**Turkey: Rail Logistics Improvement Project (RLIP)**

**TERMS OF REFERENCE**

**For Preparation of Survey and Feasibility Studies, Preparation of Detailed Engineering Designs and Technical Specifications/Bills of Quantities for 6 Rail Last-mile Connectivity Infrastructure Sub-projects**

1. Introduction and Background

The Republic of Turkey achieved strong economic and social development performance since 2000, leading to increased employment and incomes. More recently, growing economic vulnerabilities and a more challenging external environment are threatening to undermine these achievements. Turkey has maintained a long-term focus on implementing ambitious reforms in many areas, and government programs have targeted vulnerable groups and disadvantaged regions. The poverty incidence more than halved over 2002-15, and extreme poverty fell even faster. During this time, Turkey urbanized dramatically, maintained strong macroeconomic and fiscal policy frameworks, opened to foreign trade and finance, harmonized many laws and regulations with European Union (EU) standards, and greatly expanded access to public services.

Turkey, owing to her advantageous geostrategic positioning between Europe and Asia, has a strong potential in becoming a major regional logistics hub. Nevertheless, failure to develop the physical infrastructure of railways and maritime transport in a timely manner in response to the increased demand for transportation, inadequate institutional capacity and the current fact that highway transportation is the most efficient transportation mode for door-to-door transportation, have led to the intensification of freight and passenger transportation on the road network.

Turkey’s global standing in logistics performance has steadily deteriorated over the past six years, signaling an urgent need to attain further improvements and reverse this negative trend. As early as 2012, Turkey was ranked as the 27th best-performing economy in international logistics by the Logistics Performance Index (LPI), a position that has steadily weakened since—to 30th in 2014, 34th in 2016, and 47th today. Much of this deterioration stems from relative under-performance in infrastructure provision and small market scale as well as the quality of logistics services, particularly in the railways.

Improvements in containerized rail intermodal and other forms of rail-based logistics are expected to boost economic dynamism and support job creation in Turkey. By enhancing access to domestic and international markets through improved connectivity, railway infrastructure investments are recognized as direct drivers of rail adoption and indirect drivers of sustainable economic growth.

The project aims to increase rail freight efficiency in Turkey by improving last-mile connectivity (LMC), enhancing the operational efficiency of logistics centers and strengthening institutional capacity. The project is developed around three main components:

1. **Component 1 – Construction of Railway Branch Lines and Multimodal Connections at Priority Network Nodes.** This component includes construction of two main branching lines, Çukurova Region and Iskenderun Bay railway connections, and Filyos Port/Industrial Zone connections, including construction supervision consulting services, as well as construction (and construction supervision) of two to three additional subprojects to be selected from a pre-identified list of 12 potential LMC sites;
2. **Component 2 – Feasibility Studies, Detailed Engineering Designs, and Construction Supervision for Rail Last-mile Connectivity Infrastructure at Additional Freight Generation Nodes.** This component includes survey, design, and feasibility studies for the 12 potential LMC locations pre-identified by the Ministry of Transport and Infrastructure (MoTI), plus detailed engineering designs, environmental and social impact assessment and impact management documents, and construction supervision for a subset of this initial list of potential LMCs; and
3. **Component 3 – Phase 2 COVID-19 Response Support, Institutional Strengthening, Capacity Building, and Project Implementation Support.** This component will provide technical assistance on key aspects of service delivery in rail freight logistics, such as standardization of railway network technical standards, preparation of a rail freight strategy document for MoTI, and support to MoTI on the management and planning of rail-enabled logistics centers owned by TCDD, the public railway infrastructure manager. Component 3 will also finance the provision of technical assistance to MoTI to assess the medium- and long-term impacts of the COVID-19 pandemic on Turkey’s multimodal logistics system and to draw up policy measures to mitigate those impacts. Lastly, Component 3 will finance the operating costs of the Project Implementing Unit (PIU) within MoTI’s Directorate-General of Infrastructure Investments (DGII).
4. Objective of the Assignment

The objective of this assignment is to provide project preparation support from feasibility studies to detailed engineering designs for up to 6 out of a total of 12 pre-identified last-mile rail infrastructure connectivity subprojects to be considered under Component 2. The initial work in this process will entail production of survey and feasibility studiesfor all 6 subprojects to be included under this contract (the feasibility of the remaining 6 subprojects will be assessed under a separate consulting services contract subject to identical Terms of Reference [ToR]). Findings from the feasibility studies will then be used by DGII, with the help of the consultant, to prioritize the 12 subprojects based on multi-criteria analysis, including, but not necessarily limited to, 3 main factors: (i) expected economic returns (including the value of mitigating environmental and other non-market externalities); (ii) risk-adjusted technical feasibility (including environmental and social impact considerations); and (iii) magnitude of expected rail freight volume capture as a proxy for urgency of delivery. The Consultant shall collaborate with the Consultant of the assignment “Consulting Services for preparation of a full suite of detailed E&S assessment documents for 12 LMCs” (E&S Consultant) by providing/receiving information for completion of the E&S studies as per the revised designs, and for revising the designs as per the outcome of E&S studies. The Consultant shall attend all bilateral meetings and studies for updating the E&S documents when needed. E&S Consultant will be working for preliminary site E&S impact assessment reports. Based on these studies, those subprojects deemed feasible of implementation will move forward to the next stage in the project cycle, in which the consultant will prepare detailed engineering designs, technical specifications/bills of quantities and tender documentation. Simultaneously the E&S Consultant will be working for detailed environmental and social impact and impact management documentation, in accordance with the World Bank’s Environmental and Social Framework (ESF) for the subset of subprojects deemed feasible under the FS stage. And among the latter, for a subset of up to 2 to 3 subprojects (among the initial list of 12) supervision and construction contracts will be signed and implemented by the Client for the selected LMCs that the remaining budget in the project allows construction.

