Annex 9: TODIS FUNCTIONAL SPECIFICATIONS

Data collection requirements

This module includes requirements, concerning data collection, validation, and editing.
The functional requirements related to data collection and validation are defined in Table 9.1.

Table 9.1. Functional requirements related to data collection and validation

Section/ Requirement ID	Requirement Definition
FR1.0	TODIS shall provide only registered users with access to the interface of its application component Data Collection. User profiles shall fit into one of the following categories: • Regional User/RU; • Regional Coordinator/RC; • TCPS Subject Matter Expert/TCPS SME • Operations Administrator/Ops Admin; • System Administrator/Sys Admin.
FR1.1	The System should provide the capability to define multiple levels of secured access using role-based and organizational-based groups.
FR1.2	The data input in TODIS shall meet all predefined requirements (see Data Needs Tables) and would be collected by network section (segment), network node or project.
FR1.3	TODIS shall support data input in different formats.
FR1.4	TODIS will ensure the seamless combination of spatial and non-spatial information from different sources across regional stakeholders and sharing it with other users (public and non-public from the specified categories) and applications (web map applications).
FR1.5	TODIS will ensure that the information collected at one scale/level can be shared with all scales/levels.
FR1.6	TODIS will ensure that data can be collected both manually (file-based data collection) from a Regional Participant and automatically (e.g., using API) from another.
FR1.7	The system should support functionality to keep a log of incorporated data and an updated data catalogue and manage duplications and overwrites through the versioning of the data.
FR1.8	TODIS shall allow for the Ops Admin to define and introduce new data inputs/ parameters into the system, using a built-in formula builder function.

FR1.9	The system should support common data ingestion methods: file-based, web service integration, database-based, and API-based.
FR1.10	TODIS shall support file-based data exchange, where users will have to prepare the data for upload, based on the predefined reporting needs. The exchange is to be performed through the web portal after the user logs in. This functionality will also include an option for online forms to be filled by the users.
FR1.11	Functionality for web service integration and maintaining a web portal and exchanging data automatically through web services. Service layer shall include registry service, discovery service (linked to the metadata), view services, download services and transformation services.
FR1.12	Functionality for APIs based integration.
FR1.13	TODIS shall offer API interfaces to interact with external IT systems, such as: • DG MOVE - TEN-tec; • European GNSS Agency – Galileo Green Lane; • World Bank – CPMM System; • EU Agency for Railways (ERA). Details on the information exchange are defined in Annex 8.
FR1.14	The system shall support data collection through a linear referencing system.
FR1.15	Functionality for Database management system integration.
FR1.16	TODIS should support functionality for automatic validation based on given rules (red flag system), manual validation by RC and manual validation by TCPS SME.
FR1.17	TODIS shall be able to perform an automated verification of the input data based on defined Data Validation Request Criteria (as these are set in the Data Needs Tables).
FR1.18	Functionality to filter or sift out data that does not meet certain requirements (e.g., spatial, and temporal accuracy; proper categorization of the full list of layers and attributes; topological and attributive consistency; format and structure consistency; metadata for each layer).
FR1.19	TODIS should support the functionality for automatic data validation through the use of bespoke macros and scripts for efficiency and quality assurance reasons (predefined list of categories, range of values, date calendars, check boxes for multiple choices and radio buttons for single choice data fields, as well as predefined topological rules for geometric consistency).
FR1.20	TODIS shall support editing/ adding new macros/ scripts through a GUI for the Ops Admin.
FR1.21	TODIS shall ensure functionality for RC and TCPS SME to perform manual validation and checks where anomalies are found as well as ensure functionality for consideration-based validation for the quality of the supply data.
FR1.22	TODIS shall support functionality for manual validation of EU Transport Acquis Integration Monitoring of any input by a Subject Matter Expert.
FR1.23	TODIS shall support various tools for data editing.

