Ref. Ares(2023)8313160 - 05/12/2023

ANNEX II + III: TECHNICAL SPECIFICATIONS + TECHNICAL OFFER

Contract title: Supply of equipment for Sustainable Urban Mobility for Trabzon **p 1 /…**
Publication reference: NEAR/ANK/2023/EA-OP/0247

Columns 1-2 should be completed by the contracting authority
Columns 3-4 should be completed by the tenderer
Column 5 is reserved for the evaluation committee
Annex III - the contractor's technical offer
The tenderers are requested to complete the template on the next pages:

- Column 2 is completed by the contracting authority shows the required specifications (not to be modified by the tenderer),
- Column 3 is to be filled in by the tenderer and must detail what is offered (for example the words ‘compliant’ or ‘yes’ are not sufficient)
- Column 4 allows the tenderer to make comments on its proposed supply and to make eventual references to the documentation

The eventual documentation supplied should clearly indicate (highlight, mark) the models offered and the options included, if any, so that the evaluators can see the exact configuration. Offers that do not permit to identify precisely the models and the specifications may be rejected by the evaluation committee.
The offer must be clear enough to allow the evaluators to make an easy comparison between the requested specifications and the offered specifications.
The Tenderer should avoid copying the specifications required from Column 2 to specifications offered in Column 3. Column 3 shall be filled by the Tenderer with the exact/real specification for the offered supplies.
Each offered supplies must be stated with brand / product name, product version and product/part number. The tenderer shall identify model and manufacturer of each individual item in their technical offer. Offers that do not permit to identify clearly and precisely the existence of the items with all the proof documents and/or certifications requested through this annex may be rejected by the evaluation committee.

1. General Requirements

1.1. Offered supplies must be provided complete with necessary accessories and/or parts to ensure that the supplied items can operate to required technical and quality specifications.

1.2. The contractor is fully responsible for proper connections of supplied items to existing infrastructure for smooth installation and operation.

1.3. The type of voltage in Türkiye is 220 V (mono phase) and 380 V (tri phase + neutral). All hardware including charging docks in Item2.2 - SBS stations must be suitable or adapted for direct connection to the standard power outlets in Türkiye. The type of electrical outlets generally installed in Türkiye is the type with 2 side mounted earthing poles (EUROPLUG). All plugs of all goods will have to fit exactly. The contractor shall evaluate the supplied current, the quality of the current and the fluctuations of the current and take the necessary precautions to avoid damages to the equipment.

1.4. The supplies must be compliant with CE standards. Wherever reference is made in the technical specifications to specific standards and codes to be met, provisions of the latest edition or revision of the relevant standards in effect, shall apply, unless otherwise stated in this technical specification.

1.5. The supplies should comply with the regulations concerning safe operation, energy saving and environmental safety, in line with the policies or the practical measures in use within the EU and Türkiye.

1.6. During the installation of supplied items, the contractor will be responsible for providing measures for any Health & Safety risks associated with supplies provided.

1.7. For:

- Lot 1 – Equipment for server room;
- Lot 2 - Smart Bicycle System (SBS);
- Lot 3 - Peripheral smart city technologies;
- Lot 4 - Software for TMM data analysis center and mobile application for public use;
- Lot 5 - Dynamic intersection control system;
- Lot 6 - Variable Message Signs (VMS); and
- Lot 7 – Smart bus shelter.

system components and whole system must be compatible with each other “as a whole”. Any compatibility problems between software and hardware must be resolved by the contractor at no additional cost to Trabzon Metropolitan Municipality (TMM) and the Contracting Authority.

1.8. All offered supplies must be suitable for operation in the climatic conditions in place of delivery (please refer to “Draft Contract and Special Conditions, including annexes”).

1.9. For warranty, the contractor shall comply with the special and general conditions Article 32 and 33, Warranty Regulation of Turkish Law as published on Official Gazette no.29029 dated 13.06.2014.

2. Technical Documents to be provided during the implementation period

2.1. Please refer to Article 14 of Special Conditions of the Contract.

2.2. Please refer to Article 31 of Special Conditions of the Contract for obligatory documents needed for the Provisional Acceptance.

3. Installation and Commissioning Requirements

3.1. Please refer to the Article 25 of Special Conditions of the Contract.

3.2. The contractor shall make available to himself all tools, materials and equipment required for transport, assembling, installation and commissioning.

3.3. Consumptions on site during the installation and commissioning shall be borne by the contractor.

3.4. The contractor shall provide all tools and equipment needed for testing of supplies.

3.5. The contractor shall perform starting-up, installation and commissioning of the supplies by trained and authorized personnel including unloading, furnishing to designated location, unpacking, assembling and connection to main supply and removal of packing materials from site in accordance with Article 29 of Special Conditions.

3.6. Full assembly and complementary engineering related to the installation and put into operation will be borne by the contractor including integration of other software / hardware (already existing or to be procured under this operation).

Connection to main electrical, mechanical, water, air and/or gas supplies from the equipment to the existing infrastructure shall be done according to the rules and regulations of Türkiye. Recovering any damage to building structure that may occur during the installation of goods is under the responsibility of the contractor.

3.7. Subscription for all utility connections such as internet, electricity, water, etc. to relevant authorities shall be under a responsibility of TMM.

3.8. Purchasing and subscription of sim cards for Item 2.1 shall be under the responsibility of TMM.

3.9. Operation costs of SMS notification and verification services (Item 2.3.5.8) shall be under responsibility of TMM.

3.10. The mobile application module of Item 2.3 and Item 4.2 shall be uploaded to GooglePlay and Apple Store on behalf of TMM.

3.11. Any other components which are not explicitly mentioned under Lot 1, Lot 2, Lot 3, Lot 4, Lot 5, Lot 6, and Lot 7 but required for fully functioning of the system shall be provided by the contractor during installation and commissioning.

3.12. All software must be delivered and installed in electronic version. All software must be licensed to TMM.

3.13. All data shall be stored in Türkiye in accordance with Presidential Decree No:2019/12 published on 30823 numbered, 06.07.2019 dated Official Gazette. All the user data entered, collected, or produced shall be a sole property and under ownership of TMM.

4. Health and Safety

4.1. The contractor shall be fully responsible for applying the Health and Safety procedures in accordance with the legislation published by Republic of Türkiye, Ministry of Labor and Social Security during the manufacturing, delivering, assembling, installation, commissioning and testing. Moreover, the contractor shall be responsible for advising TMM and the Contracting Authority of any Health and Safety risks associated with supplies provided and suitable protective measures.

4.2. Supplies shall be designed to operate safely taking into account the characteristics of the terrain and its surroundings, atmospheric and meteorological conditions, any possible structures and obstacles located in the vicinity either on the ground or in the air in such a way as to cause no nuisance or pose no danger under operation or servicing conditions or in the event of an operation to rescue persons.

5. Training Requirements

5.1. Following installation and commissioning of supplies, the contractor shall provide trainings for TMM staff.

5.2. The tenderers shall include in their offer a training plan according to requirements in this Technical Specifications (duration, topics provided in tables hereunder are requested as minimum). The contractor (if required) may extend training durations and topics covered.

5.3. Trainings shall be realized in Turkish or English with simultaneous translation when necessary.

5.4. Trainings shall be provided by qualified instructors.

5.5. All necessary accessories, materials and documentation for the trainings shall be provided by the contractor.

5.6. Unless otherwise required, trainings shall be realized in TMM facilities.

5.7. The trainings shall be recorded by the contractor and provided as a separate media to TMM for future use.

Lot No.		Min. number of training days	Max. number of participants	Content of the trainings
1	Equipment for server room	2	10	For all lots/items: Trainings shall include theoretical training and applied training. The trainings shall cover topics including but not limited to: • Overview and terminology; • Basic usage training; • Maintenance and troubleshooting;
2	Smart Bicycle System (SBS)	5	10	
3	Peripheral smart city technologies	1	10	
4	Software for TMM data analysis center and mobile application for public use	5	10	

Lot No.		Min. number of training days	Max. number of participants	Content of the trainings
5	Dynamic intersection control system	5	10	• User interface and software; • Health and safety requirements.
6	Variable Message Sign (VMS)	2	10	
7	Smart bus shelter	2	10	

6. Warranty requirements

6.1. Please refer to Article 32 and Article 33 of Special and General Conditions of the Contract and Warranty Regulation of Turkish Law as published on Official Gazette no.29029 dated 13.06.2014.

6.2. Only original or approved by the manufacturer(s) spare parts should be used in any repair service.

6.3. The contractor shall provide available software updates during the warranty period.

6.4. For all Lots the tenderer shall provide a list of spare parts for informative purposes only.

7. Visibility

7.1. All projects /contract implemented under this programme shall comply with the latest Visibility Guidelines for European Commission Projects in Türkiye published by the EU Delegation to Türkiye. Please refer to Article 9 of Special and General Conditions of the Contract.

7.2. Proper material and size compatible with specifications and dimensions of supplies shall be offered by contractor and approved by Contracting Authority after the commencement of the Contract.

7.3. Label shall be designed in accordance with the Article 9 of Special and General Conditions of the Contract. The design shall include the logos of the Ministry of Transport and Infrastructure and Trabzon Metropolitan Municipality.

7.4. Label shall be coloured, readable, visible, and durable.

7.5. The contractor shall take the necessary measures to ensure the visibility of the European Union financing or co financing. These measures must comply with the latest Communication and Visibility Requirements for EU-funded external action, laid down and published by the European Commission.

