

TERMS OF REFERENCE FOR PROVIDING CONSULTING SERVICES FOR UPDATION OF COMPREHENSIVE MOBILITY PLAN FOR CHENNAI METROPOLITAN AREA (INCLUDING EXPANSION)

3.1 Introduction

The Chennai Unified Metropolitan Transport Authority (CUMTA) is requesting applicants to develop a Comprehensive Mobility Plan (CMP) for the Chennai Metropolitan Area. The CMP will provide a strategy for short, medium, and long-term investments to improve accessibility for its residents and guide every decision taken by the CUMTA and other relevant authorities related to people mobility and transport in urban areas. In addition, the CMP will be a key document to justify and support transport proposals to the Central Government and multilateral funding agencies.

3.2 Project Background

A Comprehensive Mobility Plan (CMP) for Chennai Metropolitan Area (CMA) spread over an area of 1189 sq.km. was prepared in 2019 following the National Urban Transport Policy (NUTP) Guidelines of the Ministry of Housing and Urban Affairs (MoHUA). The study had developed a perspective plan for the safe and sustainable mobility needs of the people of Chennai over a 30-year horizon (till the year 2048) with focus on: (i) mobility of people rather than vehicles; (ii) improvement and promotion of Public Transport, non-motorised vehicles (NMVs), and pedestrians as important city transport modes; (iii) integrating Land use and Transport Planning; and (iv) recommending urban transport strategies in line with the NUTP.

The Chennai Metropolitan Area is proposed to be expanded to 5904 sq.km covering the districts of Chennai, Kancheepuram, Thiruvallur and Chengalpattu in order to plan for balanced regional development, develop a larger road network and integrated transport plan. Chennai Metropolitan Development Authority (CMDA) is in the process of preparing a vision document for the third master plan for CMA and hence the Government of Tamil Nadu intends to update the CMP for the proposed CMA that would address mobility needs of the people, support the long-term land use objectives of third master plan and serve as an input to the strategic planning process.

CUMTA now wishes to engage a consulting firm to update the CMP (2019) for CMA for the proposed extended area of 5904 sq.km and undertake extensive stakeholder consultations to finalize the CMP and transport investment program containing short, medium- and long-term projects. CUMTA will be responsible for the coordination and streamlining of the implementation of CMP proposals through city agencies. It is thus essential that CMP recommendations are sufficiently deliberated and consulted with the various stakeholders including the people of Chennai. The CMP should also include a review of climate adaptation requirements for the system to operate effectively.

3.3 Objective of the Project

The objective of the project is to develop a long-term vision for mobility in the CMA which duly integrates land use (as per third master plan) and transportation, and presents a plan of public transport/transport infrastructure network improvements to achieve such vision. The CMP should be based on Green, Resilient, Inclusive, Development focused and Safe (GRIDS) principles focusing on the movement of ‘people’ instead of vehicles and achieve following objectives:

- ✓ **Green:** Mobility with a low carbon footprint, air and noise pollution, fostering sustainability
- ✓ **Resilient:** A system resilient to natural hazards and pandemic
- ✓ **Inclusive**
 - Affordable access to work, live, learn and play opportunities for all
 - Quality walking, cycling and integrated mobility, answering citizens’ needs
- ✓ **Efficient Development:** An efficient and well-performing system
- ✓ **Safe:** A safe and secure environment for all
- ✓ **Innovative:** A data-driven system fostering innovation and connected, autonomous, shared and electric mobility

The CMP and accompanying framework shall be developed with a data-driven approach, in which the vision is supported by quantifiable targets and set of KPIs that allow the city to evaluate future scenarios, prioritize investments and track progress towards meeting those targets.

During the updating, the consultant has to consider current and upcoming projects under the traffic & transportation sector including non-motorised transportation. It would be desirable to consider alternative long-term scenarios for land use and development so as to reduce the overall travel demand through vehicles.

The CMP update should ensure that:

- i. It addresses the most pressing mobility issues in the city (with an established link between proposed investments and issues that are to be addressed);
- ii. It first optimizes the use of existing assets (existing suburban and metro rail (service type, additional rolling stock, pricing and availability), improves use of roadways (priority allocation to buses, junction treatment, roadside friction, the role of streets in urban space) before proposing new infrastructure assets;
- iii. It fosters true integration across all modes of transport in terms of connectivity, service, ticketing, payments (with required guidelines, standards) and pricing¹;
- iv. It contains a precise implementation plan, for all the projects with clear timelines, estimated budgets, order of priority, and roles and responsibilities for different stakeholders. Opportunities to boost private sector participation should be clearly identified and suitable strategies developed, to optimise the use of scarce public resources.
- v. It allocates resources across projects as per vision in line with mobility targets and targeted mode share to establish a causal link between the two
- vi. It includes adaptation measures to address climate and disaster risks; and
- vii. It integrates the mobility needs of women and the less-mobile in line with national policy and the mobility needs of people in the bottom 40% by income

¹Current pricing system for each mode discourages multimodal integration and transfers due to major disparities in pricing..

