SINERGISE

Computer Assisted Mass Appraisal (CAMA)

SYSTEM DESCRIPTION

CONTENTS

1	Introduction	2
1.1	Sinergise Philosophy and Approach	2
1.2	Overall Solution	3
1.2.1	Key system parts within the valuation process	3
1.2.2	Authentication and security	4
1.2.3	Technology used	4
1.2.4	Multi-functional and multi-dimensional database	4
2	Basic Concepts	6
2.1	Valuation Register	6
2.1.1	Searching of technical objects	6
2.1.2	Working with individual technical objects	7
2.1.3	Editing of technical parameters	9
2.1.4	Entry forms	10
2.1.5	Transactions	10
2.2	Valuation models	11
2.2.1	Valuation zones	11
2.2.2	Valuation groups	12
2.2.3	Coefficients	13
2.2.4	Valuation functions	14
3	Compliance with AVM standards	15
3.1	Support for AVM Time Series Analysis	15
4	Mass appraisals and mass operations	16
5	Individual calculation module	17
6	Comparables module	18
7	Field data collection	19
8	Reporting, Publication and Documentation	20
9	Data Integration	20
10	Related Video Demonstrations	21

1 INTRODUCTION

1.1 Sinergise Philosophy and Approach

We are a customer-focused organization, thriving to provide excellent service to all our clients. While we have excellent knowledge and solutions, we do not come with prescribed solutions. We are very sensitive to each client's needs, ambitions and capabilities and tailor our solutions accordingly.

In delivery, as well as effective easy-to-use and intuitive software, we fully recognize the importance of business change, knowledge transfer and role-based operation and training. We strive to focus on the best business process requirements and ensure the optimum integration overall. We firmly believe that our extensive track record and delivery experience in national cadastral and real estate valuation solutions in several countries makes us an ideal development and implementation partner for any organization.

Our delivered solution is based on pre-existing technology and knowhow, which makes it possible to speed-up the development process and reduce any risks. However, we always customize the solution to fit the customer's needs perfectly. Since the vast majority of the technology used was developed in house, we can modify any part of it. The result is therefore delivered in a very short period of time, established, robust and well-tested, yet fully adopted to local requirements.

Sinergise offers a solution which is easy to use, platform-independent and utilizes graphical user interfaces and relational databases. Its fully web-enabled modular design and flexibility facilitate enhancements and integration with new or existing third-party systems.

The system captures data at the point of creation ensuring that the property and collection data is consistent. Our system can be distributed across organizations in different parts of the country with multi-thread security protection; all systems have role-bases access.

Since the system should be usable by various groups of users with different levels of technical knowledge, we feel that it is very important that user interface is made as simple, intuitive and user-friendly as possible.

1.2 Overall Solution

Assessing property values can be difficult to do without the right computer system and software for organizing important data. Computer assisted mass appraisal also called CAMA is a term used to describe a software package used by government agencies to help establish real estate appraisals for property tax calculations.

Over the last two decades, we have developed and supported several web-based CAMA/ GIS systems with mapping, data capture and assessment of land and buildings for a number of purposes (including ratings and sales), providing comprehensive, assessments based on rental or sale assessments. Hence, our system can support all the current foreseen models and needs in the short-term, plus many more value-added features.

The Sinergise CAMA solution supports the international standards for land and building definitions, and is generic enough to support different property models, including individual and combined land, buildings, apartments and condominium models.

1.2.1 Key system parts within the valuation process

The proposed system contains several key parts:

- data management - the market data can either come from the register of rights (e.g., deeds and contracts) or they can be added through web application or web services,
- efficient internal and public viewer,
- market data classification,
- data analysis and statistics.

The first step of the valuation process is collecting all available data about real-estate properties and market transactions such as sales, rental values, leases and other. Our system supports interactive, qualitative and quantitative, tabular and spatial analysis of all market transactions, to calculate overall net effective values (sales or rents) and to help identify and remove outliers and unrepresentative samples.

All data collected are managed in a central "Market data registry" which can support many processes:

- properties can be grouped based on property types, property parameters, location etc. to develop valuation schemes,
- valuation schemes can be applied to all properties in a defined area,
- property valuers can get access to real market data in specific region,
- the public gets an overview about the prices in specific area,
- creation of statistics of price trends,
- source of information for creation of the computer aided mass appraisal (CAMA),
- in relation to CAMA one can compare the contract price with the evaluated price for each transaction (useful with transaction taxations).

Once the market data are available, one can create zone value maps and valuation models, making it possible to apply the computer assisted individual and mass appraisals either on a specific set of real-estates (selected by the user) or as a continuous appraisal procedure (e.g. on a daily basis) for all the real-estates that have changed in the specific time interval.

Our system supports:

- **Formation of valuation models** and rendering valuation for unlimited number of different sale or rent comparisons models such as apartment and commercial buildings or land, apartment units, agriculture land etc. Additionally, the developed generic approach also allows the user to design any kind of cost or income models for example for commercial or production facilities such as petrol stations, malls or large industrial objects.
- **Detailed presentation** of the calculation procedure for each individual object showing all the input and output parameters used at any step of calculation.
- **History of values** calculated by valuation models and regular updating of zone value maps in line with the market requirements.
- **Creation of automated value reports** on the estimated value of each property object.

The mass appraisal system is composed of the following applications:

- **Web-based real-estate property management module** that enabled the user to view and edit different properties of each individual real-estate. At all times the history of the property changes is also traced and can be viewed by the user. The module can efficiently integrate with different external services and thus provide the information from other register (e.g. geometric properties, legal data, address, etc.).
- **Web-based valuation model editor** which shows data about model zones, valuation procedures. Additionally, the user with sufficient privileges can edit, add or delete model's data, which are used for real-estate valuation. This enables quick and efficient update of real-estate data.
- **Java-based mass appraisal engine** which allows fast and efficient (re)evaluation of real-estates.

1.2.2 Authentication and security

The system is configured to support several standard authentication and security mechanisms: from simple username / password authentication to SSO and active directory authentication. Our system is designed to have role-based access control, which prevents unauthorized access and manipulation of data. Specific functionalities and data can therefore be accessed only by users with appropriate user roles and security permissions.

1.2.3 Technology used

The proposed solution is based on the latest technology trends (Java, React, Android), which allows the software to run on all publicly available web browsers and operating systems. This gives us the ability to easily design additional customer-tailored features (based on specific national legislation). Upgrades of the software require no effort at the local offices – the web-based execution ensures that users always run the latest version of the client application. The solution includes a web GIS functionality, which is ready for wide use and can be easily and quickly adapted for customer's needs. The CAMA valuation application can be fully integrated with the case management functionality.

1.2.4 Multi-functional and multi-dimensional database

The Sinergise CAMA solution (the Valuation Register) is supported by a fully-relational multi-dimensional date-stamped highly-secure and controlled geo-database that supports historical and version management, and can hold an immense number of objects with an infinite number of relationships and variables with linked attributes including quality and source flags, dates of creation and change, and roles that affected any change.

The database permits the storing of different real-estate attributes on different types, for example:

- Types of properties: Property values for land and buildings can be modelled and estimated separately or in a combined way, e.g. for commercial, industrial and residential model type.
- Property parts: De-composition of properties into inter-linked property parts with defining attributes for each part. Each real-estate part can be modelled separately (e.g. units or floors or building parts inside a buildings), so that even complex multi-use buildings (e.g., malls) can be represented and modelled as individual valuation units with their own valuation models.
- Transactions: for example, sales, rental values, leases with a date-stamp, valuer.
- Locality: time-stamped neighborhood or geo-economic characteristics, for example development, class and affluence, pollution or noise, that may be based on existing data or re-drawn by analysts on the basis of sales and other knowledge or information.
- Location, as specified by inclusion in any number of geo-economic polygons, distance or proximity, barriers or conduits.

- Coordinates – each property location can be implicitly located by its coordinates (derived from GPS or off imagery/digital mapping) or even through address-matching.
- Time of change is recorded against all database objects, especially sales so that time-trend adjustments can be made to account for annual or seasonal effects on value.

