BOSNIA AND HERZEGOVINA

FEDERATION OF BOSNIA AND HERZEGOVINA

FEDERAL ADMINISTRATION FOR GEODETIC AND REAL PROPERTY AFFAIRS

GEOSPATIAL INFRASTRUCTURE AND VALUATION ENHANCEMENT (GIVE)
PROJECT IMPLEMENTATION UNIT

TERMS OF REFERENCE

FOR THE

A.1.3.1 - SDI DIGITAL PLATFORM SPECIFICATIONS

Bosnia and Herzegovina, June 2025

Abbreviations, Acronyms and Terms

Abbreviation/Acronym/Term	Description/Definition
ToR	This Terms of Reference
SDI	Spatial Data Infrastructure
FBiH	Federation of Bosnia and Herzegovina
SDI FBiH	Spatial Data Infrastructure of the Federation of Bosnia and Herzegovina
SDI FBiH Stakeholders – the Stakeholders	Institutions and entities including: federal and cantonal government bodies and organizations; local self-government authorities; public enterprises; legal entities entrusted with the management of spatial data; and legal entities that use the data and services covered by the SDI FBiH and provide public services based on such spatial data. These stakeholders, within their mandate or scope of work, are responsible for establishing or maintaining the spatial data referred to in Article 8(1) of the Law on SDI FBiH and are, under the Law, obliged to participate in the establishment, maintenance, and development of the SDI FBiH.
FGA	Federal Administration for Geodetic and Real Property Affairs
the Client	The FGA
the Consultant	The legal entity—whether a firm, company, organization, or a consortium/association thereof—contracted to deliver the services described in this Terms of Reference to the Client
the Platform	SDI Digital Platform
Deliverables	All outputs produced by the Consultant under this Terms of Reference, whether final or draft, tangible or intangible, in any medium or format, including but not limited to reports, studies, analyses, specifications, plans, designs, diagrams, schemas, models, workflows, architectural documentation, manuals, technical documentation, guidelines, methodologies, training materials, instructional content in general, databases, datasets, metadata, records, software (in source code, object code, executable form, scripts or configurations), prototypes, mock-ups, user interfaces, visual materials, correspondence, meeting notes, presentations, and any updates, modifications, enhancements, or derivatives thereof.

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1. Introduction and Background Information

1.1 The GIVE Project

The *Geospatial Infrastructure and Valuation Enhancement (GIVE) Project* is implemented on the basis of the Loan Agreement - *Geospatial Infrastructure and Valuation Enhancement Project* - between Bosnia and Herzegovina and the International Bank for Reconstruction and Development (IBRD).

The main objective of the GIVE Project is to improve the accuracy and accessibility of land administration information in the Federation of Bosnia and Herzegovina (FBiH). The GIVE Project will contribute to the modernization of the land administration through digitization, harmonization and standardization of data, ensuring better services for citizens and the business community.

The GIVE Project is structured around four key components:

Component A: Support to the Establishment of Spatial Data Infrastructure (SDI FBiH)

This component includes activities such as the development of standards for spatial data in accordance with INSPIRE directive, improvement of quality and completeness of digital data trough harmonization of datasets, digitization of priority analog datasets, establishment of an SDI center and digital platform, as well as continuation of data harmonization for additional 150 cadastral municipalities. The goal is to increase availability and usability of geospatial data.

Component B: Building Register Development

This component includes the Building Register establishment through the development of methodology for data collecting and processing, field data collection and processing, the establishment of an IT system for managing the Building Register, and scaling the register to 40 local self-government units.

Component C: Real Estate Valuation

The focus of this Component is on development of the Mass Valuation system through the improvement of the Sales Price Register, the development of standards and methodologies for valuation, and the establishment of the information portal with advanced tools. This system will enable a more transparent valuation and better real estate management.

Component D: Capacity Building and Project Management

The goal is to ensure the long-term sustainability of investment through efficient project management, training/education for professional staff, development of technical guidelines and legal acts, and information campaigns to raise awareness among the public and institutions about the significance of this project.

These activities are aligned with global best practices and designed to facilitate sustainable development, economic growth, and social equity in FBiH. The outcomes of these activities will contribute to better-informed decision-making in areas such as spatial planning, infrastructure investments, disaster risk management, and property taxation.

In the Federation of Bosnia and Herzegovina, the GIVE Project is managed by the Federal Administration for Geodetic and Real Property Affairs through the Sector for management of public investment program and the Project Implementation Unit (PIU). The PIU, established within the FGA, serves as the operational and executive body responsible for the day-to-day implementation of project activities. The PIU consists of civil servants and contracted specialists with expertise in geospatial data management, real estate valuation, procurement, and project monitoring, ensuring the successful execution of the GIVE Project's objectives.

1.2 The Spatial Data Infrastructure of the Federation of Bosnia and Herzegovina

Challenges related to the availability, quality, organization, accessibility, and sharing of spatial data are common to many political and informational topics and are encountered across different levels of government and various sectors. Addressing these issues requires measures that facilitate the exchange, shared use, access, and utilization of interoperable spatial data and spatial data services at different governmental levels and across sectors. Therefore, it is necessary to work toward establishing a spatial data infrastructure.

According to the Law on Spatial Data Infrastructure of the Federation of Bosnia and Herzegovina, spatial data infrastructure is defined as a set of technologies, measures, standards, services, human capacities, and other factors that enable the effective integration, management, maintenance, and sharing of spatial data for the purpose of meeting needs within the Federation of Bosnia and Herzegovina, as well as their use beyond the FBiH.

