Terms of Reference

Regarding

**Geographical Information System (GIS) development in EUACI’s partner cities: Chervonohrad and Zhytomyr**

Date: 26-Sept-2022

## Background and context

**The European Union Anti-Corruption Initiative (EUACI)**

The European Union Anti-Corruption Initiative (EUACI) in Ukraine is a joint EU and Government of Denmark financed programme aimed at supporting Ukraine in its efforts to reduce corruption at the national and local level through the empowerment of citizens, the civil society, businesses and state institutions. In May 2020, the EUACI entered into its phase II that runs till mid-2024.

The EUACI has three components supporting anti-corruption reforms from different angles:

Component 1, supporting key state anti-corruption agencies in improving their effectiveness and independency;

Component 2, supporting selected integrity cities in the efforts to strengthen their integrity, transparency and accountability; and

Component 3, supporting Ukraine’s civil society, media and business community in the efforts to increase awareness of and engagement in anti-corruption activities.

This specific assignment concerns the EUACI’s support to integrity cities (Component 2). The component aligns with the government’s encouragement of the adoption of e-government functions by using ICT to improve the efficiency, effectiveness, transparency and accountability of government at all levels.

In this context, the EUACI is seeking a Contractor that can work closely with the EUACI and its partner cities in GIS development and implementation.

These Terms of Reference (ToR) provide more details about the assignment.

**The partnership with Integrity Cities**

The five integrity cities with which the EUACI has entered into a partnership under its component 2 are: Chervonohrad, Chernivtsi, Mariupol, Nikopol, and Zhytomyr. In 2022 the Mykolayiv city council became the new partner.

During phase 1, the EUACI worked with these cities to strengthen their systems and tools to enhance integrity, transparency, and accountability. The partnership will continue in the current second phase of EUACI, focusing on the continued development of the various integrity tools launched during phase one.

One of the integrity tools promoted during the first phase was the Geographic Information System (GIS).

**The Geographic Information System (GIS)**

The GIS designed with the Іntegrity Cities aims to capture, store, analyze, manage, and present all types of spatial or geographical data. The GIS as a tool for strengthening integrity rests on the idea that a well-designed GIS (based on actual, high-quality, standardized geospatial data) can be a strong foundation for more efficient and effective municipal management of public resources, and increasing citizen engagement and participation in public planning and decision-making processes.

A reason for this potential is that GIS makes it possible to combine the simultaneous analysis of statistical-, demographical-, and geographical data; and for excellent visualization of the results. In particular, the ability to visualize the results of often very complex analyses of large amounts of data has been shown to help decision-makers and ordinary citizens better understand these results and how public plans and decisions will affect them.

Hence, a “Geo-Portal” understood as a publicly accessible module of geo-information system can help increase transparency and accountability on municipal management because it is quite difficult to manipulate open map data and facilitate increased citizen awareness of and e-participation in public planning and decision-making processes.

The EUACI supported the five partner cities in developing and implementing GIS modules during phase І. This has resulted in functioning GIS in two cities that now needs to be updated and developed in accordance with the requests of city councils and their executive bodies.

**Technical Assistance**

These Terms of Reference (ToR) are intended to meet the partner cities’ need for technical assistance with the development and improvement of GIS.

## Purpose

The purpose of the assignment is to provide a sound technical foundation for the EUACI's support to its partner cities in further development and expansion of GIS functionality.

The assignment aims to provide services for the GIS development for Chervonohrad and Zhytomyr.

## Objective

The objective of the assignment is to provide services required for the GIS development in the five partner cities according to the technical requirements annexed to this Terms of Reference.

## Scope of work

The scope of work includes all the activities necessary to ensure the achievement of the objective above, including, but not necessarily limited to:

**Kick-Off:**

1. Present updated work plan and assignment implementation strategy and considerations to EUACI Component Team during Kick-Off meeting.

**GIS modules development**:

1. Based on the technical requirements (Annexes 1-2) approved by Integrity Cities to draft terms of references (technical specification) for the development of each GIS subsystem (module) for five partner cities;
2. Present terms of reference (technical specifications)the to EUACI Component Team and representatives of Integrity Cities;
3. Develop the beta-version of subsystems (modules) of GIS, and create databases based on the approved detailed technical requirements (technical specification) for each city, namely:

|  |  |
| --- | --- |
| Zhytomyr | “Green zones management” |
| “Landscaping and sanitation” |
| Chervonohrad | "Electronic cabinet of surveyor"  “Analytical module” |

1. To organize the process of testing the beta versions of the developed subsystems (modules) in the city councils and address the comments received from the municipalities at the testing stage
2. Update the subsystems (modules) based on the test results and transfer the subsystems (modules) to cities;
3. Collect data for subsystems (modules) from municipalities, clean the data received and geocode it, refine it and upload in subsystems;
4. Provide training to local officials on how to work with, and administer the developed subsystems (modules);
5. Conduct a basic technical assessment of the developed subsystems (modules), develop and present basic technical assessment report to EUACI Component Team and partner cities;
6. Prepare technical documentation, instructions, manuals, prepare training videos and provide them to municipalities.

**Presentation of developed GIS:**

1. Participate in public presentations of the developed GIS subsystems (modules) organized by EUACI and Integrity Cities.

## Deliverables (output)

The deliverables are presented in Table 1 below along with a tentative timeline.

All deliverables are expected to be delivered in soft and hard copies unless otherwise agreed upon. Soft copies shall be submitted via email to the indicated EUACI contact person.

**Table 1: Summary of deliverables/outputs and the tentative timeline for delivery.**

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| --- | --- | --- | --- |
| **#** | **Deliverable/Output** | **Timeline** | **Note** |
| 1 | **Updated work plan**, showing the timing for the GIS development with detailed terms of reference, beta-version development, testing, training and public presentations | 2 weeks after the contract signing | To be submitted to the EUACI contact person by email during the Kick-Off meeting ahead of the presentation. |
| 2 | **Detailed terms of reference (technical specifications)** for the GIS development and approved by partner cities | 8 weeks after contract signing | These should be 4 separate detailed terms of reference presenting how the GIS subsystems (modules) shall function, reflecting both business processes agreed with cities and technical requirements. |
| 3 | **Data management:** сollection, processing, cleaning, geocoding and uploading of data in the GIS module | 3 months after detailed terms of reference approval | It should be formed qualitative and structured sets of geospatial data based on data transferred by partner cities |
| 4 | **The beta-versions of 4 GIS subsystems (modules)** are developed for each of the partner cities and data are collected, refined, geocoded and uploaded in subsystems. | 6 months after detailed terms of reference approval | The beta-versions of 4 GIS subsystems are developed for each city and presented to them.  Note: All subsystems should be developed according to the detailed terms of reference (specifications) based on technical requirements and approved by EUACI and cities. |
| 5 | **The updated version of 4 GIS subsystems (modules) installed on city servers and put into operation (productive)** | 6 months after detailed technical reference approval | After testing the beta version of the developed subsystems (modules) and addressing the comments received from municipalities, the updated version of 4 subsystems should be installed and configured on the municipalities’ servers, all documentation provided. |
| 6 | **The basic technical assessment of the developed GIS subsystems (modules) is conducted.** | 1 month after the beta version is developed and tested | The basic technical assessment of the developed and installed GIS subsystems (modules) in Integrity Cities is conducted, and a report is provided to EUACI staff and Integrity Cities. |
| 7 | **Preparation of training plan and at least 4 training sessions provided** for public officials responsible for working in developed subsystems (modules)of the partner cities | 1 month after the beta version is developed and tested | A contractor is expected to develop training materials and a plan that includes at least 4 training sessions for public officials responsible for working in GIS subsystems (modules).  A training plan is a subject for EUACI and municipalities approval. Training sessions are conducted, the list of participants and trained officials are provided to the EUACI staff with training materials. |
| 8 | **Public presentation of GIS** in partner cities. | 1 months after the subsystems were installed and configured on municipalities’ servers | EUACI will organize the public presentations of the developed subsystems (modules) in each city.  A contractor is expected to contribute to developing presentation materials and delegate a representative for presentations. |

The timelines indicated in the table above are indicative. The contractor will reflect on and update the timelines for different activities during the preparation and updating of the contractor’s work plan. During the Kick-Off meeting with the EUACI Component Team, the contractor’s updated work plan will be discussed, including the proposed timeline for the different activities and the submission of deliverables.

## Timing

The expected duration of the assignment is 9 months, with a tentative start in October 2022 and completion in June 2023.

## Methodology

The contractor will work under the supervision of the EUACI Team Leader for Component 2.

Based on the consultations with the EUACI staff and the needs identified in the documentation provided from partners, the contractor will prepare the work plan and send it to the EUACI Team Leader for Component 2 for approval at least a full work week ahead of time.

The contractor's work plan shall be output-based, specifying the outputs the Consultant will be delivering or contributing to, the activities carried out, and the input required in terms of workdays.

**Table 2: Tentative activity phases and estimated required workdays**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **Activity** | **No. of days** | **Note** |
| 1 | Preparation of work plan | 2 | Including analysis of technical requirements and communication with partner cities |
| 2 | Development of detailed terms of reference (technical specifications) | 9 | Including analysis of technical requirements, visits to partner cities, collection of requests from partner cities, approval of final versions of ToR by executive bodies of city councils |
| 3 | Development beta-versions of 4 GIS subsystems (modules) | 30 | Including building architecture, design, coding and basic testing |
| 4 | Collection, processing, geocoding, cleaning and uploading of data in the GIS modules | 26 | Including data collection, data analysis, data processing, data cleaning, data geocoding, data analysis, testing and feedback from partner cities |
| 5 | Development of final version of 4 GIS subsystems (modules) and launch on city servers, put into operation (productive) | 30 | Module upgrades including testing and collected feedback from partner cities |
| 6 | Conducting a basic technical assessment of the developed GIS subsystems (modules) | 9 | Including general external independent code quality assessment, user-friendly design requirements, general analysis of product compliance with basic cyber security standards and preparation of a detailed report |
| 7 | Development of training plan and provide 4 training sessions | 12 | Including curriculum preparation, training materials and conducting offline seminars in cities |
| 8 | Public presentation of GIS in partner cities. | 3 | Including preparing presentations for each city and participating in offline public events in each city |
|  | **Total** | **121** |  |

The contractor should appoint a responsible project manager for communication with the EUACI Component Team and responsible managers for communication with each of two cities.

The contractor reports monthly about the work plan implementation and plans to EUACI Team Leader for Component 2.

## Payment

Payment will be made in a maximum of two instalments.

The first instalment, representing a maximum of 30% of the total contract value, will be made after receipt of the contractor’s updated work plan.

Second, and final payment will be made upon receipt and approval by the executive bodies of city councils and all other supporting documents, including a Final Invoice.

Payment will be based on the actual days worked, the agreed daily fee rate and the expenses incurred by the contractor during the period. Payment will require verification of completion of deliverables and approval by the Team Leader for Component 2 of the Contractor deliverables and expense outlay.

Travel costs and other reimbursable costs will only be accepted if they are in compliance with the guidelines in the contract.

## Qualifications and Competence of Staff

The assignment described above is expected to be carried out by a qualified Contractor.

The contractor has to meet a minimum of the following requirements:

* official registration of legal entities or individual entrepreneurs according to the legislation of Ukraine;
* minimum 3 years of experience with GIS projects, including developing and implementing GIS for local self-governments, territorial communities, business process reengineering;
* minimum 6 successfully implemented GIS projects in the field of GIS for local self-governments;
* minimum 3 years of experience from working with GIS/Spatial technologies and leading the development of GIS-based software projects; and
* minimum 2 years of experience with training for public officials in GIS/spatial technologies and providing consulting services to users on the use of GIS software;
* minimum 3 years of experience of cooperation with local self-governments on the development and implementation of software;
* the level of qualification of the specialists involved in the project (summary of the involved specialists) should be high (minimum master degree in computer science, GIS or relevant field);

The contractor's core team shall include the following profiles:

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| --- | --- |
| **Position** | **Team lead, project manager** |
| 1-General Qualifications | * 4 years of experience as a team lead in GIS development projects or/and project management * Proven experience with providing technical assistance, services to government agencies or local self-government |
| 2-Adequacy for the assignment | * Experience in leading teams of a similar nature in a relevant technical field * Experience in implementation of GIS-based assets and database management systems and the application of geospatial technologies and public service provision |
| 3-Experience in the region and language | * Relevant working experience in the region. * Basic English language communication skills (verbal and written, A2-level), fluency in Ukrainian |

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| --- | --- |
| **Position** | **GIS specialist** |
| 1-General Qualifications | * Master degree in geoinformation systems and technologies or relevant * 3 years of experience of GIS development and implementation |
| 2-Adequacy for the assignment | * Experience in handling an assignment of a similar nature in a relevant technical field * Experience in implementation of GIS-based assets and database management systems and the application of geospatial technologies and public service provision. |
| 3-Experience in the region and language | * Relevant working experience in the region. * Basic English language communication skills (verbal and written, A2-level), fluency in Ukrainian |

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| **Position** | **Geoinformatics expert** |
| 1-General Qualifications | * Master degree in geoinformation systems and technologies or relevant * 4 years of experience of GIS development and implementation |
| 2-Adequacy for the assignment | * Experience in handling an assignment of a similar nature in a relevant technical field * Experience in implementation of GIS-based assets and database management systems, and the application of geospatial technologies and public service provision. |
| 3-Experience in the region and language | * Relevant working experience in the region. * Basic English language communication skills (verbal and written, A2-level), fluency in Ukrainian |

## . Estimated budget and level of effort

The maximum budget available for this assignment is **DKK 220,770 (equivalent to approx. EUR 29 633,50)**. This amount includes subsistence allowance for field work in the partner cities as well as costs related to local travel, and other project-related costs such as for example audit, basic technical assessment and printing.

Proposals, where the Contract Price offered, exceed the above maximum budget will be rejected.

## Management

The contractor is responsible for the timely delivery of the outputs required in the required quality and quantity for the internal management of the contractor’s team.

The EUACI will appoint a contact person responsible for the management of this assignment from the side of the EUACI, including for any correspondence with regard to the implementation of the assignment and for issues related to the agreement between the contractor and the EUACI. The contractor will report to and ensure that the appointed contact person is copied in on all relevant communication related to the assignment, including correspondence with all the five partner cities and any other stakeholders.

## Background documents

The key background document is the Programme Document for EUACI, Phase II, and specifically the draft Development Engagement Documents (DEDs) for the five integrity cities.

In the preparation of documents, the contractor is obligated to take into account the related local regulations about the operation of GIS, national legislation in the field of geospatial data infrastructure, and standards of the national legislation in the field of open data.

**Annex 1** Technical requirements for development GIS for Chervonohrad city council and Zhytomyr city council

1. Bidding details

The bidder must submit the following information to be considered:

* + - 1. A brief profile (maximum two pages) of the company;
      2. A list of assignments (projects), similar to this project, implemented in the last five years;
      3. The CVs (no more than three pages for each person) of the core team members who will be involved in the project;
      4. Provide a detailed description of the methodology and scope of work;
      5. Provide a budget for the services in EUR, inclusive of all taxes or other such charges.

