

TECHNICAL TASK

1. DEFINITIONS AND ABBREVIATIONS

- 1.1. Purchaser** – AB Kelių priežiūra.
- 1.2. Supplier** – agent – either natural person, private legal person, public legal person, other organization, or a group of persons – who signs the Contract with the Purchaser.
- 1.3. Competition** – procurement competition for innovative project of the Object.
- 1.4. Negotiations** – Negotiations with Competition winners precluding signing of the Contract.
- 1.5. Contract** – Contract concluded between Purchaser and Supplier on Object of Project.
- 1.6. Service** – supply of the service for the Object of the Project, provided after the signing of the Contract.
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2. OBJECT OF THE PROJECT

- 2.1. Name of the object** – System and algorithm for dynamic routing
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3. PLACE OF CONTRACTUAL COMMITMENTS

- 3.1. Place of contractual commitments** – location of the Supplier.
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4. REQUIREMENTS FOR OBJECT OF PROJECT AND OTHER INFORMATION

4.1. Description of the object

- 4.1.1. Information about the scope of Purchaser's activities and challenges:
- 4.1.1.1. Purchaser performs road maintenance tasks on national roads in whole Lithuania (about 21 000 km). These tasks are being performed during both summer and winter. Most of the roads during winter are being treated (about 16 000 km) with slipperiness- reducing materials, such as salts (NaCl, etc.) and sand.
- 4.1.1.2. Road treatment (spreading) tasks are being performed using more than 300 spreader-trucks and other equipment, that are spread out in 60 maintenance units across Lithuania.
- 4.1.1.3. Over the years the decisions for winter road maintenance tasks were made by on duty employees in the units, and the quality of such decisions were highly dependent on their experience and competence.
- 4.1.1.4. In 2018, Purchaser started using a state-of-the-art road condition forecasting system (Road status information system – RSIS), that produces a new forecast every 1 hour and displays current and future road condition maps (further referred to as the Forecast).
- 4.1.1.5. RSIS principles:
- 4.1.1.5.1. Road network is split into segments with a particular climate characteristic for each, that depends on road structure, natural and anthropogenic environments, and other factors affecting road condition.
- 4.1.1.5.2. Every 1 hour the system collects data from various sources, e.g. road weather stations, numerical weather prediction model, winter road maintenance task information from Purchaser, etc. This data is then processed and a 18h forecast is calculated according to the climate characteristic for each road segment.
- 4.1.1.5.3. The Forecast is available through graphical user interface and application programming interface (API).
- 4.1.1.6. When RSIS indicates slippery road sections, e.g. ice on road, it provides a task recommendation. The decision making of whether, where and how many spreaders and/or other equipment is needed is being left for an employee, who makes a call out for a salt spreading, road clearing or another task.
- 4.1.1.7. During the adverse winter weather at times there is a need to deploy all 300 spreaders and other equipment at once, thus, route planning and resource management becomes an arduous process. Moreover, constantly updating information on road conditions is a crucial factor in decision making, determining the way a task must be performed.
- 4.1.1.8. In order for Purchaser to perform the tasks and activities effectively, a need arose for automatic planning and routing of the spreaders and other equipment, that would consider the Forecast and available resources (Dynamic route planning).
- 4.1.2. Currently, there are these limits and factors in effect:
- 4.1.2.1. Every year before the winter season a set of optimal routes are being made according to the service areas and resources, and will only be adjusted if a significant change in management, road classification, or other area is done (Static route planning).
- 4.1.2.2. Route correction in operational work according to the weather is performed by on-duty employees, thus,