A brief description of the 12 sub-projects is presented in Table 1. **This assignment will develop survey and feasibility studies for subprojects 3, 7, 8, 9, 10, and 11 of Table 1.**

Detailed engineering designs, technical specifications/bill of quantities, and construction supervision consulting services may subsequently be provided for a subset of the initial 6 subprojects.

**Table 1. List of Priority Sites for Last-Mile Rail Infrastructure Provision**



The feasibility studies will include economic, financial, technical/engineering environmental, and social feasibility assessments. Preliminary maps of the proposed alignment of these subprojects are shown in **Annex 1**.

The feasibility studies will provide an initial assessment of the extent to which the above impacts can be avoided, mitigated and the likely mitigation measures that could be deployed, based on mitigation hierarchy adopted under the World Bank’s ESF, including a justification of same based on good domestic and international practice, cost effectiveness, international experience, and the like.

However, it should be noted that any subproject that is classified as ***High Risk,*** likely to generate a wide range of significant adverse risks and impacts on human populations or the environment, which have the majority or all of the following characteristics: (i) long term, permanent and/or irreversible (e.g., loss of major natural habitat or conversion of wetland), and impossible to avoid entirely due to the nature of the Project; (ii) high in magnitude and/or in spatial extent (the geographical area or size of the population likely to be affected is large to very large); (iii) significant adverse cumulative impacts; (iv) significant adverse transboundary impacts; and (v) a high probability of serious adverse effects to human health and/or the environment (e.g., due to accidents, toxic waste disposal, etc.); (vi) sensitive and valuable ecosystems and habitats (legally protected and internationally recognized areas of high biodiversity value), (vii) impacts to lands belong to or rights of Indigenous Peoples, Local Communities and ethnic minorities, or other vulnerable groups (viii) intensive or complex involuntary resettlement or land acquisition, impacts on cultural heritage or densely populated urban areas; (i) significant concerns that the adverse social impacts of the subproject activity; and (x) the associated mitigation measures, may give rise to significant social conflict or harm or significant risks to human security **should not be selected to move on to the** detailed design and detailed E&S documentation phase.

It should be noted the project will apply the relevant requirements of the EHS Guidelines during feasibility studies and detailed engineering design. When the Turkish requirements differ from the levels and measures presented in the EHS Guidelines, the more stringent ones (such as the most stringent discharge and emission standards) will be applied in the project specifications as per Environmental and Social Standards (ESSs) of the World Bank’s ESF. The Consultant will fully comply with the requirements of ESSs in assessment of the environmental and social impacts within the scope of the feasibility studies.

In assessment of environmental and social implications during feasibility studies and detailed engineering design, Turkish laws and requirements and the following World Bank documents should be taken into consideration as applicable but not limited to:

* World Bank’s Environmental and Social Framework (ESF) and Borrower’s Guidance Notes;
* World Bank Group’s Environmental, Health, and Safety (EHS) General Guidelines;
* World Bank Group’s Environmental, Health, and Safety Guidelines for Railways;
* World Bank Group’s Environmental, Health, and Safety Guidelines for Toll Roads;
* World Bank Group’s Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution;

1. Scope of Work of Survey and Feasibility Studies

The feasibility study for each subproject must be in compliance with the guidelines and procedures of the Government of Turkey (GoT) and the World Bank. The studies shall present, evaluate, and justify alternatives; and feature clear tables, graphs, drawings, maps, and other supporting material for technical and general descriptions. The consultant’s tasks shall include:

* + Review of existing past demand-supply, feasibility, market research, engineering, and other studies, if any
  + Review of other existing data and studies
  + Data collection and market surveys
  + Review of institutional frameworks
  + Definition of key performance indicators and their baseline values
  + Technical analyses
  + Preliminary design with assessment of alternatives
  + Financial and fiscal impact analyses
  + Economic and stakeholder analyses
  + Sensitivity and risk analyses

The details of the tasks that will need to be undertaken to complete the feasibility studies are provided in **Annex 2**.

Findings of the Survey and Feasibility Studies and environmental and social assessment (which will be provided by the E&S Consultant) will be used to identify possible alternative solutions for the last mile rail structures’ options and should be criteria for comparative analysis of options, adopting the mitigation hierarchy for adverse environmental and social impacts, as well as identification of mitigation measures and establishment of baseline which will serve as the basis of preliminary inputs into the detailed engineering design studies as well as further environmental and social assessment documents (e.g. ESIA, ESMP, RAP, other sub-management plans as relevant/needed) to be developed for feasible subprojects..

Based on the findings of the feasibility studies, the consultant shall (i) make a clear recommendation as to the feasibility or non-feasibility of each subproject and whether there is justification for the implementation of each sub-project in isolation; and (ii) develop a methodology to rank the subprojects in order of feasibility, based on multicriteria analysis (e.g., based on socioeconomic, financial, environmental and social, and technical factors of desirability and feasibility) ideally consistent with the 3-point prioritization approach described briefly above and make a clear recommendation as to the attractiveness and investment impact of the 6 subprojects in order of desirability of implementation, with well-substantiated, quantitative evidence. For those subprojects found to be feasible, irrespective of ranking, the consultant will develop detailed engineering designs (see next section). Also, irrespective of ranking, detailed engineering design will be prepared only for Subprojects that are deemed to be of Low, Moderate or Substantial Environmental and/or Social risks in light of the FS-level environmental and social impact assessments.

In carrying out these tasks, the consultant shall conduct all physical inventories, surveys, collection and analysis of market, economic, financial environmental & social(provided by the E&S Consultant), and technical data and other analytical evidentiary work as required to attain the stated objectives. The consultants shall collaborate closely with the involved authorities at MoTI’s Directorate-General of Infrastructure Investments (DGII) and other relevant agencies as appropriate, including TCDD, the public infrastructure manager and future owner of the facilities involved in the subprojects under assessment. The consultants shall be solely responsible for the interpretation of all data and studies received and for the findings and recommendations contained in their reports.

1. Scope of Work of Detailed Engineering Designs, Technical Specifications/Bills of Quantities

For each of the subprojects deemed feasible of implementation, regardless of relative ranking, the consultant will develop detailed engineering designs.