The SDI FBiH encompasses:

- sources of spatial data,
- a metadata system,
- networking services and technologies,
- agreements on sharing, exchange, access, and use of spatial data,
- terms of use,
- coordination and oversight mechanisms,
- processes and procedures,
- the SDI FBiH Geoportal,
- human resources, as defined in accordance with the provisions of the Law on SDI FBiH.

The goal of establishing the SDI is to create the preconditions for rationalizing the collection of spatial data and standardizing isolated data silos at all levels so that they can be networked and used effectively. Linking different spatially defined (georeferenced) information enables users to conduct complex searches and analyses, connect spatial phenomena, and establish the foundations for modern spatial and resource management.

Due to its fundamental value, spatial data is required by nearly all economic sectors and scientific disciplines. Spatial data, its management, exchange, and use form one of the cornerstones of societal development.

1.3 SDI Digital Platform

Within the scope of the GIVE Project (specifically, component A: "Support to the Establishment of Spatial Data Infrastructure"), the FGA aims to enhance geospatial data interoperability, availability, and use by consolidating its existing digital services into a centralized, modern SDI Digital Platform.

Over time, the FGA has built a set of digital tools and services to support SDI development. However, these systems were designed and implemented independently, over a long period of time, without scalability and upgradeability in mind, with limited interoperability, duplication of effort, and fragmented user experiences.

Current components and services of SDI FBiH include:

- WordPress-based Public Web Portal: Used for publishing news, upcoming events, official documents, strategies, publications, project reports, and other relevant materials. Although informative, the portal is not dynamically integrated with other SDI components and primarily functions as a static information channel.
- GeoNetwork Metadata Catalog: An open-source platform used by the SDI FBiH Stakeholders to enter and publish metadata about geospatial datasets and services. While aligned with international metadata standards (such as ISO 19115 and INSPIRE), the Catalog operates independently and lacks integration with other tools.
- Web GIS Viewer: A browser-accessible visualization tool that enables users to explore and interact with spatial data layers. It provides important functionality and access to harmonized geospatial datasets but lacks proper connection to metadata services.
- SDI FBiH Registers: A web service that serves as a metadata management tool primarily tailored to the SDI FBiH Stakeholders for maintaining records of datasets and spatial services. It is a useful service for SDI governance but runs in isolation, with a separate backend and data structure.
- INSPIRE Data Validator: A standalone web service hosted on a virtual machine that validates metadata and spatial datasets against European INSPIRE compliance rules. Despite its importance for quality assurance, it is not integrated into existing metadata or data entry workflows.

Each of these components is hosted, maintained, and accessed separately. This fragmented architecture results in inefficiencies such as:

- Redundant data entry and inconsistent metadata between platforms.
- Limited scalability and performance challenges as data volumes grow.
- Isolated development and maintenance processes.
- Complicated and time-consuming user experience due to lack of a unified interface.
- Difficulty in ensuring data quality, synchronization, and discoverability.

Recognizing these limitations, FGA intends to unify these services into a single, modern, centralized SDI Digital Platform (the "Platform"). This Platform will serve as a comprehensive and scalable solution that will combine all geospatial services into one centralized system.

To achieve this transformation, the GIVE Project will engage the "Consultant" to develop a full technical and functional specification for the new Platform. This specification will form the foundation for future Platform development.

2. Objectives of the Assignment

The primary objective of this assignment is to develop a detailed functional and technical specification for the centralized SDI Digital Platform of the Spatial Data Infrastructure of the Federation of Bosnia and Herzegovina, which will serve as the foundation for its future development.

This specification will serve as a guiding blueprint for future procurement, software development, and deployment activities under the GIVE Project. The Consultant must aim to specify a scalable, user-friendly, standards-compliant digital platform that will support interoperability and central governance of geospatial data, metadata and services. The Platform shall be positioned as the authoritative central hub for all geospatial data management within the Federation of Bosnia and Herzegovina.

In this context, the SDI Digital Platform is envisioned as a central system for searching, viewing, downloading, transforming, invoking (services), validating, processing, and managing all spatial data, metadata, and network services—both for the SDI FBiH Coordination Body and for each individual SDI FBiH Stakeholder. In addition, the Platform will provide registered users with professional access to selected datasets, while also enabling public access to spatial data. It will include functionalities for uploading user data and services, creating personalized workspaces, publishing and sharing spatial data and metadata services, and providing cartographic visualizations of selected or all available datasets. These features must be designed in alignment with the current business needs and processes of the Coordination Body, SDI FBiH Stakeholders, and other users. Accordingly, the Platform must be modular—allowing for the flexible addition or removal of specific functionalities and services over time.

The Consultant will be expected to analyze the current SDI FBiH digital ecosystem, identify gaps and integration opportunities, and precisely define solutions to unify required tools, services and functionality in general into one cohesive platform. The Platform envisioned must enable seamless interaction between components, ensure high performance, facilitate user accessibility, and comply with all relevant legal and technical standards.

This assignment represents a strategic step in the digital transformation of SDI governance in the Federation of Bosnia and Herzegovina and is expected to lay a solid foundation for the next generation of geospatial data infrastructure in the country.

3. Design Requirements

This section outlines the key design requirements that the Consultant must incorporate into the specification of the SDI Digital Platform. These requirements serve as a comprehensive guideline to ensure alignment with the legal, strategic, operational, and technical expectations set forth by the FGA.

