilient to climate risks/ climate change impacts, with climate proofing of existing integrated industrial/ urban roads infrastructure; and to be available for all-weather operations;
 - (xv) ensure design of complete drainage system and disposal point for stormwater is integrated with the road/culvert/structures, and any water bodies;
 - (xvi) identify the type and the design of intersections (including any railway crossings);
 - (xvii) carryout value analysis/value engineering, and subproject component/project costing duly incorporating cost of climate financing, i.e., address or consider factors for resilience to climate risks/ climate change impacts and disaster risks;
 - (xviii) undertake economic and financial analyses;
 - (xix) prepare strip plan indicating the scheme for carriageway widening, location of all existing utility services (both over- and underground) and the scheme for their relocation/rehabilitation/upgradation, trees to be felled and planted, and any land acquisition/resettlement requirements, and illustrating their proposed streetscape elements [e.g. street lighting, comprehensive range of signs or signages/pavement markings, junction/ intersection improvements, pedestrian pathways/ footpaths, road/street furniture, bus stop/transit shelter, etc.];
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- (xx) prepare DPR with detailed cost estimate, rate analysis (including analysis of rate method to be adopted for non-schedule items, and detailed bill of quantities, including safeguards monitoring and management cost estimate;
- (xxi) prepare draft bid documents for execution of civil works (including, any goods/ equipment, etc.), and finalize them in consultation with Client and concerned stakeholder authorities (including following ADB accepted formats and meeting ADB prior approval requirements for draft bid documents, as applicable), and provide procurement processing and procurement/ contract management support;
- (xxii) where required, prepare resettlement plans and related due diligence reports (DDRs) for the project affected people as per ADB–guidelines/accepted formats and Government of India Resettlement and Rehabilitation (R&R) Policy, and assess the land acquisition requirements; and undertake, as applicable, Indigenous Peoples Plan documentation and related DDRs; and
- (xxiii) prepare initial environmental examination/environmental impact assessment (as applicable) and comprehensive environmental management plan.

While carrying out the field studies and investigations for planning and design, the information available in any existing master plans/development plans/comprehensive mobility plans, etc., being implemented or proposed for implementation in near future by various stakeholders like, the DoI&C/ PMU-TIDCL, ULBs/ VPs, PWD (R&B), etc., shall be taken into account, including for any integration with such implementation elements. Such aspects, including the impacts on account of transportation-land use relationship shall be clearly brought out in the reports and drawings, to facilitate any further review and decision-making at the government level.

The details of the tasks to be undertaken are described in following paragraphs.

Standards and Codes of Practices

All activities related to field studies, design and documentation shall be done as per the latest guidelines/ toolkits/ circulars/ advisory notes of Ministry of Road Transport and Highways–MORTH, and MOHUA (*erstwhile* Ministry of Urban Development–MOUD), GoI; relevant publications of the Indian Roads Congress–IRC, Bureau of Indian Standards–BIS and its National Building Code of India (NBC 2016/ SP7:2016);etc., as applicable. For aspects not covered by IRC/ BIS, international standards such as, British and American Standards, and international best practices may be adopted. The consultants upon award of the contract may reflect the same in the consulting firm's inception report to be submitted post-mobilization. For cost estimation purposes, the consultant will adopt–the Schedule of Rates of Tripura PWD (R&B) along with rate analysis method and applicable cost index for different locations; the Central Public Works Department Specifications with Delhi Schedule of Rates along with rate analysis method; any other government or semi-government organization's schedule of rates along with rate analysis method as adopted by PWD (R&B) and/or as acceptable to the PMU-TIDCL; and market-based rates—in that order, especially for any items not available in the Schedule of Rates of Tripura PWD (R&B).

Note: The Consultant shall ensure that the references made to all the relevant national standards/codes/manuals/guidelines and international standards/codes/manuals/guidelines, etc., where applicable, is made to their latest application versions (i.e., as amended from time to time).

Quality Assurance Plan (QAP)

The Consultants shall have detailed Quality Assurance Plan (QAP) for all field studies including topographic surveys, traffic surveys, engineering surveys and investigations, analyses, design, and documentation activities. The draft detailed QAP document must be discussed and finalized with Client and concerned stakeholder authorities

immediately upon the award of the Contract, and shall be submitted as part of the inception report.

Traffic Survey

The Consultants shall undertake necessary surveys for classified traffic volume count, origin-destination and commodity movement, characteristics axle loading, characteristics intersection volume count, speed-delay characteristics, pedestrian/animal crossing as per relevant IRC codes. The Consultants shall, immediately upon award of the work, submit to Client, proposals regarding the total number as well as the locations of the traffic survey stations as part of at each stage. Suitable maps and charts should accompany the proposals clearly indicating the rationale for selecting the location of survey stations. The methodology of collection and analysis of data, number and location of traffic survey stations shall be finalized in consultation with Client and concerned stakeholder authorities. In addition, undertake pedestrian pathway audit to plan for and strengthen/ rehabilitate pedestrian pathway or footpath.

Traffic Demand Estimates

The Consultants shall make traffic demand estimates and establish possible traffic growth rates in respect of all categories of vehicles, taking into account the past trends, annual population and real per capita growth rate, elasticity of transport demand in relation to income and estimated annual production increase. The methodology for traffic demand estimates shall be finalized by the Consultants in consultation with Client and concerned stakeholder authorities, including considering the due integration with transport-land use planning proposals (e.g. traffic impact analysis of any proposed surrounding greenfield or brownfield/ densification development projects, etc.) and forecast figures of projected population/employment/traffic generation as per any master plan/development plan exercise by government for respective ULBs and/or as per any regional planning-level/ industrial development-level proposals for urban areas/ border towns managed by ULBs and rural areas managed by district authorities/VPs, as applicable. Overall traffic forecast, thus made shall form the basis for the design of each pavement type (including pedestrian pathway or footpath), bicycle lane, and other facilities/ancillary works.

Further considering the COVID-19 impact, demand for urban public transit during the pandemic has been suppressed and expected to remain below pre-COVID-19 levels if work-from-home and e-learning are sustained. The two key challenges would be tackling capacity challenges on public transport. Additional efforts would be required to reassure public transport users of safety precautions and demonstrate that public transport is clean and safe. Physically active transport, such as walking and cycling, is also a key strategy. Aside from promoting well-being and health, walking and cycling are far more environment-friendly options, contributing to enhanced air quality, lower CO₂ emissions, and liveability of cities. Physically active transport modes tend to offer a higher switching opportunity during change conditions such as the pandemic, as they provide a cost-effective alternative to meet safe distancing requirements and relieve the burden on public transport.⁵⁰

Engineering Surveys and Investigations

Reconnaissance and Alignment

The Consultants shall make an in-depth study of the available right-of-way (ROW), topographic maps, and other available relevant information collected by them concerning the existing alignment/ layout network. The Consultants in coordination with the Client will arrange the required maps and the information needed by them from the potential sources, including any existing GIS-mapping database available with the

⁵⁰ ADB. 2021. *Creating Livable Asian Cities*. Manila.

government. The detailed ground reconnaissance may be taken up immediately after the study of maps and other data. The primary tasks to be accomplished during the reconnaissance surveys include:

- (i) topographical features of the area;
- (ii) typical physical features along the existing alignment within and outside ROW, i.e., land use pattern;
- (iii) scheme for the widening of the existing road;
- (iv) realignment/ strengthening requirements;
- (v) preliminary identification of improvement requirements including treatments and measures needed for the cross-roads;
- (vi) traffic pattern and preliminary identification of traffic homogenous links;
- (vii) sections through congested areas;
- (viii) inventory of major road infrastructure aspects, including land width, terrain, pavement type, carriageway type, culverts/structures (type, size and location), intersections (type, cross-road category, location), storm water drains/ sewers, pedestrian pathways or footpaths, bicycle lane, street lighting, abutting industrial areas, loading/ unloading areas, parking areas (passenger/ freight-traffic), urban areas (location, extent), geologically sensitive areas, environmental features (including integration with surrounding open spaces that may generate traffic demand based on type of open spaces and their intended usage, existing streetscape planting/trees and any existence of linked open space systems/ green corridor continuum, etc.);
- (ix) critical areas requiring detailed investigations;
- (x) requirements for carrying out supplementary investigations;
- (xi) soil (textural classifications/infiltration capacities) and surface/sub-surface drainage conditions; and
- (xii) type and extent of existing utility services along the alignment (within ROW).