**The deadline for proposals submission is October 9, 2022**

1. How to apply

The proposals shall be submitted within the above deadlines to the e-mail: [dmynai@um.dk](mailto:dmynai@um.dk) indicating the subject line “GIS development in Chervonohrad and Zhytomyr”.

Bidding language: English.

Clarification questions

Questions for the Request for Bid should be addressed to Dmytro Naidin, [dmynai@um.dk](mailto:dmynai@um.dk) cc: [tarslu@um.dk](mailto:tarslu@um.dk) no later than September 30, 2022 16:00 Kyiv time.

1. Evaluation criteria

Bids will be evaluated in accordance with the criteria provided below:

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| --- | --- | --- |
| **#** | **Criteria** | **Weight** |
| 1 | Portfolio of projects successfully completed in municipal and government GIS development | 40% |
| 2 | Core team members - relevant experience, skills and competencies | 25% |
| 3 | Proposed methodology | 10% |
| 4 | Proposed budget | 25% |

Annex 1

Technical requirement for GIS subsystem “Green zones management” and “Landscaping and sanitation” in Zhytomyr City Council

Content:

1. Introduction
2. Technical requirements for GIS subsystem “Green zones management”
3. Technical requirements for GIS subsystem “Landscaping and sanitation”
4. Nonfunctional requirements for all GIS subsystem
5. Technical requirement for data collection, processing, refining and uploading
6. Technical requirements for trainings for internal GIS subsystem users
7. Technical requirement for technical and consultation support of GIS subsystem in Zhytomyr City Council
8. Stages of GIS subsystem implementation in Zhytomyr City Council

## Introduction

These technical requirements for subsystems “Green zones management” and “Landscaping and sanitation” is developed as a part of the Memorandum of Understanding between Zhytomyr City Council and the EU Anti-Corruption Initiative (hereinafter - EUACI), approved by the city council decision №195 in June 17, 2021. In this Memorandum one of the results is identified the development and implementation of additional modules (subsystems) of geographic information system. These subsystems will be developed within the functioning of the existing geographic information system, will be displayed on the existing official geoportal of the Zhytomyr City Council.

The introduction of new GIS subsystems requires standardization of the workflow in Zhytomyr City Council, communal enterprise, institutions, organizations, vectorization, and digitization of materials to create a cartographic basis for subsystem development. Training of responsible city council employees is also a part of the new GIS subsystem implementation.

The document consists of terms of reference (ToR) for subsystem development and ToR for collecting, processing, and uploading data to GIS subsystem, training public officials, and technical support.

* 1. **1.1. General software requirements**

The subsystem should be developed using the principles of the concept of Free and Open Source Software (FOSS), extended by the paradigm of humanitarian responsibility (Humanitarian-FOSS) and includes the following requirements:

1. Focus on solving critical tasks to increase the speed of service delivery. High focus on quality, reliability, and stability of the GIS, elimination of data loss and duplication.
2. High requirements for the organization of the user interface (usability), minimum requirements for the qualifications of users and the need for their training.
3. Ensuring the required level of personal data protection in accordance with the Data Protection Law.
4. Ensuring transparency of access to information.
5. Ensuring software components reservation.

All components that will be implemented and shipped under this procurement must be provided under the terms of the GPL (http://www.gnu.org/licenses/gpl.html) and ensure the openness, transparency, and availability of product codes based on the OpenSource ideology (free software license).

**1.2. Software requirements**

The software should consist of:

* system software, based on existing GIS software;
* application software.

The software should reflect the specifics of the functional tasks of users and provide:

* support for generally accepted international standards for open systems;
* compatibility and integration;
* support for operation in heterogeneous hardware and software environments;
* built-in error protection mechanism and integrity maintenance.

System software includes:

* operating systems;
* database management system;
* application servers.

The result of subsystem development should be installed on existing servers, and should not be accompanied by the installment of additional operating systems, databases, application servers.

The system software decisions must be technically and economically justified in terms of integrity and reasonable completeness of the software application and its components for the purpose and minimize the cost of further maintenance.

The application software should include software that is developed and configured during the subsystem's development. Based on the results of development and implementation, the software code of the application software in electronic form and non-property, property rights must be transferred by the Contractor to the Customer.

The application software development should be carried out with the help of modern software engineering tools to design and generate distributed databases (CASE-tools).

**1.3. Requirements for technical and information architecture**

**1.3.1. Basic requirements**

Three-tier architecture: Database Management System/Database (DMBS), Application server, Thin client. All components (including DBMS and Application Server) must be free of charge based on freely distributable software. Preference may be given to components with public (open) source code. The software assumes presence in delivery of a DBMS and adjustment of work with it. The terms of delivery of the database should be without any paid types of licensing.

A thin client is a web interface for users to work through a web browser (the solution must be compatible at the time of implementation with the late versions of the most popular browsers).

The interaction between the application servers of individual subsystem must be performed via the HTTPs protocol.

The interaction between the application server and the client must be performed via the https (tls) protocol.

Service-oriented technology should support geospatial data storage (topographic maps and plans, remote sensing data, profile geospatial data of application modules) and ensure the publication of this data in workplaces with limited hardware resources.

For e-maps and online applications software run an open source library using JavaScript, HTML 5 as a semantic markup language, CSS3 as a stylization language, and Bootstrap 3 as an adaptive layout, or the equivalent distributed with a free license except for Adobe Flash or Microsoft Silverlight technologies should be used.

The application server must be developed on Node.js using the Express framework or a similar input/output non-blocking platform that executes asynchronous requests to build high-performance networking applications that are distributed under free software license.

Basic mapping, cartography, analysis and data management tools should be ready to use immediately after the launch and easy to set up. Interfaces, dialogues, messages, forms of issuing results, documentation of workstations and administrators should be formed only in Ukrainian.

1.3.2. Requirements for the components

All components (subsystem) must have a unified web user interface of automated workstations. All web interfaces must be unified to work and perform on personal computers, tablets and mobile devices.

Each subsystem that is involved in the formation, filling, editing and maintenance of data must contain mandatory sections:

* register of objects;
* object card;
* editing forms;
* cartographic visualization on the map (for objects that have spatial localization).

The register of objects should provide:

* control the display of columns with information in the tabular register;
* page-by-page display of data in the tabular register (for registers where the number of objects exceeds 100 pieces) to minimize the hardware resources;
* control the display of the number of objects within one page (example: display on one page of 10, 20, 50, 100 objects)
* export of information about registry objects in xls, csv or other agreed with Customer format;
* search for objects by text query;
* search query should be stored and saved in the address bar of the web interface to allow sharing the selected information with other users of the system.
* selection of objects (filtering) with the following capabilities:
  + date range filter (for data containing date format),
  + drop-down list filter (for directory-generated data),
  + checkbox filter for selecting several options (for data generated on the basis of the directory),
  + numeric range filter,
  + filter with the choice of spatial coverage (for registers that contain spatial localization),
  + actions with the selected filters should be stored in the address bar of the web interface to provide the ability to share the selected information with other users of the system.
* editing the data of the table register when you click on a cell in the table,
* color gradation of registry objects according to status.

The object card must provide:

* display all the information stored on the object in the database;
* display the spatial position of the object on the map;
* display attached photos (photo galleries) and other attachments;
* the option to attach an unlimited number of documents;
* the option to comment on the object;
* display information on the change of the object (by whom and when the object was created, who and when last edited it), log change should be available;
* the option to generate a document about the card object with all available information;
* interface elements such as horizontal and vertical "tabs", "accordions", image gallery and others should be used to display a large amount of information on the object card.

The editing form should provide:

* entering the following category of information: text information, directory information, numerical information, object geometry, images, files;
* the information in the form should be divided into groups by the appropriate title;
* drop-down lists in the form should be formed on the basis of directories or other registers in the system;
* fields for entering numbers must be controlled for entering inappropriate characters;
* drop-down lists, which are formed on the basis of a significant amount of information, should be downloaded only at the request of the user with notification about the size of the file, and not in full (to reduce the hardware load on the system);
* the form element for entering the spatial position of the object must be able to load the geometry of the object from a third-party file, and it must be possible to export this information to a file.

Mapping of registry objects should provide:

* display objects on the map as point, linear, or polygonal objects;
* display point objects with icons defined by the Customer;
* display of registry colors in different colors according to the status;
* selection of objects on the map using a system of filters;
* building buffers around registry objects within the map;
* construction of heat maps of the density of objects on the map or other categories defined by the Customer;
* setting the transparency of the display of registry objects for use in visual comparative analysis with other registries;
* selection of an object on the map to obtain information about it (register objects on the map must be interactive);
* save information about the selected registry object layer and selected filters in the address bar of the web interface.

## Technical requirements for the subsystem “Green zones management”

### **2.1. Goals and purpose of the subsystem “Green zones management”**

The subsystem implementation is for improvement of efficiency and transparency of the city council, its executive bodies, utility companies in order to ensure quality management of green areas, providing relevant and objective information about the state of green zones and plants, work, green zones maintenance.

The subsystem must collect, process and analyze data on the state of green zones and plants, types of work performed over certain period of time, accounting and management of data on green plants, automation of accounting and management of data.

The subsystem implementation will provide reliable data on quantitative and qualitative characteristics of green plants in the city; determine the compliance of the activities of the owners of green areas with the established functional purpose of the territory; create a database for better management of green areas; help to monitor and control over the preservation of plants by enterprises, organizations and institutions; use of subsystem data for development of programs, activities of development of green zones; planning of green zones reconstructions.

The main task of registers, maps is to increase the efficiency of utility companies, avoid unnecessary costs, competent allocation of resources in everyday work and unusual situations.

**2.2. Subsystem structure**

The subsystem structure should include a data storage subsystem (file storage) and a database subsystem (relational storage of dynamic content), a topographic plan 1: 2000 (1: 500), external services such as Google Maps, Bing Maps (or equivalent) for work with maps. The design of the subsystem must be in the style of the implemented Zhytomyr city geoportal https://gis.zt-rada.gov.ua/, in soft tones and using HTML and CSS languages.

The subsystem “Green zones management” structure belongs to the category that must remain relevant for an extended period. Static materials are technically implemented in the form of HTML pages containing text, graphics and multimedia components. The Contractor develops tools for work and interaction with the subsystem, data storage (file storage) and database subsystem, process and load of data necessary for the operation of the subsystem. Zhytomyr City Council constantly updates data (text, graphics, and multimedia components) of the subsystem.

The subsystem consists of an administrative and a public part. The administrative part is designed to maintain databases, input data and work, planning, control and monitoring the work of structural units of the executive bodies of the Zhytomyr City Council and others responsible for the subsystem. The public part of the subsystem is on the official geoportal of the Zhytomyr City Council. In addition to viewing data in registers, maps, and data access, access to data via API and download data in a machine-readable format, it is possible to engage with citizens.

The administrative part operates data input data on green areas and plants, provides options for monitoring and control, digitization and automation of management, governance, planning and reporting processes, citizens engagement.

The subsystem consists of next modules:

**Register of green zones**. The register consists of a list of parks (parks of culture and recreation, for sport, children, dendrological, historical, national, memorial, ethnographic parks-museums, historical, zoological etc.), gardens, boulevards, groves, hydroparks, forest parks, meadow parks, city parks. Each of the elements of the register contains a detailed description of the green zone.

**Register of green plants**. The register contains information on types, age, quality and quantity, documents. The register of green plants should contain typical lists of trees, bushes, lawns, stumps, flower beds, borders and natural monuments with a detailed description. All green areas should be described and data on replacement value should be in the register, together with information on the balance holder, contacts, unique identifier, type of use of the land on which green plants are located.

**Register of small architecture forms of green infrastructure**. The register contains information on types, state, documents of forms and additional detailed information linked to the register of green zones.

**Register of documents**. The register consists of acts of inspections, permits, decisions (including on commissions), orders, schemes, passports (optionally for addition - the list and plans of works, current, capital repairs, technical specifications and contracts, acts on their performance, technological cards) with reference to objects, elements.

**Inspection module**. This is a database of applications, inspection reports, draft and decisions on the removal of green plants, orders with replacement value.

**Citizen’s engagement module**. The module provides an option to track and respond to reports from citizens received through the geoportal (there also should be an option to integrate it with the e-reception) on 1) detection of green plants, areas, small architecture forms of green infrastructure that are not in the registers, 2) violations of the rules of maintenance, 3) detection of errors in the register. The register maintains a list of messages, responsible for reacting on messages and stages of response to them.

The module "**Planning**" contains data on planning and schedule of works on management of green areas in Zhytomyr (types of works and periodicity of performance on sites (every week, every third week, etc.), and also an opportunity to specify days of week Mon, Tue, Wed, Thu, Fri, Sat, Sun are entered), routes, seasonality, responsible, contact details).

The subsystem includes the **reporting module** to generate reports based on forms provided by the Customer, download data from the system using filters.

All subsystem registers must be interconnected and interoperable, unique identifiers introduced and used.

It should be possible to download (attach) files in the format csv, xls, xlsx, docx, pdf, jpg, png (photos, decisions, orders, resolutions, laws, acts (inspections, work performed), as well as provide additional fields for downloaded documents: number, date, name, type of document (list of values, for example, decision, act, order, resolution).

The subsystem modules should support prompt and high-quality input of data on quantitative and qualitative characteristics of objects, including with the help of mobile devices, uploading photos and documents with the possibility of fixing them to the object, changing and assigning object status in the relevant registers, automation of report generation, data input with photofixation, geolocalization using gps.

**2.3. Subsystem tasks**

- formation of the register of green zones, plants, small architecture forms, documents according to the Rules of the maintenance of green plants in the settlements of Ukraine;

- convenient access to relevant, structured and high-quality geospatial data on ecological development and green areas;

- automation of management and accounting of green zones and plants;

- digitization of materials for inventory of green zones and plants;

- monitoring the state of green plants;

- ensuring appropriate control over the cutting and other procedures with green plants;

- access to data on search results of trees and permits for their latest edition;

- automation of reporting processes, preparation of statistical data on the state of green plants and zones in Zhytomyr.

**2.4. Legal framework of the subsystem “Green zones management”**

● Law of Ukraine “On Information”

● Law of Ukraine “On Access to Public Information”

● Law of Ukraine “On Electronic Documents and Electronic Document Circulation”

● Law of Ukraine “On Personal Data Protection”

● Law of Ukraine “On Local Self-Government in Ukraine”

● Order of the Ministry of Regional Development “On approval of the Standard rules of landscaping”

● Instruction on accounting of green infrastructure objects: Order of the State Committee for Construction, Architecture and Housing Policy of Ukraine № 226, 24.12.2001.