3.1 Legal and Strategic Compliance, Business Needs and Processes

The design of the SDI Digital Platform must be fully aligned with the business needs and processes of the SDI FBiH. In this regard and in order to ensure efficiency and consistency, the Platform's design must, amongst others, full comply with and satisfy:

- All business needs and processes, key services, datasets, and operational workflows required by SDI FBiH, described in the following:
    - Strategic framework – The SDI Strategy of the Federation of Bosnia and Herzegovina for the period 2023–2027, which outlines the long-term vision, priorities, and development objectives.
    - Legal and institutional framework, including:
        - The Law on SDI FBiH (for instance all of the functionalities outlined in Article 16 – e.g., metadata management, data services, coordination, access rights, etc. – must be fully implemented);
        - Implementing Rules:
            - Implementing Rules on Metadata;
            - Implementing Rules on SDI FBiH Registers;
            - Implementing Rules on Network Services (currently under development);
        - relevant by-laws and administrative acts;
    - Licensing Model (currently under development) – which should serve as the basis for the proper definition of user roles and categories, permissions, and access rights within the Platform.
- Stakeholder needs, in alignment with the findings and recommendations of the Baseline Study (Phase 1), including institutional roles, service expectations, and regulatory obligations.

3.2 Core Functional Capabilities

The SDI Digital Platform shall support a set of core capabilities in accordance with the Law on SDI FBiH (Chapter II, Articles 10–21) and the related Implementing Rules. The following core functionalities shall be supported at the minimum:

- Registration and administration of SDI FBiH Stakeholders and data sources – The Platform must include functionality for the registration, administration, and structured maintenance of all SDI FBiH Stakeholders and their corresponding spatial data sources. This includes a unified registry of institutions and the datasets and services they are responsible for.
- Search across data and services – A centralized, universal search functionality shall be implemented, capable of querying metadata of both data sources and network services. Within the map interface, the Platform must also support search functionality at the level of individual dataset records—allowing users to perform spatial queries by location (e.g., clicking or drawing on the map), geocoding-based search (e.g., by address or place name), and filtering based on selected dataset attributes of interest.
- View and visualization of data – Users must be able to view available spatial datasets, including those published on the Platform or uploaded into their personal workspace. The viewer must support OGC-compliant services and provide customized cartographic views based on user type (public, Stakeholder, registered user, etc.).

- Download of spatial data – The Platform must enable users to download available spatial data in standard, open formats for use in their own systems or applications, subject to data access restrictions.
- Data transformation – Transformation tools must be available for converting datasets into INSPIRE-compliant data models, changing coordinate reference systems, and converting between data formats.
- Service access and integration – The Platform must support service-based interaction, enabling users to invoke and use network services (e.g., WMS, WFS, WMTS) through both the UI and APIs.
- Geoprocessing and spatial analysis – Geoprocessing tools shall support operations such as spatial queries, overlay analysis, and multi-criteria evaluation to facilitate spatial decision-making.
- Validation of data and metadata – A validation module must be provided to assess the compliance of spatial data, metadata, and services with INSPIRE and ISO standards, ensuring quality and interoperability.
- User workspaces – Registered users must have access to personal workspaces where they can upload limited data (e.g., up to 100 MB), conduct analyses, create maps, and collaborate with other users on shared projects.
- Thematic dashboards – The Platform should provide predefined, user- and group-specific dashboards (e.g., for Stakeholders or users from specific institutions and government) that present key spatial indicators, analysis tools, and dataset summaries in domains such as environment, urban planning, and infrastructure. This will improve usability for policymakers and non-GIS experts by delivering tailored, visual access to spatial data along with built-in reporting functionality.
- Monitoring and usage statistics – The Platform must offer real-time monitoring of network service availability, usage statistics, and performance indicators through a central dashboard for administrators.
- Metadata catalog and management – The Platform must include a centralized metadata catalog service that supports the entire metadata lifecycle, including entry, viewing, editing, transformation, export (e.g., GeoDCAT, XML), and sharing. Metadata must be maintained in a unified system to prevent duplication and simplify management.
- API access – All core functionalities must be accessible via well-documented APIs to allow integration with third-party systems, automate workflows, and enable data exchange with external platforms.
- Administration of local data sources and services – The system must provide administrative tools for managing spatial databases and publishing network services, available to both Super Administrators and Stakeholder Administrators.
- Core cartographic tools – The map viewer must include essential tools such as zoom, pan, print, measure, draw, add annotations, share maps, view attributes, use base maps, set coordinate systems, display legends, and access help. These functions should support an intuitive user experience for both basic and advanced users.

  The viewer should also support time-aware visualization of spatial datasets, including tools such as time sliders and historical layers, to enable users to explore and analyze changes over time directly within the cartographic interface. This should enhance spatial-temporal analysis capabilities, supporting use cases such as urban planning, environmental monitoring, disaster risk assessment, and land use dynamics.
- PDF report and map export tool – The Platform should provide functionality for generating standardized, printable reports that combine selected datasets, associated metadata, and cartographic visualizations into PDF documents. This tool must allow users to export maps

with legends, scale bars, titles, and other contextual elements, ensuring professional-quality outputs suitable for reporting and presentation.

3.3 General Design Requirements

- Interoperability and standards compliance – All components and services of the Platform must be designed in compliance with applicable international and local standards for spatial data infrastructure, and in accordance with the SDI FBiH Implementing Rules. This includes, but is not limited to:
    - Metadata formats (e.g., ISO 19115/19139, INSPIRE Metadata; multilingual support)
    - Dataset formats (e.g., GML, GeoJSON, GeoTIFF, NetCDF, Shapefile, KML)
    - Network services (e.g., OGC WMS, WFS, WCS, CSW, WPS, OGC API standards with a transition plan while retaining legacy compatibility)
    - Data encoding and transmission protocols (e.g., XML, JSON, SOAP, REST, HTTPS)
    - Coordinate reference systems (CRS adopted by the SDI FBiH; EPSG codes)
    - Data quality and validation (e.g., ISO 19157 for data quality, INSPIRE/OGC/ISO conformance testing with published reports)
    - Security protocols (e.g., TLS/SSL for secure data transfer, OAuth2/OpenID for authentication)
    - Catalog and discovery (e.g., INSPIRE discovery services; OGC CSW / OGC API – Records)
    - Identifiers and registries (persistent identifiers; INSPIRE codelists and SDI FBiH registries)
    - Data sharing and exchange standards (e.g., DCAT-AP for metadata exchange with EU/national portals)
    - Accessibility standards (e.g., WCAG 2.1 Guidelines for web accessibility)