3.4 Scope of work

The planning region of CMA covers an area 5904 sq.km which comprises districts of Chennai, Kancheepuram, Chengalpattu and Thiruvallur. The study area includes CMA and the planning horizon is 25 years. The consultant is expected to undertake the following tasks in line with the objectives:

Task 1 Project delivery planning and methodology

Task 2 Review of Existing CMP and Urban Transport System of Extended Area and Establish Key Performance Indicators

Task 3 Data Collation, Collection, Analysis and Spatial Mapping

Task 4 Analysis, Update and Benchmarking of Key Performance Indicators

Task 5 Update of Transport Demand Model

Task 6 Scenario Evaluation

Task 7 Develop Urban Mobility Plan in Line with the Vision of CMP

Task 8 Regulatory and Institutional Measures

Task 9 Stakeholder & Public Consultations

Task 10 Prepare Funding & Implementation Programme

The consultant is expected to re-evaluate the recommendations/proposals presented in earlier CMP and update it in order to meet the study objectives and key goals of CMP. The focus of the plan should be on structuring growth in the CMA region wherein Chennai function as main focal centre and other satellite towns/growth areas in the vicinity as nodes. The CMP shall recommend the strategies/proposals at city level and for surrounding satellite towns/growth areas with an aim to reduce the overall motorized travel demand and foster higher public transport and non-motorized transport.

Task 1 Project Delivery Planning and Methodology

Task 1.1 Mapping the Study Area

The consultant will identify the boundary of the study area to be covered in the CMP. The boundaries of the study area along with that of each municipality, district, and development authority, should be coded using GIS.

Task 1.2 Define Project Approach & Methodology

The consultant should clearly define approach and methodology to be adopted for the study.

Task 1.3 Profiling of the Study Area

The consultant will prepare a brief profile of the study area (including but not limited to socio-economic, demographic, health and pollution parameters) from available documents/reports and merge with the GIS layers of geographical boundary.

Task 1.4 Survey Plan

The consultant will prepare detailed description of all the surveys to be carried out as a part of the CMP. Consultant shall review the existing CMP prepared for area of 1189 sq.km and prepare survey plan accordingly to supplement the extended area. The plan should describe the locations, schedule, sampling approach, and staffing plan for each survey. The plan shall build on recent traffic surveys carried as part of the road safety work for CSCL. The Inception Report should also include all survey forms that the consultant plans to use.

Task 1.5 Work Plan

The consultant should prepare a detailed timeline for the updated CMP preparation process indicating key dependencies and should identify contingencies to account for the possibility that certain types of data are not available.

Task 1.6 Stakeholder Consultation Plan

The consultant shall devise and deploy a comprehensive plan and strategies for stakeholders and public consultation with target audiences.

Task 2 Review of Existing CMP and Urban Transport System of Extended Area and Establish Key Performance Indicators

Accurately identifying existing conditions in the transport system will provide an effective base to define the direction for transport improvements and evaluate alternative transport development scenarios.

The Consultant is expected to create framework for monitoring and evaluation of key performance indicators (KPIs) based on GRIDS principles. The goal is to collate all the data from transport related activities carried out by different authorities, map ongoing/proposed transport projects, map all the data using GIS database, identify the gaps and recommend measures the stated objectives and goals of CMP.

Task 2.1 Review of Existing CMP

1. The consultant shall review the plans, proposals and recommendations, including the analytical and modelling work undertaken during the preparation of CMP with respect to the objectives stated in section 3.3, and make recommendation for adjustments as appropriate in a stand-alone report.

2. The consultant shall prepare a summary of transport characteristics and recommendations given in earlier CMP for each transport mode (roads, walking, cycling, 2 wheelers, 3 wheelers, bus and e-buses, metro, suburban rail, MRTS, shared mobility options, car, urban freight, etc). The consultant shall also estimate per passenger and per vehicle kilometres in terms of: CO₂ emissions, air pollutants, total cost, cost to user, cost to government; space use; fuel use; fatalities and severe injuries. For bus, metro and suburban rail, the consultant will also include the fixed cost (independent of number of riders) and variable cost (dependent on number of riders). The summary data will be presented in a well-illustrated short document for policy makers.

Consultant will be provided with the available past CMP Reports comprising relevant traffic data in the available format and other transport related study reports available. Consultant will also be provided with Urban Travel Demand Model (UTDM) developed earlier (including the Highway, Public Transport Network, and Mode-wise O-D Matrices in CUBE platform). Consultant is required to calibrate and update the travel demand model for the expanded CMA.

Task 2.2 Review existing plans and other relevant studies

The consultant should obtain and review all relevant documents on the land use and transport system as available i.e., Transport-related Detailed Project Reports, Master Plan, Development Plan, Resilient Urban Mobility, Road Safety Action Plan, Women and Bus Transportation in Chennai (study conducted by ITDP Public transport operating statistics and route definitions or other transport/land use planning documents).

Any additional data on the transport network, transport policy, road crash data, land use planning, mapping, rights of way on key corridors and other available engineering parameters relevant to the study shall be collected by the consultant as necessary. Any inconsistency or deficiency in the information shall also be addressed by the consultant.