The data derived from the reconnaissance surveys will be utilized for planning and programming the detailed surveys and investigations. All field studies including the traffic surveys should be taken up on the basis of information derived from the reconnaissance surveys.

Topographic Surveys

The basic objective of the preliminary topographic survey would be to capture the essential ground features along the alignment in order to consider improvements and for working out improvements, rehabilitation and upgrading costs. The detailed topographic surveys should be taken up after the completion of reconnaissance surveys. The field surveys shall be carried out using high precision instruments, i.e., Total Station, GPS, Auto level, LIDAR, etc., as per best practices.

Details of Utility Services and Other Physical Features

The Consultants shall collect details of all important physical features along the alignment. These features affect the project proposals and should normally include industrial buildings/ sheds, common infrastructure and community facilities, social or institutional-commercial-residential use buildings and structures, any monuments/ burial grounds/ cremation grounds/ places of worship, railway lines, stream/river/canal, water mains, stormwater drains/ sewers, gas/oil pipelines, crossings, trees, plantations, utility services such as, electric and telephone lines (O/H & U/G) and poles, optical fibre cables (OFC), etc. The survey would cover the entire right-of-way of the road on the adequate allowance for possible shifting of the central lines at some of the intersection locations. The information collected during reconnaissance and field surveys shall be shown on a strip plan so that the proposed improvements can be appreciated and, utility

removals of each type and tree cutting, etc., assessed and suitable actions can be initiated. Separate strip plan for each of the services involved shall be prepared for submission to the concerned agency.

Road Inventory Surveys with Pavement Features

Detailed road inventory surveys shall be carried out to collect details of all existing road and pavement features along the existing road sections. This includes roadside pedestrian pathway or footpath, bicycle lane, etc.

Pavement Investigation

Pavement Composition

The data concerning the pavement composition may be already available with the Client on its own or through concerned stakeholder authorities. However, the Consultants shall make trial pits to ascertain the pavement composition.

Road and Pavement Condition Surveys

Field studies shall be carried out to collect road and pavement surface conditions. The data should generally cover: (i) pavement condition (surface distress type and extent); (ii) shoulder or pedestrian pathway or footpath condition or bicycle lane; (iii) embankment condition; and (iv) drainage condition. The objective of the road and pavement condition surveys shall be to identify defects and sections with similar characteristics. All defects shall be systematically referenced, recorded and quantified for the purpose of determining the mode of rehabilitation. The pavement condition surveys shall be carried out using visual means supplemented by actual measurements and in accordance with the widely accepted methodology adapted to meet the study requirements. The shoulder or pedestrian pathway/ footpath or bicycle lane and embankment conditions shall be evaluated by visual means and the existence of distress modes (cuts, erosion marks, failure, drops) and extent (none, moderate, frequent and very frequent) of such distress manifestations would be recorded. For sections with severe distresses, additional investigations as appropriate shall be carried out to determine the cause of such distresses. The data obtained from the condition surveys should be analyzed and the road segments of more or less equal performance may be identified using the criteria given in IRC: 81-1997.

Pavement Roughness and Structural Strength

The roughness surveys, where required, shall be carried out using Bump Integrator or similar instrument. The methodology for the surveys shall be as per the widely used standard practices and would be finalized in consultation with Client/concerned stakeholder authorities.

The structural strength surveys for existing pavements, where required, should be carried out using Benkelman Beam Deflection technique in accordance with the CGRA procedure given in IRC:81-1997 ("Guidelines for Strengthening of Flexible Road Pavements Using Benkelman Beam Deflection Technique"). Axle Load surveys as per relevant IRC codes to be carried out.

Subgrade Characteristics and Strength

Based on the data derived from condition (surface condition, roughness) and structural strength surveys, the project road section should be divided into segments homogenous with respect to pavement condition and strength. The type of testing, frequency of test and the methodology should be finalized in consultation with the Client/ concerned stakeholder authorities.

Investigations for Culverts/Structures

Inventory and Condition Survey of Culverts/Structures

The Consultants shall make an inventory of all the structures (culverts, bridges, etc., as applicable) along the integrated industrial/ urban roads under the PRF. The Consultants shall inspect the existing structures and shall prepare a report about their condition.

Hydraulic and Hydrological Investigations

The Consultants shall collect information on high flood level (HFL), low water levels (LWL), discharge velocity, etc., from available past records, local inquiries and visible signs, if any, on the structural components and embankments. Local inquiries shall also be made with regard to the road sections getting overtopped during heavy rains. The Consultants shall make a desk study of available data on topography, storm duration, rainfall statistics, top soil characteristics, vegetation cover, etc., so as to assess the catchment areas and hydraulic parameters for all existing and proposed drainage provisions. The findings of the desk study would be further supplemented and augmented by a reconnaissance along the area. All-important hydrological features shall be noted during this field reconnaissance. Wherever required, for culverts/cross drainage structures having inadequate waterway, history of overtopping/flooding and are proposed for reconstruction, the detailed hydrological and hydraulic studies shall be carried out.

Geo-technical Investigations and Sub-Soil Exploration

The Consultants shall carry out requisite geotechnical investigations and subsurface explorations for any proposed new culverts/structures or those proposed for reconstruction etc., along appropriately high embankments and any other location as necessary for proper design of the works and conduct all relevant laboratory and field tests on soil and rock samples. The scheme for the boring's locations and the depth of boring shall be prepared by the Consultants and finalized in consultation with Client/concerned stakeholder authorities. The sub-soil exploration and testing should be carried out through the Geo-technical Consultants empanelled by the MORTH. The soil testing reports shall be in the format prescribed in relevant IRC Codes.

Material Investigations

The Consultants shall identify sources (including use of flyash/slag), quarry sites and borrow areas, undertake field and laboratory testing of the materials to determine their suitability for various components of the work and establish quality and quantity of various construction materials (including any potential of reuse of cleaned milled/recovered material) and recommend their use on the basis of techno-economic principles. The Consultants shall prepare mass haul diagram for haulage purposes giving quarry charts indicating the location of selected borrow areas, quarries and the respective estimated quantities. It is to be ensured that no material shall be used from the right-of-way except by way of levelling the ground as required from the construction point of view, or for landscaping and planting of trees etc., or from the cutting of existing ground for obtaining the required formation levels.

Environmental restrictions, if any, and feasibility of availability of these sites to prospective civil works contractors, should be duly taken into account while selecting new quarry locations. The Consultants shall make suitable recommendations regarding making good the Borrow and Quarry Areas after the exploitation of materials for construction of works. The Material Investigation aspect shall include, preparation and testing of bituminous mixes for various layers and concrete mixes of different design mix grades using suitable materials (binders, aggregates, sand filler etc.) as identified during Material Investigation to conform to latest MORTH specification.

Road Safety Audit

Road safety audit shall be carried out for each candidate of integrated industrial/ urban road subproject component for prioritized industrial estates or areas, including non-

processing areas, to identify areas of major concern, including black spots, any blind spots/ traffic congestion stretches, and measures to be taken for improving detailed engineering design with respect to road safety. The audit should be in line with the ADB's Road Safety Audit for Road Projects: An Operational Toolkit (2003) and other references or publications reflecting international best practices. The road safety audit includes pedestrian or pathway safety audit to be conducted. The data on accident statistics should be compiled and reported showing accident type and frequency so that black spots are identified along the project road section. The possible causes (such as poor geometric features, pavement condition, lack of footpaths/access to safe pathways/ bicycle lanes, refuge areas/other intersection features for safety, etc.) of accidents or accident-prone areas should be investigated into and suitable cost-effective remedial measures suggested for incorporation in design and implementation. In this context, the international best practice of planning and implementation of "Vision Zero" strategy that reflects "Safe System" approach (originated in Sweden in 1990s) on road safety may be adopted for progressive improvement in safety of physical access and commuting on integrated industrial/ urban roads.⁵¹ Apart from saved lives due to increased road safety, this would also facilitate in achieving better economic use of development resources and enhanced human productivity as well.