  The Consultant shall identify and propose the most relevant current standards during Phase 2: Design Concept, and justify their applicability to the SDI Digital Platform.
- Security and data protection – The Platform specification must incorporate robust, multi-layered cybersecurity measures to ensure secure operation and protection of all system components. This includes safeguards against DDoS and overload attacks, secure storage and handling of user data, credentials, and files, as well as appropriate encryption and secure communication protocols.

  Additionally, the system must include protective mechanisms against unauthorized access to and extraction of raw data through network services, particularly in scenarios involving public access. For example, without proper safeguards, users could potentially retrieve raw JSON data used to generate map layers by inspecting network traffic in their browsers. To prevent this, the design should, for example, ensure that data preparation and access occur entirely server-side, with only rendered or otherwise non-exploitable representations delivered to the client. The frontend must not expose source datasets in a way that allows inspection, reuse, or reverse engineering. Where applicable, map content should be served in a format that is view-only and non-downloadable by unauthorized users.
- Usability and user-centered design – The Platform's design should offer an intuitive and user-friendly interface, accessible to both technical and non-technical users. Where appropriate, advanced settings and configuration options should be placed in clearly separated "Advanced" sections.

  The user interface should dynamically adapt to user roles, showing relevant tools and views tailored to each role.
- Reliability – The design should incorporate fail-safes to isolate and contain the impact of crashes in individual modules, preventing cascading failures across the entire Platform.

- (Penetration) Testing and security assurance – The specification must require comprehensive testing (unit, integration, performance, security) during development, to identify and eliminate potential bugs and instabilities, and an independent pre-release penetration test on a staging environment mirroring production. Testing must at minimum cover authentication/authorization, role-based access control, APIs and download services, file upload/processing, admin modules, rate limiting, and resilience to overload/DoS attacks.
- High availability (HA) design – The Platform must be designed for high availability, by incorporating load balancing, failover mechanisms, and service redundancy across all critical components (e.g., web services, authentication, data access). This ensures platform responsiveness and resilience during peak usage and uninterrupted delivery of services such as orthophoto or LiDAR downloads.
- Backup strategy – The Consultant must define a complete backup system for the Platform, including a fully functional replica that can automatically take over in case of a critical failure. The backup solution should, among others, specify:
    - Whether backups are stored locally or also remotely
    - Hardware requirements and implementation method (including, where applicable, failover clustering, redundant power and network paths, dual controllers, mirrored storage options, and other equivalent redundancy mechanisms), with clear justification for the selected approach
- Event logging – The specification must incorporate comprehensive event logging for all operations and user actions to enable auditing and security monitoring.
- Usage analytics and monitoring – The Platform shall provide comprehensive analytics and reporting capabilities to monitor platform usage, user behavior patterns, data access, and system performance metrics. The system shall also include or integrate with a monitoring module that continuously measures availability, response times, and resource consumption, with results accessible to administrators through dashboards and reports.
- Configurable alerting system – The specification shall include a configurable alerting module for administrators (e.g., Super Administrators and Stakeholder Administrators), enabling threshold-based warnings for key operational parameters such as storage capacity, failed services, unusual activity, and security anomalies. Alerts should be issued internally on the Platform and, where necessary, externally through alerting channels to be defined, configured, and justified by the Consultant. This functionality is required to support proactive maintenance, timely response to system degradation, and early detection of issues that may impact platform availability or data integrity.
- Dataset versioning and change history – The specification must incorporate functionality to track and manage all changes made to datasets and metadata, including time stamps, version identifiers, and user attribution. It should also provide the ability to revert to previous versions when necessary. This ensures full traceability, supports legal and institutional accountability, and provides a transparent record of spatial data evolution over time.
- Development versioning – The proposed specification for the development of the Platform must utilize a Git-based version control system to ensure traceability of progress, changes, and the ability to revert when necessary.
- Environment separation – The specification must include both production and testing environments, either through separate virtual machines or distinct physical hardware, depending on what is more appropriate.
- Documentation – The Consultant shall define the requirement for the delivery of comprehensive documentation and user manuals covering all aspects of the Platform at the time of its development. The specification must clearly state the expected structure and format of this documentation (a proposed standard where and if appropriate). It must also include a

requirement for regular updates to the documentation and manuals as part of ongoing maintenance and with every future upgrade or change to the Platform.