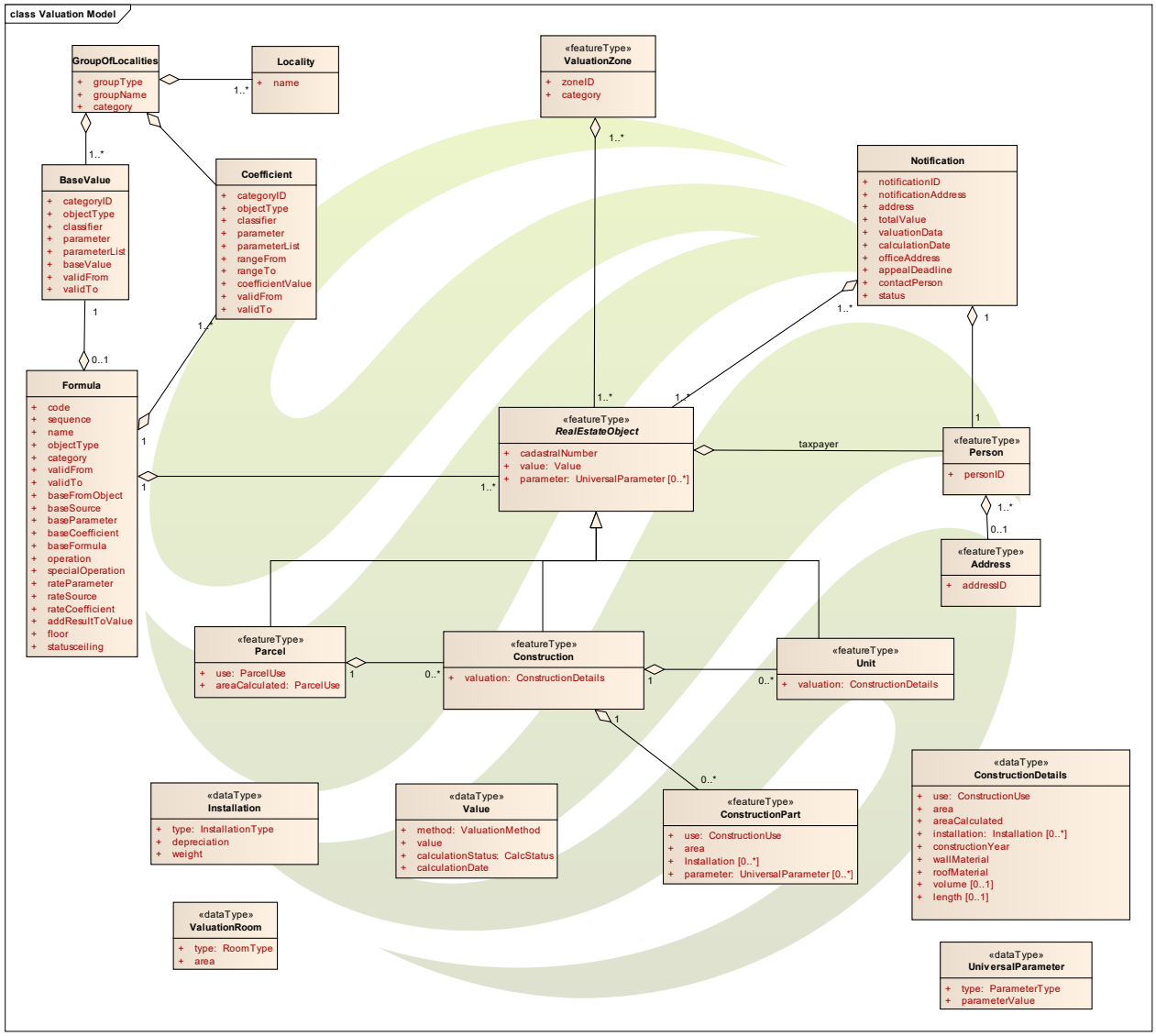

Figure 1: Conceptual data model of the Valuation Register

In the database, journaling and auditing is treated to highest possible level of importance. For each change in the dataset additional data are recorded (user id, timestamp, reference to the process through which the change was made).

The database structure can be easily customized to provide the immediate and significant improvements in the support to the valuation process and maintenance of uniform and equitable valuation base.

2 BASIC CONCEPTS

In order to illustrate the comprehensive workflow performed within the Valuation Register, one must first get familiar with the key concepts of the proposed system. In order for the valuers to be able to work and make appraisals on realistic real-estates which can vary from case to case by number and type of building on the parcel, number and/or type of units inside the building etc., we propose the following three-level technical object (TO) schema:

1. **Parcel** – represents land on which a specific building or set of buildings is located

2. **Building** – represents individual structure on the land parcel

3. **Building unit** – represents individual building units (e.g., apartments, stores, factory units) inside individual buildings, or even parts of a unit, e.g., store-front as required

Note: Other types of TO (such as parcel improvements, building parts, floors, etc.) can be added based on the specific requirements of the customer or the given the country legislation.

Each type of TO can have its own set of technical parameters (TPS) based on the type of TO. Technical parameter sets represent a set of technical parameters that were collected at a certain point in time (e. g. in a field visit or reported by the owner) and is used in the valuation procedures to establish the generalized value of the object. Usually, the technical parameters of the individual objects as well as the parent objects can be used in the valuation procedures (e.g., when calculating unit value, some of the building or even parcel parameters can be used in the valuation process).

Furthermore, for each TO the user can define the valuation (model) category (e.g., apartment, commercial unit, agriculture land, commercial land, etc.). Ideally the categories are defined based on the list of available valuation model types (this restriction can be relaxed or changed based on client specification of the rules).

Types of technical parameters can differ based on the category of the objects as well as on the physical type of TO (e.g., units will have different technical parameters than parcels).

2.1 Valuation Register

Our valuation system supports fast and efficient editing of all types of technical objects (TO) and their technical parameters (TP). It also allows the users to specify new model types based on the legislation requirements or edit the existing ones. It consists of five different modules designed to support the modelling and valuation processes on individual real-estates or group of objects.

The Valuation Register supports the following functionalities:

- Search of technical objects by different criteria
- Editing and data display of TO
- Editing technical parameters
- Editing of existing sale information
- Editing of existing rental information
- Editing of valuation models and model analysis

2.1.1 Searching of technical objects

The search functionality in the Valuation Register is designed to support an advanced set of query and search options with the purpose of assisting the valuer when searching for the TOs by their attributes, such as type of TO, identifier, technical parameter data (e.g. object size, floor, year of construction, etc.), valuation data (calculation value or date, calculation status, …). It can also integrate with other external services that support the search mechanisms and thus provide the possibility to search for example by legal data (owner, use type, date of transaction), address and other parameters.

Search by location is enabled by drawing a geometry using a GIS functionality. Search results within the specified spatial location are shown.

A result list with technical objects that correspond to the specified attributes is displayed. Users can then choose work on an individual TO (see next chapter) or perform mass operations.