The detailed engineering design work will include the following:

* Build on the preliminary engineering designs developed under the scope of work of the feasibility studies, as well as on any existing past studies relevant at the subproject level, if any;
* Carry out the required topographic surveys, soil investigations, and any other physical surveys of the project landscape necessary to prepare the detailed designs;
* Using relevant GoT design standards supported where necessary by appropriate international standards, carry out the detailed design and prepare all necessary engineering drawings, specifications and description of works to be carried out. The drawings shall include:
* Track alignment plans showing overall layout, intersecting roads, stations, ports, industrial zones, logistics centers, and any other kind of logistics cluster, major manufacturing and distribution facilities, and any other points of interest in the subproject vicinity;
* Track alignment plans showing cross-sections, elevation, dimensions and similar operating parameters, and engineering supporting features such as bridges, culverts, drainage systems, over/under-passes, sub-stations, etc.;
* Detailed plans for civil works, for example as to the use and location of borrow pits, quarries, spoil containment areas, dykes, materials, depth of borings and other critical infrastructure resilience parameters, and other works setting out details, reference points and benchmarks, cross-sections, and typical construction details;
* Plans showing the deployment of signalization, electrification facilities, and other operating equipment in typical detail at the detailed design level; and
* Layouts, dimensions, operating parameters, and facility distribution and functionality of any railway/multimodal stations involved, including inter-connections between rail, road, and other potential modes (e.g., maritime in the case of ports, if any), storage areas, cargo loading/unloading areas, shunting areas, road truck-in/truck-out facilities, and any ancillary facilities such as water treatment facilities, drainage systems, and pollution containment areas/equipment.
* Prepare operational plans for the phased development of the rail terminal(s) relevant to each subproject, in order to improve the efficiency of rail freight operations and the environmental footprint of rail freight transportation of bulk and containerized cargo;
* Prepare drawings showing the benchmarks/demarcation lines and stake out positions relating to resettlement activities in line with the existing regulations;
* Pay particular attention to rail traffic management and road safety interventions. These elements should be clearly incorporated within the final engineering designs and subject to a safety audit by an experienced Safety Auditor who may be nominated by MoTI;
* Prepare construction methods and schedules, including determination of most cost-effective construction methods and equipment/personnel needs, packaging of works, and accompanying schedules;
* Prepare bills of quantities and detailed cost estimates, including preparation of detailed analysis of inputs and prices for items such as labor, materials, equipment, tax, overhead, profit, etc., breakdown of the foreign currency and local currency requirements, preparation of the related disbursement schedules; and if data available, potential cost estimates for resettlement needs in the case it is unavoidable;
* Prepare tender documents (using the World Bank’s Standard Documents applicable), including relevant supporting documents such as instructions to tenderers, draft contract documents, conditions of contract; general and technical specifications, BOQs, and relevant drawings.
* Fully reflect in the detailed designs the findings from the detailed E&S documentation.

The details of the above tasks are presented in **Annex 3**.

1. Consultant Inputs

The successful fulfillment of the scope of services requires professional qualification in the fields of railways engineering and associated facilities such as bridges, stations, terminals, and shunting yards (including drainage, structural, soils and materials engineering); transport engineering; transport economics, multimodal logistics systems and management of railway information systems; and flood control, infrastructure resilience, and disaster risk mitigation.

It is anticipated that key professional staff of the consultant’s team to undertake the **feasibility study, detailed engineering design of these Terms of Reference** will include professionals, as follows:

The consultant shall assemble a team capable of implementing an integrated approach to planning, feasibility evaluation, engineering design, and the attainment of desired outcomes in terms of reductions in logistics costs and increases in rail freight market share. The team shall have **at least** the following key positions (or equivalent):

* (KE-1) Team Leader (Senior Transport Economist);
* (KE-2) Senior Railways Engineer;
* (KE-3) Senior Multimodal Transport (rail/road/ports/structures) Engineer;
* (KE-4) Senior Structural Engineer;
* (KE-5) Senior Multimodal Logistics Specialist;
* (KE-6) Transport Economist and Economic and Financial Modeling Specialist;
* (KE-7) Railway Safety Specialist;
* (KE-8) Senior Geological Engineer;
* (KE-9) Surveying Engineer;
* (KE-10) Geotechnical Engineer;
* (KE-11) Mechanical Engineer;
* (KE-12) Electrical Engineer;
* (KE-13) Railway Engineer;
* (KE-14) Structural Engineer;
* (KE-15) Tender Manager;
* (KE-16) Infrastructure Engineer;
* (KE-17) Transport Engineer;
* (KE-18) Hydraulic Engineer;
* (KE-19) Signalling System Engineer;
* (KE-20) Landscape Architect;
* (KE-21) Logistics Engineer;
* (KE-22) Transport Economist;
* (KE-23) Tender Engineer.

This **core team** shall be supported by other professionals (such as IT Specialist, Finance Specialist, GIS Expert, Soil Expert, Mechanical Draftsman, Electrical Draftsman, Railway Draftsman, Senior Structural Draftsman, Structural Draftsman, Senior Surveyor, Surveyor, Statistician/Analyst, Interviewer, topographers, accountant, documentation expert, translators, and any other engineers/experts in relevant fields) as proposed by the Consultant. These additional profiles must indicate whether they are to be regarded as long-term/short-term and senior/junior so that it is clear which fee rate in the budget breakdown will apply to each profile.

All staff proposed must be independent and free from conflicts of interest in the responsibilities accorded to them. Civil servants and other staff of the public administration of Turkey may not be recruited as experts, unless prior written approval has been obtained from DGII. As the final reports will be produced in both English and Turkish, the consultant may wish to consider having translators on the team or propose a viable alternative for reliable and high-quality translation.

The Consultant shall employ personnel fully qualified and capable of performing all aspects of the Employer’s specific needs and requirements for the Services as outlined herein to the satisfaction of the Employer during the entire period of the Services. The Consultant shall clearly indicate the location (Home Office/Site/etc.) of proposed key staff in the proposal.