FR1.24	TODIS shall support a functionality to assign specific access rights to each user (For example a RU from a specific sector may have access to input only limited parameters for the specific sector) that should be adjustable by the Operations Administrator on user level.
FR1.25	TODIS shall provide an interface for editing, creating, or removing objects using a set of forms and instruments for attributive and geometrical modifications for RU.
FR1.26	The system should be providing a specific interface with functionalities for checking, approving or declining changes for the RCs and TCPS SMEs.
FR1.27	RC and/ or TCPS SME can verify the changes by either accepting or rejecting the requests and to specify the reason for the rejection.
FR1.28	TODIS shall support functionality for topological validation of geometry of all point, line, and polygon features with minimum rules.
FR1.29	TODIS shall assure a front-end validation on a field level, with a proper notification for the RU. Additional server-side validations must be developed when saving the data. Validations can include obligatory fields, drop down menus, spatial validation.
FR1.30	All values that are entered in TODIS shall automatically become available but be labelled as “UNVALIDATED”.
FR1.31	Validating existing value should only be active when a value has been encoded for the selected year. When a value is entered for a year then automatically the same value appliers for all future years as “UNVALIDATED” until a new value is entered for a year. As soon as it is validated then the label changes to “VALIDATED”.
FR1.32	Only changes that have successfully passed the automated verification shall be sent for manual validation by the RC. If the RC confirms the validity of the data, then the system shall accept the provided data and proceed to notify the TCPS SME, who in turn can proceed with the final validation.
FR1.33	Changes to objects/features (added/changed/deleted) are only labelled as “VALIDATED” to other users when a TCPS SME has validated the change. When modifications are cancelled by TCPS SME, the system returns the label to “UNVALIDATED”.
FR1.34	TODIS shall support a functionality for cancellation of the current editing session, which requires justification in the comment field and shows users a confirmation screen with information about the type of action and the comment.
FR1.35	TODIS shall support functionality for value resubmission if a value has been erroneously rejected. Comments are mandatory when resending a value. TODIS shall present users with a confirmation screen with information about the type of the action and the comment.
FR1.36	Functionality for all registered users to be able to view workflow actions, history, and comments, in the form of logging system overview.

FR1.37	Upon saving the changes (textual, graphical or documents attached), the system automatically generates a report and sends a message to the responsible parties for validation.
FR1.38	All requests and notifications shall be facilitated by the system, i.e. the user shall be able to raise requests and receive notifications through the system.

Data storage requirements

This module includes requirements concerning data storage, back up and retention, defined in Table 9.2.

Table 9.2. Data storage, back up and retention requirements

Section/ Requirement ID	Requirement Definition
FR2.0	TODIS shall provide only authorized users with access to the interface of the application component Data Storage. User profiles shall fit into one of the following categories: • Operations Administrator/Ops Admin; • System Administrator/Sys Admin.
FR2.1	The data input in TODIS would be stored by network section (segment), network node or project.
FR2.2	TODIS will ensure the seamless storage of spatial and non-spatial information from different sources across regional stakeholders and sharing it with other users and applications.
FR2.3	TODIS will ensure that the information stored at one scale/level can be shared with all scales/levels.
FR2.4	Database software (DBMS) of the system must have full RDBMS capabilities of storing both GIS data objects and attribute data tables, as well as support of OGC standards and functions for password-protected multi-user data access and editing of attributes and GIS objects (standard EPSG projections, internal topology support for vector objects, spatial indexing and spatial queries, geo-processing functionality) along with SQL querying and replication capabilities.
FR2.5	All data that is uploaded in the system should be named according to a predefined naming convention.
FR2.6	The System shall have a mechanism to manage the nomenclatures, classifiers comprised by all *TODIS* metadata.
FR2.7	The System shall have a mechanism to manage all system configurations, parameters, and constant values necessary for the *TODIS* operation.
FR2.8	The System shall maintain metadata of the spatial and non-spatial data must be based on international standards, with predefined template structure.
FR2.9	The System should store all metadata within the database management system.
FR2.10	The System should maintain history of transactions (on data and files document history)
FR2.11	The System should provide a file storage mechanism for data outside the DBMS.
FR2.12	The System should maintain and display classifiers/IDs of the historical records.
FR2.13	The System should have backup and recovery procedures.
FR2.14	Security must be provided such that an individual user sees only his/her workflow items

FR2.15	The system shall support data storage through a linear referencing system.