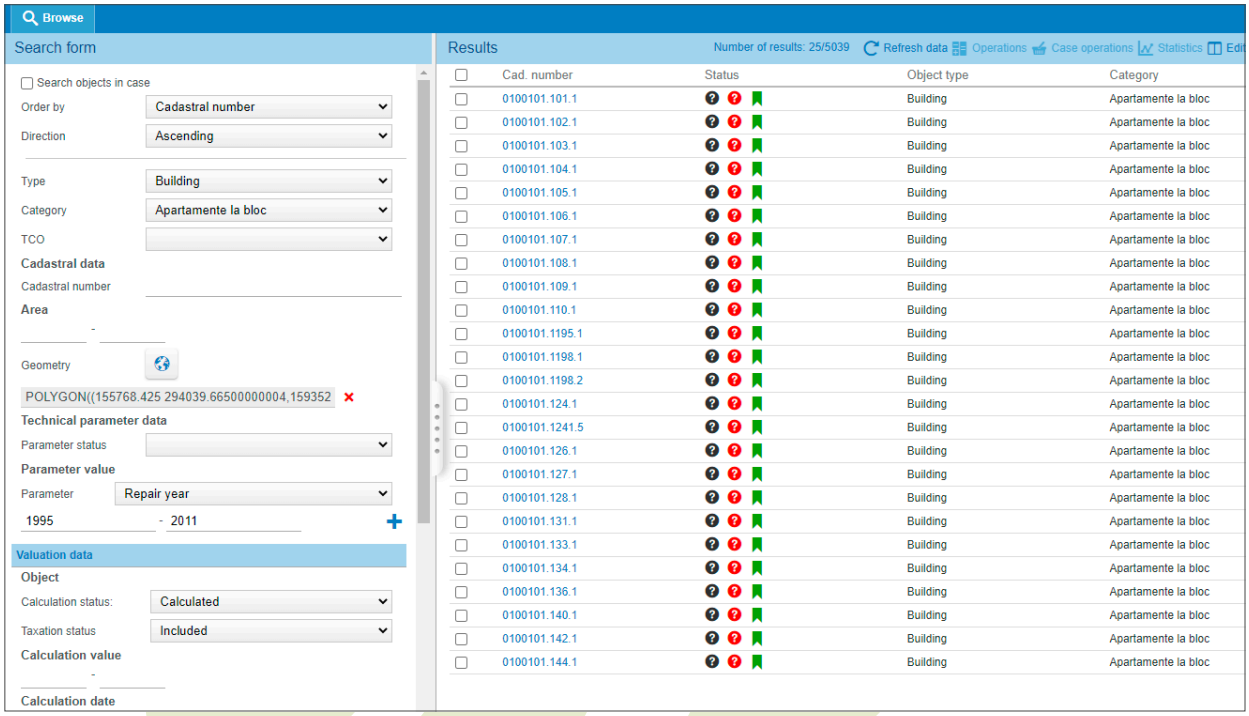

Figure 2: Technical objects search form with an advanced set of query and search options (left) and a result list of technical objects (right)

2.1.2 Working with individual technical objects

Most of the routine work is carried out on individual technical objects (TOs). The application supports the following functionalities:

- **Easy access** to all related TOs using a tree view of the relation structure. User can get a clear overview of all parcel-related building units, their attributes and assigned value(s).
- **Add new, retire or remove** existing technical objects
- **Edit technical parameters**: For each TO the users may view and edit the values of technical parameters. Different parameters can be defined for different types (e.g. unit, land, building) of objects or object categories (e.g. apartment, commercial building or agriculture land).
- **Add object-related documents** (e.g., photographs, deeds, entry forms collected in the on-site visits, etc.)
- **View owner information:** A list of owners with some basic attributes is displayed. For users with appropriate access permissions viewing of personal details is enabled.
- **View the existing transactions**: A list of all transactions (sales, rents or leases) is displayed. For each transaction contains date of transaction, value, value per m2 and other relevant information.
- **Print technical parameters** as pdf document.
- **Calculate TO value and view the existing and historic values and define a manual value** (in case of external valuation).
- **Create certificates, information letters and other documents** required by the legislation
- **Observe the graphical structure of the TO** with an easy access to the GIS interface of the object location where he can graphically inspect the neighboring objects by using the map functionality.

For each TO, all existing valuation results are displayed. When working with valuation results, valuers can obtain the exact calculation procedure by clicking on the individual valuation result details. There, the valuer can observe the date of calculation, the valuer/model who performed, reviewed and amended the calculation as well as a detailed step-by-step calculation with all the technical parameters, coefficients and other data used in the valuation procedure defined by the valuation model.

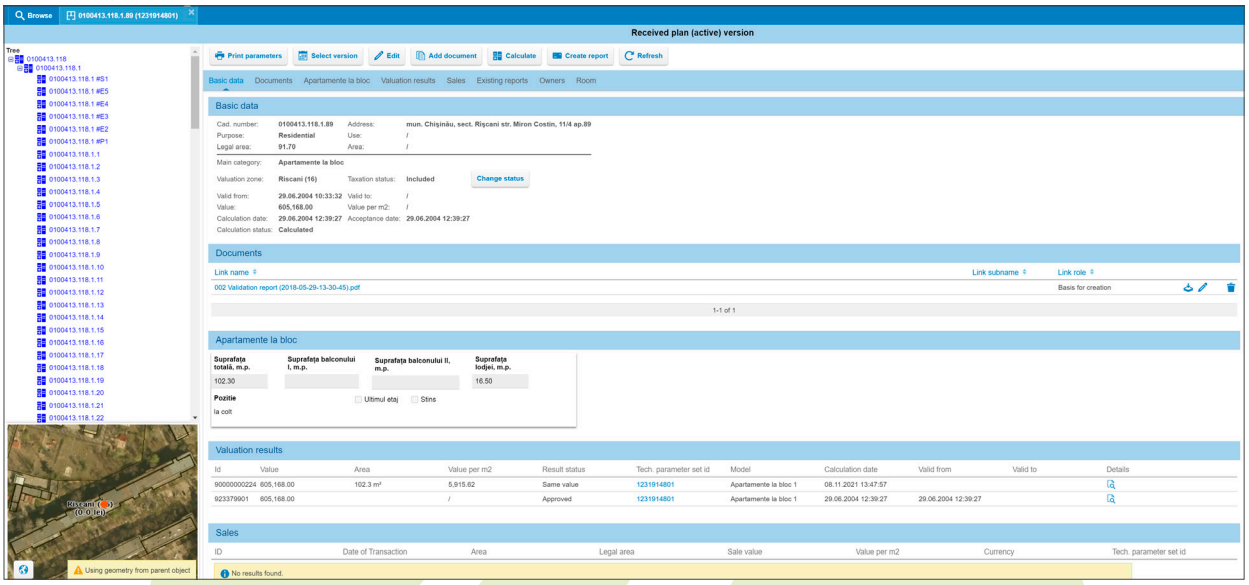

Figure 3: Detailed view of the technical object data with the tree structure of the parcel, GIS support and technical and legal data. Display of entry form, object-related documents and history of valuations.

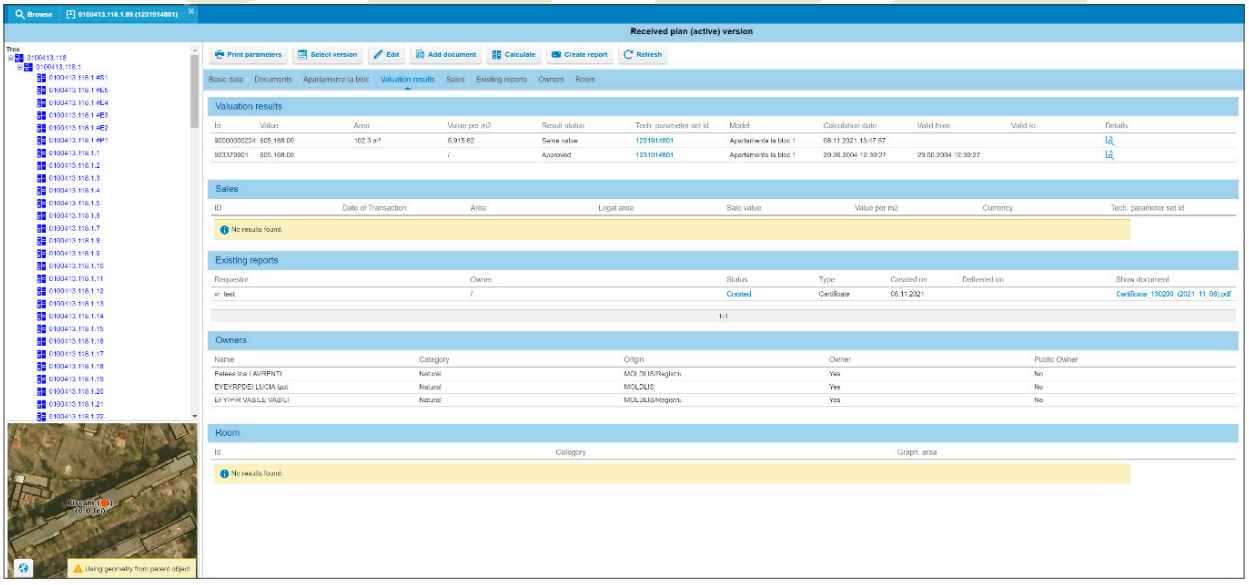

Figure 4: Detailed view of the technical object data. Display of owners, existing documents for owners and internal object structure.