Detailed Design of Road and Pavements, Culverts/Cross-Drainage Structures

General

The Consultants shall carry out detailed designs duly considering the comprehensive requirements from the integrated industrial/ urban roads infrastructure sector perspective that will include the following, but not limited to:

- (i) safe geometric design of road/highway segments, and design safer at-grade junctions or intersections/any grade-separated intersections, with appropriate level of service;
- (ii) design of pavement for the widening and rehabilitation for the existing road, paved shoulders, carriageway improvements, medians/refuge areas, verges (as applicable);
- (iii) design of culverts/cross-drainage structures etc.;
- (iv) alignment plans, longitudinal sections, and cross-sections (including those that illustrate the complete streetscape features);
- (v) designs for road/street furniture, road safety, traffic control/calming/management features with necessary signs and pavement markings, loading/ unloading areas, parking areas (passenger/ freight-traffic), pedestrian pathways or footpaths and other roadside environment-friendly streetscape elements;
- (vi) designs and drawings for service road (if applicable), tree planting/guide- or barrier-railing/fencing, traffic calming measures with necessary signs, street lighting, landscaping, etc., at locations where necessary/required in the streetscape;
- (vii) integrated and resilient road and stormwater drainage design adopting low-impact development/green infrastructure principles, as feasible, including showing location of turnouts, out falling structures;
- (viii) rehabilitation and repair plan with culverts/structures-related design and drawings;

⁵¹ADB. 2021. *Creating Livable Asian Cities*. Manila. ["Vision Zero" which envisages a road system where there are no deaths or serious injuries. The principles underpinning the safe system approach acknowledge that people make mistakes. The blame for crash fatalities and injuries is shifted from road user behavior to a shared responsibility wherein the various elements of the road network should be fair to users who are always susceptible to making mistakes and prone to errors. Road safety should perhaps be better termed mobility safety as crash risks permeate across all modes including pedestrian and nonmotorized transport. The concept of safer people zones in urban areas should be a priority and is an important concept toward achieving a better living environment.]

- (ix) design traffic amenities (Parking Areas, Weighing Station and Shelter/Rest Areas, etc.);
- (x) design of other features to ensure overall that access, mobility, and safety is improved, without further increasing any congestion on the integrated industrial/urban roads; and
- (xi) bid-level drawings, and good for construction drawings for all subproject work components.

Design Standards

The Consultants shall evolve Design Standards and material specifications as part of the project study/ review, primarily based on IRC publications, MORTH/ MOHUA Circulars and relevant recommendations of the international standards. The Design Standards evolved for the project shall cover all aspects of detailed design, including the design of—geometric elements, pavement, culverts/structures, pedestrian pathways or footpaths, traffic safety and materials (including any potential of reuse of cleaned milled/ recovered material, if meeting applicable quality standards and specifications), etc.

Geometric Design

The detailed design for geometric elements shall cover, but not be limited to (i) horizontal alignment; (ii) longitudinal profile; (iii) cross-sectional elements; (iv) junctions/ intersections; and service roads (if applicable). The Consultants shall make detailed analysis of traffic flow and level of service for the existing road and workout the traffic flow capacity for the improved project road. The analysis should clearly establish the widening requirements with respect to the different horizon periods taking into account special problems such as road segments with isolated steep gradients.

In the case of closely spaced crossroads, the Consultant shall examine different options to reduce conflicts and furnish appropriate proposals for this purpose keeping in view the cost of improvement, impact on traffic movement and accessibility to cross roads. The drawings and cost estimate should include the provisions for realignments of the existing cross roads to allow such arrangements. The Consultant shall also prepare details for intersections taking into account the site conditions, turning movement characteristics, level of service, overall economy, and operational safety.

Pavement Design

The detailed design of pavement shall involve (i) strengthening of existing road pavement and design of the new pavement for the widening/additional lane(s), if the findings of the traffic studies and life-cycle costing analysis confirm the requirement for widening or reconstruction of the road; (ii) design of shoulders and/or pedestrian pathways/ footpaths or bicycle lane that are connected with approach roads, including loading/ unloading areas and parking areas (passenger/ freight-traffic). The design of pavement shall primarily be based on IRC publications. However, the Consultants shall use the recommendations given in widely used international practices. The design of pavement shall be rigorous and shall make use of the latest national and international standards and/or practices. The design alternatives and the most appropriate design option suited to the conditions of State of Tripura shall be established on life-cycle costing and techno-economic consideration.

For the design of pavement, each set of design input shall be decided on the basis of rigorous testing and evaluation of its suitability and relevance in respect of in-service performance of the pavement. The design methodology shall accompany the design proposals and shall clearly bring out the basic assumptions, values of the various design inputs, rationale behind the selection of the design inputs and the criteria for checking and control during the implementation of works. In other words, the design of pavement structure should take due account of the type, characteristics of materials used in the

respective courses, variability of their properties and also the reliability of traffic predictions. Furthermore, the methodology adopted for the design of pavement shall be complete with flow charts indicating the various steps in the design process, their interaction with one another and the input parameter required at each step.

For the design of overlays for the existing pavement, the strengthening requirement shall duly take into account the strength of the existing pavement vis-à-vis the remaining life. The overlay thickness requirements shall be worked out for each road segment homogenous with respect to condition, strength and sub-grade characteristics. Appropriate and most suited techniques of pavement design and rehabilitation should be duly considered. As an international best practice for design and construction: (i) the designed finished pavement level shall always be retained as prior to any resurfacing intervention (by milling existing layers, including reuse of cleaned materials post-such milling) so as to remain at prior level flush with the roadside gutter edge, unless deemed to be in need of change on critical review, at such a time of intervention; and (ii) ensure prior to road construction/ reconstruction scheduled activity that all the laying/ construction activity of various utility services located within the right-of-way of the integrated industrial/ urban roads like, *wet utilities* of water supply, effluent/ wastewater/ sewerage, stormwater drain or storm sewer, and *dry utilities* of gas pipeline, cabling for electrical and communication networks, whether laid separately or as part of a unified utility duct, as best feasible is first completed (this is also important prior to any bituminous top layered resurfacing activity is undertaken to achieve the designed finished pavement level).

The pavement design task shall also cover working out the maintenance and strengthening requirements and periodicity and timing of such treatments. The maintenance requirements would be identified and evaluated for a period of 5 years after rehabilitation, together with the bill of quantities and the cost estimates.

Design of Embankments

The embankments design should provide for maximum utilization of locally available materials consistent with economy. The levels shall ensure that factors for resilience to climate risks/ climate change impact impacts and disaster risks are duly incorporated in design as risk avoidance/ minimization, and adaptation and/or mitigation measures.

Design of Culverts/Cross-Drainage Structures

The Consultant shall prepare General Arrangement Drawing (GAD) and Alignment Plan showing the salient features of the new culverts/cross-drainage structures, as applicable, and proposed to be constructed/reconstructed along the integrated industrial/ urban road sections covered under the study and selected for the detailed engineering design stage work. These salient features such as, alignment, overall length, span arrangement, cross section, deck level, founding level, type of culverts/structure-components (superstructure, substructure, foundations, bearings, expansion joint, return walls, etc.), as applicable, shall be finalized based upon any hydrological/hydraulic and geotechnical studies, cost effectiveness and ease of construction. The GAD shall be supplemented by preliminary designs. In respect of span arrangement and type of culvert/structure, a few alternatives with cost-benefit implications should be considered and the best alternative adopted. The Consultants shall also carry out the design and make suitable recommendations for protection works for culverts/cross drainage structures (as specifically applicable for integrated industrial/ urban roads), wherever it is felt required/found inadequate. The Consultants will prepare and submit related bid-level working drawings to support bidding process, and good for construction drawings as part of readiness of the ensuing project to the Client.

Subsequent to the approval of the subproject, the Consultant shall undertake detailed design for all components of the culverts/structures. The Consultant shall undertake

detailed design for suitable protection works (including retaining walls/ breast walls, etc.), and/or river/stream training works, wherever required.

Suitable repair/rehabilitation measures shall be suggested in respect of the existing structures as per IRC-SP:40 along with their specifications, drawings and cost estimate in the form of a report. The rehabilitation or reconstruction of the structures shall be suggested based on broad guidelines for rehabilitation and strengthening of existing culverts/ structures contained in IRC-SP:35 and IRC-SP:40.

Integrated Stormwater Drainage System

The requirement of roadside stormwater drainage system (open drains or preferably covered drains/storm sewers, etc.) and the integration of the same with proposed cross-drainage system and/or existing water retention ponds, and other urban water bodies, etc., shall be worked out for the integrated industrial/ urban road sections under PRF Project. In addition to the roadside drainage system, the Consultants shall design the special drainage provisions for sections with super-elevated carriageways, high embankments and for road segments passing through cuts. The drainage provisions shall also be worked out for road segments passing through peri-urban areas/ rural settlements, as applicable in the project context. Where feasible, the stormwater management through adoption of natural filtration principles and low-impact development/green infrastructure principles, as feasible, should be considered for design interventions. The designed drainage system should show locations of turnouts/outfall points with details of outfall structures fitting into natural contours, any integration with retention ponds, and other water bodies, etc.