Data analysis requirements

The functional requirements related to data inspection, exploration and calculations of outputs and indicators, as well as their presentation either in the form of reports or through dashboards or interactive maps are defined in Table 9.3.

Table 9.3. Functional requirements related to data analysis and reporting

Section/ Requirement ID	Requirement Definition
FR3.0	TODIS shall provide authorized users with access to the interface of its application component Data Analysis. User profiles shall fit into one of the following categories: • Regional User/RU; • Regional Coordinator/RC; • TCPS Subject Matter Expert/TCPS SME • Operations Administrator/Ops Admin; • System Administrator/Sys Admin.
FR3.1	TODIS shall include both a map and tabular interface for the data analysis GUI.
FR3.2	TODIS shall allow for the Ops Admin to define and introduce new KPIs/ statistical indicators into the system, using a built-in formula builder function.
FR3.3	The data available for analysis shall always provide its status regarding validity (i.e., VALIDATED/ UNVALIDATED).
FR3.4	TODIS shall support functionality to perform any analysis using only VALIDATED or VALIDATED and UNVALIDATED data.
FR3.5	TODIS shall ensure different tools and methods for data analysis for the different data types used (e.g., georeferenced data, link-based data, node-based data, etc.).
FR3.6	TODIS shall support visual representation and analysis of spatial datasets by creation of thematic maps: • Static maps created as printouts or graphical files (raster images or PDF documents); • Dynamic maps created as graphical files from running models or on-line web-maps.
FR3.7	Users shall be able to select data based on: • Input (per individual input – dependent of the data input granularity); • Section (geographical section including more than one individual input); • TEN-T Corridor, Network (core/ comprehensive); • Sector (Road, Rail, IWW, Seaports, Airports, Border Crossings, Freight Terminals); • Regional Participant;

	• User defined area within the Transport Community; • Transport Community (entire database).
FR3.8	The user shall be able to define what is included in the analysis, by selecting: • Data categories/ individual parameters/ KPIs; • To include unvalidated data or not; • The reference year(s).
FR3.9	TODIS shall support spatial analysis, including various types of spatial queries on vector datasets: • Selection of objects from one layer located within objects from another layer; • Selection of objects from one layer located outside objects from another layer; • Selection of objects from one layer within a certain distance (buffer zone) from objects of another layer; • Overlay of two (or more) object layers in order to identify cross-sections.
FR3.10	TODIS shall support statistical analysis of attribute data produced by spatial or attribute data queries: • General statistics of a single sample (analysis of statistical distribution and variation); • Analysis of inter-relation of two or more samples (correlation and regression analysis); • Analysis of difference between samples and statistical grouping of objects (cluster analysis); • Multivariate statistical analysis (co-variation, factor analysis); • Time-series analysis (trends, autocorrelation).
FR3.11	TODIS shall support geostatistical analysis of spatial data distribution patterns: • Interpolation and extrapolation of data values over regular grids based on the existing point-based measurements; • Extraction of user-defined ranges of extrapolated data in the form of isolines (cartographic applications) or polygon coverage (further spatial analysis).
FR3.12	TODIS shall support spatial analysis and modelling based on raster datasets: • Generalization (recoding) of raster values and creation of user-specified thematic raster datasets; • Spatial queries and filtering operations based on values from multiple raster layers; • Cost surface modelling tools.
FR3.13	Data analysis tools shall be able to deal with large datasets (i.e. more than 10,000 records/features per geospatial layer/table).
FR3.14	TODIS shall support the functionality to present the data analysis results and performance outputs as: • Project/network sheets (providing reporting summaries);