The descriptions below provide further details on the roles, responsibilities, and required qualifications of the core team positions:

The **Team Leader (KE-1)**, in addition to defining and supervising the activities of other members of the consultancy team and liaising with the PIU, is expected to provide key technical inputs, conduct quality assurance, ascertain consistency of results across individual tasks and studies, and be the day-to-day single point of contact and party ultimately responsible to the client for the work to be conducted under this contract. The Team Leader shall be a senior transport economist who will be responsible for execution of transport economic studies, traffic surveys to determine traffic, traffic growth factors and vehicle operating costs for all studies, as well as the financial, economic and risk analyses of the different components under consideration. In addition to holding a suitable graduate degree (MS or above), the Team Leader is expected to have at least 15 years working experience in transport economy, and relevant experience in similar last-mile rail infrastructure development projects.

The **Senior Railway Engineer(KE-2)’s** main responsibilities for each of the subprojects will include data collection and review, carrying out the required additional surveys, identifying critical engineering requirements and/or problems requiring improvements, and recommending cost-effective and sustainable technical measures for improvement, assisting the Transport Economist with traffic engineering calculations, and guiding his counterparts in the performance of their duties during his absence. In addition to holding a degree in civil engineering, transport engineering or other engineering degree with equivalent qualification on relevant subject, the railway engineer must have at least 15 years of professional experience in design or construction of railway and including relevant experience in similar last-mile rail infrastructure development projects.

The **Senior Multimodal Transport (Rail/Road/Ports and Structures) Engineer (KE-3)** should hold a university degree in road engineering, transport engineering or other engineering degree with equivalent qualification on relevant subjectand should have at least 15 years of professional experience in the design or construction of roads and associated works and/or rail/ports and associated works, with experience working with multimodal structures and connectivity infrastructure, including relevant experience in similar last-mile rail infrastructure development projects.

The **Senior Structural Engineer (KE-4)** will have an understanding and experience in designing flood-affected works, in carrying out hydrological and soil conditions review and analysis; upgrading engineering design of existing structures and design of new structures for resiliency against climate change impacts, extreme weather events, and non-climate natural disasters such as seismic activity. In addition to holding a civil engineering degree, the Structural Engineer should have at least 10 years of professional experience in drainage, structural design of railway track lines, roads, culverts, piers, railway stations, logistics facilities, etc.

The **Senior Multimodal Logistics Specialist (KE-5)** with at least 10 years of experience in physical distribution and logistics facilities planning and multimodal transport. The Specialist should be familiar with operation management of cargo warehousing, forwarding, container transport, cargo trucking, rail intermodal, rail bulk transport, and rail enabled logistics centers, and the concepts, analysis, and modeling of modal shift, modal choice, and logistics costs. The Specialist should be experienced in assessing the demand for logistical clusters, industrial zones, and other areas of demand generation, in identifying optimal locations for facilities and connectivity at the last-mile, and should be familiar with the different models for public private participation in infrastructure and service provision for such facilities and connectivity infrastructure. The Specialist should be able to translate theories of inventory, input-output, queuing models into practical issues for logistics centers/clusters and last-mile rail and road connectivity. And he/she should be able to inform and implement plans for data gathering from shippers, carriers, and logistics service providers that are likely to be the beneficiaries of the facilities in the different subprojects, to reflect their operating needs and levels of demand into the engineering, economic, and financial assessments.

The **Senior** **Transport Economist and Economic and Financial Modeling Specialist (KE-6)** will gather data and conduct economic and financial feasibility models based on standard cost-benefit analysis, to produces economic and financial net present values, internal rates of return and other key metrics of viability, as well as fiscal impact assessments at the level of MoTI, TCDD, and the national government. The Transport Economist will have at least 10 years of experience analyzing economic and financial viability of infrastructure investments.

The **Railway Safety Specialist (KE-7)** will be responsible for safety performance of the railway system and develop institutional, procedural and infrastructure recommendations to improve railway safety considering expected future demand, including railway level crossing, station safety, passenger coach safety, station layout and footbridges, station accessibility, safety reporting and management procedures. The railway safety specialist must have at least 10 years experience as a Railway Safety Specialist.

The **Senior Geological Engineer** **(KE-8)** will be responsible for conducting preliminary and detailed geological mapping, stability analysis of slope, rock classification of railway and tunnel (if needed), detailed geological and geotechnical investigation of railway alignment and structures, potential quarry site identification and quantification and other activities related to geological design. In addition to holding a Geology Engineer degree, he/she should have 15 years of professional experience in railway or highway design.

The **Surveying Engineer** **(KE-9)** will be a university graduate in topographical engineering and should have at least 10 years’ experience in topography, hydrography hydrology or related fields, and the knowledge to use computer software for processing and analysis. The Surveying Engineer will be expected to:

* Determine all necessary geotechnical, topographical, and/or other surveys to be conducted to inform the design process (and possibly also the feasibility study process);
* Oversee the conduction of these surveys;
* Incorporate survey findings into engineering designs and drawings; and
* Develop databases for available and newly acquired survey data at the various work sites.

The **Geotechnical Engineer** **(KE-10)** will be responsible for all activities related to identifying, testing, and classifying of rock and similar naturally occurring materials existing in the project area and/or required for the project, carrying out detailed survey and sub-soil investigations of bridge and any other structures’ sites, and analysis and design works for soil/rock slope stabilization. In addition to holding a university degree in Civil or Geology Engineering with preferably Master's degree in Geotechnical Engineering / Engineering Geology, and should have at least 10 years of professional experience in geotechnical design of railway track lines or roads.

The **Mechanical Engineer (KE-11)** will be responsible for the design of the mechanical works and preparing mechanical specifications. In addition to holding a Mechanical Engineering degree, he/she must be a versatile Mechanical Engineer having more than 10 years of general professional experience with at least 6 years of specific experience of working on similar detailed engineering design studies.