2.1.3 Editing of technical parameters

Valuation register supports efficient management of technical parameters which can be collected for individual object type and valuation model. This facilitates the addition of new parameters when for example a new model is developed or when existing valuation models are upgraded and new technical parameters are introduced into the model.

List of parameters | Add parameter

Name	Object type	Categories	Parameter type	Is virtual	Is mandatory	Is active	
Accesul la calea ferată	Building	Comerciale complicate, Agricole	Boolean	No	No	Yes	Edit
Accesul pentru autovehicule	Building	Comerciale complicate, Agricole	Boolean	No	No	Yes	Edit
Accesul pentru autovehicule	Parcel	Comerciale complicate, Agricole	Boolean	No	No	Yes	Edit
Alte camere	Building	Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Alte elemente constructive	Edifice	Comerciale complicate, Agricole	Enumerated	No	No	Yes	Edit
Alte servicii	Parcel	Garaje	Boolean	No	No	Yes	Edit
Amplasare	Parcel	Garaje	Enumerated	No	No	Yes	Edit
Amplasarea față de strada principală	Parcel	Comerciale, Comerciale complicate, Agricole	Enumerated	No	No	Yes	Edit
Amplasarea la demisol	Building Unit	Garaje	Boolean	No	No	Yes	Edit
Amplasarea la etaj	Building Unit	Garaje	Boolean	No	No	Yes	Edit
Amplasarea la subsol	Building Unit	Garaje	Boolean	No	No	Yes	Edit
Anexă	Building	Garaje	Boolean	No	No	Yes	Edit
Anexă	Building Unit	Garaje	Boolean	No	No	Yes	Edit
Anexă	Building Part	Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Anul construcției	Building Part	Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Anul construcției	Building	Casa individuala, Case ind. mun.Chișinău,Bălți	Numeric	No	No	Yes	Edit
Anul construcției	Building	Casute Sezoniere	Numeric	No	No	Yes	Edit
Anul construcției	Building	Comerciale, Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Anul construcției	Building	Apartamente la bloc	Numeric	No	No	Yes	Edit
Anul construcției	Building	Garaje	Numeric	No	No	Yes	Edit
Anul reconstrucției	Building	Casa individuala, Case ind. mun.Chișinău,Bălți	Numeric	No	No	Yes	Edit
Anul reparației	Building	Comerciale, Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Anul reparației	Building Unit	Case ind. mun.Chișinău,Bălți	Numeric	No	No	Yes	Edit
Anul ultimei reparații capitale	Building Part	Comerciale complicate, Agricole	Numeric	No	No	Yes	Edit
Apă	Building	Casa individuala, Case ind. mun.Chișinău,Bălți	Boolean	No	No	Yes	Edit

Figure 5: A list of technical parameters

The system supports the following types of parameters: Numeric, Enumerated (code-list), Date, Boolean and String.

When adding a new technical parameter, its name and type need to be defined first. Each parameter has to be linked to a specific type of technical object and to one or more valuation model category. Same parameter such as for example land area can be used on several model types which means that the same parameter can be used when a new model is introduced or the real-estate category is changed removing the need to collect the same parameter several times.

For each technical parameter additional limitations can be specified (e.g., min/max value, precision, list of allowed code-list values, min/max length of text, etc.).

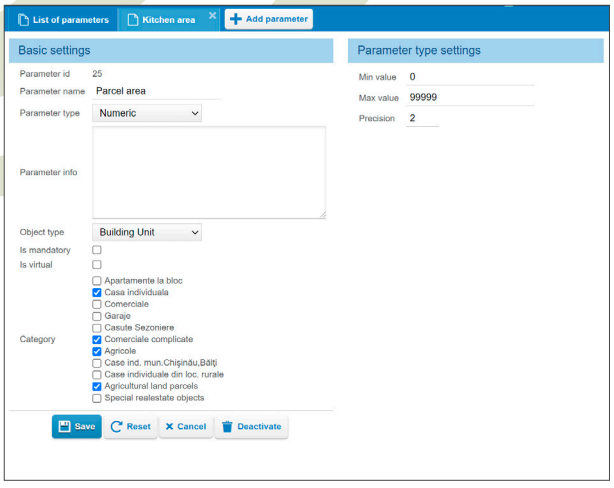

Figure 6: Adding a new parameter

2.1.4 Entry forms

To collect market data e.g. during fieldwork, the entry forms are used. In the proposed solution, the entry forms with technical parameters for each model and object type can be created.

The Forms graphical user interface enables the users to effortlessly create new or edit existing entry forms by specifying the list of parameters that will be collected for specific category and object type. The appearance of an entry form can be adjusted by re-positioning of entry form elements by dragging them with a mouse, adjusting their size and appearance (color manipulation, changing of font, style, drawing of borders, etc.)

is able to perform analyses with external statistical software (e.g. Excel, SPSS, Matlab or R).

For each transaction some basic attributes are displayed, e.g. the cadastral number, date of transaction, sale value, value per m, etc. are displayed. The transactions are shown for the selected model type. Effective browsing the transactions can be executed by using sorting and searching functionalities. For each transaction a list of technical parameters can be displayed and users can change the validity of transactions (e.g. if the reported value is out of range of transactions with similar object specifications).

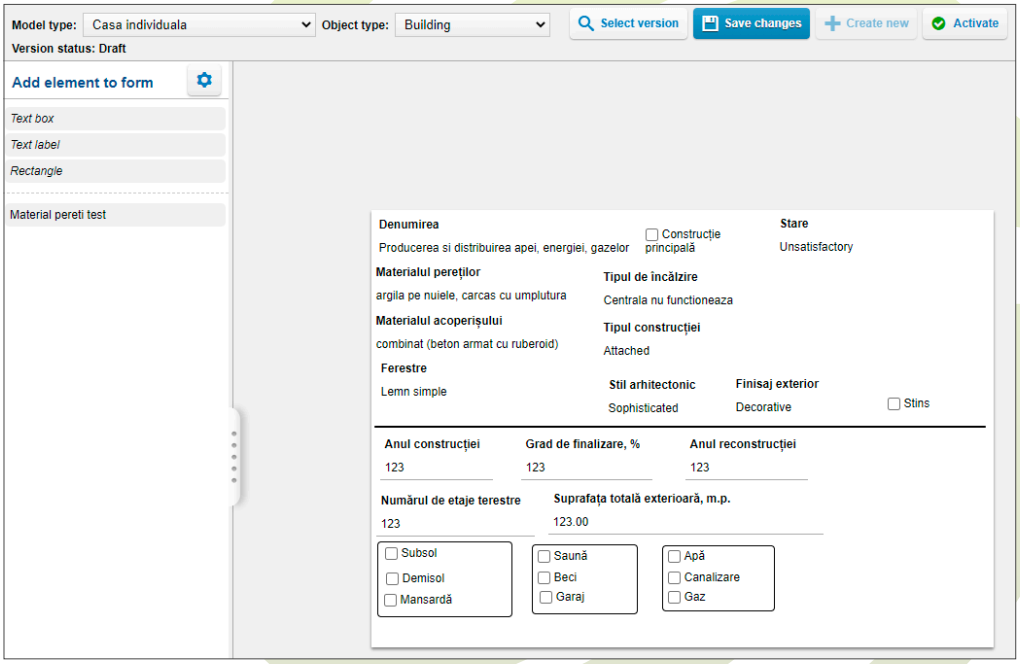

Figure 7: Entry form editing

2.1.5 Transactions

The system offers effective management of the transactions – either sale or rentals. The transactions are imported into the system in a .csv format. The system also allows exporting of transactions together with the object technical parameters and other relevant information (e.g. location, address, valuation zone) so that the user