	• Tables and charts (for in depth review of the results); • Interactive maps (for further user interaction); • Dashboards (including combinations of all the above).
FR3.15	Functionality to illustrate the resulting data colour coded (based on user predefined thresholds/ criteria, or the actual data values), as percentiles per parameter/ KPI value; filtered or sorted by any of the data categories/ individual parameters/ KPIs; or indicate their status regarding validity (i.e., based on verified data / data pending verification).
FR3.16	All analysis and reporting outputs shall be easily extracted in a variety of formats (i.e., DOCX, XLS/XLSX, CSV, PDF, JPG) for further analysis and dissemination.

Data sharing requirements

The functional requirements related to data sharing are defined in Table 9.4.

Table 9.4. Functional requirements related to data sharing

Section/ Requirement ID	Requirement Definition
FR4.0	TODIS shall provide public and authorized users with access to the interface of its application component for Data Sharing, with options to configure data access and functionality, based on the different user profiles. User profiles shall fit into one of the following categories: • Public user/audience (user without registration); • Regional User/RU (authorized users); • Regional Coordinator/RC (authorized users); • TCPS Subject Matter Expert/TCPS SME (authorized users); • Operations Administrator/Ops Admin (authorized users); • System Administrator/Sys Admin (authorized users).
FR4.1	TODIS shall include both a map and tabular interface for the data sharing GUI.
FR4.2	The tabular interface should allow users to view and manipulate data available in TODIS, relevant to each user's access level, in tabular form.
FR4.3	The tabular interface should allow for searching and selecting data using record filters: • To filter the data by key parameters; • To delete filters; • To restrict the results of selection to corridor network sections; • To restrict the results of selection to core network sections; • To include deleted TEN-T sections into the results of filtering; • To view section details. Users would be able to select data based on: • input (per individual input – dependent of the data input granularity);

	• section (geographical section including more than one individual input); • TEN-T Corridor, Network (core/ comprehensive); • sector (Road, Rail, IWW, Seaports, Airports, Border Crossings, Freight Terminals); • Regional Participant; • User defined area within the Transport Community; • Transport Community (entire database).
FR4.4	The user shall be able to define what is included in the query/analysis, by selecting: • Data categories/ individual parameters/ KPIs; • To include unvalidated data or not; • The reference year(s).
FR4.5	TODIS shall showcase section details by providing an overview window that provides a summary that includes the section's geographical location and attributes, as well as creation date. The overview window includes an overview map, description, and other key features (e.g., core network, country, etc.).
FR4.6	TODIS shall ensure the seamless experience of the user through interactive tables that would allow users to: • Add or hide values for specific years; • Colour code attribute values; • Access parameter information; • View workflow information; • View section descriptions, parameter description and year; • View all records of changes to the value - date, username, action, and comment; • Sorting the table on several columns.
FR4.7	TODIS shall allow for the export of table results in different formats (i.e. DOCX, XLSX, CSV, PDF).
FR4.8	TODIS shall facilitate the creation of fully customizable outputs using a range of templates (Project Reference Sheet, Network Reference Sheet, Data Table, Charts, Maps, Dashboards).
FR4.9	TODIS shall support functionality for interactive maps and satellite overlays (e.g. OpenStreetMap, OpenTopoMap, Satellite imagery background).
FR4.10	The map interface should allow users to view and analyse data available in TODIS, relevant to each user's access level.
FR4.11	The web map interface must include basic functionality for map display map navigation functionalities, including: • Panning and zooming in or out to a certain area of interest; • Setting map extent (view) by returning to initial extent or going back to previous extent (or to a next extent, if one is applicable); • Functionality to automatically show the position of the coordinates of the cursor displacement; • Selection between different coordinate systems (Geographic WGS 84, Web Mercator, etc.); • A list of predefined scales to choose from;