- Multilanguage support (non-technical content) – The Consultant shall specify multilanguage support for non-technical components of the Platform, such as general news, notifications, articles, announcements, and similar content intended for broad user communication. The solution shall allow the Client to manage translations efficiently and ensure that end users can access this content.
- Visual identity – The design of the Platform's user interface must follow best practices in user interface (UI) and user experience (UX) design, and align with the official visual identity and branding of the SDI FBiH.
- Mobile accessibility and responsive design – The Platform must be designed to fully support access via mobile devices through responsive web design and, if appropriate, through a dedicated mobile application. The Consultant shall evaluate and justify the option of mobile application design and development as part of the Phase 2: Design Concept, ensuring that mobile access delivers a seamless user experience while maintaining performance and security.
- Crowdsourced data management – The specification should include a module for collecting, managing, and validating spatial data submitted by the public or non-authoritative stakeholders. The Platform should be designed to support structured data submission forms, capture of basic metadata, and moderation workflows that allow administrators to review, approve, or reject submissions prior to publication. All such datasets must be explicitly marked and stored as "crowdsourced," ensuring they are distinguishable from authoritative datasets. This feature enhances data coverage and collection in a cost-effective way and promotes participatory SDI governance by engaging citizens, local communities, and NGOs.
- User feedback and dataset commenting – The Platform's design must include functionality for registered users to provide feedback, suggest improvements, or report issues related to datasets and services. All submissions must be routed to the appropriate dataset owners and administrators (e.g., Super Administrators and Stakeholder Administrators) for review, moderation, and resolution. This will improve data quality, enable systematic issue reporting and continuous improvement, and foster collaboration between users and data providers.
- Interoperability with external crowdsourcing platforms – The Platform must be designed to support integration with, or data import from, external crowdsourcing platforms such as OpenStreetMap, Mapillary, and similar sources, preferably through APIs. Robust validation and quality control mechanisms must be incorporated to ensure reliability of imported data. This will leverage existing public data sources to fill gaps (e.g., road networks, building footprints, mobility features) while ensuring overall data quality.
- Modular architecture – The Platform should be designed using a modular architecture to facilitate seamless future upgrades—whether related to data storage, functionalities, or services—by both the Client and potential future external collaborators. Modularity should also allow for flexible integration of new components without disrupting existing operations.

3.4 Users

- Authentication and secure access – The design must include a secure, user-friendly authentication and login system, implemented securely on both the frontend and backend.
- Role-based access control – The Platform must support multiple user roles, each with differentiated access rights and permissions. At minimum, the following roles must be implemented:
    - Super Administrators (FGA) – Registered users with full access to all services, data management, system configurations, and user administration.

    - Stakeholder Administrators – Registered users that will administer their own stakeholder groups which will on the other hand be used organisationally to share stakeholder datasets and services.
    - Basic Users – Registered users who may or may not be members of stakeholder groups.
    - Guest Users – Unregistered users with limited, public access.
- Stakeholder group management – The Platform must allow for the creation and management of dedicated user groups for each SDI FBiH Stakeholder, with the ability to assign users and one or more administrators per group.
- Granular access permissions – User permissions must be restricted based on role, limiting access to specific datasets and modules of the Platform. Super Administrators (FGA) must be able to configure access permissions at a granular level for all users. User privileges should be aligned with the Licensing Model of SDI FBiH (which is currently under development).
- Data privacy – The system must ensure appropriate protection of personal user data, in compliance with the Law on Personal Data Protection of Bosnia and Herzegovina.

3.5 General Software Requirements

The specification must clearly define the complete technology stack required for the Platform (to enable planning of the future SDI FBiH Data Center) including, but not limited to:

- Supported operating systems (e.g., Windows, GNU/Linux),
- Runtime environments (e.g., virtual machines, containers (Docker etc.)),
- Programming languages, development frameworks, and middleware components,
- Communication protocols,
- Compatibility considerations to ensure seamless integration within the planned SDI FBiH Data Center infrastructure.
- Load balancing mechanisms – The software architecture shall support load balancing across multiple servers or service instances, ensuring optimal distribution of requests, continuous availability, and responsiveness of the Platform during periods of peak usage,
- The system's general software design must ensure high availability, stability, and responsiveness, especially during periods of peak usage demand, aligned with the findings and conclusions of the Baseline Study (Phase 1).

All of the Platform’s software components (excluding the operating systems and runtime environments the Platform is hosted on) must be open-source and available for free use without licences and additional payment.

3.6 Hardware Specification – ICT Resources

Regarding hardware, the Consultant should specify the minimum hardware requirements to support the Platform, in detail. This includes, but is not limited to:

- Quantity, specifications, and configuration of physical servers (CPU, RAM, power supplies, motherboards, cooling components, storage types and capacities).
- Hardware load balancing solutions designed to manage peak usage and heavy data transfers, particularly large downloads such as orthophoto and LiDAR datasets.
- Networking infrastructure components including switches, routers, and firewalls.
- Network Attached Storage (NAS) systems (if necessary) to provide adequate data throughput and redundancy.
- An approach for horizontal and vertical scaling of storage infrastructure, including guidance on expansion scenarios to accommodate growing orthophoto, LiDAR, and vector datasets over time, in order to ensure that the infrastructure can grow with increasing data volumes and user demand without service degradation.

- Uninterruptible Power Supply (UPS) systems to safeguard against power interruptions.
- Environmental controls such as cooling systems to maintain optimal operating conditions.

The system's hardware design must ensure high availability, stability, and responsiveness, especially during periods of peak usage demand. It must also provide sufficient capacity and flexibility to accommodate future upgrades and scalability requirements. All of these aspects should be aligned with the findings and conclusions of the Baseline Study (Phase 1).

The SDI Digital Platform is intended to operate entirely on the FGA's local infrastructure, specifically within the future SDI FBiH Data Center. As this Data Center will also host numerous other services and platforms, it is essential that the hardware requirements for the Platform are specified with high precision. This will allow the Client to accurately plan the overall infrastructure capacity and resource allocation for the Data Center.

3.7 Capacity Building and Transfer of Knowledge

After the development of the Platform is completed, a series of training sessions shall be organized for FGA technical staff. These sessions shall focus on the administration, configuration, and operational management of the Platform. The training should also cover monitoring and interpretation of analytical data, system logs, and usage statistics related to both data and platform activity.