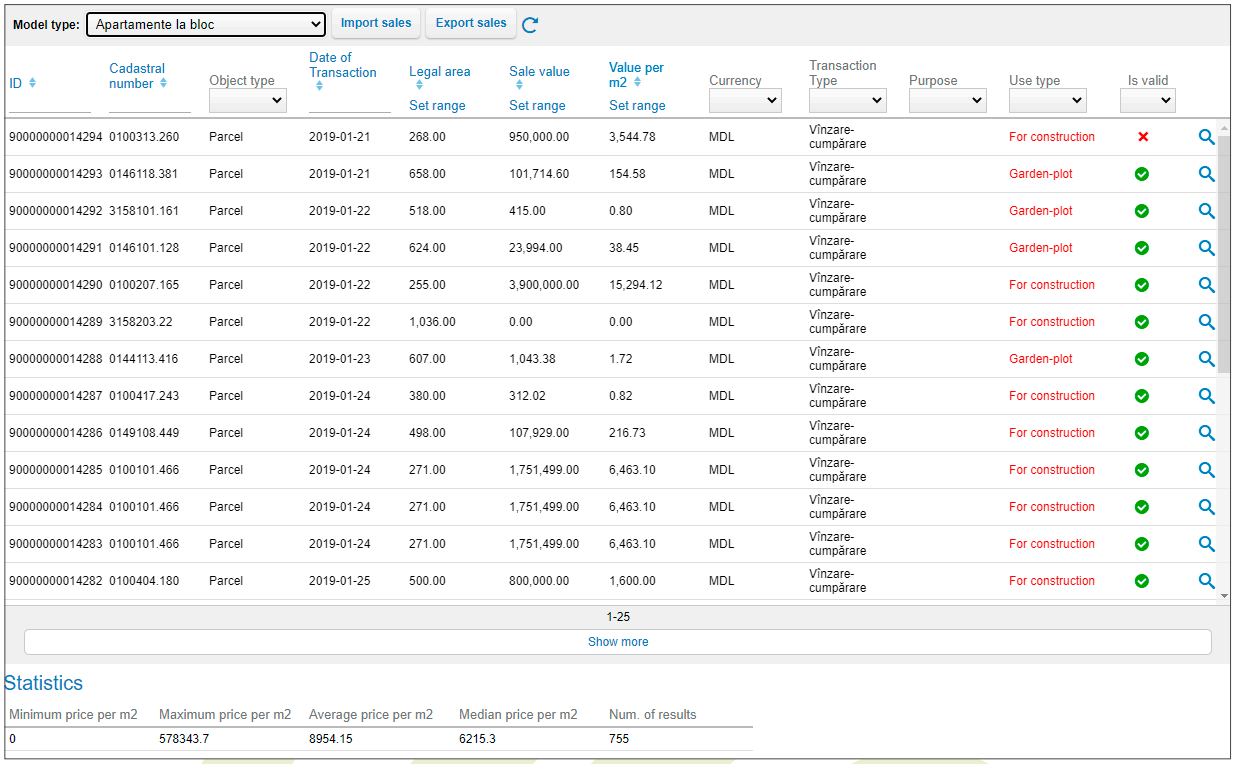

Figure 8: A list of transactions for the Apartments model

2.2 Valuation models

The Valuation Register contains a versatile and generic modelling functionality, allowing the valuer to specify easily any type of valuation model (sale comparison, cost or income) by defining and linking together the basic elements of the model based on the user requirement and country legislation:

- Valuation zones
- Valuation groups
- Coefficients
- Valuation functions

Note: Not all elements need to be defined if not available. If needed, the entire calculation can be defined only by using the valuation functions.

If the, the market (sales, rentals) data are available, the process of computer aided mass appraisal can be performed. The Valuation Register enables assisted and agile creation of valuation models. Valuation models are versioned and each version is permanently stored in the system. This allows the user to study old valuations and valuation models even if a newer model version is introduced in the meantime.

2.2.1 Valuation zones

The valuation zones can be useful to represent geographical parts of the country (i.e. postcode areas, enumeration districts, towns or regions, or even as, for examples buffers on high streets or industrial zones), which may have similar statistical influence on the technical parameters and on the technical objects' value (for example, the square-meter value of the apartment in the urban centers or along main roads can be much higher than that in suburbs or in backstreets).

Our solution provides facilities for editing and refinement of valuation zones, visual inspection based on transaction and basic diagnostic tests to see if/how they can make a difference and whether they should be used in different and evolving models. Editing of both geometry and attributes of the valuation zones is supported.

2.2.2 Valuation groups

Similarly to the valuation zones, valuation groups can represent the geographical union of different parts of country with similar statistical characteristics (e.g. major city centers, rural suburbs, west/east of the country, etc.). With the groups, the valuer can specify these relations based on the address of the objects and not from the actual location of the objects (meaning, no object coordinates or geometry are needed).

Usually, the groups represent a more general grouping of the country to individual statistical regions and zones may be used to define a more

detailed division on a city level (e.g., individual districts). Localities can be easily moved/removed from one group to another.

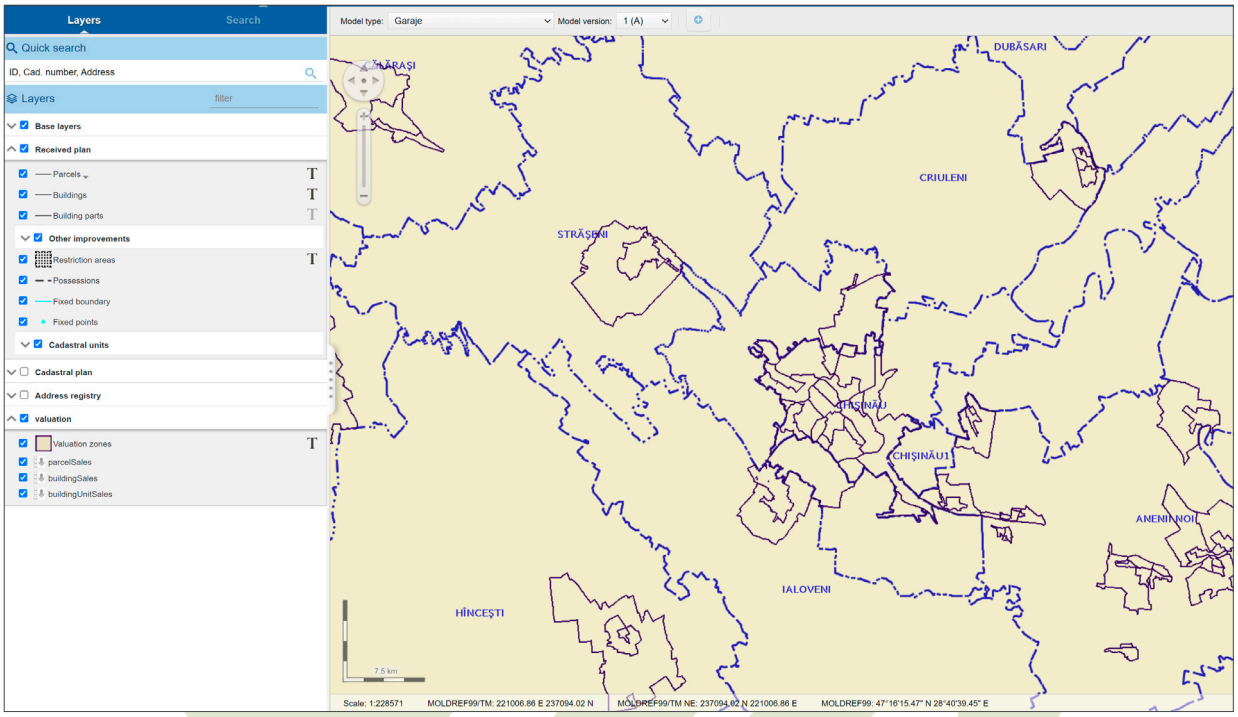

Figure 9: Example of valuation zones for Commercial model in Moldova, displayed in Map viewer

Model type: Apartamente la bloc
Model version: 1 (A)