LOT 1: Equipment for server room

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.	**Server**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
1.1.1.	Rack type server, maximum 2U height.			
1.1.2.	Central Processing Unit (CPU) able to work in standard 64-bit architecture.			
1.1.3.	At least 2 physical processor sockets.			
1.1.4.	At least 2 processors with operating speed of min. 3.1 GHz.			
1.1.5.	Each processor will have at least 20 cores.			
1.1.6.	Each processor will have at least 35 MB of L3 cache memory.			
1.1.7.	DDR4 type, at least 2933 speed and at least 1024 GB.			
1.1.8	At least 24 memory slots.			
1.1.9	Possibility to install at least 24 x 2.5" disks.			
1.1.10	At least 2 X 240 GB M.2 SSD disks configured as RAID .1			
1.1.11	At least one 12 Gbit SAS RAID controller supporting RAID 1/5/10/50.			
1.1.12	At least 4 X 10 Gbit SFP+ ports.			
1.1.13	One Gbit RJ45 standard interface for remote access and management.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.14	At least 1+1 redundant power supply on server, each with at least 1100W, which can be disassembled and reassembled during server operation. 80 Plus Platinum certified.			
1.1.15	At least 4 X 10 Gbit SFP+ optical transceiver modules.			
1.1.16	At least 5 x 3.84TB GB SSD for each server.			
1.1.17	Server shall support at least ECC or Advanced ECC, Fast Fault Tolerance or Adaptive Double Device Data Correction (ADDDC), SDDC, Memory Mirroring, Memory Rank Sparing or Online Spare, Patrol Scrubbing, and Demand Scrubbing features.			
1.1.18	Server shall support at least SAS, NL-SAS, NL-SATA, U.2 NVMe PCIe SSD, and M.2 SSD disk types.			
1.1.19	With remote management port, manage remotely through a graphical interface.			
1.1.20	With integrated or card-based graphics processor with a minimum of 16MB memory, supporting a resolution of at least 1920x1200 at 60Hz.			
1.1.21	Minimum of 4 (four) fans.			
1.1.22	The network interface card on the supplied server shall have at least RDMA over IP and port virtualization capabilities.			
1.1.23	The server shall have Trusted Platform Module (TPM) support.			
1.1.24	The server shall have a minimum of 3 (three) PCI-Express slots.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.25	The server shall have a minimum of 3 (three) USB 3.0 ports and a minimum of 1 (one) VGA input.			
1.1.26	Fleet management software (Item 2.3) shall be installed and configured on the server for data transfer and management.			
1.1.27	Air-quality sensors (Item 3.2), Pedestrian counting sensors (Item 3.3), Noise sensors (Item 3.4), shall be installed and configured on the server for data transfer and management.			
1.1.28	The server shall have rack mounting rails and cable management arm for cabinet installation.			
1.1.29	The server should support the installation of at least 3 GPUs (Graphics Processing Units).			
1.1.30	The server should support a minimum of 64GB DDR4 2933MHz (4Rx4 1.2V) DIMMs (Dual In-Line Memory Modules).			
1.1.31	The server should support a minimum the installation of 2 M.2 drives for hardware RAID-1 configuration or provide an additional RAID card for the boot section, The RAID card should support at least RAID 0, 1, 5 configurations.			
1.1.32	LED indicator light that displays the system status information.			
1.1.33	The server should support remote KVM (Keyboard, Video, Mouse) access, remote CD/DVD/Disk mounting for operating system installation, power consumption monitoring, temperature monitoring, fault monitoring, and hardware component firmware updates.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.34	The server should operate within the temperature range of 5°C to 45°C and humidity range of 8% to 90%, according to ASHRAE Class A4 standard.			
1.1.35	Proactive alert system for detecting failures in the processor, memory, disk, fan, power supply, voltage regulator, and RAID controller unit products.			
1.1.36	Architecture should be able to integrate with virtualization management software for server management.			
1.2.	**Notebook for server room**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
1.2.1.	Notebook processor will have at least 10 core.			
1.2.2.	At least Intel Core i7 Processor or equivalent.			
1.2.3.	64-bit architecture and at least 24 MB cache.			
1.2.4.	Notebook processor clock speed (even dynamic performance enhancement technologies (turbo boost) will be at least 4.7 GHz.			
1.2.5.	With DDR4 type RAM (or higher technology) memory, at least 16 GB capacity, at least 3200 Mhz speed.			
1.2.6.	At least 512 GB SSD storage.			
1.2.7.	At least 2GB dedicated GPU (Graphics Processing Unit).			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.2.8.	Display will have a LED screen of at least 15.6 inches. Resolution of the screen will be at least 1920 x 1080 (16:9) pixels. Screen will have Full HD feature, No touchscreen			
1.2.9.	At least Windows 11 or Windows compatible equivalent standard operating system (OS).			
1.2.10	Keyboard with Turkish Q type and numeric key section integrated into case.			
1.2.11	Integrated webcam for image taking.			
1.2.12	Built-in microphone, Built-in speakers for output stereo sound.			
1.2.13	Wireless LAN will have a wireless network hardware infrastructure that supports at least Wi-Fi 6, Bluetooth 5.1 features.			
1.2.14	At least 2 USB (a minimum 3.0); At least 1 HDMI reader; At least 1 audio output			
1.2.15	1 AC adapter, including battery; Adapter to charge the battery of offered notebook brand and model.			
1.2.16	Maximum weight including the battery shall not exceed 2.8 kg (excluding accessories).			
1.3.	**LCD monitor for server**			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
1.3.1.	Screen size of at least 27".			
1.3.2.	Panel type must be IPS or better.			
1.3.3.	Aspect ratio at least 16:9.			
1.3.4.	Resolution of the monitor will be at least 60 Hz. Minimum 2560x1440.			
1.3.5.	At least, 1 HDMI output, 1 USB-C Port input, 1 DP Port, USB 10 Gb/sn (USB 3.2).			
1.3.6.	shall have an anti-glare screen coating.			
1.3.7.	The screen view angle must be minimum 170 degrees horizontally and vertically.			
1.3.8.	Maximum 5 ms response time.			

LOT 2: Smart Bicycle System (SBS)

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.1	**Electric bicycle**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 200			
2.1.1	The bicycle shall be same brand or fully compatible with the Item 2.2 SBS station.			
2.1.2	The bicycle shall have a unique identification number registered in the Item 2.3 (Fleet Management Software).			
2.1.3	The motor of bicycle shall have a power of min. 250W with brushless engine type.			
2.1.4	The bicycle shall comply with the certification CE EN15194 for electric power bike. It shall be possible to use bicycle without an energy source (with pedals only).			
2.1.5	The bicycle shall achieve 25 km/h speed on straight road.			
2.1.6	The bicycle battery; • Shall be lithium-ion type, • Shall have minimum 36V nominal voltage and minimum 12.5 Ah or higher storage capacity, • Shall ensure minimum 60 km operation range with fully charged, • Shall fully charge in max 6 hours, • Shall be swappable, • Shall be suitable for safe transport and not classified as a dangerous substance according to GHS Hazard Classification.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.1.7	The frame of the bicycle shall be made with 6061 or higher quality aluminium alloy.			
2.1.8	The bicycle shall be in accordance with ISO 4210-2:2015 Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles. The bicycle cables shall be protected from external access i.e. all cables shall be interlaced within the bicycle. Gear mechanism, chain, brakes, dynamo and electrical components must be enclosed into the bicycle according to the above-mentioned ISO Standard.			
2.1.9	As a minimum the bicycle shall have IP65 water, dust, rust resistance.			
2.1.10	The rims of the bicycle shall be 26 inches. Front and rear tires of the bicycle shall have mudguards made from impact resistant plastic, the connection points shall be made of steel. It should have adjustable angle and position for tire coverage. Tires of the bicycle shall be inflatable and resistant to bursting in accordance with: ISO 5775-1:2014 -Bicycle tires and rims — Part 1: Tire designations and dimensions; ISO 5775-2:2015 - Bicycle tires and rims — Part 2: Rims.			
2.1.11	The bicycle shall have front and rear roller or hydraulic brake system.			
2.1.12	The bicycle shall have a hub gear system with minimum 3, maximum 7 gears with automatic torque sensor.			
2.1.13	The weight of the bicycle shall not exceed 30 kg.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.1.14	The bicycle shall integrate with Item 2.3 (Fleet Management Software) for the purpose of localization through GPS system. GPS system shall be compatible with Geo-fencing security measures defined under item 2.3 (Fleet Management Software). Geo-fencing system shall use GNSS (Global Navigation Satellite System) device data. Geo-fencing system data which will be used in the bicycles shall also receive (or shall be compatible) GNSS signals. The bicycle shall be capable of receiving signals from at least two GNSS systems (GPS or Galileo or Glonass or equivalent).			
2.1.15	The bicycle shall integrate with Item 2.3 (Fleet Management Software) for the purpose of data transfer through sim card. (See 3.9 of Installation and commissioning requirements).			
2.1.16	The bicycle shall have theft and vandalism prevention mechanisms including GPS tracking/locking, alarm, anti-theft nuts on front and rear. The vandalism prevention mechanism on bicycles shall detect irregular actions and send a warning notification (signal) to the Item 2.3 (Fleet Management Software).			
2.1.17	The bicycle shall have auxiliary cable lock system, which shall unlock through Item 2.3 (Fleet Management Software) with QR code or Bluetooth. Auxiliary lock system shall have rust-proof vinyl coating on the flexible braided-steel cable. Cable thickness minimum 12 mm; Cable lock weight between 0,6 and 1,4 kg; Cable length minimum 120 cm; Minimum security standard level shall be silver or high or 4 star or 10 to 15 or 6 of 10 or equivalent.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.1.18	There shall be a basket in a front handlebar stem on the bicycle. Internal volume of the basket shall have a minimum capacity of 14 litres. It shall be made of electrostatically painted aluminium alloy tubular frame structure. It shall have a minimum carrying capacity of 10 kg.			
2.1.19	The bicycle shall have cell phone holder.			
2.1.20	The bicycle shall be equipped with: LED headlight with minimum 600 lumens. 2 red warning tools reflectors on the back of the seat and on the rear fender. Reflectors must be visible from a minimum distance of 140 m. Bell with an aluminium body.			
2.1.21	The bicycle shall have an advertisement on the lateral sides of the fender of the rear wheel.			
2.2	**SBS Station**  * This picture is provided for illustration only. SBS Stations shall be delivered, installed/built by the contractor at the locations in Trabzon according to Appendix 1.			
	Manufacturer's name; product model/type:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Country of origin:			
	Quantity: 10			
2.2.1	Each SBS station shall have 10 charging docks to be installed at 10 locations in Trabzon. SBS station shall have a modular design that can be adjusted for different number of docks and dock layouts for bicycles.			
2.2.2	The concrete foundation for SBS Station shall be C30 or better quality with thickness of minimum 15 cm and size of 12x3 meters.			
2.2.3	The body of SBS station shall be made of corrosion resistant metal or shall be corrosion resistant (i.e. painted with electrostatic powder).			
2.2.4	SBS station shall be waterproof in accordance with IP65 or higher standard.			
2.2.5	Each dock of the SBS station shall fully charge electric bicycle (Item 2.1) in maximum 6 hours.			
2.2.6	SBS station shall prevent docking of other types of bicycles.			
2.2.7	When the electricity in the system is cut and/or exhausted, the user will still be able to park and lock the bicycle.			
2.2.8	The lock system of the SBS station shall have an option to be opened manually by administration.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.2.9	The SBS station shall be equipped with a sensor identifying movements of the electric bicycle (Item 2.1). The SBS station shall be equipped with a sensor that recognizes electrical bicycles using RFID, Bluetooth, or equivalent technologies. The charge status of the bicycle, the bicycle's estimated percentage of charge and data like, which bike was locked when it was unlocked shall be transmitted to the Fleet Management Software. In case of any change in the values of electric current and voltage or any type of malfunction, the system shall send an alert to the Item 2.3 (Fleet Management Software).			
2.2.10	SBS station shall have IP camera with 3G + 4G-LTE connectivity working 7/24. Cameras shall record in HD quality (minimum 720p resolution) working effectively during day and night and shall have min. 30 days record capacity. Cameras shall have IP65 or higher water, dust, rust resistance.			
2.2.11	There shall be a light pole with minimum 20W LED lighting armature to sufficiently light all the charging docks, aid camera's visual for night recordings. Light pole shall have warning metal sign with minimum 20 cm x 30 cm size to prevent people from locking their regular bicycles to the charging docks.			
2.2.12	Lighting and camera shall be installed on galvanized metal pole with minimum 4-meter height.			
2.3	**Fleet management software**			
	Manufacturer's name; product model/type:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Country of origin:			
	Quantity: 1			
2.3.1	The software shall be used for management of the Smart Bicycle System.			
2.3.2	The software interface shall be mobile and web-based (SSL certificated connection) for System Management. The Software interface shall be web-based (only for information purposes) and mobile for end-users.			
2.3.3	The software shall have following modules: 1. Authorization Management, 2. System Management, 3. Mobile Application.			
2.3.4	The software shall have minimum following hierarchy roles: 1. Super Admin/Admin or equivalent, 2. Operators (customer support, sales, field maintenance, others) or equivalent 3. Customer/End-user or equivalent			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.5	**Authorization Management module** shall have at least following functions: 1. Log management; 2. Subscriptions (registration/closing/blocking accounts) including collecting profile's name, surname, identification number, GSM number, e-mail address and other information to complete subscription; 3. Classification of all users' profiles; 4. Recording as a log all transactions made by users (log in, log out, payment history and others); 5. Recording the profiles passwords into software database (i.e., AES or BCrypt hash algorithm or equivalent); 6. Resetting user's passwords; 7. E-mail notifications; 8. SMS notification and verification system. (See 3.9 of Installation and commissioning requirements)			
2.3.6	Validation web-services shall be integrated with Authorization Management module.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.7	System Management module shall have at least followed functions for management (super admin/admin, operators): 1. Locations and status of SBS stations and bicycles; the location data shall be transmitted in maximum 10 seconds; 2. Station profiles (hardware version, firmware version, station status and last check-in time, local physical address, station location/coordinates, modem firmware, list of equipment on station and their statuses, firmware versions, etc.); 3. Indication of available bicycles and their situation (battery level, malfunctions and others) in a real time; 4. Allowing parking of the bicycle at any place for end-users (free-float system or virtual station or other solution); 5. Supporting geo-fencing usage of the bicycles for end-users according to forbidden zones defined by management; 6. Marking and blocking certain bicycles as needed; 7. Updating locations of SBS stations and updating number of charging docks; 8. Marking the SBS stations as active and passive as needed; 9. Package creator (for a definition of different rental rules with limitations, geofencing, different packages for different zones, allowing changes of tariff fees in order to encourage citizens to use bicycles during some certain periods, etc.); 10. Providing emergency warnings and notifications; 11. The system should send data to TMM Data Analysis Center via Web Service / API without any data restrictions. The data to be transferred should include as minimum locations, validations, payment, warning alarms and other relevant data.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.8	System Management module shall report the performance of rental system, the stations occupancy, and the situation of all bicycles (locations, battery situation, functional status, availability and other).			
2.3.9	System Management module shall report (daily, monthly, and yearly) at least following information: 1. Rental revenues, 2. End-user's membership status, 3. Bicycles locations and physical situations, 4. Bicycle travel distance information/details. 5. Maintenance and repair history. System Management module shall show all bicycles, SBS stations/docks on a list format.			
2.3.10	System Management module shall have an Emergency Alert feature that shall warn the management and end-users at least at following situations: 1. SBS station and docks lock down; 2. Bicycle battery warning; 3. Locations of the bicycles; 4. Forbidden zones (Geo-fencing); 5. Users mistakes / miss-usage; Warnings shall be automatically provided by the System Management module to the management and end-users via mobile/e-mail.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.11	System Management Module shall allow management to mark and block a certain bicycle in a case of reported mismanagement, disability, malfunction, out of charge, maintenance and other conditions preventing usage of the bicycles. Operators shall be able to identify certain bicycle for a collection from and return to SBS station through alert from the System Management module.			
2.3.12	Shall show active and passive usage time of bicycles and docks in real time.			
2.3.13	Mobile Application module shall enable end-users to rent electric bicycle (Item 2.1).			
2.3.14	Mobile Application module shall be compatible with IOS and Android. All updates related to current versions of IOS and Android shall be done by the contractor.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.15	**Mobile application module** shall have at least following functions: 1. Showing location and availability of the stations and their distances to end-users on the mobile application map, 2. Showing usage period, travel distance made, and rental cost of the bicycles related to user, 3. Providing notification about promotional campaigns to the end-users through push notification feature, 4. Providing payment method(s) for the end-users, 5. Providing information about battery level of the bicycle, 6. Alerting if battery level of the bicycle goes below 20 percent, 7. Possibility for the end-users to rent multiple bicycles at the same time, 8. Issue Membership and Personal Data Protection Law agreement documents (the contract) between TMM and end-user to be validated by the end-user through the mobile application, 9. Enable reservation for particular bicycle, 10. Bicycle shall be unlocked through application with QR code or Bluetooth.			
2.3.16	Mobile application module shall provide a section called as Solution Center integrated into TIKOM 153[1], Solution Center shall contain a sub-section called as Help. This section shall be in Turkish and English and it shall also include frequently asked questions & answers.			
2.3.17	Providing secure verification for the end-users.			