In addition, the sessions should include guidance on maintaining system documentation, managing user roles, and performing routine troubleshooting tasks. The overall objective is to ensure that FGA staff acquire the necessary knowledge and skills to independently operate, maintain, and continuously improve the Platform.

The Consultant shall plan and include these training sessions as a requirement in the final specification. The training sessions will further be specified in detail and organized by the Platforms future development team.

4. Scope of Work

4.1 Phase 1: Baseline Study

Prior to initiating work on this phase, the Consultant shall participate in an inception meeting with the Client to clarify the assignment objectives, expected outcomes, and review available documentation (laws, strategies, communication plans, visual identity materials, etc.).

As part of the Baseline Study, and in order to align with and support the business processes and requirements of the SDI FBiH during the design of the SDI Digital Platform, the Consultant is expected to thoroughly assess the current context and initial conditions in the domain of SDI FBiH.

This includes, but is not limited to, analysis of the following:

- Strategic framework – The SDI Strategy of the Federation of Bosnia and Herzegovina for the period 2023–2027;
- Legal and institutional framework – The Law on SDI FBiH, Implementing Rules, and relevant by-laws and administrative acts;
- Licensing model (currently under development) – To inform the appropriate design of user roles, permissions, and access rights;
- Data holdings – Analysis of the existing spatial datasets currently managed by FGA.

The Consultant should also review the currently existing tools and services of the SDI FBiH, including:

- WordPress web portal
- GeoNetwork Metadata Catalog
- Web GIS Viewer
- SDI Registers service
- INSPIRE Data Validator

This review should evaluate which business needs and processes are currently supported by these tools, identify existing gaps or redundancies (e.g., duplication between the Registers and the Catalog, inefficiencies in the process of registering SDI FBiH Stakeholders), and assess how well these components align with the strategic goals of the SDI FBiH.

For the purposes of ensuring adequate performance of the Platform—primarily in terms of speed and responsiveness—the Consultant shall analyze the current capacity, usage, and system load of *katastar.ba* and the SDI FBiH Geoportal. Specifically, the Consultant should assess the number of users, the currently available network services and their load, as well as estimate the expected growth in the number of users, network services, and their usage—both annually and over a multi-year period. The findings of this analysis will serve as the basis for specifying the appropriate software and hardware resources necessary to ensure the stable and uninterrupted operation of the Platform, as well as to support its scalability.

The Consultant shall evaluate the existing hardware infrastructure at the FGA Data Center, with the goal of identifying potential improvements. This includes an assessment of whether current hardware resources should be upgraded or replaced entirely with new hardware, based on performance and scalability considerations.

Additionally, the Consultant should conduct a comparative analysis of current international trends, relevant standards, and examples of good practices in SDI implementation—both from the region and globally—to inform decisions regarding the Platform's architecture and functionalities.

The deliverable of this phase is a Baseline Study Report that includes:

- The findings and assessments outlined above;
- A summary and review of the Platform's foundational elements to be covered and designed (e.g., registration process for SDI FBiH Stakeholders, metadata catalog structure, user administration, viewer functionality, data storage systems, etc.);
- A proposed implementation plan for the remaining phases of this ToR, aligned with Section 5;
- A brief description of the methodologies and approaches that will be used throughout the assignment.

4.2 Phase 2: Design Concept

In this phase, the Consultant shall develop and deliver a preliminary system design (conceptual design) for the SDI Digital Platform, based on the design requirements outlined in Section 0 of this ToR. This design concept should include a comprehensive description of the proposed architecture, accompanied by a full set of UML (Unified Modeling Language) diagrams that illustrate the structure and relationships between the Platform's components.

As part of the conceptual design, the Consultant is expected to elaborate on the following items, among others:

- The architecture and interrelation of backend software components;
- The conceptual layout and structure of the frontend interface;
- A workflow design showing how the Platform will support key business needs and processes of the SDI FBiH;
- The technologies, frameworks, and tools to be used (e.g., open-source solutions, virtualization technologies, programming languages, third-party libraries, and system components).

Where multiple technical approaches or architectural alternatives are feasible for specific aspects of the Platform, the Consultant is encouraged to present those options, accompanied by a comparative analysis outlining the advantages and disadvantages of each. This will support informed decision-making by the Client.

The deliverable of this phase is a comprehensive System/Software Architecture Concept document including all relevant UML diagrams. This document will be reviewed and approved by FGA, after which the next development steps may proceed. Considering the structure and content of the document, the Consultant shall refer to relevant standards (such as the ISO/IEC/IEEE 42010 – Software, systems and enterprise — Architecture description) and include a concise system context, major components/modules, key interfaces, and high-level data concepts.

4.3 Phase 3: Drafting the Specification

In this phase, the Consultant shall prepare detailed technical documentation defining both the software and hardware specifications of the SDI Digital Platform. This documentation must translate the approved conceptual design into precise technical requirements and specifications ready for the development of the Platform.

The specification shall be based on the design requirements outlined in Section 0 of this ToR, as well as the approved deliverables from Phase 2.

Deliverables of this phase:

The Consultant shall deliver, at a minimum, the following:

- Software Requirements Specification (SRS) – prepared in accordance with ISO/IEC/IEEE 29148, this document shall describe in detail the functional and non-functional requirements of the Platform, including performance, security, scalability, and interoperability considerations.
- Software Architecture & Design Description (SAD/SDD) – developed in line with ISO/IEC/IEEE 42010 and IEEE 1016, this document shall provide detailed architecture views (components and their responsibilities, interfaces, data flows, behavioral scenarios) and the deployment view; include updated UML diagrams and an explicit record of key architectural decisions and their rationale.
- A Deployment & Infrastructure Specification (as an architecture viewpoint under 42010) covering environments, sizing and capacity, high availability and disaster recovery, backup/restore, networking, and security hardening, including a UML Deployment diagram.
- API/Interface Specification, defining external and internal interfaces, and including schemas and example requests/responses.
- A Data & Interoperability Specification detailing information models and formats and aligning, where applicable, with SDI/geospatial standards (e.g., ISO 19115-1 for metadata and relevant OGC/INSPIRE service/data standards used by the Platform).