- there is a high risk of human factor.
- 4.1.2.3. Formation of ice on road is more often patchy than not, therefore, it usually is ineffective to spread slipperiness reducing materials on a whole road.
 - 4.1.2.4. The amount of salt that is needed is usually decided upon by the on-duty employee, who often does not follow RSIS recommendations.
 - 4.1.2.5. The decision of whether to call-out the spreaders is left for on-duty employees too, instead of a centralised road maintenance centre.
 - 4.1.2.6. The drivers receive the callouts using text or verbal communication, instead of maps or navigation apps.
- 4.1.3. The essential requirements for the final version of the offered system (further will be referred to as the System):
 - 4.1.3.1. Routes shall be generated optimally, being of the shortest length possible and only covering road sections that need to be treated.
 - 4.1.3.2. Routes shall take into consideration time restrictions, that are set in the contract of Purchaser and client.
 - 4.1.3.3. System shall integrate RSIS information.
 - 4.1.3.4. System shall generate a set of routes according to RSIS Forecast every 1 hour.
 - 4.1.3.5. System shall leave the decision whether to choose either Static or Dynamic route for the on-duty employee.
 - 4.1.3.6. Drivers shall receive the generated route, task, and other information via an app in a mobile device with Android OS.
 - 4.1.4. Purchaser will select 3 winners of the innovative project competition (further referred to as Competition) using methods presented in procurement documents.
 - 4.1.5. General requirements for the offer:
 - 4.1.5.1. The offer shall include the algorithm for Dynamic route planning (further referred to as Algorithm).
 - 4.1.5.2. Algorithm shall evaluate Forecast, Purchaser's equipment and their location, and other important resources.
 - 4.1.5.3. Routes, generated by the Algorithm, shall fit the optimal principle, id est, in order to fulfil the task requirements, the length of the route shall be the shortest and amount of required resources shall be the smallest.
 - 4.1.5.4. Both Algorithm and System shall perform both ways, id est, they shall receive current road condition data and generate new routes and recommendations constantly and provide the routes and other information to the mobile devices of employees expeditiously.
 - 4.1.5.5. Offer that is presented for the Competition shall have these parts:
 - 4.1.5.5.1. A mock-up of System graphical user interface (GUI).
 - 4.1.5.5.2. A functional System prototype.
 - 4.1.5.5.3. An example of generated routes using data samples from Purchaser.
 - 4.1.5.5.4. A description of the System, user manual, and other important information (according to Supplier).
 - 4.1.6. When Competition is completed, Purchaser will negotiate (further referred to as Negotiations) with up to 3 potential suppliers. After Negotiations are concluded, Contract will be concluded with 1 Supplier on pilot test period.
 - 4.1.6.1. The pilot test period will be the 2020-2021 winter season.
 - 4.1.6.2. Both Algorithm and System will be under testing for one of Purchaser's maintenance units (service areas), that contains around 700-900 km of road network and about 20 spreaders and other equipment.
 - 4.1.6.3. There shall be a functional first version of GUI for the pilot test period. Purchaser's employees shall be able to use the results of the Algorithm in their operational work and evaluate generated maps.
 - 4.1.6.4. System shall integrate data sources via various APIs in real time during pilot test period.

4.2. Rules and terms of contractual commitments

- 4.2.1. Supply of the Services shall last for 12 months and start on the day the Contract is signed.
- 4.2.2. Contract can be extended by 1 month in case of delay of execution of contractual commitments. The extension of the Contract shall be legalised with a signed document by both parties.
- 4.2.3. In case of connectivity or other issues on the Supplier's side that would cause a disruption in supply of Services, Supplier is obligated to inform the Purchaser about the event and restore full functionality of the System. There shall be three categories of these events:

- 4.2.3.1. Critical error (critical incident) – when the System does not work or does not provide any result. Response time – up to 4 business hours, time to resolve – up to 1 business day.
- 4.2.3.2. Error (high or moderate incident) – when the System operation is limited: there was a gap in operation, but it is functional again. Response time – up to 1 business day, time to resolve – up to 2 business days.
- 4.2.3.3. Fault (small incident) / Inquiry – when an error or a bug is identified but its effect on the result is isolated and compensated. Response time – up to 3 business days, time to resolve – up to 5 business days.
- 4.2.4. Supplier shall have a working helpdesk system for registration of questions and incidents.

4.3. Provision of documents during contract realisation

- 4.3.1. All the procurement documents can be submitted, and Contract can be signed either in Lithuanian and/or English.

5. PURCHASER LIABILITY

- 5.1. Purchaser is obligated to provide the necessary data and documents to the Supplier in 5 business days after the signing of the Contract.
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