[1] TIKOM 153 is a Public Relations Application of TMM serving to resolve requests, complaints, opinions, suggestions and denunciations

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.18	Mobile application module shall have at least following functions and payment options: 1. Secure customers credit card information through encryption (AES or BCrypt hash algorithm or equivalent); 2. Providing virtual wallet for end-users; 3. Send security code to the end-users' GSM numbers in order to complete payment; 4. Automatically prepare financial invoices arising from the charges of bicycle usage. The software shall send these invoices to provided e-mail addresses of users. Invoicing shall be suitable for the general accounting system used in Türkiye; 5. Payment Provider Type shall be Virtual Point of Sales (virtual POS).			
2.3.19	Mobile application module shall be Native, or Hybrid developed.			
2.3.20	The database of the software should be based on relational management and licensed to full use without any restrictions.			
2.3.21	All data obtained from Fleet Management Software shall be stored in Türkiye in accordance with Presidential Decree No:2019/12 published on 30823 numbered, 06.07.2019 dated Official Gazette. All the user data entered, collected, or produced by the Fleet Management Software shall be a sole property and under ownership of TMM.			
2.3.22	Fleet Management Software and Operation system shall be installed and configured by the contractor on the server (Item 1.1) provided by TMM.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.3.23	All data including payment transactions shall be transmitted to the TMM Data Analyses Center through any of the following data transfer protocols: TCP/IP and HTTP.			
2.3.24	Software shall have both Turkish and English language interface.			
2.3.25	10 years license for use of the Fleet Management Software. Necessary licences and all updates for usage of minimum 200 bicycles.			

LOT 3: Peripheral smart city technologies

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
3.1.	**IP PDU gateway**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			
3.1.1	Data transfer to the requested servers via Ethernet, LTE or wifi.			
3.1.2	Minimum IP65 certified case.			
3.1.3	Working with Linux, Windows or compatible OS.			
3.1.4	With IP-based DHCP Client & Server structure that allows remote connection.			
3.1.5	At least 128-bit integrated soft firewall.			
3.1.6	LoRaWAN or RF Mesh shall be used as communication protocols to enable long-range communication between devices.			
3.1.7	All data shall be transmitted to requested servers through data transfer protocols: TCP/IP or MQTT or HTTP.			
3.1.8	A minimum of 8 channels.			
3.1.9	A minimum of 5 dBi anthenna.			
3.1.10	The IP-PDU-gateway shall transfer data taken from outdoor air quality sensor (item 3.2), pedestrian counting sensor (item 3.3) and noise sensor (item 3.4) to TMM Data Analysis Center.			

3.2.	**Outdoor air quality sensor**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
3.2.1	PM10, PM2.5, PM1 Measurement Support.			
3.2.2	Optimum operating range between -10°C and +45°C, unaffected by temperature.			
3.2.3	Suitable for outdoor conditions.			
3.2.4	Waterproof IP67 or IP65 certified case.			
3.2.5	PM1 must be 0 to 100 µg/m3 or better.			
3.2.6	Communication with LPWAN network via gateway up to MAC layer for interaction with LPWAN protocol.			
3.2.7	Collected data shall be sent from connected sensors (nodes) in LPWAN network via MQTT/TCP communication protocol.			
3.2.8	Standard authentication to enable data access to authorized users.			
3.2.9	Sensors suitable for use with LPWAN compatible module with long battery life.			
3.2.10	Calibration setting to avoid deviations.			
3.2.11	Allowing data exchange in situations such as free fall, tilt, touch.			
3.2.12	All data shall be transmitted to existing TMM Data Analyses Center through data transfer protocols: TCP/IP, MQTT, HTTP.			
3.3.	**Pedestrian counting sensor**			

	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
3.3.1	Counting technology camera or radar.			
3.3.2	The minimum detection range should be 10 meters.			
3.3.3	Sending data collected from connected sensors (nodes) in LPWAN network via MQTT/TCP communication protocol.			
3.3.4	All data shall be transmitted to existing TMM Data Analyses Center through data transfer protocols: TCP/IP, MQTT, HTTP.			
3.3.5	Allowing data exchange in situations such as free fall, tilt, touch.			
3.3.6	Data transfer to existing TMM Data Analysis Center over both Ethernet, LTE, wifi.			
3.3.7	A minimum operating range between -10°C and +50°C.			
3.3.8	For outdoor conditions, waterproof IP67, IP66 or IP65 certified special case.			
3.4.	**Noise sensor**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
3.4.1	The Noise Sensor Measurement Range, Frequency Response range should be minimum 35-120 dB.			

3.4.2	IP67 or IP65 certified special case.			
3.4.3	A protocol used for serial communication between devices should be RS-485 or a better one.			
3.4.4	Sending collected data from connected sensors (nodes) in LPWAN network via MQTT/TCP communication protocol.			
3.4.5	Broadcasting MQTT/TCP protocol, collecting subscriber commands and sending data.			
3.4.6	Standard authentication to enable data access only to authorized users.			
3.4.7	As a wireless communication protocol, LoRaWAN, Sigfox, LTE-M, or NB-IoT should be used.			
3.4.8	Minimum operating range between -10°C and +50°C.			
3.4.9	Possibility for calibration setting to avoid deviations.			
3.4.10	All data shall be transmitted to existing TMM Data Analyses Center.			
3.4.11	The Noise Sensor Measurement Range, Frequency Response range should be minimum 35-120 dB.			