These documents will serve as the foundation for the development of the Platform and must therefore be accurate, unambiguous, and detailed enough to allow the future development team to build the Platform according to specifications.

4.4 Phase 4: Final Specification

Following the Client's review of the draft specification, the Consultant shall deliver the final specification, incorporating all feedback and input received from the Client.

The Final Specification must also concisely cover the following elements:

- Estimated Development Time – The Consultant shall provide a preliminary estimate of the total time required to develop the Platform. A timeline (possibly in the form of a Gantt chart, or some other appropriate form) outlining key development activities and their expected durations shall also be included.
- Estimated Development Cost – The Consultant shall provide an indicative cost estimate for the complete development of the Platform.
- Proposed Development Team – The Consultant shall specify the development team required to develop the Platform. This should include detailed descriptions of the required expertise, skills, and professional background for each team member.

Deliverables of this phase:

- The Final Specification package: finalized versions of all Phase 3 documents (SRS; Architecture/Design; Deployment & Infrastructure; API/Interface; Data & Interoperability; Quality & Traceability) updated per Client feedback, plus a Change Log summarizing revisions since Phase 3.
- Final version of the specification prepared in accordance with the Part 2 of the World Bank's "Request for Proposals - Information Systems (Design, Supply and Installation)" SPD (Standard Procurement Document), provided as an appendix to this ToR.
- Final report including all documentation produced under this Terms of Reference, consolidated into a single deliverable (PDF), plus editable/source files for all documents and diagrams (e.g., word-processing files, spreadsheets etc.); machine-readable artifacts, relevant schemas (e.g., JSON Schema/XSD) for data models, and original diagram/model files.

All materials shall be consistent, versioned, and sufficiently detailed to enable competitive procurement and subsequent development of the Platform.

5. Schedule of the Assignment

The Consultant is expected to complete the assignment in accordance with the deadlines for each phase outlined in the table below.

Phase	Deadline
Phase 1: Baseline Study	30 days
Phase 2: Design Concept	60 days
Phase 3: Drafting the Specification	120 days
Phase 4: Final Specification	180 days

The indicated deadlines are measured from the date of contract signing. It is mandatory to adhere to the specified deadlines for the execution of Phase 1 and Phase 4.

As part of the Baseline Study (Phase 1), the Consultant shall submit a detailed implementation plan, which may include proposed adjustments of the deadlines for Phase 2 and Phase 3, based on the Consultant's assessment of the time required to effectively complete the respective phases. The Client will review the proposed timeline as part of the overall review of the Baseline Study (Phase 1). The implementation of subsequent phases may only commence after FGA has formally approved the Baseline Study (Phase 1) and the proposed implementation plan.

The implementation plan must cover the detailed description of all phases of the assignment and provide a comprehensive breakdown of related activities, including their sequencing, interdependencies, and estimated durations. It must also include a Gantt chart that visually presents the timeline of all activities.

Additionally, the Consultant must allocate and clearly indicate the estimated time required by the Client to review and approve the final version of each deliverable within each phase. The Client can require up to 10 working days to review and provide feedback on each deliverable.

6. Data and Services to Be Provided by the Client

During the assignment, and for the purposes of communication, review, and control of delivered services, the Client shall ensure a cloud-based repository with an agreed-upon file structure, aligned with the assignment phases. This repository will store all Deliverables, organized by version and delivery date. The repository will serve as the working folder during the duration of the assignment. The Consultant shall submit all Deliverables to the Client in properly versioned electronic format, accompanied by the relevant metadata and supporting documentation.

All relevant documents referenced or mentioned in this ToR will be made available to the Consultant for use as working materials—either as annexes to this ToR or upon the Consultant's request.

The Client remains available to the Consultant for any additional information, materials, or meetings that may be required during the course of the assignment.

7. Institutional and Organizational Arrangements

The Client shall review, monitor, and approve all Deliverables provided. Once all Deliverables have been accepted by the Client, and feedback is provided if necessary, it will be deemed that all Deliverables have been produced in accordance with the Terms of Reference.

The Client shall provide contact information of their representative team, authorized for communication with the Consultant, as well as the review, monitoring, and approval of all Deliverables provided.

8. Qualification Requirements

8.1 The Consultant's Qualification Requirements

The Consultant must meet the following criteria and have the institutional capacity to successfully carry out the assignment. This includes, but is not limited to:

- Legal and professional capacity – The Consultant must be a legally registered entity with the capacity to operate in the fields of geospatial information systems, software development, or IT consulting.
- Relevant experience – Demonstrated experience in at least two comparable assignments within the last 5 years, involving:
    - Spatial data infrastructure (SDI),
    - Design of digital platforms for geospatial data management,
    - Development of system specifications for public institutions or international organizations.
- Multidisciplinary capacity – Proven ability to mobilize a multidisciplinary team with expertise in SDI, software architecture, hardware infrastructure, and public sector project delivery.
- Standards and domain competence – Proven familiarity with relevant geospatial and interoperability standards and technologies (e.g., INSPIRE concepts, OGC web services such as WMS/WFS/WCS/WMTS, metadata/catalogs, raster/LiDAR/vector data handling).
- Language and local delivery capacity – Ability to perform the assignment in the English language. The Consultant must also be able to participate in on-site/remote meetings with the Client, as required.