● Rules for maintaining green zones

● Procedure for removal of trees, bushes

● The Methodology for determining the replacement value of green plants

**2.5. Functional roles of the subsystem**

The administration system should provide configuration access rights for standard functional roles.

|  |  |
| --- | --- |
| Functional role name | Description and access rights |
| Responsible for the subsystem | - ensuring the maintenance and updating of registers of the subsystem  - editing the registers of the subsystem, requests for updates if necessary  - generation of reports based on subsystem data  - administrating of citizens requests and appointment of responsible for responses and checking information in requests |
| Responsible for monitoring | - data input in registers  - data correction, verification  - reviewing and action on citizens requests regarding data in registers |
| External users | - View data on the geoportal  - Opportunity to register on the geoportal  - Ability to leave a message with geolocation about green zones, green plants, small architecture forms of green infrastructure (both for registered and non-registered users)  - Download data  - Access to data through ARI |

**2.6. Basic business processes**

**Data input on green zones, plants, small architecture forms of green infrastructure in the subsystem**

This business process involves the work of persons responsible for monitoring of data input on green zones, plants, forms in the subsystem "Green zones management" according to the forms approved by the Customer with geolocation, photos and other supporting documents. Responsible for monitoring can make changes to data based on the results of surveys, citizens' reports, and additional inspections. All changes are recorded in the log. The data and changes are verified by responsible for the subsystem.

**Register administration and data verification**

The responsible for the subsystem are responsible for the up-to-dateness, accuracy and completeness of the data in the subsystem. They verify and approve the information entered by those responsible for monitoring. If data does not meet the needs of the subsystem, those responsible for the subsystem have the opportunity to notify the person responsible for monitoring (notification in the administrative part of the relevant register) about the need to verify, correct data. The person responsible for monitoring receives the notification and is obliged to respond and make appropriate changes within the set time limit. The data in the subsystem is also updated.

**Citizen engagement**

The subsystem "Green zones management" allows citizens to leave messages on the public part of the subsystem (through the official geoportal of the Zhytomyr City Council and in the e-reception). Citizens have the opportunity to register, track changes that occur with green zones, plants that are in the subsystem, receive notifications to the e-mail specified during registration about the tracked objects, as well as report inaccuracies in the registers, the problem with green plant, zone, small architecture for of green infrastructure, leave a proposal. Unregistered users can leave messages in the subsystem. Unregistered users do not receive notifications, can not track the elements of the subsystem.

Citizens can upload photos and documents together with text information in their messages.

**Responding to citizens' messages**

The citizen engagement module is combined with an e-reception, where all messages are processed and sent to those responsible for monitoring to verify the specified information. Information about the progress of the message is synchronized in the subsystem. Responsible for monitoring points the stage of review on the notification (pending, considered, rejected). Based on the results of the message, the system generates a response to the registered user, which is sent to the e-mail specified by him. The response template is developed by the Customer and provided to the Contractor for implementation.

**Planning**

Data on plans and schedules of work on the maintenance of green zones, plants are collected in the subsystem. These plans and schedules are input by responsible for monitoring (in certain cases - responsible for the subsystem) into the subsystem and updated with changes in plans and schedules.

**Inspection**

All requests and actions for inspection of green areas, its removal are input into the subsystem with reference to green zones if there is such. Based on the results of the commission's decision, appropriate changes are made to the subsystem data within the terms specified by the regulations.

**Reporting**

The subsystem provides generation of reports according to the forms provided by the Customer, downloading of data using filters.

The subsystem must provide convenience and intuitive management of all business processes. Details and specifics of each of the processes should be agreed between the Customer and the Contractor.

**2.7. Subsystem interfaces**

2.7.1. Public part structure of the subsystem

|  |  |  |
| --- | --- | --- |
| № | Interface | Basic components |
| 1 | Green zones | List of green zones with the main characteristics with the list in each zone of green plants, documents concerning a green zone, plans-schedules of the maintenance, responsible for the maintenance, contacts, working hours |
| 2 | Green plants | List of green plants with links to green zones, if any, with all characteristics, documents, responsible for maintenance, contacts |
| 3 | Small architectural forms | List of forms with links to green zones if any, all characteristics, documents, responsible for maintenance, contacts |
| 4 | Inspection acts | List of inspection acts with links to green plants and commission decisions. |
| 5 | Citizen engagement | Part of geoportal “Citizen notification” on the page of “Green zones management” where citizens can register or without registration leave a message about the state of a green plant, zone, form, add photos, geolocation, propose some solutions. Registered users can review their requests, reaction, follow plants, zones and receive notifications about any change there. |

If the green plant is removed by the decision of the relevant commission, this is noted on the map and in the register. Green plants are displayed on the public map in different colors depending on their condition (excellent, good, satisfactory, emergency, for removal). The same information display is in the administrative panel, as well as in the form of a message to an external registered user after registration to facilitate the geolocation of objects and messages.

Additional components of the interface, graphic, color display, marks for objects display should be discussed and agreed with the Customer during the detailization of the requirements and implementation of the subsystem.

The public part of the subsystem provides:

* access to registry data,
* access to the card with display of register information (with information card),
* access to data through an open API,
* the option to put several marks on the map at the same time,
* the option to leave a message about the objects (zone, plant, form), add photo, document
* the option to follow the situation with a green plant, plants for registered users, receive notifications on e-mail.

2.7.3. Administrative part structure

|  |  |  |
| --- | --- | --- |
| № | Interface | Basic components |
| 1 | Green zones | List of green zones with detailed characteristics defined by the Customer |
| 2 | Green plants | List of green plants with detailed characteristics defined by the Customer |
| 3 | Small architectural forms of green infrastructure | List of small architecture forms of green infrastructure with detailed characteristics defined by the Customer |
| 4 | Documents | List of documents, protection agreements, decisions, passports, orders, schemes, plans of zones and plants, forms, relevant documents. |
| 5 | Inspections | List of acts, decisions regarding green zones. |
| 6 | Citizen engagement | List of messages from citizens (complaint, proposal, error, new element) received through the geoportal with a notification of responsible for the response and a notification on the response stage. Link to green plants relevant to messages. |
| 7 | Planning | List of planned works, schedule for maintenance and development of green zones and plants |
| 8 | Reports | List of forms for reporting, list of created reports. |

Additional components of the interface, graphic, color display, marks for display of objects are discussed and agreed with the Customer during the detail of the technical task and implementation of the subsystem.

**2.8. Functions of the subsystem**

The “Green zones Management” subsystem must provide:

- for the administrative part:

1) different types of access to the subsystem for data input and maintaining a database;

2) option to input and edit data by responsible for monitoring from mobile devices, tablets, setting geocoordinates, landfills, to take photos in the system, upload documents, diagrams, maps;

3) to use the base map to enter and maintain registers with maximum detail and accuracy of the location of objects;

4) for responsible for the register to assign tasks to responsible for monitoring (the list of tasks is determined by the Customer at the stage of detailing the terms of reference);

5) to generate reports in the form specified by the Customer;

6) to download data from the subsystem, the generated filters;

7) to add categories to the registers as needed;

8) to overlay cartographic materials in the administrative panel (for example, the data of the passport of the green zone and the data of the cartographic basis);

9) automatically indicate the relevance of the data of each of the objects;

10) to plot several objects with the same characteristics (trees of the same type) on a map at the same or create several elements of the same type (forms) associated with one object (green zone).

- for the public part

## 1) to view the objects of the subsystem on the geoportal in the form of a map, objects must be visually marked and differ in key characteristics - green zones, plants (status), forms, inspection acts, plans, as well as downloadable registers in machine-readable formats;

## 2) access to subsystem data through the application programming interface (API);

## 3) external users can register on the geoportal by specifying an e-mail with confirmation via mail;

## 4) to leave messages about green areas, plants, forms through the geoportal (for registered and unregistered users);

## 5) registered can monitor the situation with the objects of the subsystem with a notification to the e-mail specified during registration.

## 3. Technical requirements for the subsystem “Landscaping and sanitation”

**3.1. Goals and purpose of the subsystem “Landscaping and sanitation”**

The goal of the subsystem "Landscaping and sanitation" implementation is to increase the openness of Zhytomyr City Council, improve access to information provided by structural units of the executive body of Zhytomyr City Council, utility companies, institutions and organizations of the communal property, improve the quality of public information, automation of processes and implementation of modern information technologies, providing the ability to manage data on the state of objects, elements and areas of landscaping and sanitation, types of work performed over a period of time, automation of accounting and data management of objects, elements and areas of landscaping, household waste management, recycling collectors, areas of responsibility for the landscaping in Zhytomyr and engagement with citizens regarding additional attention places.

Implementation of the subsystem involves the formation and updating of registers for various categories of objects and elements of landscaping, sanitation, formation and maintenance of a separate register of organizations that perform work to improve and maintain urban development, landscaping, sanitation, their area of ​​responsibility, formation and updating of household waste, secondary raw materials collectors registers, monitoring and control over the performance of works, maintenance of sanitary zones and cleaning zones, engagement of citizens to provide data about places of additional attention of Zhytomyr City Council.

The main task of registers, maps is to increase the efficiency of utility companies, avoid unnecessary costs, competent allocation of resources in everyday work and unusual situations.

The subsystem will provide reliable data on quantitative and qualitative characteristics of objects and elements of landscaping, identification of relevant areas of cleaning, monitoring and control of landscaping, sanitation, condition; use of subsystem data for the development of programs, activities for landscaping and sanitation of the city.

**3.2. Subsystem structure**

The subsystem structure should include a data storage subsystem (file storage) and a database subsystem (relational storage of dynamic content), a topographic plan 1: 2000 (1: 500), external services such as Google Maps, Bing Maps (or equivalent) for work with maps. The design of the subsystem must be in the style of the implemented Zhytomyr city geoportal <https://gis.zt-rada.gov.ua>, in soft tones and using HTML and CSS languages.

The subsystem “Landscaping and sanitation” structure belongs to the category that must remain relevant for an extended period. Static materials are technically implemented in the form of HTML pages containing text, graphics and multimedia components. The Contractor develops tools for work and interaction with the subsystem, data storage (file storage) and database subsystem, process and load of data necessary for the operation of the subsystem. Zhytomyr City Council constantly updates data (text, graphics, and multimedia components) of the subsystem.

The subsystem consists of an administrative and a public part. The administrative part is designed to maintain databases, input data and work, planning, control and monitoring the work of structural units of the executive bodies of Zhytomyr City Council and others responsible for the subsystem. The public part of the subsystem is on the official geoportal of Zhytomyr City Council. In addition to viewing data in registers, maps, and data access, it is possible to access data via API and download data in a machine-readable format, leave a message on geoportal about places of additional attention for Zhytomyr City Council.

The administrative part operates data input data on landscaping objects and elements, provides options for monitoring and control, digitization and automation of management, governance, planning and reporting processes, citizen engagement.

The subsystem consists of next modules:

**Register of landscaping objects**. This register contains detailed information about parks; monuments of cultural and historical heritage; squares, boulevards, avenues; beaches; cemeteries; other public areas with all documents, schemes, passports for these objects, balance holders, responsible for landscaping.

**Register of landscaping elements**. The register consists of detailed information on landfills, garbage collection sites and containers, public toilets, recycling point, urns, balance holders, responsible for landscaping. The register contains details on garbage collection schedules, systems according to the information provided by the Customer.

**Register of street and road network**. The register contains detailed information about streets, roads, lanes, ascents, passages (including inter-house), pedestrian and bicycle paths, all documents, schemes, plans, passports about these objects, balance holders, responsible for landscaping, maintenance.

**Register of container places and containers**. The register contains detailed data about containers and sites, specifics of collection, schedules, routes, responsible for collection, balance holders and other information specified by the Customer.

**Register of contragents**. The register contains detailed information on those responsible for landscaping, balance holders of objects and elements of landscaping and sanitation, contractors, managers.

**Register of areas of responsibility**. The register contains information about the territory (with addresses) for which contragent is responsible for the maintenance of landscaping objects, elements and sanitation. Areas of responsibility are also marked on the map. The register indicates the period of work to be performed by the contragent with a plan and schedule.

**Register of documents.** The register consists of acts of inspections, permits, decisions (including the commission creation), orders, schemes, passports (optional to add - list and work plans, current, major repairs, contracts, acts for their implementation with integration with E-procurement system Prozorro) with linkage to objects, elements.

**Register of control of landscaping**. This register provides a database of acts, projects and decisions on violations of the rules of landscaping.

**Citizen engagement module.** Citizens can leave a mark on a map via public part of geoportal and fill the online form (structure is provided by the Customer) and provide information about “Additional attention places”. They can add photos and other documents to the message. These messages are collected in the citizen engagement register and responsible for the subsystem can track messages, set tasks for responsible for landscaping and accounting.

The module "**Planning**" contains data on planning and schedule of works on sanitation of the city, landscaping works, maintenance of landscaping objects and elements (types of works and periodicity of performance on sites (every week, every third week, etc.), and also an opportunity to specify days of week Mon, Tue, Wed, Thu, Fri, Sat, Sun are entered), routes, seasonality, responsible, contact details).

The subsystem includes the **reporting module** to generate reports based on forms provided by the Customer, download data from the system using filters.

All subsystem registers must be interconnected and interoperable, unique identifiers introduced and used.

It should be possible to download (attach) files in the format csv, xls, xlsx, docx, pdf, jpg, png (photos, decisions, orders, resolutions, laws, acts (inspections, work performed), as well as provide additional fields for downloaded documents: number, date, name, type of document (list of values, for example, decision, act, order, resolution).

The subsystem modules should support prompt and high-quality input of data on quantitative and qualitative characteristics of objects, including with the help of mobile devices, uploading photos and documents with the possibility of fixing them to the object, changing and assigning object status in the relevant registers, automation of report generation, data input with photofixation, geolocalization using gps.

**3.3. Subsystem tasks**

- formation of the register of objects and elements of landscaping, sanitation, zones of responsibility;

- convenient access to relevant, structured and high-quality geospatial data on landscaping and sanitation;

- automation of the processes of proper management of objects and elements of landscaping;

- digitization of materials for monitoring objects and elements of landscaping, sanitation of the city;

- ensuring proper control over the maintenance of objects and elements of landscaping and sanitation;

- citizen engagement on additional attention places;

- automation of reporting processes, preparation of statistical data on landscaping and sanitation in Zhytomyr.

**3.4. Legal framework for the subsystem “Landscaping and sanitation”**

● Law of Ukraine “On Information”

● Law of Ukraine “On Access to Public Information”

● Law of Ukraine “On Electronic Documents and Electronic Document Circulation”

● Law of Ukraine “On Personal Data Protection”

● Law of Ukraine “On improvement of settlements”

● Law of Ukraine “On Local Self-Government in Ukraine”

● Law of Ukraine “On Waste”

● Law of Ukraine “On Environmental Impact Assessment”

● Law of Ukraine “On self-organization of the population”

● Order of the Ministry of Regional Development “On approval of the Standard rules of landscaping”

**3.5. Functional roles**

The administration system should provide configuration access rights for standard functional roles.

|  |  |
| --- | --- |
| Functional role name | Description and access rights |
| Responsible for the subsystem | - ensuring the maintenance and updating of registers of the subsystem  - editing the registers of the subsystem, requests for updates if necessary  - generation of reports based on subsystem data  - formation of the list of those responsible for accounting, landscaping to provide access to the registers of the subsystem  - reviewing messages from citizens and setting notification to responsible for accounting or landscaping if needed |
| Responsible for accounting | - data input into registers  - data correction and their verification |
| Responsible for landscaping | - data input on violations of landscaping rules  - access to data on objects, elements, areas of responsibility for prompt response |
| External user | - View data on the geoportal  - Download data  - Access to data via API  - Leave a message about the additional attention places according to the form provided by the Customer |

**3.6. Basic business processes of the subsystem “Landscaping and sanitation”**

**Data input in the subsystem about objects and elements of landscaping and sanitation**

This business process involves the work of persons responsible for accounting to enter data on objects and elements of landscaping in the subsystem with geolocation, photographs and other supporting documents in accordance with the forms approved by the Customer. Those responsible for accounting may make changes to the data based on the results of inspections. All changes are recorded in the log. Those responsible for the subsystem verify the data and changes.