Basic data | Locality groups | Valuation zones | Coefficients | Functions

Groups: 1 - Coefficients - Comparable method

- 1 (M1 G1 T1) — Bunești, Ceroborta, Cheltuitori, Condrița, Cruzești, _extravilan*6
- 1 (M1 G1 T28) — Bîc, Brăila, Dumbrava, _extravilan*13, Făurești, Frumușica, Goian, Goianul Nou, Hulboaca, Humulești,
- 14 (M1 G1 T1) — Botanica, Buiucani, Centru, Chișinău, Ciocana, Rîșcani
- 47 (M1 G1 T1) — Budești, Colonița, Tohatin, Vadul lui Vodă
- 47 (M1 G1 T28) — Băcioi, Bubuieci, Ciorescu, Codru, Cricova, Dobrogea, Durlești, Ghidighici, Grătiești, Sîngera, Stău

Localities

Name	Full name	Level
Condrița	Republica Moldova, Municipiu Chișinău, Sat Condrița	Localitate
Ceroborta	Republica Moldova, Municipiu Chișinău, Comuna Cruzești, Sat Ceroborta	Localitate
Cheltuitori	Republica Moldova, Municipiu Chișinău, Comuna Tohatin, Sat Cheltuitori	Localitate
Bunești	Republica Moldova, Municipiu Chișinău, Comuna Tohatin, Sat Bunești	Localitate
Tohatin	Republica Moldova, Municipiu Chișinău, Comuna Tohatin	UAT 3 (municipiu, comună, oraș, sat)
Cruzești	Republica Moldova, Municipiu Chișinău, Comuna Cruzești	UAT 3 (municipiu, comună, oraș, sat)
Colonița	Republica Moldova, Municipiu Chișinău, Sat Colonița	UAT 3 (municipiu, comună, oraș, sat)

Figure 10: Example of valuation groups (left) and localities and communes inside individual group (right)

2.2.3 Coefficients

Coefficients contain the information about the statistical influence of a particular technical parameter on the overall value of TO (for instance, base value of a square meter of a shop or apartment, influence of year of construction, etc.). They can also contain other information such as weights (like the influence of the balcony in the overall calculation area of the apartment).

Coefficients can be defined for individual valuation zone, individual locality groups or even without a specific grouping (content for the entire country). The structure of the coefficient can be defined by the valuer by defining the dimensions of the coefficient. This allows the valuer to definition of more complex coefficients, such as 3-dimensional coefficients. For example, 1st dimension the valuation zone or locality group and 2nd and 3rd dimensions representing the other two different technical parameters, making it possible to incorporate into the valuation model the correlation between a pair of parameters.

Figure below shows some examples of such coefficients for the commercial model. For example, AIR_COND coefficient consists of three dimensions, 1st dimension being the valuation group, 2nd the type of commercial object and 3rd the presence of air conditioning in the commercial object.

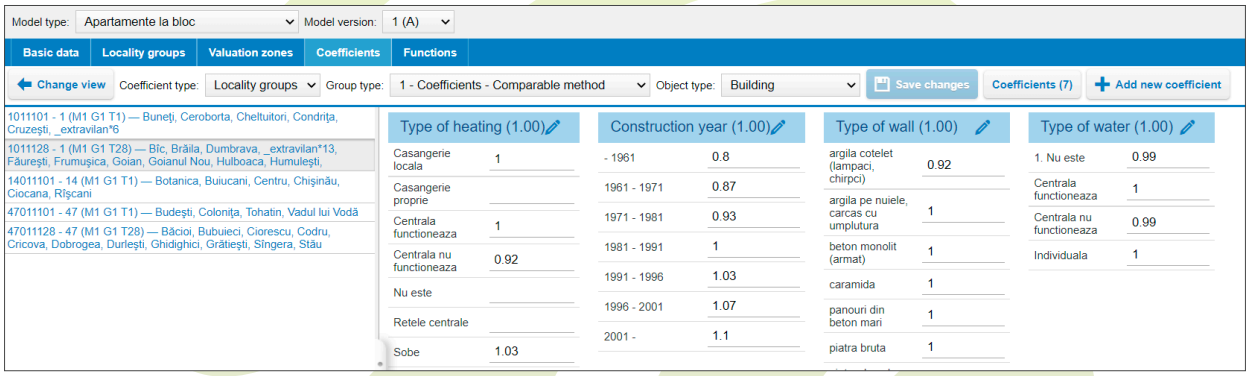

Figure 11: Example of coefficients for Apartments model

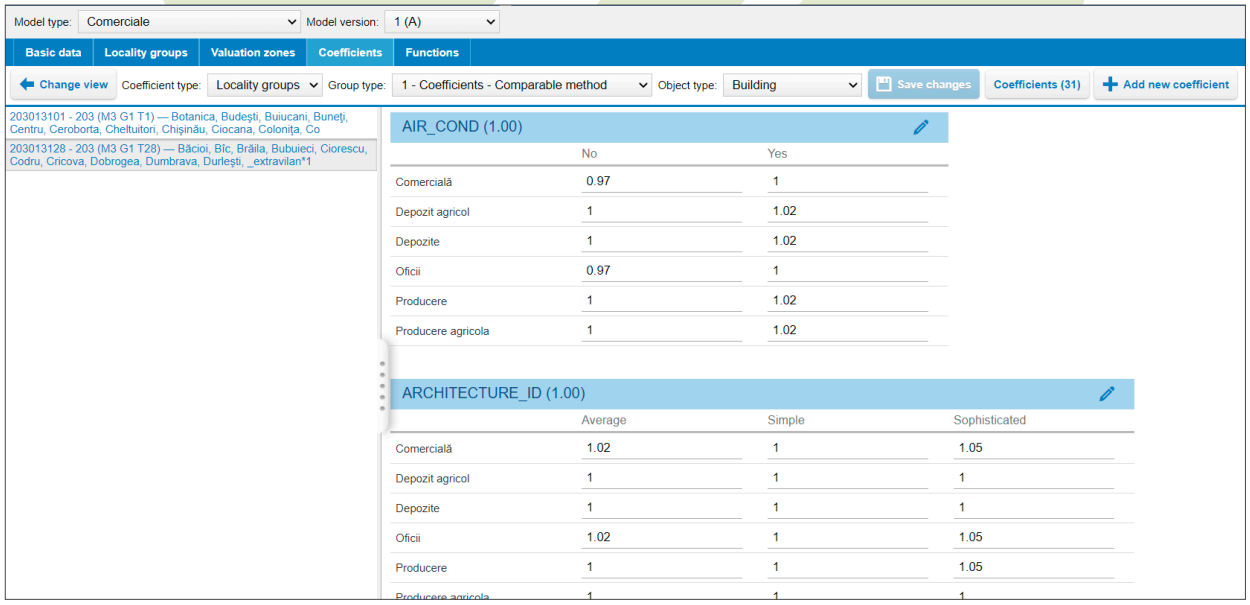

Figure 12: Example of 3D coefficients for Commercial model

2.2.4 Valuation functions

Valuation functions are used to define the actual calculation procedures by linking together coefficient, technical parameters (e.g., object area) and other valuation functions. By doing so, the valuer has the possibility and flexibility to define any type of calculation procedure by simply linking together a set of Excel-like valuation function. Different sets of functions can be defined for each type of TO (unit, building, parcel, etc.) based on the national legislation.

Our solution supports dozens of different types of valuation functions:

- **arithmetic functions**: sum, subtraction, product, division, min, max, lower, greater, etc.
- **logical operations**: is null, not, OR, AND, equals
- **functions that allow consideration of parcel structure**: map, use parent, map for category
- **special function**: decode, call database function, error, etc.

The valuation functions interface enables straightforward editing and adding of valuation functions by defining the basic function parameters (name, operation), additional parameters (e.g. precision, default value, comments/descriptions, etc.) and then simply adding function attributes.