The consultant should collate list of existing and proposed transport projects in the study area and map them on a GIS platform.

Task 2.3 Review of Land Use Plan

Data on existing land use and land use plans should be reviewed/collected for the old and extended study area and presented through a detailed review of existing development plans, including the Master Plan and/or the City Development Plan (CDP). In particular, new development areas that will affect transport demand in the study area should be inventoried and summarized. **Land use shall be reviewed with local planning authority to discuss the major developments that are being envisaged in the study area and the needs to be incorporated in the updated study.** The population and employment need to be updated according to the expanded area of CMA and other major developments planned/proposed after the last CMP preparation. In the process of integration, the consultant should review the future land-use patterns from the mobility optimization point of view and propose patterns of land-use/transport integration. As Third Master Plan (TMP) preparation has been initiated, the consultant should also consider the vision of TMP while developing the scenarios.

Task 2.3 Prepare CMP Visions, Objectives and Goals

The consultant should clearly define vision and goals to guide the policy making process. The vision statement has already been prepared in earlier CMP and this need to be updated in line with the defined CMP objectives, and in consultation with various stakeholders, factoring in the economic and development potential of the CMA, and the integration of land use and transport. The overall vision should be supported by detailing objectives (in line with GRIDS) and goals that capture, in qualitative terms, the overall aspirations of the city. It is essential that the mobility improvement measures in a

CMP form a coherent package with a consistent vision and goals for the desirable direction of city urban transport. The goals of CMP will be quantitative targets as mentioned in Section 3.3 and finalised in discussion with stakeholders to be achieved within the planning horizons. The following are suggested Objectives and Goals that may serve as a base to be updated, based on the vision, objectives and goals of the CMP.

	Objective	Pillar	Goal
Green	Mobility with a low carbon footprint, air and noise pollution, fostering sustainability	Greenhouse gas emissions	Reduced GHG emissions by all passenger and freight transport modes
		Noise Pollution	Reduced noise pollution levels from urban transport
		Air Pollution	Mitigated air pollutants from all urban area passengers and freight transport modes
		Mobility Space Sustainability	Increased sustainability of urban mobility space-consumption
		Biodiversity Measure	Improved biodiversity and sustainability of streets
Resilient	A system resilient to natural hazards and pandemic	Resilient mobility & transportation network	Reinforced flood-vulnerable communities and major corridors with alternative mobility option
		Covid-19 spread control	Controlled Covid-19 community spread in the public transportation network
Inclusive	Affordable: Affordable access to work, live, learn and play opportunities for all	Sustainable Access for Women and Children to public transport	Increased access to public transit and other mobility networks for women and children (Gender Informed)
		Low Income household Sustainable Access to Jobs/POIs	Increased access to jobs, and key places of interest for Low-income households through sustainable transport.
	Citizen Experience: Quality walking, cycling and integrated mobility, answering citizens' needs	Walking and cycling networks	Improved cyclist and pedestrian satisfaction and connectedness of point of interest by walking and cycling (Gender Informed)
		Satisfaction with Public Transport	Increased satisfaction with the quality of public transport (Gender Informed)
		Inclusiveness	Improved inclusiveness of all riders in public transportation
		2-wheeler and 4-wheeler Vehicle Travel Experience	Improved traveling convenience on roads and reduced delay at intersections.
		Easy-to-use Digital tools	Increased availability of cohesive easy-to-use digital solutions for real-time information and ticket payments
	Efficient Development	An efficient and well-performing system	Public transit reliability and utilization
Connectivity level			Strong connectivity to and from public transportation nodes
Financial Efficiency			Improved financial efficiency for transportation
Road performance and parking utilization			Improved Road and parking performance
Sustainable Access to Jobs/POIs			Increased access to jobs and key places of interest through sustainable transport modes
Sustainable 30-minute Neighborhoods			30-minute neighborhoods - number of commonly used services that can be accessed within a 30-

			minute walk from residences
		Access by Two-wheelers and Private Cars	Increased access to jobs and key POIs for two-wheelers and private cars
		Integrated public transport network	Improved public transport network integration to facilitate seamless citizen travel
Safe	A safe and secure environment for all	Crashes	Reduced crashes of different types
		Safety Factors	Reduced factors that cause higher road safety risk
		Women's Safety	Improved women's safety in public transport and public space
Innovative	A data-driven system fostering innovation and connected, autonomous, shared and electric mobility	Innovative mobility policy	Developed city level innovative mobility policy
		Ecosystem Solutions:	Increased number of quality innovative ecosystem solutions for mobility
		Data Governance Framework	Improved data frameworks for mobility innovation

Task 2.4 Establish Key Performance Indicators to Assess Urban Mobility

Once finalized the development of a vision, objective and goals, the consultant must develop a set of key performance indicators (KPIs) to monitor progress toward these. The KPIs shall be quantifiable and should be able to be aggregated or disaggregated to inform various stakeholder of the mobility ecosystem (eg. policy makers, planners, and operators). The KPIs shall be reflective of international best practices, as well as the guidelines set forth by Ministry of Housing and Urban Affairs (MoHUA). Each of the broad mobility objectives shall be further classified into several sub-objectives that are more focused on tangible activities and quantifiable. In addition to the vision/objective KPIs, the indicator list shall include a list of quantifiable indicators describing system characteristics in line with the Ministry of Housing and Urban Affairs (MoHUA) guidelines.