Traffic Safety Features, Road/Street Furniture and Road/ Pavement Markings

The Consultants shall design for integrated industrial/ urban roads, the suitable traffic safety features and road/street furniture including junction/ intersection improvements, traffic signals, signs (regulatory/warning signs and directional/guide/informational/monument or site-signage), pavement markings (traffic lane, bicycle lane, traffic island, crosswalks, bus bay/bus box, kerbs, etc.), overhead sign boards, crash barriers, additional fence over underpass lanes carrying significant traffic in case of over bridges/flyovers and over streams located at significant depths from road level in case of large culverts/bridges towards restricting any over-toppling/fall below, bollards, separator/guide railings, delineators, etc. This includes other road/street furniture in pedestrian zones beyond kerb-side edges (e.g., rest-benches, waste bins, bicycle racks, pathway/ landscape lighting, etc.). The safety and security features of the road infrastructure integrated with its industrial/ urban and peri-urban surroundings should also be designed considering innovative/best practice principles, e.g., complete streets, universal access design, planning and implementation of vision zero strategy, exploring retrofitting right-of-way spaces by any road diet interventions, gender-sensitive public realm design promoted by crime prevention through environmental design—CPTED, etc., as feasible. The locations of these features shall be given in the reports and also shown in the drawings.

Miscellaneous Works

The Consultants shall suggest suitable sites for bus parking, enroute lay-byes in general and truck lay-byes in particular, parking areas and rest areas, and prepare suitable separate designs in this regard. The common facilities like petrol pump/gas filling station, vehicle parking, tyre repair, first-aid medical facilities, police post, café/restaurant, etc., should be included in the general layout in due integration with existing land use proposals in master plans or from any integrated sector planning/local area planning/site planning perspective for implementation in future.

The Consultants shall prepare detailed traffic management plan (TMP) for the traffic management and safety, to be followed subsequently during the construction period.

Estimation of Quantities and Subproject Component/Project Costs

The Consultants shall prepare detailed estimates for quantities (considering designs and mass haul diagram) and subproject component/project cost for the entire project (civil works/goods, etc., contract package-wise), including the cost of environmental and social safeguards management proposed based on MORTH's Standard Data Book and market rate for the inputs or the local Schedule of Rates (applicable in State of Tripura for locations corresponding to respective Circle/Jurisdiction of concerned stakeholder authorities), duly accounting the costs for climate change mitigation and adaptation measures considered in detailed engineering design. The estimation of quantities and costs would have to be worked out separately for each civil works/goods, etc., subproject contract package.

The Consultants shall make detailed analysis for computing the unit rates for the different items of works. The unit rate analysis shall duly take into account the various inputs and their basic rates, suggested location of plants and respective lead distances for mechanized construction. The unit rate for each item of works shall be worked out in terms of manpower, machinery and materials. The cost estimates shall be benchmarked with contracts with similar conditions in order to get a more realistic cost estimate.

Economic and Financial Analysis

The subproject will have clear economic rationale. The economic rationale includes an analysis of the market for the subproject's output and assesses its demand. The problem to be addressed by subproject components should be defined, together with identification of options for technical solutions.

The subproject will be cost effective. This usually involves a review of technical options available to address the identified problem and selecting the least cost option. Alternatively, economic efficiency may be demonstrated by the calculation of economic internal rate of return (EIRR) based on "with and without" subproject basis which will be equal to or higher than 9%. Similarly, financial internal rate of return (FIRR) needs to be arrived at. The EIRR and FIRR would be monitored and compared from the time of appraisal to the time when assessment of achievements is made subsequently during-/post-project implementation.

Poverty, Social and Gender

The Consultants will conduct poverty, social, and gender assessment for formulating and incorporating necessary components in the project design. Consultants will prepare the poverty and social assessment, and gender analysis/ GESI aspects/ gender-responsive design features (integrated with climate resilience aspects) based on ADB's Technical Note on Social Analysis for Transport Projects (2008); Handbook on Poverty and Social Analysis: A Working Document (2012); Gender Toolkit: Transport (2013); Guidelines for Climate Proofing Investment in the Transport Sector: Road Infrastructure Projects (2011); etc. The assessment will cover issues related to participation, integrated gender-responsive/ GESI and climate resilience aspects, labor, affordability, sexually transmitted diseases or STI (including HIV), human trafficking, and other social risks. The assessment will recommend actions, mitigation plans, adaptation and/or other measures, as necessary; duly including in its advice/ recommendations, the potential EWCDT—elderly, women, children, differently-abled, and transgender facilities, and other gender and socially inclusive approaches that have been incorporated in the design of the ensuing project.

Safeguards – Environmental

The Consultants will collect environmental data, assess environmental impacts and propose mitigation measures in compliance with ADB's Safeguard Policy Statement (2009), and government guidelines, regulations, and policies. Integrated industrial/ urban

roads subproject components in, or close to, national parks, wildlife sanctuaries, or any other environmentally sensitive areas shall be avoided. Consultants will prepare initial environmental examination, including comprehensive environmental management plans, as applicable, for the urban roads' subproject component integrated with culverts/structures.

The Consultants will furnish any relevant information required for obtaining clearance from various state and central government agencies such as:

- (i) If required, to assist Client and concerned stakeholder authorities in the submission of application and required documents for the Clearance of Reserved Forests to the Forest Departments, where necessary.
- (ii) If required, to assist Client and concerned stakeholder authorities in the submission of forms and documents for obtaining Environmental Clearance for the subproject/project, where necessary.
- (iii) Assistance to Client and concerned stakeholder authorities in submission for any other clearance requirements with respect to the environmental components relevant to the PRF.

Safeguards – Social

Social and environmental impacts will be assessed and mitigation measures proposed in compliance with ADB's Safeguard Policy Statement (2009), and government guidelines, regulations, and policies. Consultants will prepare relevant social safeguard planning documents which may include resettlement framework, resettlement plan (RP), land acquisition and resettlement related due diligence report (DDR), and Indigenous Peoples plan documentation, as applicable.

Procurement

While the town sizes in Tripura being a north-eastern State is small in area and population, the integrated industrial/ urban road segments in and around industrial estates or areas are also likely to be of over relatively small stretches/ network layouts. The Contractors may face challenging site conditions and difficulties in sourcing and transporting construction materials, and will have limited working season to execute the works. As such, civil works/goods contract under these integrated industrial/ urban roads' subproject components may attract only small to medium sized contractors from within the State and the nearby States. In the context of comprehensive DPRs along with bid documents to be prepared for prioritized subprojects, the Consultants will undertake assessment of the availability of suitable contractors and the contract packages will be formulated suitably. The Consultant's expert in the field of procurement will be required to have specific experience in: (i) addressing the procurement risks and challenges under similar conditions, including identifying any potential of reuse of cleaned milled/ recovered material and their specifications that meet quality standards; and (ii) have practical experiences in raising and attracting interests of qualified contractors for procurement under the Project, for example through road-show(s) and/or business opportunity seminar(s). The Consultants will provide procurement processing and procurement management support to the Client in bid evaluation and the award of civil works/goods contracts, and any consulting/ non-consulting services, and build the capacity of PMU-TIDCL concerned stakeholder authorities on procurement in integrated industrial/ urban roads sector.

C. Common Infrastructure and Community Facilities

For the common infrastructure and community facilities in and around industrial estates or areas (including in non-processing areas), the PDMC in consultation with PMU-TIDCL would arrive at a list of such potential work components such as, industrial estate or area premises' boundary walls (with entry and exit gates, including for non-processing areas), layout and built-form control for industrial sheds, parking areas (including

loading/ unloading areas and passenger-/ freight-parking), industrial estate or area premises safety and security through CCTV cameras and private security; and other administrative facilities like, administrative block, guest house, fire station, police station, public toilets, landscaping with signage/ site signs, etc., as felt required, including for any integrated social/ commercial/ residential use infrastructure for communities in non-processing areas, etc., in terms of planning and design work of buildings/ sheds, site infrastructure and its connectivity components, landscaping with signage/ site signs, along with supporting goods/ equipment, etc. to be covered under the prioritized subprojects, duly incorporating use of earlier stated innovative principles or concepts/ best practices/ technology, as feasible. Accordingly, and/or based on any revised priority decisions of the government during PRF implementation, PDMC would:

- (i) undertake feasibility studies (as felt required)/ prepare detailed engineering designs of these work components to be covered under the comprehensive DPRs of respective prioritized subprojects (with due diligences covered under comprehensive DPRs); and
- (ii) include the necessary bid requirements of these work components in the bid documents of the respective contract packages under the prioritized subprojects.