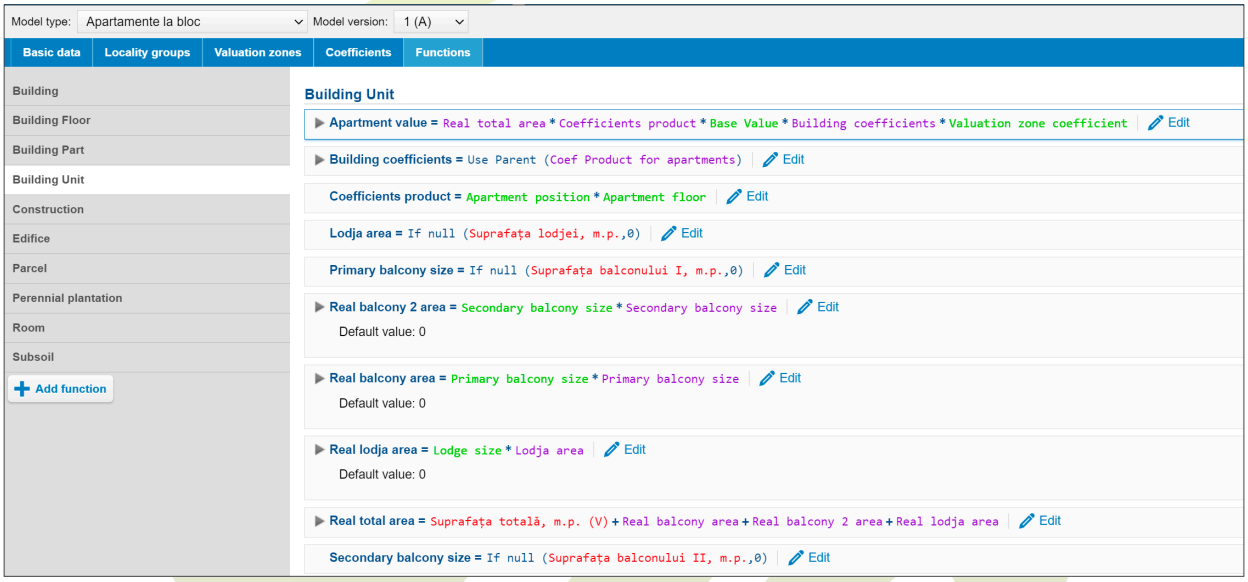

Figure 13: Example of valuation formula for Apartments model

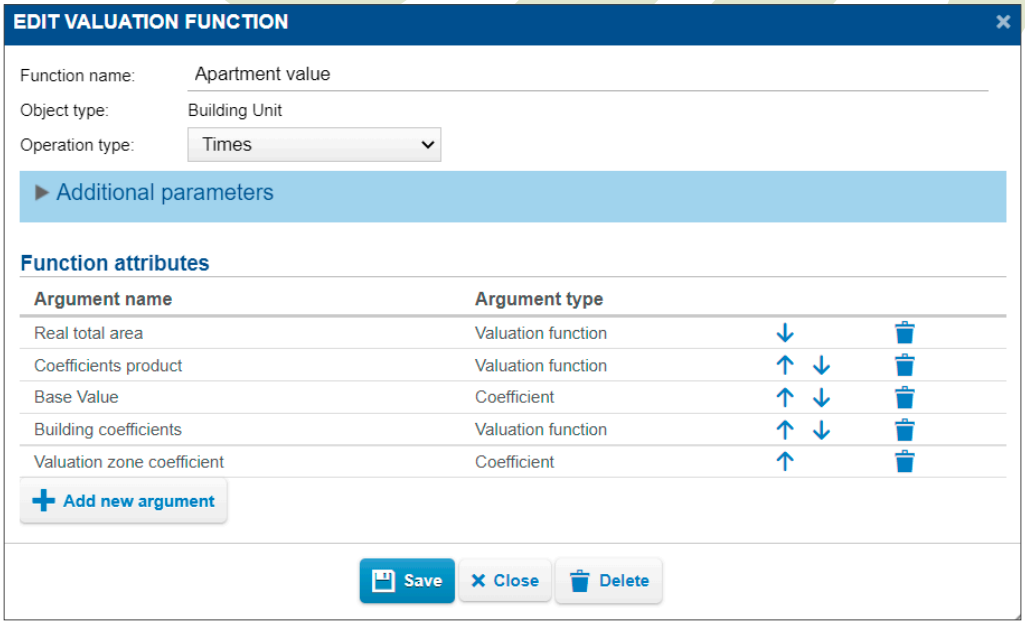

Figure 14: Example of editing of valuation functions

3 COMPLIANCE WITH AVM STANDARDS

The Sinergise CAMA Valuation Module provides support for all the principles of the Automation Valuation Models (AVM) Standard, in deriving market appraisals through applying mathematically models to property characteristics. In several projects, we have worked with the national authorities to gather and maintain efficiently representative data of acceptable and documented quality, which have proven to be statistically sufficient for the applications developed and that have been published in an open, transparent way to provide confidence to the intended users.

3.1 Support for AVM Time Series Analysis

The Sinergise CAMA system supports time series analyses to measure the cyclical movements, random variations, seasonal variations, and trends observed over a period. Methods used to develop time trend factors for property valuation, which are supported by our system, include:

- Value per-unit analysis, which track changes in sale price per unit (e.g., per square foot for residential properties or per unit for apartments) over time.
- Re-sales analysis, which uses repeat sales occurring over a given period of time. The system converts price changes between sales to monthly rates and an average (or median) rate of change is extracted.
- Sales/assessment or sales/AVM value ratio trend analysis, which involves tracking changes in the ratio of sales prices to existing assessments (or AVM values) made as of a common base date.
- Median/mean value per period in the form of a moving average/median sale price with the average or median prices per period regressed to establish a trend line. The trend value can then be used to adjust the sale price to the effective date of the valuation, which can support, for example, all ratable properties in a local authority area to be valued by reference to a single valuation date.

When economic or sales information is limited, sales and income data can be expanded by using data from multiple years for similar property types. This may require time trending and related adjustments of sale prices to bring them to current market levels. Inclusion of time sale variables can be used to adjust values to any point within the sales period.

Figure 15: Tool for definition of temporal normalization (adjustment of prices through years)

Figure 16: Editing of price/area function parameters

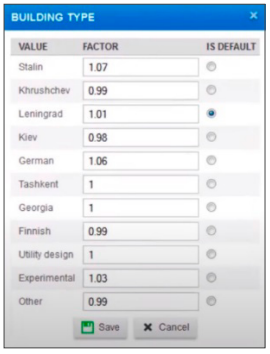

Figure 17: Editing of additional valuation model parameters

4 MASS APPRAISALS AND MASS OPERATIONS

Our solution enables effortless editing and thorough overview of data for individual TO. However, when there are large quantities of objects that need to be processed in a very short time, the individual approach is not very user-friendly. Therefore, the system also supports several operations that can be carried out in a mass mode such as:

- **mass appraisal**
- **mass creation of notifications or information letters**
- **mass creation of pdfs for TO parameters**
- **export of selected TO data**
- **statistical analysis of valuation results**

An advanced set of query and search options is incorporated into the system with the sole purpose of providing the valuers the ability to find the TOs which can then be included in any of the above-mentioned mass operations (see example below).

The report and valuations are created asynchronously giving the valuer the possibility to perform other tasks while waiting for the operations to be finished.

If needed, the system can be configured in such a way that mass valuation can be automatically performed on a regular daily basis. This way the system always contains the up-to-date values of the TOs even if the (re)calculations were not specifically requested by the valuer. This functionality also allows and facilitates the calculations when the data are changed from the external sources (e.g., through services).