The aim is to understand overall performance for the population as well as for each group, including the most vulnerable. The consultant in discussion with the client shall finalise list of key performance indicators to monitor the system characteristics and CMP goals. Based on the indicators finalised the consultant shall prepare list of data to be collated. The KPIs to be developed shall include but not limited to the following:

KPIs Associated with CMP Vision/Objectives

	Pillar/Objective	KPIs
Green	Greenhouse gas emissions	Well-to-wheels GHG emissions by all urban area passenger and freight transport modes
	Noise Pollution	Noise Hindrance Index
	Air Pollution	Emission Harm Equivalent Index
	Biodiversity Measure	Streets Biodiversity Measure (Green cover and trees)
Resili	Resilient mobility & transportation network	Flood/Storm Surge Vulnerability Indicator
		Vulnerable Critical Node/Link with Alternative
Inclusive	Sustainable Access for Women and Children to public transport	All off-peak (10am-4pm) hour modal access using the dominant 5 modes (Walking, 2-Wheeler, Private Bus, Rickshaw, Tata)
	Low Income household Sustainable	Jobs/POIs accessible within 30/60 minutes
		Capacity to pay for transport

	Access to Jobs/POIs	
	Walking and cycling networks	Overall satisfaction with walking and cycling <i>Gender disaggregated</i>
		Connected cycling network
		Connected footpath network
	Satisfaction with Public Transport	Perceived Satisfaction of using public transport, <i>Gender disaggregated</i>
	Inclusiveness	Perceived satisfaction of mobility-impaired groups
		Amount of travel by mobility-impaired groups
Access to attractive Public Spaces		
2-wheeler and 4-wheeler Vehicle Travel Experience	Reduced delay at major intersections for pedestrian, 2-wheelers and cars	
	Parking availability – using parking density parameter	
Easy-to-use Digital tools	Ridesharing platforms; multimodal trip planning tools, Taxi tools; public transport tools; parking tools, smart card penetration; digital payments penetration	
Efficient Development	Public transit reliability and utilization	Reliability of public transport services
		Rail track use: Number of peak hour trains
		Occupancy of Public Transport/ Crowdedness
	Connectivity level	Average waiting time
		First Mile - Last Mile connectivity: IPT fixed route effectiveness
		Land use integration/TOD
	Financial Efficiency	Cost of transport
		Operating deficit from public transport
		Inefficient routes
		Cost of congestion
	Road performance and parking utilization	Traffic congestion
		Parking utilization
	Sustainable Access to Jobs/POIs	Jobs/POIs accessible within 30/60 minutes using shared/public transport
	Sustainable 30-minute Neighborhoods	30-minute walking / cycling coverage to common services
		6-minute walking to affordable transportation modes
30-minute job to housing ratio		
Access by Two-wheelers and Private Cars	Jobs/POIs accessible within 30/60 minutes using private cars	
	Jobs/POIs accessible within 30/60 minutes using 2wheelers	
Integrated public transport network	Public Transport integration	
	Transit score	
Safe	Crashes	Non-fatal injuries due to traffic accidents
		Number of deaths in public transport (stops/stations and while travelling)
	Safety Factors	Road Safety star rating
		Intersection safety
	Women's Safety	Reported crimes and harassment at transit stops, public spaces& transport
Perception of safety at transit stops, in public space and public transport		
Innov	Innovative mobility policy	Presence of data governance mechanisms
	Ecosystem Solutions:	Presence a cross-departmental data sharing platform

Data Governance Framework	Availability of open data and standards
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KPI s for Benchmarking System characteristics