	• Overview map; • Selection from predefined base maps (Open Street Map, Open Topo Map, Satellite background) and transparency settings for individual layers.
FR4.12	Table of contents with geospatial layers would allow users to: • Add a view (see FR4.11 Views functionality); • Turn on/off all layers; • Expand all layers; • Collapse all layers; • Add a new layer.
FR4.13	Table of contents would consist of two tabs - layers and legend.
FR4.13.1	Layers tab consist of all the layers uploaded in the application. Operations users can perform with these layers: • toggling the visibility of the layer; • increasing/decreasing the transparency of the layer; • changing the order of the layers; • creating labels; • filter; • opening attribute table; • zooming to layer.
FR4.13.2	Legend tab that would be similar in structure to the tree hierarchy of layers and is displayed according to the symbols predefined for the field type and values.
FR4.14	TODIS shall support functionality to create bookmarks. Bookmarks can be created by each individual user and sent via email, or users can copy the URL and share it that way with others. Bookmarks shall be able to be saved with graphics or without. Saving it with graphics also saves the current map view and adds graphic elements and will be displayed during the next overview of the bookmarked location.
FR4.15	Search and tabular presentation of results functionality that shall be based on a predefined search tool that executes the search based on the chosen layer and its attributes. Search tool shall also include additional search options such as displaying the results tabularly or spatially. Users can also choose to search only within the current extent, within previously conducted spatial selection, or search without considering the extent.
FR4.16	TODIS shall allow the identification of objects via Identify tool. The identify tool shall have the functionality to showcase results in tabular form and exporting the results in different file formats (xls, csv, pdf). Results shall give information about the attributes of the identified feature, which layer it belongs to, additional information about the feature (images, documents).
FR4.17	TODIS shall support spatial selection functionality. Users would be able to select features from a chosen layer using shapes that each individual user defines. The selection can be done by point, polyline, polygon, freehand polygon. The tool would support functionality for a buffer option that will allow users to view features that are located at a distance from the selection form in

	the buffer value in predefined units (meters or else). Users may also choose from two options on whether they would want the tool to show features only within the shape or also those that intersect the boundary as well.
FR4.18	Intersecting and obtaining the intersection results functionality. The tool shall work independently or in combination with other tools (Search, Identify, Query Builder). Users should be able to choose the layers whose features will participate in intersection. The tool should have "Use selected features" option when intersection is used in combination with other tools. Users should be able to apply buffer values in meters and kilometres relative to the feature. Results from intersection shall be showed in a tabular form, as well as graphically.
FR4.19	Data Sharing module should have linear referencing functionality. The tools should support: • Functionality to calibrate (create) LRS from a list of predefined layers, creation of punctual and linear events, measuring and calculation of measures for points; • Functionality to support all vector formats supported by the system. Supported are lines, multi-lines, points, multi-points. The lines don't need to be oriented. Single route may be represented by multiple features; • The system should support network topology, as well as methodology for handling special features of a route topology: discontinuous, dog-leg, split roads, cul-de-sacs, ramps; • Functionality to support dynamic segmentation; • Functionality to display event data cartographically; • Functionality to export results in tabular form; • Functionality for data maintenance of routes, events, and measures; • For the event analysis the tool can work in combination with other tools such as clip, selection, intersect, buffer, query builder etc.
FR4.20	Users shall have the option to build queries and query the data via query builder tool. The tool should have functionality to perform attribute queries to the layers in the platform, to save the queries at the browser level if users want to use them again, and to choose from different predefined functions for easier querying. The tool shall support functionality to notify the user if the query is not spelled correctly or if there are no results. The results shall be shown in tabular form, while the geometry is indicated on the map.
FR4.21	TODIS's Data Sharing module shall support print functionality. Users should have the option to export maps in pdf and jpg file and choose from different printing options. Users should be able to choose from predefined templates, select the print format, choose a title, set the resolution, choose a coordinate system, set the scale, and choose whether a legend would be shown or not. Or completely forego the predefined templates.
FR4.22	Data Sharing module should support data export functionality. For the export users would need to define certain output parameters like in what coordinate system to export the data in, and whether to export all the data visible in the map