**Register administration and checking data**

The employee or employees responsible for the subsystem are responsible for the up-to-dateness, accuracy and completeness of the data in the subsystem. They verify and approve input data. If the entered data does not meet the needs of the subsystem, responsible for the subsystem notify relevant internal user (notification in the administrative part of the relevant register is appeared) about the need to verify, correct data. The person in charge receives the notification and is obliged to react and make the appropriate changes in due time. The data in the subsystem is also updated.

**Areas of responsibility definition**

The subsystem provides automatic localization of areas of responsibility according to the parameters set by the Customer. For example, if it is a municipal educational institution, the subsystem calculates a certain distance of the perimeter around the institution and marks it on the map as the area of ​​responsibility of the educational institution. It is based on data provided by the Customer, according to the chapter 5 of technical requirements.

**Planning**

Data on plans and schedules of works on improvement and sanitation are in the subsystem input by defined responsible person.

**Landscaping management**

For the convenience of the Zhytomyr City Council responsible for landscaping, the subsystem provides an opportunity to keep a register of applications, acts, protocols on violations of landscaping rules, acts of inspection and the results of commission decisions, monitor the implementation of commission decisions.

**Citizen engagement**

Citizens can leave messages via public part of geoportal by marking a place on a map, provide additional information, add photo regarding “Additional attention places”. All messages are collected in the Citizen engagement register and responsible for the subsystems is responsible to react and set tasks to check or add data about mentioned places.

**Reporting**

Internal users (responsible for the subsystem and for landscaping) have the opportunity to upload reporting documents in the form specified by the Customer.

The subsystem must provide convenience and intuitive management of all business processes. Details and specifics of each of the processes are agreed and can be supplemented between the Customer and the Contractor.

**3.7. Subsystem interfaces**

3.7.1. Public part structure

The interface provides the display of objects on the map and information card, which contains all the information entered in the administrative part, except for access to which is restricted by law, as well as registers and access to data through API.

Objects of the public and administrative part should be displayed with different iconograms and colors, which are agreed with the Customer at the stage of detailing the requirements and implementation.

|  |  |  |
| --- | --- | --- |
| № | Interface | Basic components |
| 1 | Landscaping objects | List of objects with detailed characteristics, responsibilities, plans, information on sanitation |
| 2 | Landscaping elements | List of elements with detailed characteristics, responsibilities, plans, information on sanitation |
| 3 | Street and road network | List of elements with detailed characteristics, responsibilities, plans, information on sanitation |
| 4 | Garbage collection | List and display on the map relevant elements of garbage collection, schedules, systems, responsible for collection, quantity of technique used |
| 5 | Special technique performance monitor | A map that with the help of GPS-monitoring system displays the activity of utility companies vehicles (garbage trucks, snowplows, snowplows) in real time. |
| 6 | Recycling | List of recycling places with detailed characteristics |
| 7 | Service areas | List and map of responsible for providing landscaping services with indication of addresses, streets, land plots, service perimeter |
| 8 | Additional attention places | External users can put a mark on the map and indicate data on places of additional attention for the city council. Without registration. |

Additional components of the interface, graphic, color display, marks for objects display should be discussed and agreed with the Customer during the detailization of the requirements and implementation of the subsystem.

The public part of the subsystem provides:

access to registry data,

access to the card with display of register information (with information card),

access to data through an open API,

the option to put several marks on the map at the same time,

the option to leave a message, proposal about the object, add photography, other document, geolocation.

3.7.3. Administrative part structure

|  |  |  |
| --- | --- | --- |
| № | Interface | Basic components |
| 1 | Landscaping objects | List of objects with detailed characteristics, responsible for maintenance, linked to elements |
| 2 | Street and road network | List of elements of street and road network with all details and responsible for maintenance |
| 3 | Landscaping elements register | List of landscaping elements with detailed characteristics, linked if relevant to objects. |
| 4 | Contragents | List of balance holders, responsible, managers, companies |
| 5 | Service areas | List and map of responsible for providing landscaping services with indication of addresses, streets, land plots, service perimeter |
| 6 | Documents | List of documents, protection agreements, decisions, passports, orders, schemes, plans of objects and elements, relevant documents. |
| 7 | Landscaping management | List of decisions, acts, protocols on violations of the rules of landscaping, the list of permits for temporary violation of the rules of landscaping with notification of the approaching date of completion of the permit (heat map of the approaching expiration of the permit) |
| 8 | Planning | List of planned works, schedule of landscaping services for maintenance and development |
| 9 | Reports | List of forms for reporting, list of created reports. |
| 10 | Citizen engagement | List of messages received from citizens with the option to set tasks for responsible for accounting and improvement and phased execution of tasks |
| 11 | Special technique | List of special equipment for sanitation with detailed characteristics, and also a map to trace in real time movement of special equipment |

Additional components of the interface, graphic, color display, marks for display of objects are discussed and agreed with the Customer during the detail of the technical task and implementation of the subsystem.

**3.8. Subsystem functions**

The subsystem must provide:

- for the administrative part:

1) the possibility of different types of access to the subsystem for input and maintaining a database;

2) input and edit data from mobile devices, tablets, determine geocoordinates, landfills, take photos in the system, upload documents, diagrams, maps;

3) use the base map to enter and maintain registers with maximum detail and accuracy of the location of objects;

4) generate reports according to forms specified by the Customer;

5) download data from the subsystem using filters;

6) add categories that make up the registers as needed;

7) overlay cartographic materials in the admin panel;

8) receive and systematize notifications from citizens about places of additional attention;

9) the responsible for the subsystem can assign tasks for responsible for accounting, improvement (the list of tasks is determined by the Customer at the stage of detailing the technical task);

10) automatically indicate data update.

- for the public part

1) view subsystem data on the geoportal in the form of a map, objects must be visually marked and differ in key characteristics, as well as in the form of registers that can be downloaded in machine-readable formats;

2) access to subsystem data through the application programming interface (API);

3) user can leave a message about places of additional attention, upload a photo, leave additional information.

## Non-functional requirements

**4.1. Requirements for internal and external integration**

The subsystem must meet the technical characteristics and requirements of the GIS implemented in Zhytomyr City Council. The interface, functionality and databases should be fully integrated into the existing GIS and displayed on the geoportal of Zhytomyr City Council. All components of the subsystem must be compatible with the basic software package GIS, namely:

Subsystem must be integrated with the Open Data Portal, data must be automatically uploaded in open data formats (CSV - for tabular data, GeoJSON - for data with spatial localization) in the data holder account on the Open Data Portal.

Integration with registers such as:

Unified Register of Legal Entities and Individual Entrepreneurs

Prozorro

Unified portal of public funds expenditure

Unified state electronic system in the field of construction

**4.2. Requirements for mathematical and information support**

Mathematical software should include the necessary algorithms to perform data search operations, statistical information processing, data analysis. Information analysis tools should provide quick access to information and its presentation in an intuitive form.

Information support should provide:

* data storage in a form that allows organization of the system work for many users, as well as automatic system recovery in a case of emergency;
* allocation and granting of access rights on the basis of system roles;
* work of GIS users with information resources in real time;
* storage of the history of change data (maintaining a personalized protocol of changes - change log);
* integrity of geographically distributed data;
* use of state classifiers and directories, GIS directories;
* control of input and processing of input data on correctness, accuracy of writing according to classifiers, directories, file formats;
* option to work with different types of information.

**4.3. Requirements for linguistic and methodological support**

The user interface must be in Ukrainian. Instructions for users and other operating documentation for subsystem must be written in Ukrainian. GIS should provide input, storage and presentation of information in Ukrainian.

Other languages ​​can be used as an option. English can be used in regulatory procedures or in interaction (integration) with other resources.

The documentation for GIS subsystem should include:

* Detailed documentation for subsystem GIS (architecture, server and software components) in 1  (one) copy;
* Instructions for installation and configuration in 1  (one) copy;
* User's guide in 1  (one) copy;
* Administrator's guide in 1  (one) copy.

**4.4. Performance requirements**

The subsystem must work coherently with the already implemented GIS in Zhytomyr City Council, providing the possibility of uninterrupted operation and updating.

**4.5. Reliability requirements**

Reliability of work should be reached by complex application of hardware-software, technical and organizational measures. Reliability should be ensured by locating the hardware on which the main components of GIS operate, such as database servers, application servers and web servers at the data center, which provides the required level of fault tolerance.

List of emergencies that regulates reliability requirements should ensure the preservation of data in the following situations:

* emergency power outage;
* occurrence of physical defects on information carriers;
* failure of hardware components;
* incorrect user actions.

**4.6. Requirements for ergonomics and technical aesthetics**

The graphical user interface of GIS subsystem must be made in the style and colors in which the GIS implemented in Zhytomyr City Council is made. The interface of GIS subsystem should be easily understandable and convenient, should not be overloaded with graphic elements and should provide fast display of screen forms.

Navigation elements must be user-friendly. The user interface of GIS subsystem should provide the possibility of reversibility of user actions and the need to confirm potentially destructive user actions to modify and recover data. The user interface should provide the tools to obtain reference data on the capabilities of GIS, option of obtaining on-screen context-sensitive prompts to perform operations, functions and more. Data input-output, receiving commands and displaying the results of their execution should be performed in an interactive / dialog mode.

The interface of GIS subsystem should be designed for the predominant use of the manipulator type "mouse" so control of the subsystem should be carried out using a set of screen menus, buttons, icons and other visual elements.

All screen forms of the user interface must be made in a single graphic design, with the same location of the main controls and navigation. Similar graphic icons, buttons, and other elements should be used to indicate similar operations. The terms used to name typical operations, as well as the sequence of user actions when performing them must be unified. The external behavior of similar interface elements (reaction to moving the mouse pointer, switching the focus, pressing a button) must be implemented in the same way for the same type of elements.

The interface must meet modern ergonomic requirements and provide easy access to the basic functions and operations of GIS subsystem.

**4.7. Requirements for data protection from unauthorized access**

Data protection should be implemented with the use of hardware and software information security, as well as organizational measures aimed at managing security tools, regulating the actions of users and control over these actions.

Every fact of access to GIS subsystem must be noted in the access protocol. The fact of modification of data by the internal user should be noted in the protocol where the following information will be specified:

* the user who performed the operation;
* what operation was performed (entering new data, editing existing data, deleting data)
* date and time of the operation.

The access protocol and the user's action protocol must be available to the administrator, the unit responsible for information security.

The system must be ready for certification in the automated systems of the 3rd information protection class for systems that process information with limited access, which does not contain state secrets, with increased requirements for ensuring the confidentiality, integrity and availability of processed data.

Antivirus protection must be installed on all automated workstations from which the subsystem is accessed. Antivirus protection devices should be allowed for use in public institutions and provide remote monitoring to detect viral activity and attempts to penetrate the internal network of malicious software.

Users have the right to work with GIS subsystem within the limits of their rights granted by the administrator and in accordance with the approved regulatory documents and instructions.

**4.8. Intellectual rights requirements**

The software that will be used for GIS subsystem development must have the appropriate license certificates or other documents confirming the right to use this licensed software as part of the GIS.

The GIS software package must be provided under the terms of the GPL (http://www.gnu.org/licenses/gpl.html) and ensure the openness, transparency and accessibility of the product source code according to the ideology of OpenSource (free license) Software).

**4.9. Requirements for standardization and unification**

In order to ensure the logical integrity of the data at the stage of input of primary information, data classifiers should be used. The interaction of users and subsystem should be based on unified logical protocols of data exchange. Interaction with external subsystem must be carried out using the application programming interfaces (API) of the system.

The functioning of users' workstations should be ensured with the use of the same type of hardware (computers).

**4.10. Additional requirements**

The software of GIS subsystem should provide updating of information about classifiers and directories. The criterion for the quality of GIS subsystem software is the absence of critical and serious errors.

According to the degree of influence of the software defect of GIS subsystem, errors should be detected and classified as follows:

* Critical - the most serious consequences of the problem, up to complete system failure and data loss, complete or partial;
* Serious (Major) - serious consequences, possible inoperability of certain components of the system, unstable operation or "freezing" of automated workstations of the system;
* Normal - a normal error, such as a calculation error or a broken single object;
* Minor - a minor error, such as a name error, an error in formatting system controls.

The Contractor under warranty must correct all errors.

The GIS subsystem must support the mechanisms for setting up and generating notification messages on the status of documents and on other events occurring in GIS subsystem. The subsystem software must include a set of tools to create functionality and its development without the involvement of the developer. The Customer personnel using software tools (route designer, designer of functional modules and forms) can perform the development, modernization and enhancement of functionality of GIS subsystem, which are part of the GIS subsystem and do not require the involvement of developer and do not require programming skills.

**4.11. Compatibility requirements**

Client software requirements: access to system functionality (client interface) is provided by the web-browser tools allowing to organize work of users from any devices connected to a network (remote/mobile users without additional investments and with use of Internet options). For external users, the client part of the system is guaranteed to work with all modern browsers.

The public part of the GIS subsystem must be displayed correctly under all popular browsers (Internet Explorer 10, Mozilla Firefox (4.5+), Opera (9+), Chrome, Safari, Edge), and be adapted for viewing and working with the software package, administrative and public parts, on mobile devices.

**4.12. Localization requirements**

Alphanumeric information of the GIS subsystem is displayed according to the code table UTF-8. User and administrator interfaces are localized in Ukrainian. User and administrator interfaces have configuration mechanisms for changing information display parameters according to access rights, workflow stages and functional roles of system users.

**4.13. Reliability requirements**

The software is hosted on a virtual or physical server. If necessary, the software of the web server and the database server can be hosted on different servers. The system must be adapted for multi-server deployment to provide redundancy and have load balancing functionality when deployed on multiple servers.

The transfer of information between components should be performed by standard protocols at the software level or at the platform level (database management systems, web servers, etc.).

The system must operate 24 hours a day, 7 days a week. It is allowed to temporarily suspend access to the published data sets for preventive work with a notification about it beforehand.

**4.14. Backup requirements**

The GIS software provides the backup option and restore information through the web interface of the administrator. The backup is performed automatically or by the administrator's command. The administrator has the opportunity to return to one of the last 7 states of the software (backup), which is made automatically every 24 hours and contains copies of the database and files uploaded to the server along with the content referenced from the database. When creating new backups, the old ones can be automatically deleted if their number exceeds the default. The Customer defines the default number of backups.

**4.15. GIS software security**

4.15.1. The following requirements must be met during the operation of the GIS software:

* ensure the protection of information at all stages of work;
* use of HTTPS protocol;
* identification of users with limited access to data must be provided;
* user identification is performed on the basis of login / password pair, NTLM protocol and OAuth2;
* the mechanism of profiles and roles must be implemented in the access rights management system;
* the system must have the tools to record all security-critical events, including the facts of authorization of system users, as well as the main operations performed by users, including CRUD-operations;
* for all records the user and time of the last adjustment should be fixed;
* program mechanisms of the GIS software should provide functioning in a round-the-clock mode;
* software must be protected from SQL injections, as well as other means of interfering with the continuous operation of its software platform, attacks.