The **Electrical Engineer** **(KE-12)** will be responsible for the design of the llectrical installations, energy supply and distribution systems, lighting installations and preparing electrical electronics specifications. In addition to holding a Electrical Engineering degree, he/she must be a versatile Electrical Engineer having more than 10 years of general professional experience with at least 6 years of specific experience of working on similar detailed engineering design studies.

The **Railway Engineer (KE-13)** will assist the Senior Railway Engineer and must have a civil engineering or other engineering degree with equivalent qualification with more than 5 years of professional experience in design and construction of railway and associated multimodal structures and facilities, including similar detailed engineering design and technical-economic feasibility studies.

The **Structural Engineer (KE-14)** will have an understanding and experience in designing flood-affected works, in carrying out hydrological and soil conditions review and analysis; upgrading engineering design of existing structures and design of new structures for resiliency against climate change impacts, extreme weather events, and non-climate natural disasters such as seismic activity. In addition to holding a civil engineering degree, the Structural Engineer should have at least 5 years of professional experience in drainage, structural design of railway track lines, roads, culverts, piers, railway stations, logistics facilities, etc.

The **Tender Manager (KE-15)** should adopt the procurement strategies and will be responsible for (using the World Bank’s Standard Documents applicable), including relevant supporting documents such as instructions to tenderers, draft contract documents, conditions of contract; general and technical specifications, BOQs, and relevant drawings. The tender manager should hold a Bachelor’s degree in civil engineering or other university degree withequivalent qualification on relevant subject. He/she should have at least 10 years relevant experience with the specialization in procurement/contract management on transportation projects.

The **Infrastructure Engineer (KE-16)** will be responsible for designing the water supply, potable water network and sewage network design railway/multimodal stations, storage areas etc. He/she should have at least 8 years experience in similar assignments.

The **Transport Engineer** **(KE-17)** should hold a suitable university degree in road engineering or other university degree with equivalent qualification on relevant subject and should have at least 5 years of professional experience in the design of roads and associated works and/or rail and associated works preferably with experience working with multimodal structures and connectivity infrastructure on similar technical-economic feasibility studies and detailed technical design.

The **Hydraulic Engineer (KE-18)** will be responsible for all activities related to the hydraulic aspects of the project works, including design flows for bridges and other drainage structures. The Hydraulic Engineer must be a professionally qualified civil engineer or equivalent, at least 8 years experience in similar road and/or railway projects.

The **Signalling System Engineer (KE-19)** should hold a university degree in Electrical / Electronics Engineering or in any relevant Engineering course with equivalent qualification on signaling systems and should have at least 5 years experience in design of signaling system and telecommunication system in railway projects.

The **Landscape Architect (KE-20)** will be a university graduate in landscape architecture must have a minimum 8 years of specific experience in the field of road or railway design in landscape architecture.

The **Logistics Engineer (KE-21)** will assist Senior Multimodal Logistics Specialist and should hold a university degree in industrial engineering / logistics / Transport engineering or in relevant Engineering Faculty and should have at least 5 years experience in logistics facilities planning and multimodal transport.

The **Transport Economist (KE-22)** will assist the Senior Transport Economist in gathering data and conduct economic and financial feasibility models based on standard cost-benefit analysis, to produces economic and financial net present values. The Transport Economist should have at least 5 years of experience analyzing economic and financial viability of infrastructure investments.

The **Tender Engineer (KE-23)** will assist the Tender Manager in preparing and/or reviewing bid documents. The tender engineer should hold a university degree with qualification on relevant subject. He/she should have at least 5 years relevant experience with the specialization in procurement/contract management on transportation projects.

1. Timing

The 6 feasibility studies and up to 6 detailed engineering designs and sets of technical specifications/bills of quantities, tender documents shall be completed within a period of 12 months from contract signing.

1. Reporting

For the FS and detailed engineering design phases, the consultant shall deliver the following overall status reports to the PIU as scheduled below:

* Inception Report (1 month after start)
* Interim Reports (3, 6, and 9 months after start)
* Draft Final Report (10 months after start)
* Final Report (12 months after start)

The consultant shall present the findings of the inception, interim, draft final, and final reports in workshops to be scheduled shortly after submission and review of each of these reports. All reports will be delivered in hard and soft-copy formats, in English and in Turkish, including drawings, designs, models, analyses, cost estimates and implementation plans. All deliverables will be subject to comments and feedback by the PIU, other MoTI sub-agencies (including TCDD), and the World Bank.

All data obtained during the execution of the study from surveys to final report shall be reported to the PIU in appropriate electronic formats proposed by the consultant and agreed by the PIU, including partially or wholly detailed description/instructions of the survey methodology.

The consultant shall include in their reports detailed annexes explaining all assumptions and showing all calculations. Electronic copies of spreadsheets showing all calculations and raw data inputs should also be submitted. The transport models developed throughout the study should be transferred to the PIU/MoTI.