Indicator	KPI
Density of intersections	Number of intersections per sq km
Public transport routes	Total length of public transport routes
Cycling and pedestrian paths	Length of cycling and pedestrian paths of minimum width 1.2m
IPT routes	Total length of IPT routes
Public Interchange Facilities	Number of points of interchange between modes of public transport
Cycle Parking Facilities	Number of cycle parking stations and cycles per station
Public Parking Spaces	Number of parking spaces
Private Vehicle Inventory	Number of registered private vehicles
CCTV Cameras for Transport	Number of surveillance cameras for transport safety
Signalized Intersections	Number of signalized intersections
Public Transport and IPT Vehicle Inventory	Number of public transport vehicles (bus, metro and suburban train coaches), IPT Transport
Commercial Vehicle Inventory	Number of registered commercial vehicles
PT Area Coverage	Percentage of households and jobs within 500 m of PT stop
Road network density	Length of road per sq km
Sidewalk density	Length of sidewalk per sq km
Road and public transport corridor carrying capacities	Number of passengers during peak hour traffic on roads and average public transport carrying capacities
ADA compliant footpaths	Percentage of sidewalks and footpaths by length that are mobility-impaired friendly (ADA compliant)
ADA compliant transit stops	Percentage of public transit stops that are mobility-impaired friendly (ADA compliant)
ADA compliant transit stops	Percentage of buses/metro carriages that are mobility-impaired friendly (ADA compliant)
Fuelling stations density	Number of fuelling stations and fuelling points per sq. km
Private electric vehicle charging point density	Number of electric vehicles charging stations and points per sq. km
Travel Speeds (Public Transport and Motorised Modes)	Speed of travel along various corridors and for overall network
Public transportation headways	Average headways for public transport during peak hours and non-peak hours
Average trip time during peak hours	Average trip time
Travel intensity	Mode-wise passenger-km and vehicle-km travelled per day
Trips per capita	Number of linked and unlinked trips per capita per day
Mode shares	Split by mode of travel in terms of distance travelled, number of unlinked/linked trips
Passenger Counts at Transit Stops	Number of passengers deboarding and boarding at transit stops
Directness of public transport	Average number of interchanges per public transport trip
Passenger kilometers	Distance travelled in a year by all passengers
Vehicle kilometers travelled	Distance travelled in a year by all vehicles
Average trip length	Average length of trip
Passenger Counts at Transit Stops	Number of passengers deboarding and boarding at transit stop

Vehicle hours travelled	Number of hours travelled by vehicles
Parking space utilization	Percentage of time of utilization of parking spaces
Average trip duration	Average duration of trips

Task 3 Data Collation and Mapping of Data

Task 3.1 Identifying data needs and sources

Post finalising the CMP vision, KPIs and overall development process, the consultant must develop a list of required data needed to finalize the CMP and calculate necessary KPIs. The surveys might include but not limited to:

- a) Household Surveys
- b) Classified Cordon Counts
- c) Public Transport Frequency Occupancy
- d) Public Transport Passenger on Board Survey
- e) Parking Surveys
- f) Origin-Destination Survey
- g) Speed and Delay Surveys
- h) Terminal Area Survey
- i) Pedestrian Survey
- j) Update of Road network inventory
- k) Road safety survey
- l) Pollution / emission survey
- m) Road hierarchy mapping

Based on the list of data requirements, the consultant shall develop a data plan that outlines what data is available, what must be collected from other agencies, and what data gaps, additional data should be collated or collated as part of the development of the CMP. The consultant shall assess the additional data requirement post evaluating/mapping the available data from the previous CMP study/other transport related studies. The consultant shall also leverage data from other public institutions. The consultant shall also assess the geographic area for which data must be collected – eg the entire CMP area, or update to the new geographically expanded area.

Once the needs and gaps have been identified, the consultant shall develop a data collection plan for each of the identified gaps, that leverages new, innovative and low-cost alternatives for the gaps. This includes assessing the purchase and use of cell phone data, earth observation area, vehicle telematics or others.

The result shall be a list of all the data requirements and sources.

Task 3.2 Data Collection

Based on the identified data needs in task 3.1, the consultant will be in charge of collecting and collating all the data. All data shall follow the standards and licencing agreements laid out in 3.6 and 3.7.

Task 3.2.1 Household Survey

The consultant will collect data on travel characteristics and trip diary of residents and general characteristics of the household influencing trip making. The study area shall be divided into Traffic Analysis Zones (TAZs) based on the land use mapping conducted in Task 2.3. The consultant will be

provided with the household survey data of the previous CMP study. Based on the survey, travel demand characteristics shall be established.

The data must be compiled and cleaned using MS office spreadsheet and the location for each survey must be cross-referenced in the street network layer in the GIS database.

Task 3.2.2 Classified Vehicle Counts (at cordon and mid-block)

The classified traffic volume and occupancy counts of all motorised vehicles, non-motorised vehicles, and pedestrians should be carried out at critical links and intersections for 16 hours (0600 to 2200 hours) over minimum 3 days (with 1 weekday and 1 weekend) and should be conducted for each direction separately. The following data will be collected: (a) Category wise hourly flow (b) Category wise hourly turning movement (c) Variation in flow before, during and after the peak. (d) Daily and weekly variation in traffic. Volumes and mode shares should be mapped to show traffic patterns along each corridor. It is suggested to assess mode wise demand/supply and recommendations to be given accordingly. The results also will be used to calibrate the transport model. The model shall depict mode wise

Task 3.2.3 Public transport frequency-occupancy

The consultant will conduct frequency occupancy survey to aid in the assessment of the supply and quality of public transport services that includes buses, metro, sub-urban rail, MRTS. Each frequency-occupancy survey will be conducted in both directions during the five-hour peak period (2 hours morning from 8 am to 10 am and 3 hours evening from 4 pm to 7 pm) for 7 days over the week.

Task 3.2.4 Public Transport Passenger on Board Survey

The survey shall be conducted on routes within the city and at terminal areas. The surveys shall be conducted on a representative sample of trips for each route. The basic purpose of the survey shall be to collect information regarding origin, destination, trip purpose, and frequency of travel, traveller characteristics and other particulars. The random survey sampling technique shall be adopted to survey the passengers and shall cover all modes, including buses, minibuses, tempos, three wheelers and taxis.