LOT 4: Software for TMM Data Analysis Center and mobile application for public use

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
4.1	**Software for TMM Data Analysis Center**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 1			
4.1.1	**Software for TMM Data Analysis Center** compatible and integrated with other software/hardware (already existing or to be procured under this operation): **Existing software:** • Bus and data control software • Vehicle tracking software • TMM electronic fare collection system • In-vehicle camera software **Software/hardware to be procured under this operation:** • Fleet management software (Item 2.3) • Peripheral smart city technologies (Lot 3) • Dynamic intersection control system (Lot 5) • Variable Message Sign (VMS) (Lot 6) • Smart bus shelter (Lot 7)			
4.1.2	The software will also include two additional modules: • Module 1: Line relative traffic density, • Module 2: Public transport city analyses.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
4.1.3	The software shall be an event driven real-time working platform with following characteristics as a minimum: 1. Connectivity; 2. Authorization and role management; 3. Device management; 4. Orchestration; 5. Data storage; 6. Streaming; 7. Data visualization; 8. Software monitoring; 9. Rule sets and alarm; 10. Identity verification; 11. Reporting.			
4.1.4	**Connectivity** Software shall process incoming data of different types over different connection methods (2,3,4 G infrastructures, Wi-Fi, ethernet, modbus) and to store and send them to 3rd party systems.			
4.1.5	**Authorization and role management** Software shall provide authorization and role management for users. Software shall serve administrators and operators who use the system with different authorizations and role management mechanisms according to authority levels.			
4.1.6	**Device management** Software shall allow different types of devices to be added to the system as single or in multiples			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Software shall have one and two-way communication capability. Device management shall be done in two different ways: 1. Gateways (to which devices will be connected): defined in the system as real and abstract, 2. Links that consist of devices that will interact with the gateways.			
4.1.7	**Orchestration** Software shall communicate with different data types. The software shall send bulk, single and real-time data to different devices bilaterally. The software shall communicate with following tools as a minimum: REST, gRPC, Kafka, Pulsar.			
4.1.8	**Data storage** As a result of the orchestration, the software shall store data collected from different devices (Lots no: 1, 2, 3, 5, 6, 7) and from the 3rd party services. These data must be stored in 3 different ways. 1. Raw data: The software shall store the raw data collected from the field as soon as they come to the system. 2. Structured data: The software shall keep the raw data collected from the field in a structured way.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	3. Time series data: The software shall store both raw and structured data as time series: seconds / minutes / hours / days / weeks / months / years.			
4.1.9	**Streaming** As a minimum, the software shall communicate to services Kafka, Pulsar, Nats, RabbitMQ.			
4.1.10	**Data visualization** Data visualization shall monitor and track data from all devices in the system. As a minimum, features of data visualization shall be: • Easy to use / user frendly; • Integrated with databases; • Latest architecture; • Visualizations and dashboards to discover, view, review, and present data in graphical form.			
4.1.11	**Software monitoring** Software monitoring shall enable monitoring of processes and scheduling tasks on the back-end side of the system.			
4.1.12	**Rule sets and alarm** Rule sets shall be defined on real-time data. Rule sets defined in the rule engine should be made from the graphical interface without any coding.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Within the alarm scenarios, as a minimum, the following actions should be taken: • Sending e-mail, SMS for alert; • Webhook; • Writing operations to the database.			
4.1.13	**Identity verification** Identity verification should provide strong authentication, user management, and authorization as a minimum			
4.1.14	**Reporting** • As a minimum, reporting should run in latest versions of following browsers: Internet Explorer, Google Chrome, Mozilla Firefox; • Reporting should have dynamic characteristics; • Interfaces shall work without need to install additional plug-in; • Reporting and general analysis and shall be done through written interfaces or/and licensed tools; • Detailed searches and analyses will be possible with the interfaces; • All reports, interfaces, messages and other will be in Turkish and English language.			
4.1.15	As a minimum, connection methods / protocols shall be: • M2M Data Lines (2G/3G); • 3rd party system integrations; • MQTT;			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	• TCP; • RestAPI; • Modbus.			
4.1.16	**Data adapters (Connection sub-software)** 1. Adapters will process real-time data and transfer them to the Analysis Environment (4.1.17) in real-time; 2. Adapters shall enable real-time data to be received, will have data formatting and parsing capabilities; 3. There will be possibility to add adapters for new resources; 4. There will be possibility to develop adapters independently of the application provider; 5. Real-time adapters will adjust the data sending rate.			
4.1.17	**Analyses environment** 1. The analysis environment will be capable of running several data analysis models in parallel; 2. The analysis environment will ensure that data analytical models work integrated with each other, that the outputs of models are used as inputs to different analytical models and that the inputs support different data models; 3. Algorithms in the analysis environment will be available for at least the following functions: • Clustering; • Classification; • Scoring.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	4. Algorithms will enable algorithms to learn using aggregate or streaming data; 5. The analysis environment will have ability to draw the flow for both and estimation making, and the business rules will be written in the relevant flow drawing; 6. Possibility to draw on graphical screen without any programming analytical solution flows; 7. Possibility to import externally developed models into the analysis environment as Predictive Model Markup Language (PMML); 8. Analytical models should be used for data flow forecasts; 9. Python, R should be used; 10. It will be possible to have summary graphical images of the analytical models. 11. A visual analysis tool that helps transform data collected from different environments into information shall be developed; 12. Analyses environment shall provide connected network visualizations to help reveal hidden data connections and patterns.			
4.1.18	**Real-time action capabilities** Real-time action capabilities refer to a possibility of acquisition of external real-time data such as vehicle tracking, ticketing, sensors, electric bicycles, smart intersections, and others processed by the system, for obtaining meaningful results. Minimum features of real-time action capabilities shall be:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	1. With adapters, real-time data can be processed in various scenarios and a real-time; 2. Rules can be defined on real-time data; 3. Rules defined in the rule engine can be completely made from the graphical interface without any coding; 4. As a minimum, following actions can be taken within the rule scenarios; • Sending e-mail, SMS for alert, • Triggering HTTP Restful API of another system, • Ability to send push notifications to mobile applications, • Write to database. 5. It will be possible to add new actions within the scenarios, if necessary.			
4.1.19	**In-memory data storage** 1. The software shall have in-memory data storage capability for fast data access. 2. In-memory data storage shall be in the form of a cache structure. 3. In-memory data storage structure shall provide key-value data model. 4. Query for data shall be available. 5. In-memory data storage and analysis environment shall work integrated. In case of an error while receiving, collecting, or querying data with real-time or batch method, the warning mechanism shall provide notification.			
4.1.20	**Data warehouse data model**			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Data warehouse is a repository where diverse data can be queried and analysed. 1. Data warehouse data model shall be designed as a normalized logical data model and documented as an E/R (table relationship) model. The model shall be designed to be easily expandable to new source systems and being compatible with existing source systems. 2. Data warehouse data model shall have no duplicates between tables. Each table will have a unique key (primary key) and all relationships shall have assignment level (1 to 1, 1 to n).			
4.1.21	**Data transfer** 1. TMM Data Analysis Center portal will receive information from the relevant systems (smart bike, smart intersection, IOT sensors, mobile applications, fleet management, and others) in specified forms and intervals (e.g., end of day, on hour and minute basis, real time). 2. Picture, sound, image, and text-based collected information shall be uploaded to TMM Data Analysis Center portal at once, at certain intervals or in real time. 3. The data of the source systems will be collected in accordance with their structure (structural, semi-structured and unstructured), and transferred to the file system. 4. Data collection will be in the form of batch and real-time transfers from internal and external			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	systems, and the transfer methods will be defined according to needs analysis. 5. The data collected by the system should be stored as raw data before being processed. 6. Storage method will be selected according to the intended use of the table. 7. Raw data shall be modelled and transferred to the relevant target structure. Necessary transformations will be performed to transfer structural data to the logical data model. 8. The correct method for data transfer will be determined according to the table types. The system should allow transfer methods in which the entire table is loaded once for large-size tables, and only the changed record is transferred in daily running jobs. 9. The system will receive and process audio, picture, and video recordings. In exceptional cases, this information may be stored as raw data. 10. By creating template structures for data transfer, standard coding will be provided. 11. All transfer warning messages will be in Turkish, error messages will be in Turkish and English language. 12. All data transfer process will include the necessary security measures, and solutions supported by the database management system to ensure data integrity.			
4.1.22	**Extract, Transform and Load (ETL) architecture / Data collection and convert architecture**			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	All data collected will be added to TMM Data Analysis Center portal. All data will be analytic in the same performance and hierarchy in the analysis and interpretation processes. 1. Data will be divided into structured, semi-structured and unstructured. 2. The system will have the ability to store all structured data (data pulled from relational databases, Excel files, etc.), unstructured (video, audio, etc.) or semi-structured (XML, JSON, etc.) data. 3. Structured data, will be kept in relational databases and unstructured data will be kept in the **Staging Platform layer**, indexed, and made ready for search. 4. According to the reporting needs, the data in the Data Warehouse will be summarized and taken to the **Analysis layer**. 5. The appropriate storage method will be selected according to intended use of the table. 6. Fail-over and load balancing will be supported for all **Transport layers**. 7. For queries in all transport layers, appropriate indexes and data sections will be created, considering performance. 8. All transfer warning messages will be in Turkish, error messages will be in Turkish and English. 9. All transport layers will include the necessary security measures, and solutions supported by			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	the database management to ensure data integrity. 10. Each ETL job will run independently of tagging other ETL jobs. 11. Business rules containing the same data will not be duplicated. 12. As each ETL job is created, the unit test data and test cases specifically to check if the code is working properly will be created. 13. In a case of missing or corrupt data, this data will not be removed from the general table. 14. With the deletion of this missing data, the missing information in the business process/source system will not be hidden. 15. When missing information is detected it will be taken into a separate table and reported. 16. Data partitioning techniques depending on data retention time, data size and performance criteria shall be used. 17. The contractor shall report all successful logs and error logs before or after running ETL jobs. 18. Software shall ensure that there is no data loss or duplicate data. 19. The contractor will develop structures that send a warning message/e-mail to the required units when the ETL function fails. 20. Easy ETL maintenance and performance optimization.			