4.15.2. In order to ensure information security protocols, for GIS (public and administrative part) the Contractor establishes an SSL security certificate for 5 years.

4.15.3. The GIS should be able to save data in the following situations:

* power failure or emergency shutdown;
* failure of technical tools on which the GIS software is operated;
* failure due to erroneous actions of personnel, including intentional destruction or distortion of application, special and general software.

4.15.4. The storage of information in the database should be ensured by standard tools of backup and recovery after failures. To ensure the reliability and safety of operation, the software should provide tools for monitoring and diagnosing the main processes of the GIS software. List of emergency situations:

* power supply system failure;
* failure of technical means of the power subsystem;
* complete power outage;
* failure of the complex of technical means (hardware);
* server equipment failure;
* failure of network, telecommunication equipment and communication channels;
* failure of information backup equipment;
* software failure;
* failure based on the results of work of users or service personnel.

In the case of an emergency or software error, diagnostic tools should be able to store a set of information needed to identify and resolve the problem. Log files must be kept; abnormal situations and errors must be recorded automatically. In the case of an emergency, these logs should allow the administrator to store the full set of information needed to identify the problem.

A complex data protection system should be built on the information and telecommunication system, which includes subsystem and GIS, in the future, as a separate work, in accordance with regulations in the field of technical protection of information with enhanced requirements for integrity, accessibility and monitoring of information processed by the GIS software.

**4.16. Software installation and setup**

The Contractor provides installation, testing, update and configuration of relevant software at the server facilities of the Zhytomyr City Council.

**4.17. Legal requirements and documentation**

When transferring the GIS software, the following must be transferred:

* Property and non-property rights to the developed software;
* Open license or other licenses for software used to implement the project;
* Software installation package in digital form and product code;
* Data processed in the form of a database within the framework of implementation;
* Training materials, video instructions for external and internal users;
* Accompanying documentation specified in item 4.3;
* Warranty obligations for the software product

## 5. Technical requirements for data collection, processing, refining, uploading to GIS subsystem

5.1. Procedures for providing services

|  |  |
| --- | --- |
| № | Stage name |
| 1 | Receiving and processing of materials from structural subdivisions of executive bodies of city councils, other information managers, responsible person |
| 2 | Formation of e-registers of data sets, databases for loading into subsystem |
| 3 | Download processed datasets to the spatial database of subsystem |

5.2. List of services

5.2.1. GIS subsystems “Green zones management” and “Landscaping and sanitation” in Zhytomyr City Council

|  |  |  |
| --- | --- | --- |
| Service and data | Data holder | Data format |
| Update and adaptation of the relevant city documentation (zoning and urban master plan) of Zhytomyr | Urban planning and land management department, Urban cadaster service | Raster, vector |
| Uploading of available data and materials on state, private, communal lands, including leases | Urban planning and land management department, Urban cadaster service | Data in the system “Teren-GIS” |
| GPS data integration of sanitation technique with GIS | IT development department | GTFS (General Transit Feed Specification) real time data |
| List of housing cooperatives | Housing management department |  |
| Extracting data from the system "Zhytomyr housing fund" https://zhytomyr.gistechnologies.pro/ | Housing management department | <https://zhytomyr.gistechnologies.pro/> |
| Creation of a digital map (base) to ensure control over the maintenance of landscaping objects and elements and sanitation of the city by collecting, processing, geocoding, combining and buffering of individual objects from data sets:  ● Zhytomyr address register;  ● Topographic plan M 1: 2000;  ● Boundaries and characteristics of allocated land plots and leased lands or other right of use on the territory of Zhytomyr territorial community;  ● Landscaping objects;  ● Housing fund of Zhytomyr territorial community  ● Register of housing cooperatives. | Urban cadaster servicem housing management department, IT development department | SHP, geoJSON, CSV |

Geocoding for all datasets is conducted on the base of open services; geocoding completeness depends on completeness of address registers in registers, services. The Zhytomyr City Council defines and provides a list of registers and services.

## Technical requirements for trainings for internal GIS subsystem users

The contractor coordinates the detailed program of each training with the executive bodies of Zhytomyr City Council. The contractor independently provides travel, accommodation and meals for coaches.

|  |  |  |  |
| --- | --- | --- | --- |
| General topic | Specific topic | Date | Hours |
| Landscaping and sanitation | Subsystem “Landscaping and sanitation” | Date | Hour |
|
|
|
| Green zones management | Subsystem “Green zones management” | Date | Hour |
| GIS administration | GIS administration | Date | Hour |

## 7. Technical requirements of technical and consultation support of GIS subsystem in Zhytomyr City Council

1. The Contractor provides consulting services to structural units of executive bodies, utilities, institutions and organizations of Zhytomyr City Council (hereinafter - the Customer) to work with software subsystem of geographic information system (hereinafter - GIS) in accordance with technical requirements, as well as on the assessment of data and technical infrastructure, namely:

* Green zones management
* Landscaping and sanitation
* Register of temporary constructions
* Register of advertising media
* Register of communal property
* City land cadaster
* Energy efficiency of communal buildings
* Investment objects
* Budget on the map
* Geoportal

**2. Consulting services of geosystem support include:**

2.1. Consulting of the Customer's personnel on work with the software complex, consulting on optimization and reconfiguration of processes, consulting on organizational support by Internet means. The list and duration of consulting services are recorded in the Journal of Provided Services.

2.2. Each month, the Contractor provides a detailed report on the results of the technical, consulting services for approval by the Customer. A log of changes in subsystem supplements the report. If the Customer is not satisfied with the work of technical support, performance of tasks and troubleshooting, this is stated in the report. The Contractor is obliged to carry out at his own expense all the work that was not performed, but was indicated as completed in the report.

2.3. To communicate with the Customer's staff, the Contractor shall appoint a responsible person assigned for such communication with the Customer (technical support city manager). Technical support city manager of the Contractor provides monthly reports to the Customer, communicates about the work of the support service, and clarifies problem situations.

2.4. Consultations are carried out by phone or online, including with the use of Skype or Zoom technologies on weekdays from 9-00 to 18-00. All these consultations are recorded in the Journal of Provided Services.

2.5. Consultations in the support service are performed via the official link to the support office, the Customer is provided with a user account to log in to the account. The time of diagnostics of the Customer's requests, preparation of the notice in terms of the answer and performance of works is specified in item 3. "Terms and list of technical support services". The Contractor's time for diagnostics of the Customer's requests, preparation of messages and answers by email is taken into account as a part of services and is fixed in the Journal of Provided Services.

2.6. The Contractor must ensure the implementation of actions, tasks to ensure the functioning of the system and its components, recovery in case of failure, as well as server administration, configuration of system components to the extent necessary to ensure the smooth operation of the system.

2.7. The Contractor eliminates the identified errors in the operation of the system and subsystem, regularly monitors the operation of servers, system software and infrastructure optimization for the operation of the Software Complex.

2.8. The Contractor provides consultations at the request of the Customer on the results of the audit of the Customer's database located on the territory of the Customer. To provide services under this item, the Customer provides the Contractor with access to the functioning Software Complex online.

2.9. The Contractor guarantees the confidentiality of the Customer's database and the impossibility of unauthorized access to it by persons not directly related to the provision of services to the Customer. All actions of the Contractor regarding the Software Complex are recorded in the diary, which is provided monthly to the Customer together with the report on the provided technical support.

2.10. The Contractor provides consulting services on the initial introduction of the Customer's database; work in system modules, as well as on the selection of the necessary server, system software and hardware.

2.11. The Contractor must inform the Customer in advance about the release of new modules and versions of the software, as well as install updates of the software after the approval of the Customer. The Contractor must send the Customer a notice and a description of the planned updates within the time agreed with the Customer and obtain written approval for the updates of the software.

2.12. The Contractor provides consulting services on the configuration of the software and services on completion (adaptation) of the software to the specific requirements of the Customer as part of the modules transferred to the Customer at the suggestion of the Customer:

2.12.1. Proposals of the Customer for configuration and completion (adaptation) in writing with the signature of the responsible person of the Customer are sent to the Contractor for approval by email.

2.12.2. The Customer's proposals for configuration, completion (adaptation) or development of reporting forms must contain forms with a description of the rules for calculating the output information. Proposals for refining the calculation algorithms should contain a systematic step-by-step description of the algorithms and formulas for calculating indicators.

2.12.3. The composition and complexity of services for configuration and completion (adaptation) are recorded in the Journal of Provided Services. The cost of additional functions to the specific requirements of the Customer of individual functions with fixed deadlines is calculated based on the complexity of services and recorded in the Journal of Provided Services, according to the monthly report.

2.12.4. If the need to complete the system arose during the performance of the task of technical support, then before performing the completion, the Contractor must inform the Customer about it, provide comments.

2.12.5. The Contractor shall perform the completion of the system only after the approval by the Customer.

**3. Terms and list of technical support services**

|  |  |
| --- | --- |
| 1. **Name and description of services** | |
| Time of service provision (Kyiv time) | Mon-Fri from 9:00 to 18:00 |
| Consultations and technical support in the support center | Yes |
| Consultations and technical support by phone | Yes |
| Remote administration of a web resource on the Customer's server | Yes |
| Modification / adaptation of the web resource (at the request of the Customer) | Yes |
| 1. Terms of response to requests | |
| Accident | 1 working hour |
| Serious malfunction | 1 working hour |
| Minor malfunction | 8 working hours |
| Consultation | 12 working hours |
| 1. **Troubleshooting deadlines** | |
| Accident | 8 hours |
| Serious malfunction | 12 hours |
| Minor malfunction | 48 hours |

## 8. Stages of software implementation of GIS subsystems in Zhytomyr City Council

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Stage | Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Detailization of the terms of references and on its basis development of the first version of new GIS subsystems |  |  |  |  |  |  |  |  |  |
| 2 | Testing of subsystems and updating according to test results |  |  |  |  |  |  |  |  |  |
| 3 | Collection, processing and loading of data into GIS subsystems |  |  |  |  |  |  |  |  |  |
| 4 | Training for internal users |  |  |  |  |  |  |  |  |  |
| 5 | Software installation, data transfer and system configuration on server capacities, correction |  |  |  |  |  |  |  |  |  |
| 6 | Participation in the public presentation of subsystems in the city |  |  |  |  |  |  |  |  |  |

Technical requirement for GIS subsystem “Electronic cabinet of surveyor” and “Analytical module” in Chervonograd City Council

Content:

1. Introduction
2. Technical requirements for GIS subsystem “Electronic cabinet of surveyor”
3. Technical requirements for GIS subsystem “Analytical module”
4. Nonfunctional requirements for all GIS subsystem
5. Technical requirement for data collection, processing, refining and uploading
6. Technical requirements for trainings for internal GIS subsystem users
7. Technical requirement for technical and consultation support of GIS subsystem in Chervonograd City Council
8. Stages of GIS subsystem implementation in Chervonograd City Council

## Introduction

A geographic information system (GIS) was introduced in Chervonograd City Council in 2019-2020 with the support of the European Union Anti-Corruption Initiative (EUACI). According to the resolution of the Chervonohrad Mayor of May 14, 2021 the concept of updating existing, developing and implementing additional GIS subsystems of the City Council as a part of the EUACI project was approved. The development and implementation of the subsystem "Electronic cabinet of surveyor" with vectorization of the city zoning plan, as well as improvement of the GIS analytical module are part of the approved concept.

The introduction of new GIS subsystem requires standardization of the workflow in Chervonograd City Council, communal enterprise, institutions, organizations, vectorization, and digitization of materials to create a cartographic basis for subsystem development. Training of responsible city council employees is also a part of the new GIS subsystem implementation.

The document consists of terms of reference (ToR) for subsystem development and ToR for collecting, processing, and uploading data to GIS subsystem, training public officials, and technical support.

* 1. **General software requirements**

The subsystem should be developed using the principles of the concept of Free and Open Source Software (FOSS), extended by the paradigm of humanitarian responsibility (Humanitarian-FOSS) and includes the following requirements:

1. Focus on solving critical tasks to increase the speed of service delivery. High focus on quality, reliability, and stability of the GIS, elimination of data loss and duplication.
2. High requirements for the organization of the user interface (usability), minimum requirements for the qualifications of users and the need for their training.
3. Ensuring the required level of personal data protection in accordance with the Data Protection Law.
4. Ensuring transparency of access to information.
5. Ensuring software components reservation.

All components that will be implemented and shipped under this procurement must be provided under the terms of the GPL (http://www.gnu.org/licenses/gpl.html) and ensure the openness, transparency, and availability of product codes based on the OpenSource ideology (free software license).

**1.2. Software requirements**

The software should consist of:

* system software, based on existing GIS software;
* application software.

The software should reflect the specifics of the functional tasks of users and provide:

* support for generally accepted international standards for open systems;
* compatibility and integration;
* support for operation in heterogeneous hardware and software environments;
* built-in error protection mechanism and integrity maintenance.

System software includes:

* operating systems;
* database management system;
* application servers.

The result of subsystem development should be installed on existing servers, and should not be accompanied by the installment of additional operating systems, databases, application servers.

The system software decisions must be technically and economically justified in terms of integrity and reasonable completeness of the software application and its components for the purpose and minimize the cost of further maintenance.

The application software should include software that is developed and configured during the subsystem's development. Based on the results of development and implementation, the software code of the application software in electronic form and non-property, property rights must be transferred by the Contractor to the Customer.

The application software development should be carried out with the help of modern software engineering tools to design and generate distributed databases (CASE-tools).

**1.3. Requirements for technical and information architecture**

**1.3.1. Basic requirements**

Three-tier architecture: Database Management System/Database (DMBS), Application server, Thin client. All components (including DBMS and Application Server) must be free of charge based on freely distributable software. Preference may be given to components with public (open) source code. The software assumes presence in delivery of a DBMS and adjustment of work with it. The terms of delivery of the database should be without any paid types of licensing.

A thin client is a web interface for users to work through a web browser (the solution must be compatible at the time of implementation with the late versions of the most popular browsers).

The interaction between the application servers of individual subsystem must be performed via the HTTPs protocol.

The interaction between the application server and the client must be performed via the https (tls) protocol.

Service-oriented technology should support geospatial data storage (topographic maps and plans, remote sensing data, profile geospatial data of application modules) and ensure the publication of this data in workplaces with limited hardware resources.

For e-maps and online applications software run an open source library using JavaScript, HTML 5 as a semantic markup language, CSS3 as a stylization language, and Bootstrap 3 as an adaptive layout, or the equivalent distributed with a free license except for Adobe Flash or Microsoft Silverlight technologies should be used.

The application server must be developed on Node.js using the Express framework or a similar input/output non-blocking platform that executes asynchronous requests to build high-performance networking applications that are distributed under free software license.

Basic mapping, cartography, analysis and data management tools should be ready to use immediately after the launch and easy to set up. Interfaces, dialogues, messages, forms of issuing results, documentation of workstations and administrators should be formed only in Ukrainian.