Task 3.2.5 Parking Survey

Work and business centres, shopping complexes and tourist attractions are major attractors of parking. Parking demand should be established by a count of each vehicle type where there is significant on-street & off-street parking occurs. The consultant should use the data from the parking studies conducted earlier, supplement it with additional surveys and map all the parking locations (off street and on-street – authorized and unauthorized both for 2W, 4W, IPT and buses in the city). The survey shall be conducted for a period of 12 hours classified by vehicle type for off-street and on-street parking lots.

Task 3.2.6 Origin-Destination Survey

Origin-destination surveys shall be conducted through roadside interviews on outer cordon i.e. all major entry/exit points and on corridors where important activity locations are situated for 24 hours on a working day. The location of survey stations to be finalized in consultation with the client. Travel counts at survey locations to be done simultaneously to facilitate adjustment for sampling. The information shall be obtained by trained enumerators and experienced supervisors and include type of vehicle, make, type of commodity carried, origin and destination, trip purpose, place of residence and employment of road user and frequency of travel.

Task 3.2.7 Speed and Delay Surveys

These surveys shall be conducted to establish road capacity and extent of congestion on key sections to determine possible improvements: widening, intersections, traffic control, traffic management etc. The consultants shall carry out speed delay surveys in both peak and anti-peak directions during peak and off-peak hours. The free speed shall be observed and impact of the prevailing traffic on running speed during peak and off-peak hours for each section shall be established to indicate the level of congestion. Typical delays and causes shall be identified. The public transport speed per segment should be mapped using the GIS platform.

Task 3.2.8 Terminal Area Survey

This survey is to collect information on movement patterns of persons/goods at major terminal and market areas: vehicle (goods and passenger) entry/exit, including commodity/occupancy etc. The survey is to be undertaken at main railway stations, bus terminals, airport etc.

Task 3.2.9 Pedestrian Survey

Pedestrian surveys shall be carried out to assess flows/demand at identified major intersections and road corridors. The survey shall be from 06:00 to 22:00 on a normal working day and is to detail the number of pedestrians moving along and across the road at mid-block and at intersections. The survey to also map the width, length and location of existing pedestrian footpaths in the city to assess their condition, continuity and appropriateness as compared to the pedestrian flows in the city.

Task 3.2.10 Update of Road network inventory

An inventory shall be conducted along all major roads in adequate detail, including link lengths, cross-sectional details, type and general surface condition, Footpath presence and quality, cycle track presence and quality, street furniture, intersections, control devices, drainage condition, abutting land use etc. The Consultant will prepare a GIS map of the street centerlines, recording the above data for each segment

Task 3.2.11 Crash Data

The Consultant should collect traffic crash types and locations from the Traffic Police, GCC and other relevant authorities. The data should be geocoded using the GIS platform in order to create a map of crash “black spots.”

Task 4 Task 4 Analysis, Update and Benchmarking of Key Performance Indicators

Task 4.1 Study of Existing Travel Behaviour

Understand and analyze the existing travel behavior and characteristic from the data collated

Task 4.1 Review Energy and Environment

Quantifying energy consumption for Transport is important for estimating the pollution emissions from transport related activities. The consultant shall estimate energy consumption data.

Task 4.2 Calculating Key Performance Indicators

Based on the predefined indicators in Task 2.4, the consultant shall utilize the collected data to evaluate KPIs for the baseline year for CMA. The consultant will also display and compare major KPIs and results across different traffic area zones, using a dynamic tool² to be provided to CUMTA.

Task 2.5 Develop targets and benchmark Key Performance Indicators

Based on the KPI calculations for the baseline year, and utilizing the research and international examples collected as part of the KPI definition, the consultant will be in charge of defining the targets for the CMP. These targets shall be quantifiable and reflect both the baseline performance and the cities ambitions for the CMP.

The consultant shall also provide a plan as to how the data will be continuously collected and KPIs will be calculated and displayed in the dynamic tool in order to track system performance and progress towards meeting the KPI targets. The purpose of creating a continuous digital data cycle is to link the planning, operations, monitoring and evaluation of data to produce more efficient, resilient, and agile transport infrastructure and services. The output should contain digital layers and should be citizen accessible.

² Example of display:

https://public.tableau.com/app/profile/ali.al.sammorraie/viz/DeeperDiveonAccessibility/1_0SustainableAccesstoJobs

Task 5 Update of Transport Demand Model

The consultant will develop and calibrate a 4-step transport model for use in the development of the CMP strategy plan.

Consultants are expected to update the travel demand model. The calibration/validation results shall be documented. The model shall be capable of testing of various land use scenarios, traffic and policy scenarios. The study should have details of applying travel demand modelling to analyse/evaluate urban land use and the transport system considering the scenario analysis for urban land use and the transport demand and alternative land use and corresponding travel demand. All transport modes must be included in the model and must include cycles, pedestrians, and other non-motorised modes.