The Consultant's ability to perform the assignment in any one of the official languages of the Federation of Bosnia and Herzegovina will be considered an advantage.

Preferably, the Consultant should have experience in projects funded by the World Bank, EU, UN, or other international donors, particularly in the fields of land administration, SDI, or e-Government.

8.2 The Consultant's Team Qualification Requirements

The Consultant's team responsible for preparing the specification under this Terms of Reference shall, at a minimum, include the following key roles. The Consultant may propose additional roles as necessary to ensure effective and timely delivery of the assignment.

1. Team Leader / Coordinator

Responsibilities:

- Provide overall leadership and direction for the assignment, ensuring timely delivery of all outputs;
- Coordinate the work of the multidisciplinary team, consolidate inputs, and manage quality assurance of deliverables;
- Serve as the primary point of contact with the Client.

Minimum requirements:

- University degree in geodesy, geoinformatics, geography, computer science, information technology or some other related field (Master's degree preferred);
- At least 7 years of professional experience, including managing similar assignments;
- Demonstrated leadership in at least two SDI, GIS, or public sector IT projects of comparable scale and complexity;
- Excellent organizational, analytical, and communication skills;
- Excellent knowledge of the English language.

2. SDI Specialist

Responsibilities:

- Provide expertise on SDI standards, metadata, interoperability and legal compliance;
- Ensure alignment with INSPIRE Directive, ISO 191xx series, and relevant national frameworks.

Minimum requirements:

- University degree in geodesy, geoinformatics, geography, computer science, information technology or some other related field;
- At least 5 years of relevant professional experience in SDI design, metadata management, or policy alignment;
- Proven knowledge of SDI principles, geospatial information systems, geospatial data standards and the EU INSPIRE Directive;
- Knowledge of laws of Bosnia and Herzegovina, practice, and policies in the land administration sector is preferable.

3. System Architect

Responsibilities:

- Define the overall system architecture of the SDI Digital Platform;
- Specify software components, application interfaces (APIs), data exchange mechanisms, integration workflows, and technical dependencies to ensure scalability, interoperability, and maintainability;
- Ensure that the architecture aligns with the Client's infrastructure capacity, security requirements, and future scalability needs.

Minimum requirements:

- University degree in computer science, information technology, software engineering or some other related field;
- At least 5 years of professional experience in system design and architecture;
- Experience with open-source geospatial tools and modern web frameworks;
- Experience with containerization, APIs, and version control systems (e.g., Git);
- Strong knowledge of server administration, virtualization technologies, and system monitoring tools;
- Experience in designing and operating secure, high-availability, and redundant infrastructures;
- Understanding of automation and configuration management;

- Experience integrating identity management, authentication, and authorization services (e.g., SSO, OAuth2, LDAP/AD);
- Fluency in English (spoken and written), with the ability to produce technical documentation to international standards.

4. IT Specialist

Responsibilities:

- Define the hardware and network infrastructure architecture;
- Specify server, storage, backup, power, and networking requirements;
- Ensure the infrastructure supports high availability, disaster recovery, and scalability requirements;
- Ensure cybersecurity and data protection measures are implemented in compliance with relevant standards and privacy regulations.

Minimum requirements:

- University degree in information technology, electronics engineering, systems engineering, or a closely related field;
- At least 5 years of professional experience in ICT infrastructure design;
- Demonstrated experience in sizing, scalability planning, and high-availability environments for data platforms;
- Proven expertise with storage technologies (SAN, NAS, RAID configurations, tiered storage) and backup/restore solutions;
- Proven experience with networking infrastructure (LAN/WAN design, switches, routers, firewalls, VPNs) and performance optimization;
- Experience with virtualization technologies (e.g., VMware, Hyper-V, Proxmox, or equivalent);
- Experience designing and integrating redundancy and failover mechanisms (dual power supplies, redundant paths, mirrored storage, load balancing etc.).

Consultant may consider additional experts such as:

- UI/UX Designer – Responsible for user-centered interface design and accessibility compliance;
- Business Analyst / Legal Consultant – Supports the alignment of technical solutions with institutional and legal requirements, including stakeholder mapping, workflows, and regulatory considerations.

9. Language

The official language of the Terms of Reference is the English language.

All Deliverables produced by the Consultant under this Terms of Reference must be delivered to the Client in any one of the official languages of the Federation of Bosnia and Herzegovina or the English language, except for the final specification and its appendices (Deliverables from Phase 4) which must be provided in the English language only.

10.Ownership, Confidentiality, and Use Restrictions

All Deliverables and associated intellectual property rights developed under this assignment shall be the exclusive property of the Federal Administration for Geodetic and Real Property Affairs (FGA).

The Consultant, including any consortium members and subcontractors, shall not reproduce, distribute, publish, share, use, modify, or adapt any part of the Deliverables, directly or indirectly with third parties, or for purposes other than performance of this assignment, without FGA's prior written consent.

The FGA retains the sole right to publish, amend, publicly use, and further disseminate all Deliverables developed under this assignment.

The Consultant shall ensure confidentiality of all assignment-related information, whether draft or final, protect it from unauthorized disclosure, and extend the same obligations to subcontractors. These obligations shall survive completion or termination of the contract.

Any breach of this clause shall constitute a material violation of contractual obligations and may result in legal action and/or termination of the contract.

11.Payment

Payment shall be made in parts, as shown in the table below. Each payment will be issued only after the Client has formally approved the completion of the respective phase, including the review and acceptance of all required Deliverables associated with that phase.

Phase	**Percentage of Total Contract Value**
Phase 1: Baseline Study	10%
Phase 2: Design Concept	30%
Phase 4: Final Specification	60%