4.1.23	**User interfaces and reporting** 1. Detailed searches and analyses will be made with the interfaces.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	2. Special written interfaces will be used for specific searches. 3. As a minimum, interfaces will support following browsers: Google Chrome, Mozilla Firefox etc. 4. Licensed tools can be used for general analysis and reporting. 5. Reporting environment will be created for unlimited number of users. 6. Reports will have output in the original or required format and visualize data in graphic format. 7. System will support different types of graphics (lines, pie, bubble charts as a minimum). 8. There shall be dynamic reporting, to be based on the needs analysis. 9. Solutions shall be produced by designing a licensed product or customized interfaces when necessary. 10. All reports, interfaces, error/warning messages will be in Turkish. 11. Reporting system will support user authentication methods (MIT Kerberos, LDAP). 12. For all reporting developments, all types of queries will be determined, appropriate indices and data sections will be created. 13. Outputs from the report environment shall be PDF, Excel, and others that can be converted to different commonly used formats. 14. The system will have an advanced authorization and role infrastructure. Access to			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	the user, system and other interfaces will be provided based on authorization and role. 15. Access of unauthorized persons to the relevant data and interfaces will be prevented and recorded (logging).			
4.1.24	**Module 1: Line relative traffic density** 1. Module 1 must be licensed for unlimited number of users. 2. All vehicles integrated with the system, and the data to be transferred from the TMM's electronic fare collection system should be displayed on the same screen on the digital map. 3. Movements of the vehicles should be monitored on-line. 4. There should be no vehicle and/or route limitations in Module 1. 5. Module 1 should examine real-time vehicle movements in a linear plane. 6. The actual distance of all stops defined on any line should be monitored. These distances should be calculated as actual road distances and not bird flight distances. 7. The stopping points of the vehicles on the system should be followed in real time. 8. The module should detect vehicles traveling fast or slow according to the departure time. 9. The module should examine the lines as a separate route, not as a loop, but as a round trip.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	10. For each line in a real time, the number of moving, stationary, contact-off and off-line vehicles should be examined. 11. Stop pairs of non-stop waiting and/or stopping locations on the system should be detected. 12. Unlimited number of lines and buses should be examined at the same time and on the same screen. 13. The module should display instantaneous speed of the vehicles, their distance to the end of the line and their distance from other vehicles operating on the same route. 14. The module should be retrospective to examine date, time, and line filters. 15. Time-based congestion on the line, fast or slow vehicles should be detected on the system graphics. 16. Vehicles that enter the line later and vehicles that do not complete their journey should be detected on the system graphics. 17. Hours with busy buses on the line and hours with less busy buses should be determined on the system graphics.			
4.1.25.	**Module 2: Public transport city analyses** 1. Within the scope of Module 2, the general mobility analyses of the city's public transportation network shall be possible. 2. Neighbourhood area maps and population information (for potential passenger growth estimates) will be provided to the contractor. 3. Number of passengers using public transportation in the relevant date range,			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	passenger profile information, and the number of neighbourhoods that can be reached by the public transportation network shall be included. 4. Determinations about the habits of using public transportation, public transportation usage and neighbourhood relations will be provided. 5. The most active neighbourhoods reached by public transport and their internal movements should be included. 6. Information on number of passengers carried by neighbourhood public transportation should be included. 7. All data of passengers using public transport should be visualized on the map. Highly active neighbourhoods should be coloured dark, and less active neighbourhoods should be coloured lightly. 8. Public transportation usage information for the boarding line from each neighbourhood should be visualized on the map. 9. The lines passing through each neighbourhood should be visualised separately on the map. 10. Other public transport lines should be included and examined on the same map. 11. While visualizing on the map, different colour tones should be used according to the total number of passengers using public transport. 12. Information on the neighbourhoods that can be reached by public transport should be visualized on the city center map.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	13. Depending on the intensity of the movement, grouping should be possible according to mass transportation usage data 14. All visualized data such as date, time, district, neighbourhood should be filterable in sub-breakdowns 15. Information about all public transportation lines passing through the neighbourhoods, the number of passengers boarding from the relevant neighbourhood and the line usage habits of the passengers should be shown on both the list and the map. 16. Neighbourhood and line length information should be listed. 17. The module should predict potential passenger increase in case of possible route and line revision. 18. Neighbourhood information where potential passenger increase will occur and additional route distance information for route revisions be presented. 19. Neighbourhood-based public transport indexed information should be included. 20. The system should produce solutions according to neighbourhood-based person movements. 21. Frequency of public transportation use in the neighbourhoods, passenger profile (disabled, student, free, full, other) shall be included. 22. A separate simulation screen should be designed for demand-oriented transportation models.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	23. Current state of the public transport and demand-driven solutions should include potential passenger numbers and estimated routes. 24. The mobility of the city should be displayed on a single page for public transportation usage opportunity analysis. This display will be presented with colour grading. 25. A separate page should be designed to compare the public transportation usage habits of neighbourhoods/regions.			
4.2.	**Mobile application for public use**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 1			
4.2.1	The mobile phone application (the application) intended to provide practical information about Trabzon transportation, parking management and other for users. The application shall be suitable for smartphones on the IOS and Android platform.			
4.2.2	The application shall be scalable. The application shall be capable of serving at least 1000 (one thousand) concurrent users in a real-time.			
4.2.3.	The application shall have at least following modules: • Governance system; • Public transportation; • Parking management;			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	• Event tracking; • A live city map; • Walking trails.			
4.2.4	Governance system: 1. Mobile applications shall be developed using a "Cross-Platform" development approach to provide the same output for Android and IOS platforms. 2. Designs shall be sent as live output in Invision, XD, Figma, and other. 3. The application shall be publicly accessible. Users shall log in with a username and password. 4. The application shall be designed to be compatible with the database and web application. Map interface development shall be available. 5. The web interface shall work in real-time synchronization with the database. 6. The application shall be compatible with Android and IOS operating systems. The contractor shall perform available version updates throughout the contract period. 7. The application shall have at least following features: sensitivity, average GPS accuracy, tracking in flow (distance/time), and photo upload size options. 8. The application shall support sending personalized notifications to "Individual" or "Mass" audiences. To manage this notification			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	mechanism, a "Mobile Application Management Panel" shall be created. 9. The application shall share real-time relevant data collected from Dynamic intersection control system (Lot 5) and Variable Message Sign (Lot 6)with users. 10. The application shall include reward-based surveys for users' loyalty. 11. The application shall have a QR code reader feature. 12. The application shall be accessible to disabled citizens.			
4.2.5.	Public transportation: 1. The application shall display at least bus routes, bus schedules, locations, Points of Interest (POIs) coordinates/city attractions, and other relevant information. 2. The application shall have a capability of a micro-scale Mobility as a Service (MaaS) platform, including trip planning and ticketing management. 3. The application shall share information about a number of passengers using public transport lines. 4. The application shall integrate information about public and bicycle transportation. 5. The application shall display public transport stops on the map.			
	Parking management:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	1. The application shall provide parking management information, occupancy rates, and navigation services for parking areas. 2. The application shall have the capability to send personalized notifications to users when parking spaces are available at selected parking areas.			
4.2.6	Event tracking: 1. The application shall share information about city landmarks and event tracking. 2. For event tracking, the application shall provide information for personalized notifications based on user preferences. 3. Information about events shall be displayed on the map and in a list format. 4. Mobility data shall be recorded for the selected event. 5. Search options shall be available based on criteria such as district, neighbourhood, event type, and event date. 6. Through the application, users shall be able to make their mobility plans for organized event.			
4.2.7	Live city map: 1. Maps for urban noise levels and air quality information shall be created. Green, yellow, and red colours shall be used for noise mapping.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	2. Relevant data obtained from Peripheral Smart City Technologies shall be instantly reported to users through the application. 3. The application shall have a capacity to forecast and share potential risks based on the analysis of historical data at specific dates. 4. The application shall provide alerts and warning guidelines for areas with high noise levels or low air quality. 5. The application shall have optional map layers for show/hide layers. 6. The application shall have a search tool for details, addresses, routes, coordinates, and nearby existing features. 7. A query and filtering option shall be available for detailed features. 8. Multiple base map options (topographic, satellite, etc.) shall be provided. The maps shall be available for both online and offline use. 9. The application shall allow the selection of distance units (meters, km/feet, miles). 10. Real-time location tracking and live position tracking shall be possible on the routes during bicycle use. 11. Buffer analysis shall be performed based on the current location, and nearby points. 12. The places, important points, emergency support points on the route shall be loaded on the map for later offline use, as soon as the application is opened.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
4.2.8	Walking trails: 1. The application shall share data on walking trails and picnic areas. 2. The application shall provide information about carbon-neutral mobility on designated walking trails. Real-time estimates for reducing carbon emissions for selected mobility options shall be available through the application. 3. The locations of urban walking trails and air quality data shall be presented to users. 4. Users shall be able to access information such as walking distance, walking time, average speed for their preferred walking trails through the application.			