The developed travel models should reflect the travel behaviour of different income and social groups for different trip purposes. Travel assignments, both roadway and public transport, for the existing scenario should be done for both peak and off-peak hours. The consultant should develop a detailed coding of public transport service itineraries and stop locations as part of the model. The consultants, upon calibration, must demonstrate to the client how reliable the model is in replicating the current travel flows at screen lines and cordons. The consultant should produce a working paper presenting the main data and assumptions used by the model.

The consultant should therefore produce a specific report on the same that should be formally accepted before the consultant progresses further in the step. All modelling data and files should be shared with the client directly as well.

Task 6 Scenario Evaluation

Task 6.1 Urban Growth Scenarios

In this task, the consultant should create optimal land use and transport systems scenario for the 25-year time horizon of CMP for the expanded CMA area. For analytical purposes, urban growth scenarios will be developed in combination with strategic level transport networks. The study should provide a preferred growth scenario from the viewpoint of an optimal urban land use, transport development pattern and transit-oriented development (TOD). Urban growth scenarios need to be reviewed and redefined as needed and accordingly, population and employment forecasts need to be generated.

Task 6.2 Future Transport Network Scenarios

The consultant should create baseline and preferred transport scenarios for the 25-year time horizon of CMP. The future transport scenarios should incorporate the expanded area and a variety of transport system improvements that give residents better access to goods and services. These should stress on key parameters of CMP vision i.e. improved and reliable public transport connectivity, efficient and well performing system, safety, walking & cycling network improvement, along with travel demand mechanisms to manage the use of personal vehicles. Future modal travel, total and flows, need to be estimated through modelling and analysis. These will be evaluated against mode share targets established to reflect the adopted vision, goals and objectives.

Task 6.3 Evaluation of Scenarios

The consultant should develop evaluate the performance of all scenarios utilizing the framework provided by the vision, objectives and KPIs. Each combination of transport network and urban growth scenario developed in the previous tasks should be assessed using the transport demand model. Land use patterns shall be included in the modelling analyses, in terms of a specific distribution of residential population and employment. Various land-use plan measures should be considered in relation to transport development strategies. The alternative development scenarios shall be evaluated by using criteria, such as potential effectiveness of public transport total travel time, average travel speeds, and economic indices apart from the settlement pattern both present and future foreseen. An alternate analysis should be carried out to evaluate different transit systems and suggest the optimal option including making better use of existing infrastructure (e.g additional rolling stock or improved signalling). The scenarios developed shall also assess the impacts on women's/children and suggest measures accordingly. The output will help inform future revisions of the Third Master Plan. The impact of the proposed projects should be evaluated in terms of improvement in the KPIs and overall improvement. Based on the evaluation, a desirable urban development and mobility strategy shall be proposed.

Task 7 Develop Urban Mobility Plan in Line with the Vision of CMP

All the proposals in the CMP study shall be evaluated and recommended fresh proposals/modify earlier proposals that should be consistent with the vision and goals of the CMP for the study area. The plan shall include but not limited to the components listed below:

- ✓ Integrated Landuse and Urban Mobility Plan with a TOD focus
- ✓ Road Network Development Plan
- ✓ An Integrated Public Transport Plan (inclusive of Improvement Plans for each Mode)

- ✓ Non-Motorised Transport (NMT) Facilities Plan
- ✓ Sustainable two-wheeler plan³
- ✓ Demand Management Measures
- ✓ Technology Transitions (e.g electrification, Mobility as a Service)
- ✓ Urban Mobility Resilience Plan⁴
- ✓ CMP Measures and NUTP Obligations (Mobility for All)
- ✓ Cost, Financing and Funding of program by agency

Task 8 Regulatory and Institutional Measures

Effective development of urban land use and the transport system often requires regulatory and institutional changes. Such requirement should be thoroughly worked out and documented in the CMP. The consultant should examine the challenges in coordination between various authorities in the study area and recommend measures to overcome the same.

The consultant shall prepare a specific matrix of roles and responsibilities of each of the agencies designated for the plans and proposals, policies, regulations and institutional aspects recommended by the CMP. The delineation shall be on the basis of short, medium and long term proposals recommended under the CMP.

Task 9 Stakeholder & Public Consultations

The consultants should carry out consultations with all stakeholders, public, private sector, civil society, other selected Government Agencies throughout the study to identify the gaps in the existing transportation network scenario, to appreciate the concerns of the stakeholders and secure their active involvement during subsequent stages of project as appropriate etc. The consultation should demonstrate systematic efforts to engage equally with men and women, of different income level, age groups and level of mobility. The consultation should also engage with gender minority.

Prior to consultations, the consultant shall prepare a summary of transport characteristics for each transport mode (walking, cycling, biking, 3 wheelers, bus and e-buses, metro, suburban rail, MRTS, shared mobility options, car) per passenger and per vehicle kilometres in terms of: CO₂ emissions, air pollutants, total cost, cost to user, cost to government; space use; fuel use; fatalities and severe injuries. For bus, metro and suburban rail, the consultant will also include the fixed cost (independent of number of riders) and variable cost (dependent on number of riders). The summary data will be presented in a well-illustrated short document for policy makers and the general public.