	extent or export data only within a certain polygon the user has to draw. Users should be able to export data in predefined formats: shp, kml, kmz, geojson.
FR4.23	TODIS's Data Sharing module shall support measure functionality. The measure toolbar should consist of different measuring tools. The structure of the window and functionalities would vary between the tools: • Functionality to determine the coordinates of any point in the map in any given predefined coordinate system. Users can select option Copy to clipboard and be notified about successful copying in the form of notification; • Functionality to measure distances on the map. The tool is activated by clicking on the map, a single click after that will add new segments to the line, while a double-click is needed to finish the measurement. Users can change the units of measurement by picking from a drop-down list; • Functionality to measure along lines that the user sets by "free hand"; • Functionality to measure areas. The tool is activated by clicking on the map and building a polygon by choosing vertexes. A double-click is needed to finish the measurement. Users can change the units of measurement by picking from a drop-down list; • Functionality to draw "freehand" polygons and measure their area; • Functionality to measure at exact angle, without having an initially defined angle extension. Options for setting up units.
FR4.24	Paint tool functionality that would allow users to enter text or some predefined graphical elements on the map. The tool should support variety of shapes to draw - point, line, polyline, freehand polyline, polygon, freehand polygon, triangle, rectangle, circle, ellipse, arrow, text. The paint tool should also be able to allow users to: • Set the colour of the graphical element, including fill colour and outline colour; • Adjust the width and type of lines; • Customize the text sizes and colours when entering text on the map • Import and export all graphics created by drawing; • Undo graphics (undo text) to delete the last drawn graphics/written text.
FR4.25	Editing attributes functionality that allows users to: • Change the attribute values through the forms, taking care not to input unallowed characters. If an attribute field must be filled with numeric value, the attribute value field must not contain any characters besides numerical; • Tools to select an object, view related data, view attachments, split object, merge objects, reshape, delete, save; • Split objects allow users to split objects to the desired number of parts. Newly created objects receive attributes of the object from which they are incurred; • Merge objects result in the newly created object receiving attributes of the first selected object. • Reshape allows users to change an object's geometry by drawing a line;

	• Users may save, cancel, or delete features or the changes they have performed; • Users may access related data and modify it by editing it and adding new data in Editor; • Attachment editor gives users the chance to select/deselect all or only a few attachments, add new attachments, delete selected attachments, export selected attachments.
FR4.26	Editing geometry functionality that allows users to: • Edit geometry for point features (only enables location change); • Edit geometry for line features (allows users to rotate the line, change its vertices, size by x or y axis and its location on the map); • Edit geometry for polygon features (allows users to rotate the feature, change its vertices and scale it by both axes).
FR4.27	Adding new attributes should allow users to input attribute values through the forms, taking care not to input unallowed characters, depending on the type of data in the field.
FR4.28	Adding new features tool should contain the functionalities: • To select geometry object to add from a template and add it on the map; • Snapping functionality; • To draw geometry for point, line, and polygon features; • To draw free hand and measure line features (showcases line's length when drawing); • To draw free hand and measure polygon features (showcases polygon's page length, and total area surface).
FR4.29	TODIS should support Status tool that would allow users to inspect the number of objects in a layer/service, and to export the obtained data to excel in tabular form.
FR4.30	Go to x, y tool that enables searching for object/place on given coordinates. Users shall be able to: • Select one of the coordinate systems configured in the application from a drop-down list; • Change the way of setting coordinates for geographic coordinate systems, as they choose between decimal degrees format or degrees, minutes, seconds format; • Copy to clipboard all coordinate values; • Display the marked point of the entered coordinate on the map. The tool should support the functionality to automatically display the entered coordinates in all other coordinate systems configured for the application.
FR4.31	Functionality to altogether change the way of displaying layers with Layers to Search. Users may choose between four options: • Default option is initially marked and represents the setting set at the configuration level; • Visible layers option allows only layers visible on the map at the moment to be displayed in the application tools;

	• All layer's option allows users to use all layers set at configuration level with the application tools; • Layers checked in TOC allows users to display all layers checked in the table of contents.