LOT 5 - Dynamic intersection control system

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Instructions:			
1	Dynamic Intersection Control System (the system) shall utilize junction capacity thru vehicle count and density data. By installing the system, the green light time for direction where the density is high will be extended automatically.			
2	After installation of Dynamic Intersection Control System, the intersection performance shall be increased by %15 at least in comparison with previous fixed signal plans. Criteria: Weighted average vehicle waiting time.			
3	This performance criteria will not be under consideration if intersection is already working with optimized and / or best signal plans.			
4	The system must perform camera-based operation (Item 5.1).			
5	One Vehicle detection camera (Item 5.1) will be installed per each direction to perform vehicle detection in designed virtual loop for that direction.			
6	Vehicle detection cameras shall send detected information to Image Processor Unit (Item 5.2) through Cat6 FTP/UTP cables (Item 5.10).			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7	Image Processor Unit (Item 5.2) shall determine vehicle counts and density information for each direction according to given algorithms. (Item 5.2)			
8	Image Processor Unit (Item 5.2) shall send vehicle information to Dynamic Intersection Control Unit (Item 5.3) through Cat6 FTP/UTP cables. (Item 5.10).			
9	Dynamic Intersection Control Unit (Item 5.3) shall instantly decide green light duration for that direction.			
10	The system will dynamically adjust the green light times in accordance with the necessary algorithms working in Dynamic Intersection Control Unit (5.3), using the instantaneous number of vehicles data in all directions.			
11	With the system taking control of the junction, the green light durations shall be no longer fixed.			
12	The system shall minimize unnecessary green light usage.			
13	The system shall minimize queues in all directions.			
14	The system will be integrated to already existing **TMM Intersection Control Units.** Intersection Control Units are the existing units for signalling control.			
15	Dynamic Intersection Control System and TMM Intersection Control Units shall be compatible and integrated.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
16	The system should be compatible, communicate and work in integrated way with existing TMM Traffic Control Center and perform remote control functions; • Display the status of instant signalling at the intersection, • Display the number of vehicles passing through the intersection at each phase, • Report instant error situations from the Intersection Controller, • Send programs from the center to the Intersection Control Unit, • Perform the manually operation to take intersection to the flash position, disabling and restarting.			
17	The system shall be able to transmit green/red light information for directions together with vehicle density data of the intersection to the existing TMM system server instantly, over GPRS line and/or fiber lines, in order to prevent data loss.			
18	The system shall be remotely disabled or activated. It will be possible to interfere in signalizing to deactivate automatized timing calculated by the system. In that case, System shall manage the intersection according to remote intervention, not according to its own calculated schedule.			
19	Camera and Processor data will be processed by algorithms in Dynamic Intersection Control Unit (5.3) and operated instantly at the intersection.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
20	The contractor shall study Intersection Capacity Analysis and Preparation of Increasing Intersection Capacities and Capacity Utilization Rates before the installation.			
21	At signalized intersections where traffic counting has been carried out, signal duration optimization and optimal phase layout work will be carried out to increase the intersection capacity utilization rate.			
22	Signal duration optimization and optimal phase layout, which are made to increase the capacity utilization rate of intersections, will be tested in micro simulation environment.			
23	The optimum signal pattern generated will be transferred to the simulation environment.			
24	The signal plans shall be applied at intersections by transferring them to the necessary signal programs to existing TMM Intersection Control Unit.			
25	The contractor shall deliver Intersection Analyses for each of the 5-intersection containing: • Calculation method and the result of fixed time managements, • Calculation method and the result of Dynamic managements, • Calculation method and the result of performance of the system before and after.			
5.1	**Vehicle detection camera**			
	Manufacturer's name; product model/type:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Country of origin:			
	Quantity: 20			
5.1.1.	Vehicle detection camera (the camera) shall have a field of view of at least 50 meters.			
5.1.2.	The camera shall transmit images in a real time over the cable to the Image Processor Unit (item 5.2) located at the intersection.			
5.1.3.	The camera must have at least a 2-Megapixel Progressive Scan CMOS.			
5.1.4.	The camera must have 1 RJ-45(10/100Base) Ethernet on the camera.			
5.1.5.	The camera must support ONVIF profile.			
5.1.6.	The camera shall have 1 SD Card slot which support at least 64 GB of capacity on it.			
5.1.7.	The camera must be powered by PoE			
5.1.8.	The camera should be able to work in as a minimum in environmental conditions of -10°C ~ +60°C and humidity <90%.			
5.2.	**Image processor unit**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.2.1.	Image Processor Unit (the image processor) shall receive data from vehicle detection camera (Item 5.1) Image Processor Unit shall provide vehicle count data and generate vehicle density data.			
5.2.2	The image processor shall run the image processing algorithms in real time to generate vehicle count and vehicle density data and instantly transmit these data to dynamic intersection control unit (item 5.3).			
5.2.3.	The image processor unit should have a processor with the following specifications; - Processor frequency of at least 2.5 GHz, - Processor cache of at least 6 MB, - Memory of at least 4GB RAM, - 1 Ethernet port,			
5.2.4.	The image processor should have PCI slots able to host Video Processor Unit(VPU).			
5.2.5.	The image processor will have free software development tools (API/SDK communication protocol) that supports the integration of third-party systems.			
5.3	**Dynamic intersection control unit**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.3.1	Dynamic Intersection Control Unit (The Unit) shall be integrated with already existing TMM Intersection Control Units (ICU) placed at the intersections. Dynamic Intersection Control Unit must support 2-way communication with existing TMM Traffic Control Center to communicate with ICU perform remote operations, update the signal program on the ICU located at the intersection.			
5.3.2.	The Unit should collect vehicle count data from the Image Processor Unit (item 5.2) and the current traffic flow data of the neighboring intersections from TMM Traffic Control Center to optimize the green durations.			
5.3.3.	The Unit should have a processor with the following specifications; - 32 bit processor core,- Communication with RS232, USB and Digital I/O units, - Memory of at least 256MB RAM, 2GB Memory - Network 10/100Mbit Ethernet, GSM			
5.3.4.	The maximum power consumption of the unit will be 10W.			
5.3.5	The Unit should be able to coordinate the intersection its installed, with the neighboring intersections using the data collected from TMM Traffic Control Center.			
5.3.6	The Unit should support NTCIP, Customized Communication Protocols.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.3.7	The Unit should have at least 1 ethernet port and 1 serial port for communication.			
5.3.8	The Unit should have an LCD screen to display; - The current time/date, - The current phase status, - The current working status, - The current connection status.			
5.3.9	The Unit should be able to communicate with the existing TMM Traffic Control Center either via fiber or the GSM network.			
5.3.10	Dynamic Intersection Control Unit will communicate with the Image Processor Unit (item 5.2) by wire. Dynamic Intersection Control Unit will be located at the intersection and will collect all the digital data generated by the Image Processor Unit (item 5.2) on site.			
5.3.11	Dynamic Intersection Control Unit shall transfer the following data obtained from TMM ICU to existing TMM Traffic Control Center; - ICU time/date,- ICU instant fault recording, - ICU working status, - Instant status of ICU output cards.			
5.4	**Intersection monitoring camera**			
	Manufacturer's name; product model/type:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Country of origin:			
	Quantity: 5			
5.4.1.	Intersection Surveillance Camera (the camera) will be capable of providing at least a 180° image.			
5.4.2.	The camera must have at least a 1/2.5" Progressive CMOS image sensor.			
5.4.3.	Resolution of CMOS image sensor should be at least 4 Megapixels.			
5.4.4.	The camera shall have at least 1920 x 1080 resolutions, able to provide at least 15 fps image transmission.			
5.4.5.	The camera should support H264 or H265 compression formats.			
5.4.6.	The camera must have TCP/IP and ONVIF support to be used on other open platforms.			
5.4.7.	The camera must support for Power over Ethernet (PoE) or 802.3			
5.4.8.	The camera must have at least an IP66 and IK10 standard housing.			
5.5	**Field cabinet**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.5.1.	The capacity of cabinet for internal use should be at least 15 U. From outside to outside, the width should be at least 600mm and the depth should be 600mm.			
5.5.2.	The cabinet shall be at least IP54 standard.			
5.5.3.	The cabinet should have 2 upright columns.			
5.5.4.	Main body and covers will be made of galvanized sheet of at least 1.5mm.			
5.5.5.	The cabinet should be floor type; The cabinet can be attached to the base when desired. It must be installed with wall and pole devices.			
5.5.6.	The cabinet will have ventilation filters each side and fan.			
5.5.7.	The cabinet should have at least a 1U x 6 fused (16A) UPS power plug group in and will be fixed in the cabinet accordingly.			
5.5.8.	The cabinet will have at least following certificates; TSE, EN60529, IEC60917, IEC 61587-1:2017, RoHS, CE			
5.5.9.	The cabinet must have at least 2 AC fans with thermostats in it. Fans will be 220-240 VAC, 50/60 Hz. Fans will be grounded by making electrical connections with ferrules and sockets.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.5.10.	The cabinet will be painted with electrostatic powder or outdoor polyster coating. The color of the cabinet will be gray(RAL7035) to be compatible with other boards on the field.			
5.5.11.	The cabinet will be grounded by installing grounding cables.			
5.6	**Field switch**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			
5.6.1.	Field switch should have at least 16 10/100 TX RJ-45 ethernet ports on it, These ports must have support for 802.3 or Power over Ethernet(PoE).			
5.6.2.	Field switch should have at least 2 SFP slots or 2 fiber ports on the switch.			
5.6.3.	Field switch should support the key ring topology.			
5.6.4.	Field switch should support SNMP v1 or v2 or v3.			
5.6.5.	Field switch should support: - IEEE802.1d Spanning Tree protocols or - IEEE802.1w Rapid Spanning Tree protocols or - IEEE802.1s Multiple Spanning Tree protocols			
5.6.6.	Field switch should be able to provide access control.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.6.7.	Field switch should support Port Mirroring.			
5.6.8.	Field switch should include 1000-Base SX/LX SFPs with a 240W power supply.			
5.6.9.	Field switch should connect with Cat6 F/UTP cable to vehicle counting camera (item 5.1), UPS (item 5.7), surveillance camera (item 5.4), dynamic Intersection control unit (item 5.3).			
5.7	**Signaling Uninterruptible Power Supply (Signaling UPS)**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			
5.7.1.	UPS will be activated in a period of less than 50ms when the power is cut off at a signalized intersection, and the power of the UPS will be at least 3 KVA.			
5.7.2.	UPS Input Voltage will be 220VAC (single phase), input voltage range will be 110-300 VAC, input frequency will be +/-10%.			
5.7.3.	UPS output power will be at least 1800W.			
5.7.4.	UPS output voltage will be at least 220/230/240VAC.			
5.7.5.	UPS voltage distortion will be at most +/-1%.			
5.7.6.	UPS frequency at the output will be 50/60Hz.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.7.7.	UPS total harmonic distortion will also be less than 2% THD at linear load.			
5.7.8.	The efficiency of UPS will be at least 90%.			
5.7.9.	Harmonic distortion of UPS input current will be no more than 6%, and the input - power factor will be 0.98.			
5.7.10.	There should be an LCD screen on the front panel of the UPS this front panel that shows the information of the current status of UPS. As a minimum the following messages should be displayed: Battery level, battery fault, UPS fault.			
5.7.11.	The operating humidity range will be between 5%-95% under non-condensing conditions.			
5.7.12.	UPS should provide enough battery at %90 capacity at least for 4 hours in a case of electricity shortage.			
5.8	**Camera pole**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 15			
5.8.1.	Camera pole will have a height of at least 7.5 meters and it will have a structure that will give a peak displacement no more than 5cm in the wind blowing at speed of 130 km/h.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.8.2.	Camera pole will have a height of at least 7.5 meters and it will have a structure that will give a peak displacement no more than 5cm in the wind blowing at speed of 130 km/h.			
5.8.3.	The camera pole foundation will be at least 70x70x80 cm in size at least C25 concrete.			
5.8.4.	Camera pole should be made of ST37 metal sheet.			
5.8.5.	Camera pole should be hot-dipped galvanized.			
5.8.6.	The camera pole should have a hole for cabling purposes with a size of minimum 20 cm X 10 cm.			
5.8.7.	The hole (5.8.5) should be covered with a hot-dip galvanized steel cover.			
5.8.8.	The camera pole should have a camera montage box on top so that the cameras (item 5.1 and item 5.4) can be installed on top of camera pole.			
5.8.9.	The camera pole should have a top cover for a protection against environmental conditions.			
5.8.10.	Camera pole screws shall be of galvanized steel.			
5.9	**Signalization manhole**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 65			
5.9.1.	Shall be made of composite material			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.9.2.	The cover and body should be manufactured in class B125 using FRP Pulp according to TS 1478 EN 124 standard, UC CM 485-B125 or equivalent.			
5.9.3.	There should be lightning (high voltage symbol) text relief on the signaling manhole.			
5.9.4.	Dimensions for manhole in mm (between): • Cover Width: 420 – 500; • Cover Length: 420 – 500; • Cover Thickness: 18-40; • Body Width: 415 – 530; • Body Height: 375 – 530; • Body Internal Depth: 370 – 410; • Number of Locks (Pcs): 1; • Mass (Minimum Kg): 20,00			
5.10	**Cat-6 FTP/UTP cable**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 2.500 meters for 5 intersections			
5.10.1.	The cable should support communication in accordance with Cat-6 FTP/UTP standards at a distance of 100 meters.			
5.10.2.	The cable must support a data transmission speed of 250 MHz or Mbit/sec.			
5.10.3.	The cable conductor must be bare and made of solid copper.			
5.10.4.	The cable conductor must be of 23 AWG quality.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.10.5.	Operating temperature of the cable should be between -20C and +60 C.			
5.10.6.	The cable should support 10/100/1000 Mbps speed for the LAN.			
5.10.7.	In accordance with ANSI/TIA 568 and ISO/IEC 11801 standards.			
5.10.8.	The cable should have separators so that the cores within will not be damaged.			
5.11	**Corrugated pipe**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 600 meters for 5 intersections			
5.11.1.	The pipe will be used for cabling (between field cabinet (item 5.5) and camera poles (item 5.8)) between manholes (item 5.9). Max. 6 meters pipe between manholes.			
5.11.2.	Pipe diameter will be at least 70 mm.			
5.11.3.	The pipe and gaskets shall comply with TSE EN61386-24 standard or equivalent.			
5.11.4.	The length of pipe shall be at least 6 meters and sealed.			
5.11.5.	Pipe will be at least 450N pressure resistant and outdoor types.			