1.3.2. Requirements for the components

All components (subsystem) must have a unified web user interface of automated workstations. All web interfaces must be unified to work and perform on personal computers, tablets and mobile devices.

Each subsystem that is involved in the formation, filling, editing and maintenance of data must contain mandatory sections:

* register of objects;
* object card;
* editing forms;
* cartographic visualization on the map (for objects that have spatial localization).

The register of objects should provide:

* control the display of columns with information in the tabular register;
* page-by-page display of data in the tabular register (for registers where the number of objects exceeds 100 pieces) to minimize the hardware resources;
* control the display of the number of objects within one page (example: display on one page of 10, 20, 50, 100 objects)
* export of information about registry objects in xls, csv or other agreed with Customer format;
* search for objects by text query;
* search query should be stored and saved in the address bar of the web interface to allow sharing the selected information with other users of the system.
* selection of objects (filtering) with the following capabilities:
  + date range filter (for data containing date format),
  + drop-down list filter (for directory-generated data),
  + checkbox filter for selecting several options (for data generated on the basis of the directory),
  + numeric range filter,
  + filter with the choice of spatial coverage (for registers that contain spatial localization),
  + actions with the selected filters should be stored in the address bar of the web interface to provide the ability to share the selected information with other users of the system.
* editing the data of the table register when you click on a cell in the table,
* color gradation of registry objects according to status.

The object card must provide:

* display all the information stored on the object in the database;
* display the spatial position of the object on the map;
* display attached photos (photo galleries) and other attachments;
* the option to attach an unlimited number of documents;
* the option to comment on the object;
* display information on the change of the object (by whom and when the object was created, who and when last edited it), log change should be available;
* the option to generate a document about the card object with all available information;
* interface elements such as horizontal and vertical "tabs", "accordions", image gallery and others should be used to display a large amount of information on the object card.

The editing form should provide:

* entering the following category of information: text information, directory information, numerical information, object geometry, images, files;
* the information in the form should be divided into groups by the appropriate title;
* drop-down lists in the form should be formed on the basis of directories or other registers in the system;
* fields for entering numbers must be controlled for entering inappropriate characters;
* drop-down lists, which are formed on the basis of a significant amount of information, should be downloaded only at the request of the user with notification about the size of the file, and not in full (to reduce the hardware load on the system);
* the form element for entering the spatial position of the object must be able to load the geometry of the object from a third-party file, and it must be possible to export this information to a file.

Mapping of registry objects should provide:

* display objects on the map as point, linear, or polygonal objects;
* display point objects with icons defined by the Customer;
* display of registry colors in different colors according to the status;
* selection of objects on the map using a system of filters;
* building buffers around registry objects within the map;
* construction of heat maps of the density of objects on the map or other categories defined by the Customer;
* setting the transparency of the display of registry objects for use in visual comparative analysis with other registries;
* selection of an object on the map to obtain information about it (register objects on the map must be interactive);
* save information about the selected registry object layer and selected filters in the address bar of the web interface.

## 2. Technical requirements for GIS subsystem “Electronic cabinet of surveyor”

### **2.1. Goals and purpose of the subsystem “Electronic cabinet of surveyor”**

The subsystem "Electronic cabinet of surveyor" is designed to implement tasks of creating, updating, verifying topographic and geodetic surveys and the formation of a single digital topographic basis of Chervonograd City Council. The subsystem provides digital interaction of surveying engineers with executive bodies of Chervonograd City Council, responsible for maintaining a single digital topographic basis, utilities in order to provide input to surveying engineers and registration of updated surveys on topographic basis responsible employees.

The subsystem “Electronic cabinet of surveyor" should ensure the creation and constant updating of the topographic basis of the Chervonograd City Council, monitoring of topographic, geodetic and cartographic works in real time, as well as providing access to public information about the work of surveyors in the city. As a result of the implementation of the subsystem "Electronic cabinet of surveyor " it will minimize corruption risks of access to materials for certified professionals, increase the efficiency of urban planning and architecture by digitizing the processes of interaction with surveying engineers to update the topographic basis, provide access to updated data. The geoportal of the Chervonograd City Council will make publicly available information about registered legal and natural persons-entrepreneurs (PEs) who have certified specialists, the number of applications they receive, as well as the area of ​​work that they carry out.

**2.2. Subsystem structure**

The subsystem structure should include a data storage subsystem (file storage) and a database subsystem (relational storage of dynamic content), a topographic plan 1: 2000 (1: 500), external services such as Google Maps, Bing Maps (or equivalent) for work with maps. The design of the subsystem must be in the style of the implemented Chervonograd city geoportal https://gis.chervonograd-rada.gov.ua/, in soft tones and using HTML and CSS languages.

The subsystem "Electronic cabinet of surveyor" structure belongs to the category that must remain relevant for an extended period. Static materials are technically implemented in the form of HTML pages containing text, graphics and multimedia components. The Contractor develops tools for work and interaction with the subsystem, data storage (file storage) and database subsystem, process and load of data necessary for the operation of the subsystem. Chervonograd City Council constantly updates data (text, graphics, and multimedia components) of the subsystem «Electronic cabinet of surveyor».

The subsystem consists of an administrative and a public part. The administrative part is designed to maintain databases, input data and work, planning, control and monitoring the work of structural units of the executive bodies of the Chervonograd City Council and others responsible for the subsystem. The public part of the subsystem is on the official geoportal of the Chervonograd City Council. In addition to viewing data in registers, maps, and data access, it is possible to access data via API and download data in a machine-readable format.

**2.3. Subsystem tasks**

- Registration of applications of legal entities and person-enterpreneurs with a license to conduct work on geodesy and land management for inclusion in the register,

- Registration and updating of the database of certified surveying engineers,

- Registration of applications of surveying engineers through a personalized electronic cabinet for the issuance and acceptance of topographic materials

- Electronic interaction of responsible employees of the Chervonograd city council with registered engineers-surveyors,

- Assistance in updating the topographic basis after updating the materials ("highlighting" of the changed areas),

- Notification of users about the receipt of applications, materials, change of status,

- Saving, updating and displaying information on the map to visualize the application process,

- Monitoring of applications, issued and updated materials on the map,

- Access to public information about topographic, geodetic and cartographic works.

**2.4. Legal framework for the subsystem “Electronic cabinet of surveyor”**

● Law of Ukraine “On Regulation of Urban Development”

● Law of Ukraine “On topographic, geodetic and cartographic activities”

● Law of Ukraine "On Land Management"

● Law of Ukraine “On Information”

● Law of Ukraine “On Access to Public Information”

● Law of Ukraine “On Electronic Documents and Electronic Document Circulation”

● Law of Ukraine “On Personal Data Protection”

● Land Code of Ukraine

● Tax Code of Ukraine

● Resolution of the Cabinet of Ministers of Ukraine of 25.05.2011 № 559 “On the urban cadaster”

● Resolution of the Cabinet of Ministers of Ukraine of 19.10.2016 № 736 “On approval of the Standard Instruction on the procedure for accounting, storage, use and destruction of documents and other material containing official information”

● Order of the Main Department of Geodesy, Cartography and Cadaster 09.04.1998 № 56 “On approval of the Instruction on topographic surveying in the scales 1: 5000, 1: 2000, 1: 1000 and 1: 500”

● DBN A.2.1-1- 2014 “Engineering surveys for construction”

● DBN B.1.1-16: 2013 “Composition and content of urban cadaster”

● Resolution of the Cabinet of Ministers of Ukraine "On the implementation of a pilot project for the introduction of the first stage of the Unified State Electronic System in the field of construction"

**2.5. Functional roles in the subsystem**

The administration system should provide the ability to configure access rights for standard functional roles

|  |  |
| --- | --- |
| Functional role name | Description and access rights |
| Responsible for the subsystem | - Registration of legal entities and private entrepreneurs;  - Registration of surveying engineers;  - Provision of source materials to engineers;  - Receipt of updated materials;  - Providing comments on applications, updated materials  - Update data in the topographic basis |
| Surveying engineer | - Registration in a personalized cabinet (via e-signature);  - Forming an application for source materials;  - Monitoring the status of the application;  - Responding to comments on the application;  - Download updated materials;  - Responding to comments on updated materials;  - Sending a complaint about improper consideration of the application;  - Search among their applications;  - Receive notifications of changes in the status of the application. |
| Legal entity or private entrepreneur | - Submission of an application for registration in the register  - Responding to comments on the application  - Submitting a complaint about improper consideration of the application |
| External user | - View information about the register of organizations and surveying engineers, summary statistics  - View the map with changes in the topography in time |

**2.6. Basic business processes of the subsystem “Electronic cabinet of surveyor”**

**Registration of the organization and certified surveying engineers**

This business process involves the registration of legal entities and private entrepreneur who have certified employees to provide topographic and geodetic services

|  |  |  |
| --- | --- | --- |
| № | Stage | Functional role |
| 1 | Filling in the form and providing the relevant documents by the organization through the functionality of the geoportal. The form is available through the section of the geoportal "Electronic cabinet of surveyor", which contains:  1) detailed step-by-step instructions for registration of organizations and certified employees  2) the ability to upload all necessary documents (required fields should be filled, without it is impossible to send the form)  3) the option to sign the completed form  4) the option to receive comments at the e-mail address mentioned in the form | Legal entity or private entrepreneur |
| 2 | Receipt of notification about the sent form, verification of submitted documents, in case of lack of certain documents or discrepancy - a reasoned response with a deadline for correction | Responsible for the subsystem |
| 3 | Adding of the organization and certified surveying engineers in the Register of Organizations | Responsible for the subsystem |
| 4 | Creating a personal surveyor's cabinet for certified surveying engineers of a registered organization | Responsible for the subsystem |
| 5 | Sending notifications of registration of the cabinet with instructions for entering to the cabinet | Automatically |

**Application**

The business process involves submitting an application for receiving source materials of the topographic basis for the needs of a registered surveying engineer for various types of surveying.

|  |  |  |
| --- | --- | --- |
| № | Stages | Functional role |
| 1 | Login to the personal cabinet of the surveyor by login provided by the registrar and his own password with two-factor authorization. It is also possible to enter using e-signature. | Surveying engineer |
| 2 | Forming an application in accordance with the form in the system, filling in all the required fields  If there are questions or comments on the application from the responsible for the subsystem a comment on the application can be received from this person and respond within the specified period. | Surveying engineer |
| 3 | Option to mark the application area on the map | Surveying engineer |
| 4 | Option to send an application with the e-signature or save the draft | Surveying engineer |
| 5 | Application tracking | Automatically |
| 6 | Canceling application | Surveying engineer |
| 7 | Option to track restrictions (in ha, if any, in the request for the same plot) | Surveying engineer |

**Provision of source materials**

|  |  |  |
| --- | --- | --- |
| № | Stages | Functional role |
| 1 | Review of the application of a surveying engineer received from his office and change of the status of the application.  If there are questions or comments on the application, the responsible for the subsystem has the option to send a comment on the application with a deadline to respond to the applicant. | Responsible for the subsystem |
| 2 | Verification of the application for location on a topographic basis | Responsible for the subsystem |
| 3 | Formation of source materials for the area specified in the application (vector and raster) | Responsible for the subsystem |
| 4 | Provision of source materials to the applicant by a specific identified responsible employee and change of the application review status | Responsible for the subsystem |
| 5 | Receipt of source materials with notification in the personal cabinet of the surveyor and their processing | Surveying engineer |

**Obtaining source materials**

|  |  |  |
| --- | --- | --- |
| № | Stages | Functional role |
| 1 | Uploading materials in personal electronic cabinet in specific format with an option to sign it by e-signature | Surveyor engineer |
| 2 | Receiving and reviewing of materials provided by surveyors, commenting and demanding response with setting deadlines. | Responsible for the subsystem |

**Updating of the topographic basis**

|  |  |  |
| --- | --- | --- |
| № | Stages | Functional role |
| 1 | Materials are integrated into GIS and topobase | Responsible for the subsystem |
| 2 | Using highlights in the existing GIS, changes are made to the topographic basis and loaded into the topographic basis of GIS | Responsible for the subsystem |

**Monitoring**

|  |  |  |
| --- | --- | --- |
| № | Stages | Functional role |
| 1 | Review and track changes in the topographic basis over time | External user |
| 2 | Review statistics of work of registered organizations and surveying engineers | External user |

**2.7. Subsystem interfaces**

2.7.1. Public part interface

|  |  |  |  |
| --- | --- | --- | --- |
| № | Interface | Basic components | Details |
| 1 | Register organization | Registration form | The following form for registration organization:  Name of organization (with the Unified State Register linkage)  Code of organization  Legal address  Email (verification)  Contact phone number (verification)  Name of surveyor  Qualification certificate number  Date of issuance of the qualification certificate  Name of the educational institution for advanced training  Date of the protocol of the decision of the qualification commission on the issuance of the qualification certificate  Number of the protocol of the decision of the qualification commission on the issuance of a qualification certificate  Information on advanced training (number and series of the certificate, date of issue)  Information on suspension or revocation of the qualification certificate (integration with the relevant data set on the Unified State Open Data Portal https://data.gov.ua/dataset/6130efbe-eceb-4f78-beb6-3152dd3d8c36/resource/3ad50585-9ccd- 42e3-853e-01f5d8272ecf)  Information on the suspension of the qualification certificate  Reasons for renewal of the qualification certificate (receipt by the above-mentioned new qualification certificate or the presence in the staff of the subject of appraisal activity - the business entity of another appraiser who has the relevant qualification certificate)  Place of work of a surveying engineer (full name of the legal entity or full name of private entrepreneur - according to the Unified State Register)  Identifier of the place of work of the surveyor (unique legal entity number or tax payer number)  Place of economic activity of developers of topographic, geodetic and cartographic activities (administrative-territorial unit - according to the official register of codes)  Contact number of the surveyor (check)  E-mail of the surveyor (check)  (ability to add and download data about several surveyors in one organization) |
| 2 | Statistic | Organizations  Surveyor engineers  Topobase change | Register of organizations (name, legal address, code, number of registered engineers (related to the Register of Certified Engineers), applications, updates, ha)  Register of certified surveying engineers (name, organization (linked to the Register of organizations), number of applications, updates, ha)  Changes in the topography (number of applications in total, changes)  Display of changes on the map  Filters by variable names |

2.7.2. Personal electronic cabinet of certified and authorized surveyor engineer

|  |  |  |  |
| --- | --- | --- | --- |
| № | Interface | Basic components | Details |
| 1 | My cabinet | Apply | Address  Location  Map  Type of work  Save the draft  Send  Add EDS  Types of work:  topographic survey, executive survey (for assigning a postal address, engineering networks, engineering surveys) or land plot plan)  Address: from the Address Register (incorrect address cannot be entered) |
|  |  | My applications | Application number  Date of application formation  Application address  Location of the application  Application area (ha)  Application status  Type of work (according to the form)  Date of revision  Name of the person who revised documents  Source materials  Shooting materials  Comment  Draft /  Sent  Comments |
| 2 | My organization | Organization profile | Data display provided during registration with the possibility of updating, adding other surveying engineers, uploading certification updates |

2.7.3. Administrative part of the subsystem

|  |  |  |  |
| --- | --- | --- | --- |
| № | Interface | Basic components | Details |
| 1 | Register of application | Detailed data about the application for source materials from surveyors with filters and search tools.  Application number  Processing status  Name of the person who checked data  The position of the person who checked  Address  The organization that applied  Code from the Unified State Register  Phone  Email  Legal address  Name of a certified surveyor  Phone number  Email  Type of work  Date of application acceptance  Date of data issuance  Date of download of updated data  Area  Restrictions | Processing status: checked, source materials provided |
| 2 | Register of organizations | Detailed data about the organizations with certified surveyors with filters and search tools. | Name of organization (with a link to profile)  Legal address  Contact phone number  Email  Documents  List of certified surveying engineers  Registration date  License expiration date, certificate validity  Number of registered applications  Number of provided source materials (possibility to display on the map) |
| 3 | Register of surveyor engineers | Detailed data about the certified surveyors with filters and search tools with integration with official register. | Name of surveyor  Name of the organization from which it is registered  Certificate number (verification with data!)  Number of applications  Status of applications  Area of applications (possibility to display on a map) |
| 4 | Monitoring | Map and data with details about the surveyors’ activity in the subsystem and with materials | Map  Organization  Surveying engineer  Address  Date |

**2.8. Functions of the subsystem “Electronic cabinet of surveyor”**

The subsystem must ensure:

1. the work of surveying engineers in electronic cabinets through registration of organizations and surveying engineers, their identification by password / e-signature, the ability to submit applications, track applications, receive notifications by e-mail, receive source materials, download recordings, communicate with responsible employees, updating data on certification, organization.
2. the work of responsible for the subsystem in Chervonograd City Council on confirmation of registration of the organizations and engineers-surveyors, cancellation of registration, processing of applications, the analysis of applications, granting of initial materials, check of shootings, simplification of process of updating of a topobase on the basis of materials received from engineers surveying engineers.
3. access to data through the module of monitoring of changes of a topobase, and also display of a public part change of a topobase, publication of registers, the facts of changes of a topobase.