Task 9.1 Stakeholder Consultations

The consultant will conduct interagency stakeholders⁵ consultation through focused group discussions, workshops, seminars and collect comments and observations during such interactions in line with the

³ Two wheelers are the dominant mode of private mobility and require specific attention accordingly in terms of safety and pollution.

⁴ Building on the Urban Mobility Resilience study carried in 2022, updated to reflect selected scenario.

⁵ The stakeholders include Chennai Metropolitan Development Authority (CMDA), Greater Chennai Corporation (GCC), Traffic Police, Metropolitan Transport Corporation (MTC), Chennai Metropolitan Rail Ltd (CMRL), National Highways of India (NHAI), Highways and Minor Ports Department of Tamil Nadu, Southern Railways, Tamil Nadu Urban Infrastructure and Financial Services, Tamil Nadu Pollution control Board, Road Transport Authority (RTO), Tamil Nadu Public Works Department, Smart City Limited, academia, ITDP etc., Tamil Nadu Road Development Corporation (TNRDC), Tamil Nadu State Disaster Management Authority (TNSDMA)

CMP updation purpose to develop a consensus and consolidate the proposals. The consultant is expected to maintain proper documentation, minutes and recordings of such deliberations, meetings, workshops. The consultant shall recommend an appropriate mechanism and timeline for future consultations with the stakeholders to collect feedback/ opinions on the CMP implementation.

Task 9.2 Public Consultations

At the Draft CMP stage, the consultant will also hold an additional consultation to gain input from the general public. The consultant will leverage on the KPI dynamic tool in those discussions. Roles for external stakeholders and contributors in disseminating the CMP and promoting a common understanding of urban development issues should be developed and communicated to the public. The consultant will conduct public consultations with commuters, civil society/ NGOs, transport workers, Associations, Disabled groups etc. through appropriate mechanisms, that shall include but not limited to focus group discussion, workshops, public disclosure, online survey/polls and collecting comments and opinions thereof. Consultations should be preceded by a systematic stakeholder analysis, which would:

- (a) identify the individual or stakeholder groups relevant to the project and to environmental issues,
- (b) include expert opinion and inputs,
- (c) determine the nature and scope of consultation with each type of stakeholders, and
- (d) determine the tools to be used in contacting and consulting each type of stakeholders.

The consultant should focus on wider outreach and is expected to conduct at least 4 nos. of FGDs and 3 number of public consultations. In addition to this, the consultant should also conduct online survey/e-poll to gather public feedback. The consultation plans to be prepared in discussion with CUMTA and leveraging on the KPI work. A systematic consultation plan with attendant schedules, and a focus on gender representativeness should be prepared for subsequent stages of project preparation as well as implementation and operation, as required.

All feedback and the Client's responses will be documented and included as an appendix to the final Plans.

Task 10 Prepare Implementation Programme

Task 10.1 Implementation Programme

An implementation programme including practical procedures to implement the proposed measures, in terms of timeframe, financing options and implementation agencies, should be prepared. These projects should be consistent with the vision and goals of the CMP Strategy Plan as well as policy guidance from the NUTP. Proposed projects should be evaluated and prioritized against clear criteria and classified into short, medium and long-term.

Project profile sheets should be prepared for short term projects. The consultant should prepare a capital investment plan for CUMTA for the next 3 years (2023-2026) in close consultation with the state agencies. They should also recommend a funding and financing plan to realize the capital investment plan, including sources of financing (government, IFIs, PPP, market borrowings, transport fund etc.).

Task 10.2 Social and Environmental Assessment

Transport systems serve as a critical link between the promotion of social equity and economic development and the conservation of environmental resources. No primary environmental surveys are

envisaged. However, consultant needs to collect the latest secondary information and update the Social/Environmental assessment section of CMP report. Provide an environmental and social screening report for all proposals identifying the project area, review environmental, social & regulatory issues with respect to the location/implementation along with feasible solutions and project benefits to enable decision making. The consultant will review the study on “Resilient Urban Mobility and Services in Chennai” conducted as a part of Chennai City Partnership Programme and integrate & adopt its strategies/recommendations in the CMP. The findings of the study to be discussed with relevant stakeholders.

Task 10.3 Fiscal Measures

Fiscal measures should be considered to achieve balanced modal split, and to secure the budget necessary to implement urban transport projects. The following aspects would have to be examined in the CMP document:

- Summary of capital and annual operating costs for all projects proposed in the CMP Implementation Plan, Financing plan for capital projects;
- Estimation of operating gap for public transport operations, after counting customer fare revenue;
- Identification of funding sources to close the operating gap for public transport operations, including parking fees, taxes on personal vehicle purchase;
- Fare policy for public transportation, and parking;
- Taxation on private vehicles and public transport vehicles;
- Potential for road congestion charging;
- Opportunities for targeted subsidies;
- Incentives for greener modes of transport; and

Consultant to identify avenues and propose strategies for boosting private sector participation and leveraging commercial financing, to reduce the burden on public resources, while still achieving the CMP vision and objectives

Sd/- 15.09.2022

Special Officer, CUMTA