LOT 6 - VARIABLE MESSAGE SIGNS (VMS)

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6	**Variable Message Signs (VMS)**			
6.1	**Steel construction Type 1**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
6.1.1	Steel construction Type 1 will be a custom-made product to be constructed at the location of their installation (Appendix 1).			
6.1.2	Steel construction Type 1 will be "N" shaped composed of two columns and the beam.			
6.1.3	Steel construction shall have following dimensions: - 19.0 ± 1 meter length, - 6.1 ± 0,1 meter height from the road surface, - 0.80 ± 0,05 meter width.			
6.1.4	The minimum steel profile to be used shall be designed and constructed according to regulation under Official Gazette 29614. (https://www.resmigazete.gov.tr/eskiler/2016/02/20160204-2.htm). All the metal structure used in the construction shall be galvanized.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.1.5	The columns of the steel construction shall be of polygon cross-section and the beam structure shall be of either box cross-section or cylindrical cross-section.			
6.1.6	The steel construction shall be made of at least ST 37 quality metal sheets according to EN 10025-2 or higher standard.			
6.1.7	Galvanization of the material shall be in accordance with EN ISO 1461 or higher standard.			
6.1.8	The steel construction should have concrete foundations designed and constructed according to regulation under Official Gazette 29614.			
6.1.9	The foundations shall be made of minimum C25 grade concrete, designed and constructed according to regulation under Official Gazette 30364. https://www.resmigazete.gov.tr/eskiler/2018/03/20180318M1.htm.			
6.1.10	Concrete quality will be minimum C25, reinforcing iron will be ribbed S420 or higher standard.			
6.1.11	The steel construction shall be designed and constructed to resist weather conditions according to regulation under Official Gazette 30364.			
6.1.12	The design of the steel construction should take in the consideration a minimum 160 km/h wind factor.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.1.13	EIA-222-E standard shall be taken into account in wind pressure calculations.			
6.1.14	All metal materials to be used in open-air space shall be designed and produced for corrosion resistance according to regulation under Official Gazette 29614. All metal materials shall be galvanized and painted according to regulation under Official Gazette 29614.			
6.1.15	Welding shall be cleaned of oil and other substances on the surface by degreasing process. Rust on the surfaces shall be cleaned in a low-density acid bath at 25 -30ºC with 18% concentration of HCl. Iron chloride remaining on the surface shall be completely cleaned with the washing bath. The material removed from the washing bath will be precoated in zinc chloride-ammonium chloride solution.			
6.1.16	The walking path should be in the form of a corridor as from end to end, with no physical obstacles that prevent personal walking. The walking path width should be at least 60 cm.			
6.1.17	The walking path shall be made of a diamond embossed sheet to prevent icing. The structure of the walking path should prevent falling of any object larger than 1 cm in diameter.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.1.18	The walking path of the steel construction shall be in a form of cage structure with a handrail of at least 100 cm from the foot level. The personnel should be isolated from the external environment while working. The walking path should provide safe working environment regarding European Union Working Safety Directives and IRATA International Association rules.			
6.1.19	A steel climbing ladder shall be mounted after 3 meters to prevent unauthorized climbing.			
6.1.20	Steel construction shall be manufactured compatible with VMS LED display (item 6.3), visible areas and road openings.			
6.1.21	The design of the steel construction should take in the consideration proper fitting and compatibility of cabinet openings of the VMS LED displays (item 6.3).			
6.2	**Steel construction Type 2**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
6.2.1.	Steel construction Type 2 will be a custom-made product to be constructed at the location of their installation (Appendix 1).			
6.2.2.	Steel construction Type 2 will be "N" shaped composed of two columns and the beam.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.2.3.	Steel construction shall have following dimensions: - 13.0 ± 1 meter length, - 6.1 ± 0,1 meter height from the road surface, - 0.80 ± 0,05 meter width.			
6.2.4.	The minimum steel profile to be used shall be designed and constructed according to regulation under Official Gazette 29614. (https://www.resmigazete.gov.tr/eskiler/2016/02/20160204-2.htm). All the metal structure used in the construction shall be galvanized.			
6.2.5.	The columns of the steel construction shall be of polygon cross-section and the beam structure shall be of either box cross-section or cylindrical cross-section.			
6.2.6.	The steel construction shall be made of at least ST 37 quality metal sheets according to EN 10025-2 or higher standard.			
6.2.7.	Galvanization of the material shall be in accordance with EN ISO 1461 or higher standard.			
6.2.8.	The steel construction should have concrete foundations designed and constructed according to regulation under Official Gazette 29614.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.2.9.	The foundations shall be made of minimum C25 grade concrete, designed and constructed according to regulation under Official Gazette 30364. https://www.resmigazete.gov.tr/eskiler/2018/03/20180318M1.htm.			
6.2.10	Concrete quality will be minimum C25, reinforcing iron will be ribbed S420 or higher standard.			
6.2.11	The steel construction shall be designed and constructed to resist weather conditions according to regulation under Official Gazette 30364.			
6.2.12	The design of the steel construction should take in the consideration a minimum 160 km/h wind factor.			
6.2.13	EIA-222-E standard shall be taken into account in wind pressure calculations.			
6.2.14	All metal materials to be used in open-air space shall be designed and produced for corrosion resistance according to regulation under Official Gazette 29614. All metal materials shall be galvanized and painted according to regulation under Official Gazette 29614.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.2.15	Welding shall be cleaned of oil and other substances on the surface by degreasing process. Rust on the surfaces shall be cleaned in a low-density acid bath at 25 -30ºC with 18% concentration of HCl. Iron chloride remaining on the surface shall be completely cleaned with the washing bath. The material removed from the washing bath will be precoated in zinc chloride-ammonium chloride solution.			
6.2.16	The walking path should be in the form of a corridor as from end to end, with no physical obstacles that prevent personal walking. The walking path width should be at least 60 cm.			
6.2.17	The walking path shall be made of a diamond embossed sheet to prevent icing. The structure of the walking path should prevent falling of any object larger than 1 cm in diameter.			
6.2.18	The walking path of the steel construction shall be in a form of cage structure with a handrail of at least 100 cm from the foot level. The personnel should be isolated from the external environment while working. The walking path should provide safe working environment regarding European Union Working Safety Directives and IRATA International Association rules.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.2.19	A steel climbing ladder shall be mounted after 3 meters to prevent unauthorized climbing.			
6.2.20	Steel construction shall be manufactured compatible with VMS LED display (item 6.3), visible areas and road openings.			
6.2.21	The design of the steel construction should take in the consideration proper fitting and compatibility of cabinet openings of the VMS LED displays (item 6.3).			
6.3	**VMS LED display**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			
6.3.1.	The LED's used within the VMS LED display should be Surface Mount Device (SMD) type.			
6.3.2.	VMS LED display dimensions shall be at least 576cm(W) x 192cm(H)			
6.3.3.	VMS LED display shall be composed either of LED subpanels or a single LED panel			
6.3.4.	The pixel pitch of the VMS LED Display shall be 10 mm at most.			
6.3.5.	The colour spectrum of the VMS LED display shall be in 16 bits red colour, 16 bits green colour and 16 bits blue colour for each pixel.			
6.3.6.	VMS LED display shall have no mechanical parts, i.e. Fan shall not be used.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.3.7.	VMS LED display brightness should be at least 6000 cd / m2 (Nits).			
6.3.8.	VMS LED display viewing angle should be at least 120 degrees horizontally and 120 degrees vertically.			
6.3.9.	VMS contrast ratio is at least 2000:1.			
6.3.10	VMS display refresh rate should be at least 1000 Hz.			
6.3.11	The electric consumption of VMS LED display shall be less than 350W/m2 on average and shall be less than 750W/m2 at maximum.			
6.3.12	The panel material of VMS LED display shall be made of aluminium or iron or steel but not plastic.			
6.3.13	VMS LED display shall allow brightness control either manually or automatically.			
6.3.14	The front side of VMS LED display shall meet at least IP65 standards, and the backside shall meet at least IP54 standards.			
6.3.15	The operating temperature range of VMS LED display shall be -15°C to +45°C .			
6.3.16	VMS LED display shall operate at 10% to 90% humidity rates			
6.3.17	VMS LED display shall run remotely via the network system			
6.3.18	The lifetime of LEDs used in VMS LED display should be at least 100000 hours (at %50 brightness)			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.3.19	The power supply of VMS LED display shall be 220 V AC operable			
6.3.20	VMS LED display shall have over-low voltage protection to prevent damage from power outages.			
6.4	**Industrial control computer**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			
6.4.1.	Industrial Control Computer (the computer) shall be fully compatible and integrated into existing TMM Traffic Control Center.			
6.4.2.	The computer shall have at least a 2 GHz processor			
6.4.3.	Processor with min 2 cores.			
6.4.4.	Cache shall be min 1,5 MB.			
6.4.5.	The computer shall have at least 4 GB RAM.			
6.4.6.	The computer shall have at least 64 GB SSD.			
6.4.7.	Minimum 1 x HDMI output.			
6.4.8	The computer shall have a minimum 2 USB, 1 ethernet (Lan) input.			
6.4.9	The computer shall work between -10 and +50 degrees with industrial SSD.			
6.4.10	The computer shall have FAN module.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.4.11	The computer shall have minimum 2 relays and the relays shall have 16A and 250V AC characteristics.			
6.4.12	The computer shall have minimum 4 octocouplers for output isolation.			
6.4.13	The computer shall have RS232 connection.			
6.4.14	The computer should have maximum 4 U sizes.			
6.4.15	The computer should support Windows and Linux based operating systems (OS) or equivalent.			
6.5	**VMS LED display integration software**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			
6.5.1.	VMS LED display Integration Software (Integration Software) will be used to integrate VMS LED display (item 6.3) to the existing TMM Traffic Control Center.			
6.5.2.	Integration Software should run in the Industrial Control Computer (item 6.4) to provide 2-way communication between VMS LED display (item 6.3) to the existing TMM Traffic Control Center.			
6.5.3.	Integration Software should receive the information coming from the existing TMM Traffic Control Center and convert into communication protocols of the VMS LED display (item 6.3).			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
6.5.4.	Integration Software should receive the information coming from the VMS LED display (item 6.3) and convert into communication protocols of TMM Traffic Control Center.			
6.5.5.	Integration Software should allow the operators at the TMM Traffic Control Center, to; - shut down VMS LED display (item 6.3), - start and restart VMS LED display (item 6.3), - change the messages on the VMS LED display (item 6.3), - send images and videos to the VMS LED display (item 6.3), - receive images and videos displayed at the VMS LED display (item 6.3), - receive error messages from the VMS LED display (item 6.3).			