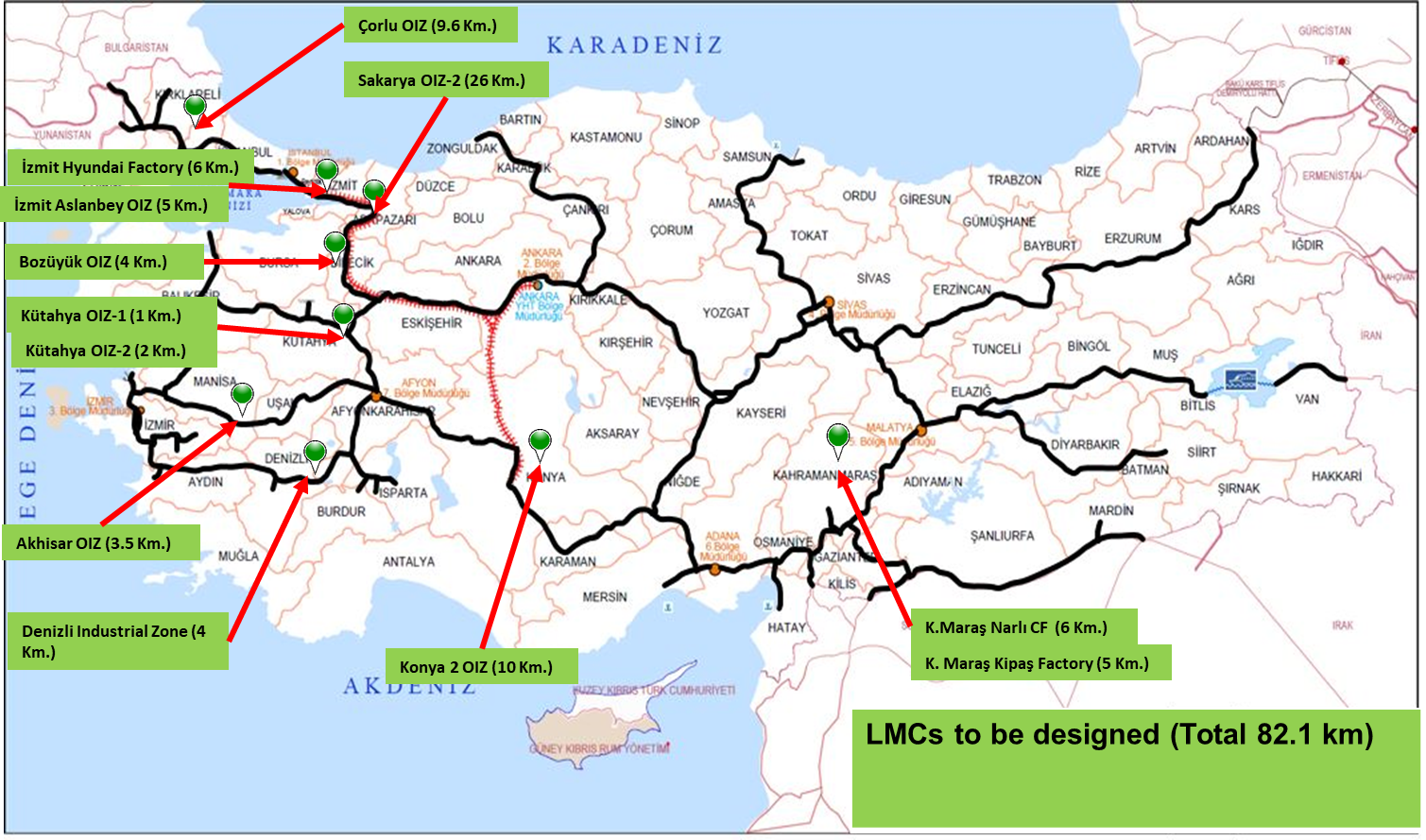
1. Copyright and Use of Documents and Publications

Copyright in all drawings, reports, specifications, bills of quantities, calculations, software, models, source code and object code and other documents provided by the consultant in connection with the assignment shall vest in DGII. The consultant shall indemnify DGII against any claims associated with any action, claim, suit or demand arising out of or in respect of any breach of any intellectual property rights relating to the provision of the consulting services. The consultant may with the prior consent of DGII publish, either alone or in conjunction with others, articles, photographs and other illustrations relating to the project.

1. Professional Standard of Care

In performing the services the consultant shall exercise the degree of skill, care, and diligence normally exercised by members of the consultant’s profession performing services of a similar nature, in accordance with the ethics of the consultant’s profession.

Annex 1. Preliminary Maps of 12 Pre-identified LMC Sub-projects



Annex 2. Detailed Tasks Required for Completion of Surveys and Feasibility Studies

Key Methodological Considerations

In assessing the economic viability of the subprojects, the consultant shall include in the economic costs the cost of environmental externalities, defined as the emission of greenhouse gases (GHGs) and local pollutants, as well as other externalities such as road safety impacts, congestion impacts, and the like. Economic costs should also include land acquisition and resettlement costs and the cost of any risk mitigation measures. Economic costs should exclude taxes and other forms of transfers. Financial costs should not include non-market externalities, but should include VAT.

Demand projections should be based on real shipper-level historical and future expected freight flow data, ideally complemented by modal choice modeling to derive likely freight capture by rail due to the subprojects compared to the without-project baseline. In this regard, it is imperative that the key shippers and logistics service providers active in each subproject’s hinterland be identified and their operations, demand levels, technical requirements, and likely future plans be reflected in the economic and financial modeling.

Financial modeling should be done at the level of “TCDD as a whole”, a conceptual approach that includes both infrastructure provision and rail freight transport service delivery, based on cost and revenue parameters to be provided to the consultant by TCDD, with the help of the PIU.

Detailed Tasks

The survey and feasibility study portion of the assignment will be conducted in 6 discrete tasks for each subproject, as follows:

TASK 1: Review of existing studies and data, and fresh data collection and survey activities

Collecting the necessary data is essential to establish a base line to carry out the analyses. The consultant will review existing studies, available data sources, and fill the gaps through interviews and surveys of shippers, carriers, logistics service providers, logistics cluster/industrial zone operators, GoT officials, academics, and others as relevant in each of the following areas: a) transport demand, b) engineering standards and design, c) financial and economic costs, d) environmental impacts, costs and mitigation costs, and e) social impacts, and land acquisition, resettlement costs.

Surveys shall be carried out to an appropriate standard and requirement for use in transport economics studies and analyses, and social and environmental impact studies. Demand and supply data collection shall be carried out as much as possible in the field. The consultant shall in their technical proposal indicate their proposed field survey standards and data gathering frequencies.