System maintenance requirements

The functional requirements related to system maintenance are defined in Table 9.5.

Table 9.5. Functional requirements related to system maintenance

Section/ Requirement ID	Requirement Definition
FR5.0	TODIS shall provide authorized users with access to the interface of its application component for System Maintenance. User profiles shall fit into one of the following categories: • Operations Administrator/Ops Admin; • System Administrator/Sys Admin.
FR5.1	User management, administration, and privileges.
FR5.1.1	Functionality to create/modify/delete users, with username and passwords and relevant details: • Name of responsible Company/Authority • Correspondence Address • Contact person • Position • Phone number • Email
FR5.1.2	Functionality to create/modify/delete user roles with relevant details (role name and role description as a minimum.
FR5.1.3	Functionality to create/modify/delete organizational units with relevant details (unit name and description as a minimum).
FR5.1.4	Functionality to assign roles to organizational units (one organizational unit can have multiple roles).
FR5.1.5	Functionality to assign organizational unit and role (within the role, available for the organizational unit) to the user.
FR5.1.6	Functionality to assign only specific tasks to the users depending on their organizational unit and role.
FR5.1.7	Functionality to restrict user's tasks to a certain territorial scope (country, region), layer, transport mode, or time period.
FR5.1.8	Functionality to block/activate the user access.

FR5.1.9	Functionality to physically delete a user account only when there is no logged event produced by the deleted user or data introduced or modified by him.
FR5.1.10	Functionality to enable establishing the principles of access to user interface and to the information content of the IT System for each individual user or group of users.
FR5.1.11	Functionality to display user interface and the DB content only on the basis of rights and roles held by the users.
FR5.1.12	Functionality to configure an unlimited number of roles.
FR5.1.13	A role is defined by a generic title, short description, active/inactive status, and list of privileges. The inactive roles are not displayed when configuring the rights of access to the application or the users' rights.
FR5.1.14	Once introduced and activated, the role will be available to be applied in users' management modules (attachment of roles to users) and management of the system components (attachment of roles with access to user interface components (resources) and configure the way of access for them).
FR5.1.15	The system will not allow deleting a role if it is attached at least to one user or to a user interface component.
FR5.1.16	Functionality to keep a historical list of created and issued roles and use time frame that should be kept in historical logs and accessible by security reports.
FR5.1.17	The system will deliver a mechanism to record user interface components (resources) to deliver a mechanism for defining the users' rights of access to user interface. A component shall be considered any modular entity of the application, which degree of detail is sufficient for configuring the rights of access, transitions of workflows and actions accessible to users.
FR5.1.18	Functionality to configure the hierarchy of user interface components, at the root level being placed the application basic modules, while the subordinated levels shall not be limited in their depth, the hierarchy being determined by their architecture.
FR5.1.19	Any component of the system user interface will contain data on their generic title, short description, actions available to users and roles with access to user interface component or action.
FR5.1.20	Any component of the system user interface will contain data on the statuses through which the data managed via components could pass, transitions through component statuses (workflow configuration).
FR5.1.21	Functionality to define permissions related to actions, available to users with access to user interface components. The system will enable configuring the following categories of actions available to users: • View data; • Add data; • Edit data; • Delete data; • Validate data; • Other relevant actions.