V. OUTPUT AND REPORTING REQUIREMENTS

15. The assignment period for PDMC consulting services as stated above is 12 months (presently envisaged). The PDMC firm is tentatively expected to be mobilized by **January 2022** and accordingly the consulting services is to complete by **December 2022**. The PDMC firm's inputs under the PRF will be discussed during the consulting services' inception phase after its mobilization. It is proposed that the PDMC will review and finalize a list of prioritized subprojects and distribute them under different status levels of any complexities related to, for example, its techno-economic due diligence, safeguard requirements (environment and social) and gender-responsive/ GESI aspects, design readiness, etc., and be mutually agreed with the Client. The consulting firm would then arrive at an appropriate phasing of DPR/bid document deliverables for prioritized subprojects in consultation with the Client, grouped in two-phases (Phase 1 and Phase 2 deliverables, with their commencement dates), and an onward scheduling for procurement of subproject contract packages in the procurement plan based on the outcome/ procurement strategy arrived at under SPP Study Report. These priority list subprojects can then in a phased manner move to the stage of bidding process, upon completion of the phased priority list subprojects' detailed engineering design, and allied activities of necessary supporting documentation and bid documents-set complete in all respects, as required. The bidding process for such subprojects' contract packages to commence latest by the third quarter of CY 2022 or earlier, for start of issuance of invitation for bids (IFBs).

16. Under the PRF, the PDMC is envisaged to prepare one comprehensive DPR per prioritized subproject industrial estate or area [covering the components of water supply, effluent/ wastewater management, septage management (in non-processing areas), roads and storm water drainage system (any integration with water bodies), industrial waste and MSW management, electrical and power systems, and common infrastructure and community facilities, as decided by the government] duly considering the required coverage/projected demand within the relevant DoI&C or TIDCL Notified Industrial Estates or Areas' boundaries, including any non-processing areas and integration with abutting urban foot prints as decided by the government under integrated industrial sector. In addition, the PDMC consulting firm by the end of PRF period should target support for completion of all the IFBs issued for identified and prioritized industrial estates or areas integrated with any proposed growth nodes/ centers (industrial/ urban/ border towns requiring trade facilitation support), and at least 50% of these contracts be ready for award to facilitate the PMU-TIDCL to indicate adequate project readiness, towards undertaking preparation/onward processing for the ensuing loan(s)/project(s).

17. The indicative stage-wise workflow is given in Table 1 (*not in any strict hierarchical order and subject to further modifications*):

Table 1: Indicative Stage-wise Workflow

S. No.	Stage of Work/Deliverable Type	Responsibility
1.	Review and validate of infrastructure gaps, exclusionary screening/ prioritization of subprojects (<i>including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation</i>), proof of concept/ site plans, development of key indicators, etc., prior to undertaking detailed engineering design stage of work	Facilitation: PMU-TIDCL/ Stakeholder Authority/ District Authority/ ADB Primary task: PDMC
2.	Reconnaissance survey, availability of land with clear-title, site/right-of-way, and all no-objection and necessary clearances for each subproject(including those from the Department of Water Resources, Government of Tripura where required, from the environmental conservation/ any downstream impacts/ environmental safeguards compliance, etc., perspectives to protect water resources)	Facilitation: Stakeholder Authority/ PMU-TIDCL Primary task: PDMC
3.	Prepare a revised list of prioritized districts/subproject towns/ subprojects, along with Phasing of Feasibility Studies/DPRs and Bid Documents based on above information <i>[Post the outcome of feasibility studies later, if and when required, the list of prioritized subprojects can be re-prioritized/ finalized for onward applicable tasks.]</i>	Facilitation: PMU-TIDCL Stakeholder Authority/ ADB Primary task: PDMC
4.	Undertaking a rapid climate risk assessment using the preliminary climate (and disaster) risk screening checklist, and as required based on risk-level assessed, undertaking detailed climate risk and adaptation assessment or CRA adopting ADB's CRA (<i>formerly CRVA</i>) Tool, and preparation of Climate Resilience Framework for onward guidance and to address climate risks/ climate change impacts and disaster risk resilience related aspects in detailed planning and infrastructure design (which would be useful during subsequent implementation, operation and maintenance processes as well), including recommended risk avoidance/minimization measures, adaptation and/or mitigation measures, etc., while duly mandating that "disaster-secure engineering," "structural norms/ non-structural measures," etc., for risk reduction are built into plans/designs from the very beginning for these PRF subprojects/projects, including any "climate proofing" of existing infrastructure towards building climate and disaster resilience; and reporting compliance of climate resilience measures in such designs, etc., incorporated at subproject/project-level	Facilitation: PMU-TIDCL/ Stakeholder Authority/ ADB Primary task: PDMC
5.	Undertake Strategic Procurement Planning (SPP) Study, conduct SPP Workshop and discuss/ assess contract management support required and prepare Contract Management Plan(s) during pre-contract award stage for finalized subproject contract packages for the ensuing project (proportional to complexity, risk, and value of the contract; and due consideration to whether large subprojects have an individual Contract Management Plan and/or one Contract Management Plan can cover a group of similar contract packages of a similar size for smaller	SPP Report review and approval: ADB Facilitation: PMU-TIDCL/ Stakeholder Authority/ ADB Primary task: PDMC

S. No.	Stage of Work/Deliverable Type	Responsibility
	contract packages, etc.), arrive at Procurement Strategy in SPP Study, and submit SPP Report and resultant Procurement Plan prepared in consultation with the Client and ADB <i>[Review/ update Procurement Plan, as felt required during PRF implementation.]</i>	
6	Review and updation of any delineation of subproject site boundary/any alignments and layouts/ utility mapping on GIS-based base maps; and undertaking topographical, geotechnical, hydrological and geological surveys (as felt required), and any other engineering/ socio-economic/inventory of loss/ demand surveys/ industry or trade surveys/ willingness-to-pay surveys, etc.	Facilitation: PMU-TIDCL Survey task: PDMC
7.	Preparation of feasibility report/concept design (including any revisions), etc., as appropriate for each subproject* a. Feasibility study report/ conceptual design, etc., complete with draft due diligences documentation of economic and financial analyses, subproject categorization from environment, involuntary resettlement, and indigenous peoples impact perspectives, along with respective screening checklists for each categorization (e.g., rapid environment assessment–REA checklist, etc.), IEE, etc. b. Broad cost estimate c. Administrative Sanction for Commencement of DPR preparation based on the feasibility report/conceptual design, etc., with complete supporting analyses and document set, along with broad cost estimate	Approval: PMU-TIDCL Facilitation: PMU-TIDCL/ Stakeholder Authority Feasibility report/Conceptual design, etc. preparation task: PDMC Administrative Sanction: PSC (as per sanctioned powers/ financial limit) Maximum time period for the Administrative Sanction: 15 calendar days
8.	a. Preparation of Comprehensive DPR for each prioritized subproject industrial estate or area / subproject work components, as applicable - Detailed Engineering Design - Detailed Cost Estimate - Drawings: bid-level working drawings first, and detailed good for construction drawings later - Draft DPR, and Final DPR	Facilitation: PMU-TIDCL/ Stakeholder Authority Comprehensive DPR preparation task: PDMC
	b. Technical Sanction of Final DPR	Technical Sanction: Authority designated by DoI&C / PMU-TIDCL, GoT Facilitation: PMU-TIDCL/ Stakeholder Authority and PDMC Maximum time period for the Technical Sanction: One-month
	c. All other supporting documents as part of complete document-set of Comprehensive DPR (updated, including for due diligences, where required, and complete in all respects) Economic and financial analyses, subproject categorization from environment, involuntary resettlement, and indigenous peoples impact perspectives, along with respective screening checklists for each categorization (e.g., rapid environment assessment–REA checklist, etc.)	Prior review and approval for each subproject: ADB Facilitation: PMU-TIDCL/ Stakeholder Authority Public consultation, baseline measurement, any investigations/ surveys, and documentation task: PDMC