1. *Transport Demand-Supply Data*
   1. Review regional, provincial, and/or local economic and transport development plans and data.
   2. Identify levels of economic activities within each subproject cargo hinterland, production and consumption patterns therein, and demographic and socioeconomic data that can be used in defining supply-demand projections for transport modeling.
   3. Estimate hinterland cargo generation and attraction volumes over a period of 30 years.
   4. Carry out origin and destination surveys to fill in gaps regarding provincial, inter-provincial, and international (as applicable) freight movements by all modes.
   5. Determine throughputs for the target clusters and other facilities as appropriate (for example, nearby maritime ports).
   6. Identify any freight transfer points and exchanges and throughputs.
   7. Identify all relevant freight flows to access the target last-mile connections.
   8. Collect other data required to develop the transport model necessary to meet the objectives of the feasibility study.
   9. Collect data on the supply side across modes (highways, main linehaul railway network, ports and terminals, main target shippers, etc.)
   10. For the financial model, collect key cost, revenue, and balance sheet information from TCDD Infrastructure and TCDD Transport, with the support of DGII/PIU.
2. *Financial, Economic and Risk Appraisal Data*
   1. The consultant shall collect the data needed to estimate the financial and economic costs and benefits of the subprojects, including:
3. Unit financial costs for the various categories subcategories of expenditures for civil works;
4. Tax and subsidy information needed to estimate, or validate, the conversion factors, which will be in turn used to determine economic prices;
5. Input output coefficients and other data needed to estimate vehicle operating costs;
6. Value of time and other parameters used in the estimation of time savings associated with the cost of holding inventory in-transit and safety stock inventory;
7. Costs associated with land acquisition and resettlement compensation, if applicable.
8. Costs of environmental mitigation measures or impacts; and
9. The appropriate economic and financial cost of capital to be used in modeling.

TASK 2: Transport Modeling/Planning

Based on the data collected in Task 1, the consultant shall define origins and destinations within each target hinterland and node to be connected at the last mile, including domestic and international shipments as necessary, to model transport movements relevant to each subproject. It is imperative that this analysis be done with disaggregation by commodity type.

The consultants shall make traffic projections for freight based on assumptions informed by real data on shipper-level historical and future flows and economic indicators such as economic growth, population growth, etc.

Traffic forecasts and modal split should be modeled under two situations: the with- and without-project scenarios.

For cargo forecasts, the consultant shall commence with the analysis of the existing situation to establish the baseline for each subproject. They shall consider cargo origin-destination patterns, market characteristics, and growth for the different types and kinds of cargo (e.g., by commodity type); transport routes, transport speed and frequency of service; the most typical equipment/vehicles used across modes, etc. The consultant shall forecast future transport flows for all cargo types. Cargo flow projections are to be carried out for the various transport modes annually for a period of 30 years.

The consultant shall use a freight modal split model to identify the freight corridor movements for each subproject node hinterland, including multimodal itineraries as relevant.

The consultant shall use transport modeling software to be specified in the technical proposal and eventual agreed with the PIU; modeling within spreadsheet environments is acceptable as long as the analysis is sufficiently nuanced to include the various analytical approaches outlined in this ToR and as long as the model adequately reflects the actual nature of the movement of freight in the target nodes and hinterlands at a granular level.

The cargo allocation study or modal split analysis shall focus on finding the cargo movements between origins and destinations in terms of existing and potential transport modes.

Traffic projections shall identify normal (i.e., existing), generated, and diverted (i.e., shifted) traffic, assuming the optimum solution for transport infrastructure improvements.

The time horizon will be 30 years. The forecasts will be made by type of cargo, mode of handling (e.g. bulk vs. containerized), type of traffic (domestic, international, transit), mode and type of transport (road and rail primarily, and others if relevant) and seasonality of traffic.

TASK 3: Preliminary Engineering Design

The consultant shall produce preliminary engineering designs for each subproject at an appropriate technical standard determined by the applicable Turkish standards and guidelines. The purpose of these preliminary designs is to (a) consider alternatives for each subproject as to key parameters like alignment, track length, number and size of stations, cargo transport and handling capacity, type of traction (electrified or not), type of equipment, resiliency standards (e.g., as to the “design storm”), etc. The design standards are expected to be, as the name indicates, preliminary and indicative, but they nonetheless shall be subject to the prior approval of MoTI/PIU. The preferred alternative for the preliminary design shall include a disaggregated cost estimate for civil works and construction supervision. The preliminary design of bridges and other critical structures should be consistent with national standards.

Level plan drawings of scale 1:500 for civil works (tracks, bridges, stations, control points and benchmarks and contour lines) are considered acceptable in principle, subject to final approval by the PIU. Drawings of other works, such as drainage structures and other features shall be of various scales to make sure all details are well-presented and clear. Preliminary design drawings include foundation structure and superstructures (profile, cross sections, views, perspective).

TASK 4: Economic, Financial, and Fiscal Analysis

On the basis of the traffic projections and other relevant information, an economic evaluation shall be carried out for the preferred alternative of each of the proposed subprojects. The analysis shall reflect the with and without project scenarios, and should use such feasibility criteria as ENPV and EIRR. Externality costs and benefits (e.g., environmental, road safety, congestion) should be included in the analysis and quantified. Optimal timing for investing should also be taken into account. The analyses shall be carried out for a period of 30 years with residual values of assets used to account for benefits beyond the period of analysis.

The consultant shall estimate operating costs for transport means of different categories using existing data. Benefits shall include benefits from transport costs (or vehicle operating costs), time savings associated with inventory carrying costs, accident and fatality impacts, incremental operating cost saving and transport infrastructure maintenance cost savings, externality-related savings, and any other appropriate un-quantifiable benefits (e.g. incremental savings in environmental costs of flooding), as long as the same set of benefits and costs are used across all subprojects.

The total cost of the various alternatives should include (if data available) the anticipated costs associated with land acquisition and resettlement compensation, and the cost of environmental mitigation measures (or environmental costs if mitigation measures are not necessary). In estimating the economic benefits and costs, the consultant shall exclude taxes.