FR5.2	Functionality to store all settings at browser level.
FR5.3	The System shall allow the System Administrator role to retrieve, display and reconfigure the TODIS parameters and system settings.
FR5.4	The System shall allow the System Administrator role to allocate functions to users and roles and allocate one or more users to one role.
FR5.5	Administrator shall have access to system logs (view, search, export etc.).
FR5.6	Administrator shall be able to prepare back-ups and restore the system functionality on the basis of such back-ups.
FR5.7	The System shall allow the System Administrator role to create topological rules between one or more than one layers with different geometries (points, lines, and polygons). Topological rules must meet the requirements of the data model and must have functionality to generate errors as violations of the errors and tools to correct the identified errors.
FR5.8	The IT System will offer 3 strategies for notification: • Notification via E-mail; • Notification via the user's Dashboard. • Notification via both categories mentioned above.
FR5.9	The authenticated users (regardless of their roles) will have the opportunity to configure their preferred notification means.
FR5.10	The authorized users will receive notifications on events related to their job duties.
FR5.11	Notifications stored in the user's Dashboard will have reference of direct access to the file/ form/document related to notifications.
FR5.12	TODIS shall notify the System Administrator on all issues affecting the performance and availability of the IT System.
FR5.13	Administrator will have functionalities for preparing a form to draft and send notifications to a group of people.
FR5.14	The IT System will contain a mechanism for logging all events related to the use of the system.
FR5.15	TODIS shall keep logs of user actions – record time and action made by the user. It shall be configurable (e.g., per user, object, etc.) with several levels of auditing of user actions. The following categories of actions shall be logged: • User authentication; • User disconnection; • Add/change/delete/access a record; • Generate/access a report; • Query the database; • Other specific actions.
FR5.16	The TODIS shall keep the logs of use of internal and external web-services

FR5.17	TODIS must keep a log of error messages and warnings. All data from disparate modules shall drain into a single, centralized log with automatic processing and analysis. Messages should be informative, structured, contain all the necessary data on the location of the error, the time of an operation, include text SQL query, and the values of the variables passed in cases where this is possible the system shall keep a log of all changes to the databases, including database transactions made by the TODIS system or database changes made by Sys Admin.
FR5.18	No user shall have the authority to change the log (not even Sys Admin).
FR5.19	The logged action will save the following categories of data (depending on the type of the logged action: • Identifier of the user who generated the action; • Category of the logged action; • Timestamp of action logging; • Resource of the IT application that generated the action; • Record affected by the action; • Action performed by the user.
FR5.20	The system shall keep logs for at least 6 months and then archive it.
FR5.21	The IT System will deliver a mechanism to generate reports related to logged actions.
FR5.22	Functionality for automatic backup of database and system configuration.
FR5.22.1	Backups shall be split into two parts – the application and mapping servers and their storage, and the database servers.
FR5.22.2	The system should be able automatically to take backups of data, such that it may be restored to a working state.
FR5.22.3	The system should backup data frequently (daily) to avoid any data loss.
FR5.22.4	The system should backup in a short period of time (overnight) with minimal disruption.
FR5.22.5	In event of a disaster, the latest backup should be immediately restored, such that the system is offline for less than one hour.
FR5.22.6	Before implementation, the system should have complete written backup and retention policy (technical guideline) in place that is periodically reviewed. Backup policy should be communicated in written format, training should be provided on the process and all Sys Admins should have access to the technical guideline.
FR5.22.7	Backup would be encrypted with password and periodically checked for reliability and the outcome tracked.
FR5.22.8	Backup media should comprise of a combination of removable hard disk or networked storage that is not generally accessible across the network, or in a separate network, or offsite (cloud).
FR5.22.9	Backup access should only be given to authorized Sys Admin.

FR5.23	The system should allow automation and functionality of the following administration functions: • Starting the system components; • Stopping the system components; • Restarting the system components, • Creating a database (DB) back-up; • Recovery of data using the indicated back-up; • Refreshing the system operational memory; • Setting up alerts for system performance, based on predefined thresholds; • Tools to analyze logs; • Tools for detection of security threats.