S. No.	Stage of Work/Deliverable Type	Responsibility
	Bid documents complete in all respects, as applicable, with comprehensive EMP (including HSMP**), IEE/EIA, RP and related DDRs/ IPP, GESI AP, etc., as part of a complete DPR document set indicating investment readiness for each subproject	
	d. Acceptance of Comprehensive DPR (including detailed estimated costs) for commencing the procurement process	Approval: PMU-TIDCL Facilitation: PMU-TIDCL/ Stakeholder Authority Follow-up, technical clarification and support task: PDMC
9.	Procurement processing and procurement management support for each subproject a. Invitation for Bid b. Pre-bid meeting/queries/response preparation c. Bid openings (technical/price) d. Bid evaluation (technical/price) e. Bid evaluation reports (technical/price) f. Bid/ Performance Security validation g. Contract document set preparation for signing h. Any other procurement process documentation/draft and final correspondences support	Final Procurement No Objection for Contract Package: ADB Bid Evaluation and Recommendation/ Approval: TERC constituted by PMU-TIDCL/ PSC Facilitation: PMU-TIDCL/ ADB (TA Consultants and TA Consulting Firm as Observers, if sought) Primary Support: PDMC
10.	Review of Institutional Strengthening/Capacity Development Plan with Programs identified for training; initiate institution strengthening/capacity building process, undertake technical capacity building activities/ on-the-job training sessions, and development of comprehensive feedback mechanism for training participants, as well as end-user experience, to be recorded, monitored, appraised and evaluated; including development of knowledge materials and knowledge database/ repository	Staff Nomination and Facilitation: PMU-TIDCL/ Stakeholder Authority/ ADB (Guidance and/or Output Review by Staff/ TA Consultants and TA Consulting Firm as Observers, if sought) Primary task: PDMC
11.	Overall project management during the consulting assignment	Oversight Body: PSC Facilitation: PMU-TIDCL/ Stakeholder Authority Primary task: PDMC
12.	Facilitation to Client in the ensuing loan/project processing stage of work by undertaking as needed financial management assessment, due diligences of economic and financial analyses, project financial management manual, project procurement risk/ capacity assessment, environmental assessment and review framework, initial poverty and social analysis/SPRSS assessment, Resettlement Plan and related due diligence reports/ Indigenous Peoples Plan, GESI AP, and assessment for resilience to climate risks/ climate change impacts and disaster risks, etc., including developing a DMF, as per relevant ADB—guidelines/accepted formats and meeting ADB approval requirements, including prioritizing and phasing investments in the identified and prioritized industrial estates or areas for ensuing project(s) for investments in integrated industrial sector	Oversight Body: PSC Facilitation: PMU-TIDCL/ ADB (Guidance and/or Output Review by Staff/TA Consultants and TA Consulting Firm as Observers, if sought) Primary task: PDMC

* These stages of study work for prioritized subprojects in this consulting assignment pertain to feasibility studies/conceptual design, improved industrial infrastructure plans, etc., as appropriate.

** Updated as site-specific health and safety management plan (SSHSM) with site-specific health and safety COVID-19 plan (HS COVID-19 Plan).

ADB = Asian Development Bank, CRA = climate risk and adaptation assessment, CRVA = climate risk and vulnerability assessment, DDR = due diligence report, DMF = design and monitoring framework, DPR = detailed project report, DoI&C= Department of Industries & Commerce, EIA = environmental impact assessment, EMP = environmental management plan, GESI AP = gender and social inclusion action plan, GoT = Government of Tripura, HSMP = health and safety management plan, IEE = initial environmental examination, IPP = Indigenous Peoples plan, O&M = operation and maintenance, PDMC = project design and management consultant, PMU = project management unit, PSC = Project Steering Committee, RP = resettlement plan, SPRSS = summary poverty reduction and social strategy, TA = technical assistance, TAC = tender approval committee, TERC = tender evaluation and recommendation committee.

18. The PDMC consulting firm will report to the Project Director (PMU). For day-to-day basis of reporting, the PDMC team would report to Additional Project Director, PMU-TIDCL, and coordinate with Project Coordinator under PMU-TIDCL, and/or any other designated representative from Client for execution of the consulting assignment. The Team Leader/Deputy Team Leader is responsible for delivery of all the work outputs and corresponding reports. The PDMC is required to submit following reports, as applicable, considering identified/ reviewed/ prioritized-subproject industrial estates or areas and its subproject work components under integrated industrial sector, to the Project Director (PMU). All reports should be submitted as required below (Table 2), in an electronic and hard copy format.

Table 2: Details of Milestones/ Deliverables: Reports/ Timing

Category	Milestones/Deliverables (Type of Report)	Timing	No. of Copies*
A. Project Management Services	PDMC Mobilization	Within 1-month of commencement of the consulting services	1
	Inception Report (including QAP/QMP)	By the end of 1-month of commencement of the consulting services	5
	Project Performance Monitoring System (PPMS), Financial Management System (FMS), and other measures	Established within 3-months of commencement of the consulting services	-
	Monthly Progress	Every month	5
	Quarterly Progress	Report every quarter/ annually (including as applicable, the GESI AP report, and update on safeguard monitoring as per monitoring reports with any updates on site-specific health and safety management plan covering HS COVID-19 Plan)	5
	Annual Report		5
	Final Report of PDMC Assignment with services and tasks undertaken/status of task accomplishment/learning for improvement/way forward	By 15 days prior to the completion of the PDMC assignment	5
	Non-Report Type Item: Handover of Procured Furniture and Furnishings, Computers/Equipment, Specialised Software/ Hardware (GIS Software and GPS Instruments), Accessories, Unused consumables, etc., along with their original relevant document sets (e.g., procurement processing documents, warranty, insurance, O&M manuals, etc.), as applicable	Before completion of the PDMC assignment [Note: Such handover to be completed along with the submission of 5 (five)-signed Transmittal copies for record/ communication purposes for each Item-Set handed over to PMU-TIDCL.]	5

Category	Milestones/Deliverables (Type of Report)	Timing	No. of Copies*
B. Planning and Detailed Engineering Design (with Detailed Project Reports– DPRs) and Procurement Processing Assistance for each Subproject	I. Secondary Data Collection/ Reconnaissance Survey/ Preliminary Study	Immediate after commencement of the consulting services	
	Infrastructure Assessment and Investment Plan (Review report): Review of infrastructure gaps, and Exclusionary Screening/ Prioritization of Subprojects <i>(including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation)</i> , proof of concept/ site plans, development of key indicators, etc., and the List of Prioritized Subprojects and Phasing of Deliverables, including List of Feasibility Reports is finalised	Within 6-weeks of commencement of the consulting services	5
	Review and updated GIS-based Base Maps of the Study Area	Within 6-weeks of commencement of the consulting services	3
	Preliminary Report on infrastructure inventory and current status based on reconnaissance survey and secondary data collection, for: • water supply system • effluent/ wastewater management and septage management • roads along with stormwater drainage system and any integration with water bodies • industrial waste and MSW management • any existing common infrastructure and community facilities	Within 6-weeks of commencement of the consulting services	3
	Rapid climate risk assessment using the preliminary climate (and disaster) risk screening checklist, and as required detailed Climate Risk and Adaptation Assessment (CRA) and Climate Resilience Framework with adaptation and/or mitigation measures to adopted at subproject/project-level	Initial due diligence by the end of Feasibility Studies/ Firmed-up during Phase-I DPRs <i>[Comprehensive Design Review Report to be submitted as stated, on periodic basis at sub-project/ project-level, as applicable]</i>	5
	Strategic Procurement Planning (SPP) Study, SPP Workshop, Procurement Strategy, and SPP Report; resultant Procurement Plan (prepare/review/update); and Contract Management Plan(s)	SPP Study, SPP Workshop, Procurement Strategy, and SPP Report, along with contract management support required, and resultant Procurement Plan (first version): SPP Study to begin in-parallel to inception activities, and all SPP Study	5