Beyond the economic analysis, the consultants shall conduct a financial analysis to determine the financial sustainability of the proposed investments from the perspective of “TCDD as a whole”, i.e., across not only infrastructure provision but also service delivery. This assessment must be made with real, updated data on key parameters to be provided by both TCDD Infrastructure and TCDD Transport, with the support of the PIU. The consultant shall substantiate its choice for the weighted average cost of capital applicable to this analysis.

Lastly, a fiscal impact analysis will be conducted to understand the nature of government subsidies and support that each subproject is likely to require, and the capacity of MoTI/the national government to provide this support.

The consultant will rank the subprojects by their level of economic and financial feasibility, and will devise a simple multicriteria methodology to rank the subprojects on a combination of the various aspects of feasibility assessed under the assignment.

TASK 5: Sensitivity and Risk Analysis

The consultant shall conduct sensitivity analysis on the results of the economic, financial, and fiscal analyses under Task 6, to assess the robustness of these results to changes in variables and assumptions, and the likely economic and financial robustness of the underlying subprojects. The analysis should identify the sensitivity of the results to key variables and assumptions, and pinpoint which variables/assumptions have the largest impact on feasibility results. The consultant shall also develop a broader risk assessment as to the likely scenarios under which the subprojects would cease to be feasible and the events that would need to transpire for that to be the case.

TASK 6: Key Performance Indicators and Recommendations

The consultant shall define 2-3 key performance indicators that would measure the progress in meeting the objectives of this project component. The consultants shall estimate the base line values for these indicators and develop a plan for updating them. The consultants may consider key performance indicators that measure the impact of the subprojects on certain stakeholders of interest.

Based on the preceding tasks, the consultant must arrive at a clear and explicit statement of recommendation and advice to the PIU as to the feasibility and desirability of each of the subprojects, based on the multicriteria analysis of Task 4 and the robustness of those results as suggested by Task 5.

Annex 3. Detailed Tasks Required for Completion of Detailed Engineering Designs   
for Feasible Subprojects

The Consultant will carry out detailed engineering designs of last-mile rail infrastructure connectivity subprojects found to be feasibly under the feasibility study portion of the assignment. The specific tasks under detailed engineering design portion of the assignment will be as follows:

TASK 1: Topographic Surveys

The consultant shall carry out topographic surveys, defining the horizontal and vertical alignments and cross-sections of the railway connections, establishment of horizontal control points, benchmarks and permanent reference beacons as required for the preparation of detailed engineering designs to enable construction quantities to be accurately calculated and for land acquisition purposes.

The proposed scope and scheduling of the topographic surveys will be approved by the PIU before the survey works start. The consultant shall inform PIU when the survey works are about to begin so that PIU can send staff to supervise the consultant’s survey works.

The results of the surveys shall be given in a set of documents previously agreed with PIU, including details of benchmarks and survey baselines, horizontal and vertical control grids, topographic maps, and field data logs and field books. The results shall be given in digital form and in hard copy.

TASK 2: Geotechnical Surveys

The consultant will carry out the necessary geotechnical/soils investigations along the railway branch line alignments, proposed rail stations, etc. These investigations should include borings, soundings, field testing, soil sampling, rock coring and the laboratory testing of recovered samples. Laboratory testing will include all the necessary testing to establish the mechanical characteristics of the subsoil layers to the required accuracy having a direct bearing on the design of the works.

A complete boring schedule shall be prepared prior to proceeding with the borings and approved by PIU. The geotechnical investigation work should be carried out in accordance with stipulations in national law and international standards.

TASK 3: Materials Surveys

The consultant shall also carry out a thorough materials survey to identify the sources and quality of construction materials required for construction of the works. Where possible, bulk materials should be transported to the site of the works in pre-identified routes and stockpile areas should be identified as well. Material sources will need to identified for concrete aggregates, rock and other fill materials. Sampling shall be carried out at potential sources and the appropriate testing carried out to ensure compliance with the specifications. In addition to materials sources, the consultant shall also identify and design suitable areas for environmentally acceptable disposal of discarded materials.

TASK 4: Detailed Design Studies

The consultant shall produce detailed design documents including a Detailed Design report, design drawings, and calculation sheets. Designs shall be based on Turkish standards or, where not available, acceptable international standards and application of sound engineering practice. The consultant will be responsible for revising and updating these detailed design documents as necessary based on findings from the environmental and social impact assessments (ESIAs), land acquisition and resettlement action plan (LARAPs), and environmental and social management plans (ESMPs) that will be produced by the E&S Consultant under another assignment

TASK 5: Unit Rates Analysis

The consultant shall develop updated unit rates for the construction for railway branch lines, stations, and other works to be constructed, including taxes and customs duties, taking into account the bid and completion costs of similar works recently undertaken in Turkey.

TASK 6: Cost Estimates

The consultant shall prepare all bills of quantities, and calculate detailed costs estimates for civil works broken down into foreign (direct and indirect) and local components as well as taxes and customs duties.

TASK 7: Construction Schedules

In conjunction with PIU, the consultant shall prepare realistic construction schedules showing anticipated progress of works and expenditures for each subproject, monitoring and reporting actions; the schedules will reflect seasonal climatic effects at the work sites, and will take into account typical outputs on recent World Bank financed projects of similar nature.

TASK 8: Bidding Documents

The consultant shall prepare bidding documents for each subproject/package according to the requirements of the GoT and World Bank Procurement Framework.

Specifically, the consultant will prepare tender drawings, civil work plans, longitudinal profiles, cross-sections, structural plans, and other details necessary to describe the scope of works to bidders. Civil work plans should include all existing features, expected land-take based on plotted earthwork limits and further right-of-way where different from existing.

TASK 9: Benchmark Survey

The consultant will carry out the establishment of a pre-construction database concerning ambiance, air, water, and soils at designated sites conformed to design works (civil works) of the project and relevant national regulations through surveys, sampling, testing at sites and in laboratory.

All of the above tasks will be subject to adjustment and updating by the consultant based on guidance by the PIU, which in turn will be informed by (a) World Bank implementation support to the PIU, and (b) findings from the independent ESIA/RAP/ESMP consultant.