LOT 7 – Smart bus shelter

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7	**Smart bus shelter**			
	Instructions: Smart Bus Shelter (the shelter) shall provide bus travel information, advertisement using data from existing TMM Traffic Control Center.			
7.1	**Bus shelter**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			
7.1.1	Shelters body dimensions: L:4000 x W:1500 x H:2620 mm (+/- 10 mm for all dimensions).			
7.1.2	Left and right-side walls: Interior; St37 galvanized & NOT painted 60 x 60 x 3mm, 50 x 100 x 3mm, 40 x 30 x 2mm rectangular steel profiles, flanges: 12mm.			
7.1.3	Roof: 60 x 60 x 3mm, 30 x 30 x 2mm; rectangular stainless-steel profiles. 8 (4+4) mm smoky coloured laminated tempered glass panels.			
7.1.4	Cabling holes: for the crossing of the cables, between the side walls through the roof.			
7.1.5	Rain gutter: stainless horizontal gutter at the back of roof. Vertical PVC gutter inside passenger information panel (Item 7.2) at back.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.1.6	Back wall: 8 mm. smoky coloured tempered glass. Aluminium glass holders with gaskets.			
7.1.7	Bottom of back wall: 60 x 60 x 3mm.; rectangular stainless-steel profile; flanges under profile; 10 mm. stainless sheets.			
7.1.8	Three linear lightings on ceiling: Each lighting shall be at least one meter long, • IP 68 flush mounted, • 24 Volt, • 3-5 Amper transformer.			
7.1.9	All coatings (except for sitting bench) are minimum 304 Grade 2 mm stainless			
7.1.10	Bult-in lighting sign on forehead: • Stainless cases; • 3mm colored plexiglass; • LED, 12 Volt, 5 Amper Transformer.			
7.1.11	Sitting bench: Used for interior; L:1500 mm x W: 360 mm x H: 450 mm; (max. +/- 10 mm. for all dimensions) 40 x 40 x 2 mm rectangular stainless-steel profiles, Coating: stainless sheet with Wood Plastic Composite (WPC)			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.1.12	Including three panels: **Panel 1- with Advertising Panel:** with LED lightings, 1000 x 1500 mm, double sided: Interior: St37 galvanized & NOT painted 40 x 60 x 3mm rectangular steel profiles.; Exterior: stainless coating. dimensions; L: 2408 x W:565 x T:240 mm (+/- 2mm. all dimensions); **Digital Panel 2 (Item 7.2) – with Passenger Information Screen:** Interior: St37 galvanized & NOT painted 40 x 60 x 3mm rectangular steel profiles.; Exterior; stainless coating. dimensions; L: 2408 x W:565 x T:240 mm 8 (+/- 2 mm. all dimensions). **Digital Panel 3 (Item 7.3) - with Advertisement and Passenger Information Screen:** Interior: St37 galvanized & NOT painted 60 x 60 x 3mm, 50 x 100 x 3mm, 40 x 30 x 2 mm. rectangular steel profiles. Exterior: stainless coating. flanges:12mm (+/- 2 mm. all dimensions).			
7.1.13	Screens will be laser cut on panel for all panels.			
7.1.14	Switch Box: Transformers and fuse of ceiling and forehead lightings shall be located inside. All cablings for screens, internet and others will be through the switch box.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.2	**Passenger information screen (32 inch)**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			
7.2.1	Screen resolution shall be min. 1920 x 1080 pixels.			
7.2.2	Display brightness min.2000 nits.			
7.2.3	Remotely control, 3G/4G/4,5G for communication with the data processing infrastructure and GSM modem or cable modem suitable for developing technologies			
7.2.4	The display technology shall be Liquid Christal Panel (LCD)			
7.2.5	Working 24 hours/7 days.			
7.2.6	Suitable for operating in the temperature range of at least -20 ºC to + 40 ºC.			
7.2.7	Lifetime of at least 50,000 hours.			
7.2.8	Automatic adjustment of display brightness according to variable light intensities.			
7.2.9	Anti-polarized (visible with sunglasses).			
7.2.10	16:9 aspect ratio.			
7.2.11	Horizontal and vertical viewing, displaying the image smoothly even when viewed from an angle of at least 178 degrees.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.2.12	Suitable for web-based application and broadcast management without the need for external media player hardware.			
7.2.13	Protection class of the passenger information screen shall be minimum IP56. Anti-reflective and anti-vandal protection, tempered glass.			
7.2.14	Display must have a closed-circuit cooling system. (no external air conditioning system)			
7.2.15	The integrated internal fan system should circulate the enclosed air through all areas, including the display surface.			
7.2.16	Real time reporting on display via Simple Network Management Protocol (SNMP).			
7.2.17	As a minimum, with following display parameters: display temperature, power consumption, backlight level, fan performance, status of the interfaces, status of electric circuits.			
7.2.18	Minimum 4-core processor, internal memory min.2GB, USB, HDMI and Ethernet ports			
7.2.19	With grounding in addition to the earthing bar coming from the city network, with leakage current relay and protective fuse.			
7.3	**Advertisement and information screen (75 inch)**			
	Manufacturer's name; product model/type:			
	Country of origin:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Quantity: 5			
7.3.1	Screen resolution shall be min. 1920 x 1080 pixels. Supports UHD content.			
7.3.2	Display brightness min. 2500 nits.			
7.3.3	Remotely control, min. 4G for communication with the data processing infrastructure, GSM modem or cable modem suitable for developing technologies			
7.3.4	Display technology shall be Liquid Christal Panel (LCD) produced in IPS technology.			
7.3.5	Working 24 hours/7 days.			
7.3.6	Suitable for operating/storage temperature range of -20 ºC to + 50 ºC.			
7.3.7	Lifetime of at least 50,000 hours.			
7.3.8	Automatic adjustment of display brightness according to variable light intensities.			
7.3.9	Anti-polarized (visible with sunglasses).			
7.3.10	16:9 aspect ratio.			
7.3.11	Horizontal and vertical viewing, displaying the image smoothly when viewed from an angle of at least 178 degrees.			
7.3.12	Suitable for web-based application and broadcast management without the need for external media player hardware.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.3.13	Protection class of the passenger information screen shall be IP56 as a minimum. Anti-reflective, tempered and anti-vandal protection glass.			
7.3.14	Display should not require an external air conditioning system; must have a closed-circuit cooling system.			
7.3.15	Designed to work in a completely isolated manner. The integrated internal fan system should circulate the enclosed air through all areas, including the display surface.			
7.3.16	Real time reporting on display via Simple Network Management Protocol (SNMP).			
7.3.17	As a minimum, with following display parameters: display temperature, power consumption, backlight level, fan performance, status of the interfaces, status of electric circuits.			
7.3.18	4-core processor, internal memory min. 2GB, USB, HDMI and Ethernet ports.			
7.3.19	With grounding in addition to the earthing bar coming from the city network, with leakage current relay and protective fuse.			
7.4	**Central management and screen media player software**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 1			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.4.1	Central Management Software (the Software) able to manage players running as a minimum on Samsung SSSP and Tizen, LG WebOS, Windows, Android, Linux, Raspbian OS and compatible platforms.			
7.4.2	With feature to schedule content to be published at a certain time or between certain hours on certain days of the week.			
7.4.3	With feature to remove content from the playlist in advance or automatically via the Software at scheduled time.			
7.4.4	With feature to produce preview images of picture and video content and display them in the content lists.			
7.4.5	The Software shall create dynamic content with XML or JSON information from external sources and add them to player lists by associating with each other.			
7.4.6	The Software should have a design interface. *With this interface, depending on external source, the Software should define single content, player list, text or variable groups.			
7.4.7	The Software should have visual content (Widget) at least date/time, weather, currency. *Users should be able to create similar content using HTML, CSS or JavaScript and upload their own widgets to the system.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
7.4.8	Screen media player must run on System-on-Chip (SoC) and must be the same brand as the display manufacturer, without the need for additional hardware.			
7.4.9	Screen media player must be able to save the content in its own Flash Disk Memory (FDM) internal memory.			
7.4.10	Screen media player should be able to collect information at least temperature, CPU, RAM, free memory status, MAC address, IP and local IP address, firmware version of the industrial display and send it to the Central Management Software.			
7.4.11	Screen media player should allow the settings of the screen, at least brightness, sharpness, contrast, command to restart, open, close and volume control to be changed via the content management.			
7.4.12	The opening and closing time of the screen on which the media player is located should be adjustable through the Central Management Software.			
7.4.13	Information coming from external sources (such as XML, REST, RSS) on the screen media player should be played and displayed on the screen in accordance with the applied template.			
7.4.14	Screen media player should play at least streaming text, weather, time, date, currency, traffic information (widgets).			