Category	Milestones/Deliverables (Type of Report)	Timing	No. of Copies*
		tasks/ documents as stated-above be completed within 6-months of commencement of the consulting services. Procurement Plan to be thereafter reviewed/ updated at appropriate timing in consultation with PMU-TIDCL on a continuous basis of information made available w.r.t. firmed-up/ approved DPR(s), etc. Contract Management Plan(s): At appropriate timing in consultation with PMU-TIDCL on a continuous basis as DPR(s) get firmed-up/ approved, and completed latest before the end of PDMC assignment	
	II. Preparation of Comprehensive DPR of <u>each</u> Prioritized Subproject Industrial Estate or Area with subproject work components as applicable	Concurrent activities would commence in consultation with PMU-TIDCL from 7th-week onwards of commencement of the consulting services. [Maximum typical duration available for <u>each</u> DPR completion is 14-weeks from its scheduled commencement as per Phasing till Final DPR stage of work.]	
	a. Detailed Surveys (Primary and Engineering Surveys like, socio-economic survey/ inventory of loss survey/ demand survey/ industry and trade survey/ willingness-to-pay survey/ topographical survey, etc.) and Detailed Investigations at Feasibility Study/ DPR-level	2-weeks for each subproject	5
	b. Infrastructure Design		
	Identification and Confirmation Report of Conceptualization of Requirements (water supply source, effluent/ wastewater management and septage management, storm water drainage system; identified road alignment/right-of-way/culvert etc., in need widening/ strengthening/reconstruction; and common infrastructure and community facilities)	2-weeks for each subproject	5
	Feasibility Report/Conceptual Design (including, any revisions), etc., with draft due diligences documentation undertaken**	5-weeks for each subproject [For all prioritized subprojects to complete latest by 3 months from commencement of the	5

Category	Milestones/Deliverables (Type of Report)	Timing	No. of Copies*
		consulting services]	
	Draft DPR	18-weeks (cumulative duration = 6 + 12 weeks) [For all prioritized subprojects to complete latest by 6 months from commencement of the consulting services]	5
	Final DPR	20-weeks (cumulative duration = 6 + 14 weeks) [For all prioritized subprojects to complete latest by 7 months from commencement of the consulting services]	5
	c. Safeguard Documentation (as applicable) [Duly updated from Feasibility Report- to DPR-level of work]	[Cumulative duration continued for each subproject]	
	Initial Environmental Examination Report covering project proposals (In case, if Environmental Impact Assessment is applicable, higher duration would be required)	18-weeks	5
	Involuntary Settlement and Resettlement Plans	18-weeks	5
	Indigenous Peoples Plan	18-weeks	5
	GESI AP	18-weeks	5
	Due Diligence Report	18-weeks	5
	Design and Monitoring Framework related work w.r.t. each subproject and consolidation at project-level	Continuous [in consultation with PMU-TIDCL]	5
	d. Procurement Support		
	Draft Bid Document	20-weeks [For all prioritized subprojects to complete latest by 7 months from commencement of the consulting services]	3
	Final Bid Document[^]	22-weeks [For all prioritized subprojects to complete latest by 8 months from commencement of the consulting services]	3
	Draft Final Report of each Subproject, with Implementation Plan and Financial Operating Plan	24-weeks	5
	Final Report of each Subproject, with Implementation Plan and Financial Operating Plan	26-weeks [after incorporating final comments from PMU-TIDCL]	5
	Pre-Bid Process Support	At appropriate timing in	-

Category	Milestones/Deliverables (Type of Report)	Timing	No. of Copies*
	Bid Evaluation Reports (Technical and Financial)	consultation with PMU-TIDCL on sequential basis once the procurement of first subproject bid is ready to commence	5
	Draft Letter of Acceptance		1
	Other Technical Documents		
	QAQC Manual	Within 10 months of consulting firm mobilization in consultation with PMU-TIDCL	5
	O&M Manual		5
	Detailed good for construction drawings	Before the end of procurement processing support for each subproject/contract, and completed latest before the end of PDMC assignment	5
	Comprehensive Design Review Report on compliance of aspects of Climate and Disaster Resilience incorporated in detailed engineering design and DPR	Quarterly (from second quarter onwards and complete by third quarter)	5
C. Institutional Capacity Development Strengthening	Review Report of Institutional Strengthening/Capacity Development Plan with Programs identified for training and identified technical capacity building requirements for on-the-job training	Within 3-months of commencement of the consulting services	5
	Initiate institution strengthening/capacity building process	At appropriate timing, in consultation with PMU-TIDCL	-
	Undertake technical capacity building activities/ on-the-job training sessions	At appropriate timing, in consultation with PMU-TIDCL	-
	Training Implementation and Evaluation Report, including compilation of Presented Documents/Proceedings etc.	Within 1-month after conducting training	5
	Project Financial Management Manual	Within 8 months of consulting firm mobilization in consultation with PMU-TIDCL, and latest by commencement of ensuing loan/ project processing stage of work during PRF implementation	5

* The consulting firm is required to submit soft copy of all the reports in editable formats.

**These stages of study work for prioritized subprojects in this consulting assignment pertain to feasibility studies/conceptual design, improved industrial infrastructure plans, etc., as appropriate.

^ Inclusive of bid-level working drawings as well.

19. Few key milestones are summarized below (Table 3) for delivery of outputs. In conjunction with these timeframes, the acceptance of each monthly invoice by the Client will depend on the Client's acceptance of the quality of outputs or deliverables produced for which the consultant's time-inputs are attributed to in the respective monthly timesheet.

Table 3: Key Milestones Schedule

S. No.	Key Milestones	Reference description	Due Date*
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S. No.	Key Milestones	Reference description	Due Date*
1	Inception Report	For overall PRF Project	1
2	Infrastructure Assessment Investment Plan (Review Report): Review of infrastructure gaps, and Exclusionary Screening/ Prioritization of Subprojects (including for any updation in investment plan and action plan, and any phasing of deliverables on iterative basis during PRF implementation), proof of concept/ site plans, development of key indicators, etc., and the List of Prioritized Subprojects and Phasing of Deliverables, including List of Feasibility Reports is finalised ^a	Under Output 1, review and finalization of Prioritization of Subprojects and Phasing of Deliverables arrived at to commence sequentially the onward work of Feasibility Study/ DPR-level Work/ Bid Documents preparation	2
3	Review Report of Institutional Strengthening/ Capacity Development Plan	For Output 3, with Programs identified for training and identified technical capacity building requirements for on-the-job training	3
4	Feasibility Reports	For Output 2, to be completed for all prioritized subprojects with draft due diligences documentation undertaken and Feasibility Reports/ Conceptual Designs, Improved Industrial Infrastructure Plans, etc., prepared, and to facilitate any revision in the list of prioritized subprojects for onward DPR preparation based on outcome of feasibility studies undertaken	3
5	Workshop 1 for Phasing of Deliverables: Review Operating Environment and Market Analysis under Strategic Procurement Planning (SPP) Study ^b	For Output 2, based on Market Analysis and including in conjunction with the outcome of Feasibility Reports, revise and finalise the List of DPRs to be prepared along with onward Phasing of Deliverables	3
6	Climate Resilience Framework: Rapid climate risk assessment using the preliminary climate (and disaster) risk screening checklist, and as required detailed Climate Risk and Adaptation Assessment (CRA) and Climate Resilience Framework	For Output 2, initial climate resilience due diligence by the end of Feasibility Studies/ Firmed-up during Phased DPRs (first phase)	4
7	Workshop 2 - SPP Study Report: Procurement Strategy, and SPP Report; and resultant Procurement Plan	For Output 2, including identification of contract management plan(s) required for prioritized subprojects	6
8	Draft DPR	For Output 2, Phased DPRs amongst prioritized subprojects, with updated due diligences documentation	6
9	Final DPR	For Output 2, Phased DPRs amongst prioritized subprojects, including bid-level drawings, and after incorporating the comments on Draft DPRs	7
10	Final Bid Document	For Output 2, Phased DPRs amongst prioritized subprojects, including bid-level drawings, and after incorporating the comments on Draft DPRs	8

S. No.	Key Milestones	Reference description	Due Date*
11	Good for Construction Drawings - Final Version	For Output 2, GFC drawings (Final Version) to be handed over before the completion of PDMC assignment	11
12	All other documentation	For overall PRF Project, all other documentation such as, PPMS/ FMS for project monitoring and progress reporting, comprehensive design review report, procurement processing support, contract management plans final report, ensuing loan processing support, etc.	11

DPR = detailed project report, FMS = financial management system, GFC = good for construction drawing, PDMC = project design and management consultant, PPMS = project performance monitoring system, PRF = project readiness financing.

* Due date in months from commencement of consulting services. The Client will make bestefforts to provide comments onthe submitted documents within appropriate time.