The function of registration of the organization and engineers should be automated with integration into the address register, Unified State Register of Legal Entities, Unified state register of certified surveying engineers, verification of entered data, the possibility of identification through e-signature.

After registration, certified surveying engineers get access to the personal cabinet. This cabinet has an application function, which should provide access to the form called "Submit an application". Logged in engineer can specify the address, location, select a place on the map (on the topographic plan 1:2000), as well as specify what kind of work (topographic survey, executive survey, for assigning a postal address, engineering networks, engineering survey, or a plan of the land plot). All fields provided for the application must be filled in and marked as mandatory. If there is no information, the form will not be formed and it will not be possible to send it. The user receives a notification where exactly the information is not provided. After filling in all the required fields, the user can send the form by clicking the appropriate confirmation button and signing using e-signature. The user is also notified about the date of receipt of the application for consideration, and the generated application is sent to the e-mail specified during registration.

An authorized user can create a draft of application and send it later. Drafts have the appropriate mark. The authorized user has the opportunity to respond to the comments provided by the responsible for the subsystem regarding the application. An authorized user may not submit an application for the territory in respect of which another application has already been formed and registered.

In the personal cabinet there is an opportunity to view and filter the submitted applications. This page is displayed to the authorized user after logging in. The general statistics of activity of the authorized user in system (quantity of appeals, their status, projects of appeals) is also displayed. It is possible to search by appeals, display 5, 10, 20, 50 appeals on one page, search by number, address, status of appeals (verified, canceled appeals, entered in the centralized database) filters by number, address, dates). There is an opportunity to view and update information about the organization, surveying engineer in the personal cabinet. All changes are approved by the responsible for subsystem of the Chervonograd city council.

The subsystem "Electronic cabinet of surveyor" should automate the work of responsible employees with applications and facilitate the process of updating the topography. The administrative part, to which the responsible for subsystem has access according to logins and passwords provided by the GIS administrator, reflects all activities related to the registration of applications, provision of source materials, obtaining surveys and updates of the topographic basis from registered surveying engineers. In the administrative part it is possible to view the register of organizations, surveying engineers, to approve or reject changes, cancel registration, communicate with registered users.

In case of receipt of the application from the surveyor, the responsible for subsystem receives the notification and has an opportunity to view the application, to export raster and vector data from a topographic basis, to choose layers, coordinate systems, to specify the buffer. The relevant employee can compare the received application with the exported source data, generate source materials in DMF format and download them. In the administrative part, the search for applications by number, responsible person, organization-provider of documents, address and location, as well as by the date of operations to change the status of applications is provided.

The subsystem "Electronic cabinet of surveyor" provides constant monitoring of changes in the topography, monitoring the activities of registered organizations, surveying engineers. All documents are linked to objects on the map, it is possible to view information about changes. In addition, the subsystem should provide the option of public monitoring of changes in the topography, the activities of relevant organizations, what types of work carried out. This data is publicly available.

## 3. Technical requirements of the subsystem “Analytical module”

**3.1. Goals and purpose of the subsystem “Analytical module”**

The analytical module of Chervonohrad City Council geoporal is designed to provide access to systematic, interactive information about the spheres of life available on the implemented subsystems of GIS, as well as statistical information about the community. It should be implemented based on existing GIS analytics

https://gis.chervonograd-rada.gov.ua/analitika, made in colors in which GIS is implemented, using modern data visualization tools

The subsystem "Analytical module" should provide fast access to GIS data of registers via interactive maps, tables, graphs, visualizations. This will help to display detailed information from different subsystems, the ability to combine and filter data by different criteria in a convenient and clear format and user-friendly way.

The key task of the subsystem is to create the possibility of access of the public and business to the main indicators of the city development and key statistics in a convenient format.

The subsystem will also provide information for executive bodies on the activities of the executive bodies responsible for the GIS registers about data input, updating and verification. This will help increase the level of data culture and responsibility for maintaining and updating GIS in Chervonohrad City Council.

**3.2. Subsystem structure**

The subsystem “Analytical module” consists of a map with selection addresses, zones, analytical panels with interactive data on GIS registers, statistics on the Chervonohrad territorial community.

Responsible employees input statistical data for analytical panels through the interface, data from GIS registers are updating automatically.

**3.3. Functional roles of the subsystem “Analytical module”**

|  |  |
| --- | --- |
| Functional role | Description and access rights |
| Responsible for subsystem | Statistic data input using web-oriented interface  Data update |
| External user | Data review in form of dashboards  Using filters, data selection for display  Data download in different formats defined by the Customer |
| Internal user | Internal GIS activity statistic review (update, verification, user activity)  Creation new indictors, topics for dashboards |

**3.4. Subsystem interfaces**

The subsystem consists of public and administrative part. There is an option both to enter data, and to review activities in GIS in the administrative part of the subsystem.

3.4.1. Administrative part

|  |  |  |  |
| --- | --- | --- | --- |
| № | Interface | Basic components | Description |
| 1 | Statistic data | Population   * actual on the data * men/women * age * education * average salary   Budget   * income * expenditures * development budget * citizens budget * investments   Transport   * public transport vehicles quantity * passengers transported quantity (update is defined by the Customer) * schedule of public transport (links)   Education   * preschool institutions quantity * middle school institutions quality * other educational institutions quantity * pupils quantity * testing results of every school * education budget (expenditure)   Health care   * hospital/clinic quantity * family doctor quantity with details defined by the Customer * COVID statistic * birth rate * death rate * health care budget (expenditure)   Security   * crimes quantity * quantity of solved crimes * quantity of police (with details defined by the Customer)   Emergency   * quantity of emergency situations * quantity of emergency service staff (with details defined by the Customer) | Data input according to agreed and defined by the Customer forms. Data update by the responsible for subsystem person via web-oriented interface with identification and displaying of data of update on the geoportal. |
| 2 | Analytical panel | GIS activity   * Responsible for registers/subsystems * Quantity of system logins * Quantity of input and updated data * Verification statistic * Register review | The analytical panel "Analytics of GIS" displays a table with graphs and indicators of responsible departments, registered internal users to fill and update registers, the number of actions in the system, the number of corrected, verified data, the number of actions with registers of external users, dynamics, filters. |

**3.4.2. Public part**

|  |  |  |  |
| --- | --- | --- | --- |
| № | Interface | Basic components | Description |
| 1 | Statistic data | Population   * actual on the data * men/women * age * education * average salary   Budget   * income * expenditures * development budget * citizens budget * investments   Transport   * public transport vehicles quantity * passengers transported quantity (update is defined by the Customer) * schedule of public transport (links)   Education   * preschool institutions quantity * middle school institutions quality * other educational institutions quantity * pupils quantity * testing results of every school * education budget (expenditure)   Health care   * hospital/clinic quantity * family doctor quantity with details defined by the Customer * COVID statistic * birth rate * death rate * health care budget (expenditure)   Security   * crimes quantity * quantity of solved crimes * quantity of police (with details defined by the Customer)   Emergency   * quantity of emergency situations * quantity of emergency service staff (with details defined by the Customer) | In the section "Analytical module" there is a subsection "Chervonohrad in numbers", from which there is a transition to the sections "Population", "Community budget" and other sections defined by the Customer.  After updating the data, the dynamics is displayed in the form of a graph.  It is possible to report an error, make a suggestion |
|  | Analytics on GIS | City land cadastre  ● Register of land plots  ● Register of agreements  Budget on the map  ● List of projects  ● Contractors  Investment map  ● Objects  ● Projects  Communal property  ● List of property  ● Free premises  ● Rent  ● Privatization  Advertising objects  ● Advertising constructions  ● Contracts  ● Agents and contractors  Electronic cabinet of surveyor  ● Organizations  ● Certified surveying engineers  ● Applications  ● Area  ● Statistics of changes in the topography | The analytical panel "City Land Cadaster" displays data from two registers. In the register of land there is an analysis of the number, form of ownership, purpose, amount of monetary valuation, contracts, details with the tenant. It is possible to rank each of the variables, combine with the register of contracts. In the register of contracts user can see who had which contracts on what date, view tenants, the amount of rent, rank.  The analytical panel "Budget on the map" displays an interactive table, graphs, diagrams with projects, contractors, project budgets, type, stage.  The analytical panel "Communal property" displays an interactive table, graphs, diagrams with a list of property, vacant premises for rent, the cost of rent, who are the tenants, what are the conditions, objects for privatization.  The Analytical panel "Advertising objects" displays an interactive table, graphs, diagrams, maps of the types of structures, tenants, terms, rental costs, status.  The “Investment Map” dashboard displays projects and objects in a table, graph and map. Possible gradation by type and type, initiator, date.  The analytical panel "Electronic cabinet of surveyors" displays the register of organizations, surveying engineers, the number of applications and the area. Statistics of changes in the topography, the option to analyze changes over time. |

Additional components of the interface, graphic, color display, marks for objects display should be discussed and agreed with the Customer during the detailization of the requirements and implementation of the subsystem.

**3.5. Functional of the subsystem**

Within the framework of the implementation of the subsystem "Analytical module», next functions should be implemented:

1) import of data from tables, databases, automation of data unloading, data entry by responsible employees;

2) the ability to expand the list of data for analytics and editing the structure of tables, graphs;

3) provide analysis, summary statistics, data visualization in GIS;

4) collect and provide analytics on the work of internal GIS users;

5) interactive dashboards on the topic set by the Customer.

Analytical panels that use data from subsystem registers should be updated automatically as new data is entered into the system.

All data, graphs, charts, tables, maps must be available for download and use with the original source (when uploading images, the appropriate watermark must be displayed, when loading tables - a reminder to specify the original source in the download window).

Internal user can create their own dashboard using simple and user-friendly instructions.

Analytical panels should be interactive, data can be filtered, indicators selected, sorted, ranked.

## 4. Non-functional requirements

**4.1. Requirements for internal and external integration**

The subsystem must meet the technical characteristics and requirements of the GIS implemented in Chervonograd City Council. The interface, functionality and databases should be fully integrated into the existing GIS and displayed on the geoportal of Chervonograd City Council. All components of the subsystem must be compatible with the basic software package GIS, namely:

Subsystem must be integrated with the Open Data Portal, data must be automatically uploaded in open data formats (CSV - for tabular data, GeoJSON - for data with spatial localization) in the data holder account on the Open Data Portal.

Integration with registers such as:

Unified Register of Legal Entities and Individual Entrepreneurs

Prozorro

Unified portal of public funds expenditure

Unified state electronic system in the field of construction

**4.2. Requirements for mathematical and information support**

Mathematical software should include the necessary algorithms to perform data search operations, statistical information processing, data analysis. Information analysis tools should provide quick access to information and its presentation in an intuitive form.

Information support should provide:

* data storage in a form that allows organization of the system work for many users, as well as automatic system recovery in a case of emergency;
* allocation and granting of access rights on the basis of system roles;
* work of GIS users with information resources in real time;
* storage of the history of change data (maintaining a personalized protocol of changes - change log);
* integrity of geographically distributed data;
* use of state classifiers and directories, GIS directories;
* control of input and processing of input data on correctness, accuracy of writing according to classifiers, directories, file formats;
* option to work with different types of information.

**4.3. Requirements for linguistic and methodological support**

The user interface must be in Ukrainian. Instructions for users and other operating documentation for subsystem must be written in Ukrainian. GIS should provide input, storage and presentation of information in Ukrainian.

Other languages ​​can be used as an option. English can be used in regulatory procedures or in interaction (integration) with other resources.

The documentation for GIS subsystem should include:

* Detailed documentation for subsystem GIS (architecture, server and software components) in 1  (one) copy;
* Instructions for installation and configuration in 1  (one) copy;
* User's guide in 1  (one) copy;
* Administrator's guide in 1  (one) copy.

**4.4. Performance requirements**

The subsystem must work coherently with the already implemented GIS in Chervonograd City Council, providing the possibility of uninterrupted operation and updating.

**4.5. Reliability requirements**

Reliability of work should be reached by complex application of hardware-software, technical and organizational measures. Reliability should be ensured by locating the hardware on which the main components of GIS operate, such as database servers, application servers and web servers at the data center, which provides the required level of fault tolerance.

List of emergencies that regulates reliability requirements should ensure the preservation of data in the following situations:

* emergency power outage;
* occurrence of physical defects on information carriers;
* failure of hardware components;
* incorrect user actions.

**4.6. Requirements for ergonomics and technical aesthetics**

The graphical user interface of GIS subsystem must be made in the style and colors in which the GIS implemented in Chervonograd City Council is made. The interface of GIS subsystem should be easily understandable and convenient, should not be overloaded with graphic elements and should provide fast display of screen forms.

Navigation elements must be user-friendly. The user interface of GIS subsystem should provide the possibility of reversibility of user actions and the need to confirm potentially destructive user actions to modify and recover data. The user interface should provide the tools to obtain reference data on the capabilities of GIS, option of obtaining on-screen context-sensitive prompts to perform operations, functions and more. Data input-output, receiving commands and displaying the results of their execution should be performed in an interactive / dialog mode.

The interface of GIS subsystem should be designed for the predominant use of the manipulator type "mouse" so control of the subsystem should be carried out using a set of screen menus, buttons, icons and other visual elements.