^a The final value and number of Feasibility Reports will be finalised at this key milestone stage by the EA. The milestone payment related to Feasibility Reports at S. No. 4 (Table 3) will be paid on pro-rata basis of total project cost resulting from Feasibility Reports. For example, say 20 Feasibility Reports to be prepared resulting into total project cost of INR 1000 crores. Therefore, the payment due at the milestones for one Feasibility Report (say for project cost of INR 100 crore) will be calculated in the ratio of 100/1000

^b The final value and number of DPRs will be finalised at this key milestone stage by the EA, in conjunction with the outcome of Feasibility Reports. The milestone payment related to DPRs/ Bid Documents/ Good for Construction Drawings at S. No. 8, 9, 10 and 11 (Table 3) will be paid on pro-rata basis of total project cost resulting from DPRs. For example, say 10 DPRs to be prepared resulting into total project cost of INR 500 crores. Therefore, the payment due at the milestones for one DPR (say for project cost of INR 100 crore) will be calculated in the ratio of 100/500.

20. The inception report shall cover the following major aspects:

- (i) project appreciation;
- (ii) detailed approach and methodology to meet the requirements of the TOR; including scheduling of various sub-activities to be carried out for completion of various stages of the work; stating out clearly their approach and methodology for project preparation and design activities after due inspection of the potential subproject and collection/collation of necessary information;
- (iii) summarise clearly wherever deviating from TOR and/or technical proposal with reasons and seeking for approvals;
- (iv) task assignment and personnel deployment schedule to achieve key milestones/ deliverables should be discussed and approved by the Client;
- (v) work programme/ plan;
- (vi) proforma for data collection/respective surveys, as applicable; and
- (vii) draft design standards/ best practices, etc., as applicable.

21. The personnel deployment schedule accepted at inception report stage would be updated at key milestones of feasibility reports, DPRs, and bid documents, discussed and approved by the Client.

VI. EXPERTS REQUIRED

22. For the PDMC consulting services towards integrated industrial infrastructure development in and around 15 industrial estates in six (6) districts of Tripura, a total of 360 person-months, including 130 person-months of national key experts and 230 person-months of national support staff, would be required to be mobilized by the consulting firm as minimum inputs during the assignment under PRF loan. The team composition of PDMC covering key experts and support staff, and their minimum person-month inputs is in Table 4.

Table 4: Team Composition for PDMC Consulting Firm

Annexure 1

TECHNICAL SPECIFICATIONS FOR PLANNING AND DESIGN OF WATER SUPPLY SYSTEMS

1. References

The following references are used in these terms of references:

Software	EPANET Version 2.0 <i>Freely downloadable from the US Environmental Protection Agency (USEPA)</i>
References	<u>Reference 1</u> CPHEEO Manual on Water Supply and Treatment, Third Edition, Revised and Updated, May 1999 CPHEEO Manual on Operation and Maintenance of Water Supply Systems, January 2005 IS: 10500-2012, Water Quality Standards (Bureau of Indian Standards) <u>Reference 2</u> EPANET 2 - User's Manual, Lewis A Rossman, USEPA

2. Planning Studies

Reference 1 – CPHEEO Manual on Water Supply and Treatment, 1999 sets out the requirements for the planning and design of water supply systems.

Reference ⁵³		
2.2.6	Design Period	The design period shall be: • 50 years for surface water intakes • 30 years for pipes • 15 years for reservoirs • 15 years for water treatment plants • 15 years for electro-mechanical systems
2.2.7.1 (h)	Population Forecasts	Several Options of determining population forecasts are provided. The Option of density is to be used. This Option will need to be applied in consultation with the municipal council. The resulting population forecast is to be capped at an increase of 20% over the current population, with intervening years back-proportioned accordingly
	Planning Horizon	Start Year – 2023 Base Year – 2025 Intermediate Year – 2040 Ultimate Year – 2055
2.2.8.3 (a)	Service Level for domestic and non-domestic needs	The domestic and non-domestic needs shall be 135 lpcd for all towns
2.2.8.3 (b)	Institutional and commercial and industrial demand	5% of domestic and non-domestic demand or as per actual survey whichever is lower
2.2.8.3 (c)	Fire Fighting Demand	To be provided from existing untreated ground water supply and not to be integrated with treated fresh water supply

⁵³Reference clauses are from CPHEEO Manual on Water Supply and Treatment, 1999 by the Central Public Health and Environmental Engineering Organisation, currently under Ministry of Housing and Urban Affairs, Government of India.

Reference ⁵³		
	Water losses in treatment	5% with provision for wash water recovery in the event coagulation, flocculation, clarification and rapid gravity filtration treatment is chosen basis for treatment and provision of wash water recovery plant to be provided
	Water losses in transmission	2% of volume of water transmitted
	Water losses in distribution	13% of volume of treated water produced
	House Connections	Each town will be required to achieve universal coverage with simplified procedure for provision of connections cost of which is capitalized, included and financed under the project

lpcd = liters per capita per day.

3. Pipeline Materials and Diameters

The following table shows the pipeline materials that are required to be used.

Permitted Pipeline Materials – Networks	HDPE ≤ DN300 mm Ductile Iron ≥ 350 mm and for all rising mains irrespective of diameters
Permitted Pipeline Materials – Connections	PVC-C HDPE MDPE
Minimum Pipeline Diameter for Networks	75 mm
Minimum Pipeline Diameter for Connections	15 mm

DN = nominal diameter, HDPE = high density polyethylene, MDPE = medium density polyethylene, mm = millimeter, PVC-C = chlorinated polyvinyl chloride.

Note: The Consultant shall ensure that the references made to all the relevant national standards/ codes/ manuals/ guidelines and international standards/ codes/ manuals/ guidelines, etc., where applicable, is made to their latest application versions (i.e., as amended from time to time).

Annexure 2

TECHNICAL SPECIFICATIONS FOR PLANNING AND DESIGN OF STORMWATER DRAINAGE SYSTEMS

1. References

The following documents are to be used as references for this project and this project must follow the technical requirements set out in these documents unless specifically directed otherwise.

Models	HEC HMS (Hydrologic) ⁵⁴ HEC RAS (Hydraulic) <i>Freely downloadable from the US Army Corps of Engineers Hydrologic Engineering Centre</i>
Guidelines	NDMA Management of Urban Flooding 2010 NDMA Management of Floods 2008 CPHEEO Manual on Storm Water Drainage Systems 2019 Part I HECHMS User's Manual (CPD-74A) HEC HMS Technical Reference Manual (CPD-74B) HEC HMS Applications Guide (CPD-74C) HEC-RAS 5.0, User's Manual HEC-RAS 5.0.4 Supplemental User's Manual HEC-RAS 5.0, Applications Guide HEC-RAS 5.0 Hydraulic Reference Manual

2. Design Criteria

The following design criteria are to apply. These criteria take precedent over published criteria.

Design Rainfalls	1. 1 in 1-year storm 2. 1 in 2-year storm 3. 1 in 5-year storm IDF Curves for a City/ Region from Indian Meteorological Department Scaling factor for Climate Change: 5%
Runoff Control	Conveyance Priority: 1. Road Gutter 2. Buried pipeline 3. Drainage Channel 4. Road Floodway 5. Overbank Flow
General	Impervious Area: 60% to 100% depending upon development Retention Basin: (only where land is available and only as a last resort) Pollutant Loading: Not Required
Maximum overland velocity times	0.4 m ² /s

⁵⁴ Consultants may use other equivalent computer software for the rainfall-runoff and hydraulic design.

depth	
Materials	Channels, Gutters, Roads: Concrete Pipelines: HDPE
Dimensions	1
Maximum Drainage Pipe Depth	Four meters
Maximum Length of Rising Main	350 meters

IDF = intensity-duration-frequency, HDPE = high density polyethylene, m^2/s = square meter per second.

The minimum design rainfall for a town drainage system is a 1 in 2-year event. However, this study requires the option of designing for a 1 in 1-year event as a further possible option for practical reasons.

The concept of maximum overland velocity times depth is introduced. Ideally the flood waters are controlled to the extent that the velocity of the water does not exceed 0.4 meters per second for a depth of one meter of water, and subsequent combinations (for example 0.8 meters per second for a depth of 500mm). It is recognized that this may not always be possible. The areas where this parameter is exceeded are to be marked on the plans for the design rainfall events.

Dimensions means only one-dimensional modelling is required.

3. Model Options

The following modelling options are to be used for HEC HMS.

Loss Method	Initial and Constant Loss
Transformation Method	Kinematic Wave Transform
Baseflow Method	Recession Baseflow
Routing Method	Kinematic Wave Routing (Inflow = Outflow)
Loss/Gain Method	Constant

Note: The Consultant shall ensure that the references made to all the relevant national standards/ codes/ manuals/ guidelines and international standards/ codes/ manuals/ guidelines, etc., where applicable, is made to their latest application versions (i.e., as amended from time to time).