All screen forms of the user interface must be made in a single graphic design, with the same location of the main controls and navigation. Similar graphic icons, buttons, and other elements should be used to indicate similar operations. The terms used to name typical operations, as well as the sequence of user actions when performing them must be unified. The external behavior of similar interface elements (reaction to moving the mouse pointer, switching the focus, pressing a button) must be implemented in the same way for the same type of elements.

The interface must meet modern ergonomic requirements and provide easy access to the basic functions and operations of GIS subsystem.

**4.7. Requirements for data protection from unauthorized access**

Data protection should be implemented with the use of hardware and software information security, as well as organizational measures aimed at managing security tools, regulating the actions of users and control over these actions.

Every fact of access to GIS subsystem must be noted in the access protocol. The fact of modification of data by the internal user should be noted in the protocol where the following information will be specified:

* the user who performed the operation;
* what operation was performed (entering new data, editing existing data, deleting data)
* date and time of the operation.

The access protocol and the user's action protocol must be available to the administrator, the unit responsible for information security.

The system must be ready for certification in the automated systems of the 3rd information protection class for systems that process information with limited access, which does not contain state secrets, with increased requirements for ensuring the confidentiality, integrity and availability of processed data.

Antivirus protection must be installed on all automated workstations from which the subsystem is accessed. Antivirus protection devices should be allowed for use in public institutions and provide remote monitoring to detect viral activity and attempts to penetrate the internal network of malicious software.

Users have the right to work with GIS subsystem within the limits of their rights granted by the administrator and in accordance with the approved regulatory documents and instructions.

**4.8. Intellectual rights requirements**

The software that will be used for GIS subsystem development must have the appropriate license certificates or other documents confirming the right to use this licensed software as part of the GIS.

The GIS software package must be provided under the terms of the GPL (http://www.gnu.org/licenses/gpl.html) and ensure the openness, transparency and accessibility of the product source code according to the ideology of OpenSource (free license) Software).

**4.9. Requirements for standardization and unification**

In order to ensure the logical integrity of the data at the stage of input of primary information, data classifiers should be used. The interaction of users and subsystem should be based on unified logical protocols of data exchange. Interaction with external subsystem must be carried out using the application programming interfaces (API) of the system.

The functioning of users' workstations should be ensured with the use of the same type of hardware (computers).

**4.10. Additional requirements**

The software of GIS subsystem should provide updating of information about classifiers and directories. The criterion for the quality of GIS subsystem software is the absence of critical and serious errors.

According to the degree of influence of the software defect of GIS subsystem, errors should be detected and classified as follows:

* Critical - the most serious consequences of the problem, up to complete system failure and data loss, complete or partial;
* Serious (Major) - serious consequences, possible inoperability of certain components of the system, unstable operation or "freezing" of automated workstations of the system;
* Normal - a normal error, such as a calculation error or a broken single object;
* Minor - a minor error, such as a name error, an error in formatting system controls.

All errors must be corrected by the Contractor under warranty.

The GIS subsystem must support the mechanisms for setting up and generating notification messages on the status of documents and on other events occurring in GIS subsystem. The subsystem software must include a set of tools to create functionality and its development without the involvement of the developer. The Customer personnel using software tools (route designer, designer of functional modules and forms) can perform the development, modernization and enhancement of functionality of GIS subsystem, which are part of the GIS subsystem and do not require the involvement of developer and do not require programming skills.

**4.11. Compatibility requirements**

Client software requirements: access to system functionality (client interface) is provided by the web-browser tools allowing to organize work of users from any devices connected to a network (remote/mobile users without additional investments and with use of Internet options). For external users, the client part of the system is guaranteed to work with all modern browsers.

The public part of the GIS subsystem must be displayed correctly under all popular browsers (Internet Explorer 10, Mozilla Firefox (4.5+), Opera (9+), Chrome, Safari, Edge), and be adapted for viewing and working with the software package, administrative and public parts, on mobile devices.

**4.12. Localization requirements**

Alphanumeric information of the GIS subsystem is displayed according to the code table UTF-8. User and administrator interfaces are localized in Ukrainian. User and administrator interfaces have configuration mechanisms for changing information display parameters according to access rights, workflow stages and functional roles of system users.

**4.13. Reliability requirements**

The software is hosted on a virtual or physical server. If necessary, the software of the web server and the database server can be hosted on different servers. The system must be adapted for multi-server deployment to provide redundancy and have load balancing functionality when deployed on multiple servers.

The transfer of information between components should be performed by standard protocols at the software level or at the platform level (database management systems, web servers, etc.).

The system must operate 24 hours a day, 7 days a week. It is allowed to temporarily suspend access to the published data sets for preventive work with a notification about it beforehand.

**4.14. Backup requirements**

The GIS software provides the backup option and restore information through the web interface of the administrator. The backup is performed automatically or by the administrator's command. The administrator has the opportunity to return to one of the last 7 states of the software (backup), which is made automatically every 24 hours and contains copies of the database and files uploaded to the server along with the content referenced from the database. When creating new backups, the old ones can be automatically deleted if their number exceeds the default. The Customer defines the default number of backups.

**4.15. GIS software security**

4.15.1. The following requirements must be met during the operation of the GIS software:

* ensure the protection of information at all stages of work;
* use of HTTPS protocol;
* identification of users with limited access to data must be provided;
* user identification is performed on the basis of login / password pair, NTLM protocol and OAuth2;
* the mechanism of profiles and roles must be implemented in the access rights management system;
* the system must have the tools to record all security-critical events, including the facts of authorization of system users, as well as the main operations performed by users, including CRUD-operations;
* for all records the user and time of the last adjustment should be fixed;
* program mechanisms of the GIS software should provide functioning in a round-the-clock mode;
* software must be protected from SQL injections, as well as other means of interfering with the continuous operation of its software platform, attacks.

4.15.2. In order to ensure information security protocols, for GIS (public and administrative part) the Contractor establishes an SSL security certificate for 5 years.

4.15.3. The GIS should be able to save data in the following situations:

* power failure or emergency shutdown;
* failure of technical tools on which the GIS software is operated;
* failure due to erroneous actions of personnel, including intentional destruction or distortion of application, special and general software.

4.15.4. The storage of information in the database should be ensured by standard tools of backup and recovery after failures. To ensure the reliability and safety of operation, the software should provide tools for monitoring and diagnosing the main processes of the GIS software. List of emergencies:

* power supply system failure;
* failure of technical means of the power subsystem;
* complete power outage;
* failure of the complex of technical means (hardware);
* server equipment failure;
* failure of network, telecommunication equipment and communication channels;
* failure of information backup equipment;
* software failure;
* failure based on the results of work of users or service personnel.

In the case of an emergency or software error, diagnostic tools should be able to store a set of information needed to identify and resolve the problem. Log files must be kept, abnormal situations and errors must be recorded automatically. In the case of an emergency, these logs should allow the administrator to store the full set of information needed to identify the problem.

A complex data protection system should be built on the information and telecommunication system, which includes subsystem and GIS, in the future, as a separate work, in accordance with regulations in the field of technical protection of information with enhanced requirements for integrity, accessibility and monitoring of information processed by the GIS software.

**4.16. Software installation and setup**

The Contractor provides installation, testing, update and configuration of relevant software at the server facilities of the Chervonograd City Council.

**4.17. Legal requirements and documentation**

When transferring the GIS software, the following must be transferred:

* Property and non-property rights to the developed software;
* Open license or other licenses for software used to implement the project;
* Software installation package in digital form and product code;
* Data processed in the form of a database within the framework of implementation;
* Training materials, video instructions for external and internal users;
* Accompanying documentation specified in item 4.3;
* Warranty obligations for the software product

## 5. Technical requirements for data collection, processing, refining, uploading to GIS subsystem

5.1. Procedures for providing services

|  |  |
| --- | --- |
| № | Stage name |
| 1 | Receiving and processing of materials from structural subdivisions of executive bodies of city councils, other information managers, responsible person |
| 2 | Formation of e-registers of data sets, databases for loading into subsystem |
| 3 | Download processed datasets to the spatial database of subsystem |

5.2. List of services

5.2.1. GIS subsystem “Electronic cabinet of surveyor” in Chervonograd City Council

|  |  |  |
| --- | --- | --- |
| Name of services, datasets | Data holder | Data format |
| Vectorization of the zoning plan of the territory, which establishes the functional purpose, requirements for the development of individual territories (functional zones) of the settlement, their landscape. When one click on the zones, their characteristics, conditions and restrictions should be displayed. A search by zones or individual conditions and restrictions should be provided, the results of which should reflect the relevant territories / zones on the Geoportal | Architecture and urban planning department | ARCHICAD |
| Unify all topographic surveys in the city in one format | Architecture and urban planning department | 80% data in MapInfo (75%) and Geo Project (5%). |

5.2.2. Subsystem “Analytical module”

|  |  |  |
| --- | --- | --- |
| Name of services, datasets | Data holder | Data format |
| Statistical data for the creation of dashboards (provided by the Customer, detailed at the implementation stage) | Information policy department | Excel |

Geocoding for all datasets is conducted on the base of open services, geocoding completeness depends on completeness of address registers in registers, services. The Chervonograd City Council defines and provides a list of registers and services.

## 6. Technical requirements for trainings for internal GIS subsystem users

The contractor coordinates the detailed program of each training with the executive bodies of Chervonograd City Council. The contractor independently provides travel, accommodation and meals for coaches.

|  |  |  |  |
| --- | --- | --- | --- |
| General topic | Specific topic | Date | Hours |
| Electronic cabinet of surveyor | Subsystem “Electronic cabinet of surveyor” | Date | Hour |
|
|
|
| Analytical module | Subsystem “Analytical module” | Date | Hour |
| GIS administration | GIS administration | Date | Hour |

## 7. Technical requirements of technical and consultation support of GIS subsystem in Chervonograd City Council

1. The Contractor provides consulting services to structural units of executive bodies, utilities, institutions and organizations of Chervonograd City Council (hereinafter - the Customer) to work with software subsystem of geographic information system (hereinafter - GIS) in accordance with technical requirements, as well as on the assessment of data and technical infrastructure, namely:

* Electronic cabinet of surveyor
* Analytical module
* Register of advertising media
* Register of communal property
* City land cadaster
* Investment map
* Budget on the map
* Geoportal

**2. Consulting services of geosystem support include:**

2.1. Consulting of the Customer's personnel on work with the software complex, consulting on optimization and reconfiguration of processes, consulting on organizational support by Internet means. The list and duration of consulting services are recorded in the Journal of Provided Services.

2.2. Each month, the Contractor provides a detailed report on the results of the technical, consulting services for approval by the Customer. A log of changes in subsystem supplements the report. If the Customer is not satisfied with the work of technical support, performance of tasks and troubleshooting, this is stated in the report. The Contractor is obliged to carry out at his own expense all the work that was not performed, but was indicated as completed in the report.

2.3. To communicate with the Customer's staff, the Contractor shall appoint a responsible person assigned for such communication with the Customer (technical support city manager). Technical support city manager of the Contractor provides monthly reports to the Customer, communicates about the work of the support service, clarifies problem situations.

2.4. Consultations are carried out by phone or online, including with the use of Skype or Zoom technologies on weekdays from 9-00 to 18-00. All these consultations are recorded in the Journal of Provided Services.

2.5. Consultations in the support service are performed via the official link to the support office, the Customer is provided with a user account to log in to the account. The time of diagnostics of the Customer's requests, preparation of the notice in terms of the answer and performance of works is specified in item 3. "Terms and list of technical support services". The Contractor's time for diagnostics of the Customer's requests, preparation of messages and answers by email is taken into account as a part of services and is fixed in the Journal of Provided Services.

2.6. The Contractor must ensure the implementation of actions, tasks to ensure the functioning of the system and its components, recovery in case of failure, as well as server administration, configuration of system components to the extent necessary to ensure the smooth operation of the system.

2.7. The Contractor eliminates the identified errors in the operation of the system and subsystem, regularly monitors the operation of servers, system software and infrastructure optimization for the operation of the Software Complex.

2.8. The Contractor provides consultations at the request of the Customer on the results of the audit of the Customer's database located on the territory of the Customer. To provide services under this item, the Customer provides the Contractor with access to the functioning Software Complex online.

2.9. The Contractor guarantees the confidentiality of the Customer's database and the impossibility of unauthorized access to it by persons not directly related to the provision of services to the Customer. All actions of the Contractor regarding the Software Complex are recorded in the diary, which is provided monthly to the Customer together with the report on the provided technical support.

2.10. The Contractor provides consulting services on the initial introduction of the Customer's database, work in system modules, as well as on the selection of the necessary server, system software and hardware.

2.11. The Contractor must inform the Customer in advance about the release of new modules and versions of the software, as well as install updates of the software after the approval of the Customer. The Contractor must send the Customer a notice and a description of the planned updates within the time agreed with the Customer and obtain written approval for the updates of the software.

2.12. The Contractor provides consulting services on the configuration of the software and services on completion (adaptation) of the software to the specific requirements of the Customer as part of the modules transferred to the Customer at the suggestion of the Customer:

2.12.1. Proposals of the Customer for configuration and completion (adaptation) in writing with the signature of the responsible person of the Customer are sent to the Contractor for approval by email.

2.12.2. The Customer's proposals for configuration, completion (adaptation) or development of reporting forms must contain forms with a description of the rules for calculating the output information. Proposals for refining the calculation algorithms should contain a step-by-step description of the algorithms and formulas for calculating indicators.

2.12.3. The composition and complexity of services for configuration and completion (adaptation) are recorded in the Journal of Provided Services. The cost of additional functions to the specific requirements of the Customer of individual functions with fixed deadlines is calculated based on the complexity of services and recorded in the Journal of Provided Services, according to the monthly report.

2.12.4. If the need to complete the system arose during the performance of the task of technical support, then before performing the completion, the Contractor must inform the Customer about it, provide comments.

2.12.5. The Contractor shall perform the completion of the system only after the approval by the Customer.

**3. Terms and list of technical support services**

|  |  |
| --- | --- |
| 1. **Name and description of services** | |
| Time of service provision (Kyiv time) | Mon-Fri from 9:00 to 18:00 |
| Consultations and technical support in the support center | Yes |
| Consultations and technical support by phone | Yes |
| Remote administration of a web resource on the Customer's server | Yes |
| Modification / adaptation of the web resource (at the request of the Customer) | Yes |
| 1. Terms of response to requests | |
| Accident | 1 working hour |
| Serious malfunction | 1 working hour |
| Minor malfunction | 8 working hours |
| Consultation | 12 working hours |
| 1. **Troubleshooting deadlines** | |
| Accident | 8 hours |
| Serious malfunction | 12 hours |
| Minor malfunction | 48 hours |

## 8. Stages of software implementation of GIS subsystem in Chervonograd City Council

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Stage | Name | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Detailization of the terms of references and on its basis development of the first version of new GIS subsystem |  |  |  |  |  |  |
| 2 | Testing of subsystem and updating according to test results |  |  |  |  |  |  |
| 3 | Collection, processing and loading of data into GIS subsystem |  |  |  |  |  |  |
| 4 | Training for internal users |  |  |  |  |  |  |
| 5 | Software installation, data transfer and system configuration on server capacities, correction |  |  |  |  |  |  |
| 6 | Participation in the public presentation of subsystem in the city |  |  |  |  |  |  |