The visual flag on the search results allows the user to observe current calculation status of the objects and objects with invalid calculation status (because of change of object parameters) can be obtained using the search parameters thus

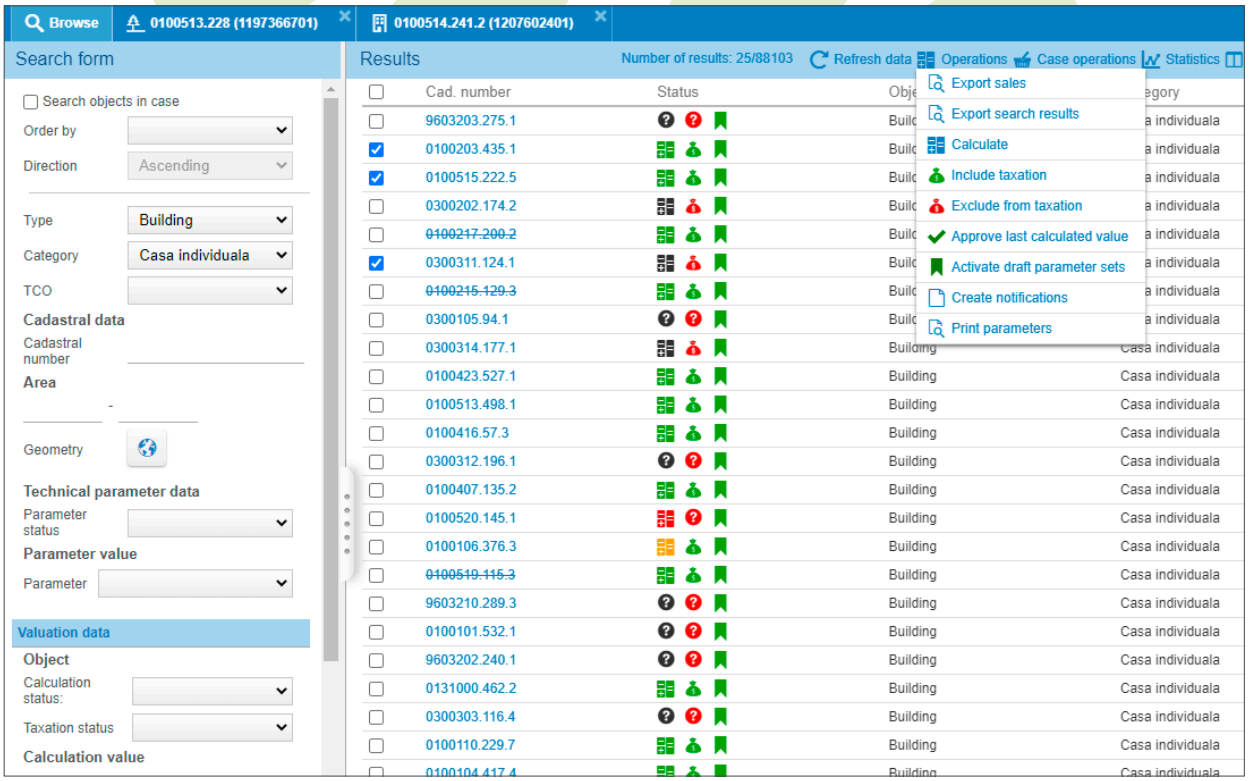

Figure 18: Selection of technical objects and mass operations

facilitating the re-evaluation of objects that have recently changed.

A specific feature of the mass operation is the speed and optimization that allows several statistics to be calculated on the fly for a selected set of objects. Valuers can obtain, for example, the comparison results of the minimum, maximum, average, median and standard deviation (and all other measures) of difference between:

- last two calculated valuation results
- the last calculated results and sale prices (if available)
- a set of objects with the greatest difference between the selected criteria, etc.

This allows the valuer to perform basic model calculation quality control, quickly identifying possible problems/outliers in the model settings. Additionally, all the valuation results and technical objects can be exported in any user-friendly format allowing additional high-level analysis of valuation results in external statistical software (e.g. Excel, SPSS, Matlab, R etc.).

5 INDIVIDUAL CALCULATION MODULE

Once a valuation model is calibrated and applied, the individual calculation module makes it possible to perform individual calculation and check valuation models on all and individual properties, perhaps outliers or ones where special information is known or needed. Our individual AVM calculation module also makes it easy to identify, which attributes were relevant or contributed most to the final price modelled estimate. For each real estate object details of each valuation result calculation are available together with all the input parameters used each calculation step.

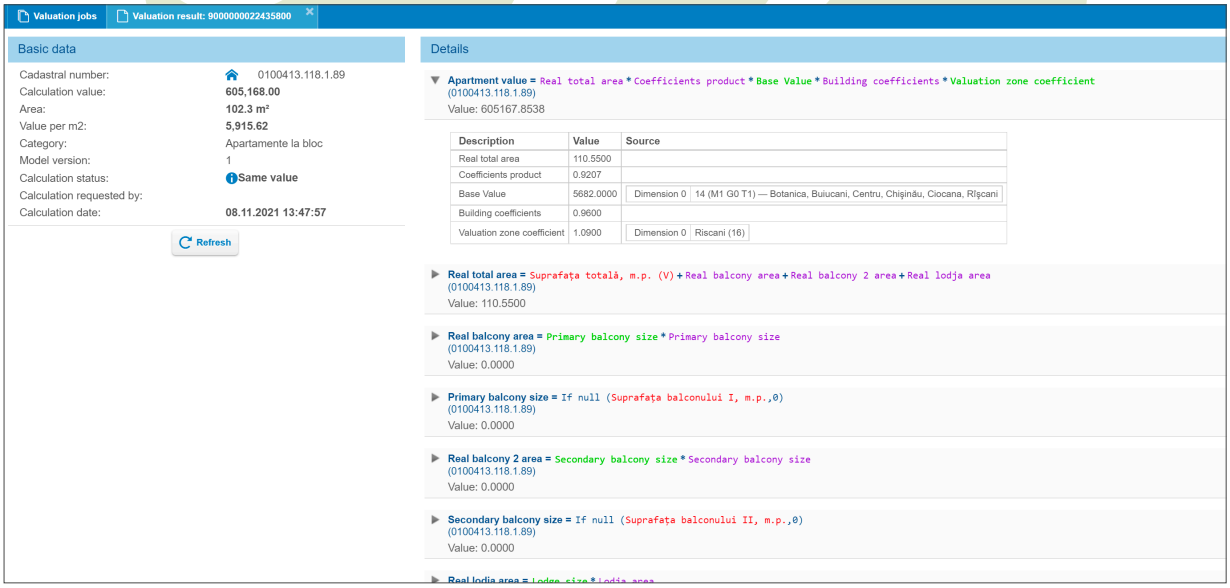

Figure 19: Details of a valuation result calculation

6 COMPARABLES MODULE

The Comparables module is designed to identify transactions (sales) that may be used for valuation of an individual property, by presenting relevant comparable property information. It allows the valuer to select distance, type, age or other parameters to form a list of comparable sales.

The comparables module supports the use of comparables for different types of transactions – either sales or rentals.

The process is performed in the following steps:

1. Identify the property, for which an individual appraisal is to be made. The property can be either selected from the map or found using the search functionality (e.g. search by location, owner, technical parameters, etc.).
2. Search comparable transactions in the nearby area. The user can select the parameters of the search, including distance, dates, types, age, technical parameters, etc.
3. The result is provided in a form of a list of transactions (sales), which have the same or similar attributes.

The system allows generation of comparison reports (in a pdf format), which show the comparables and how they may be used to adjust the subject property rating value. The comparables, presented in the report, can be defined by the valuer.

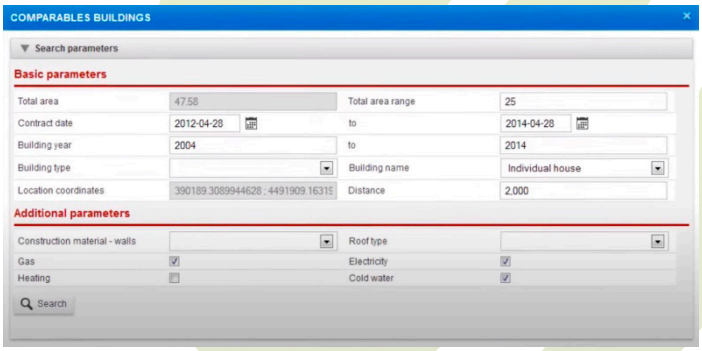

Figure 20: Step 2: Search comparable transactions in the nearby area

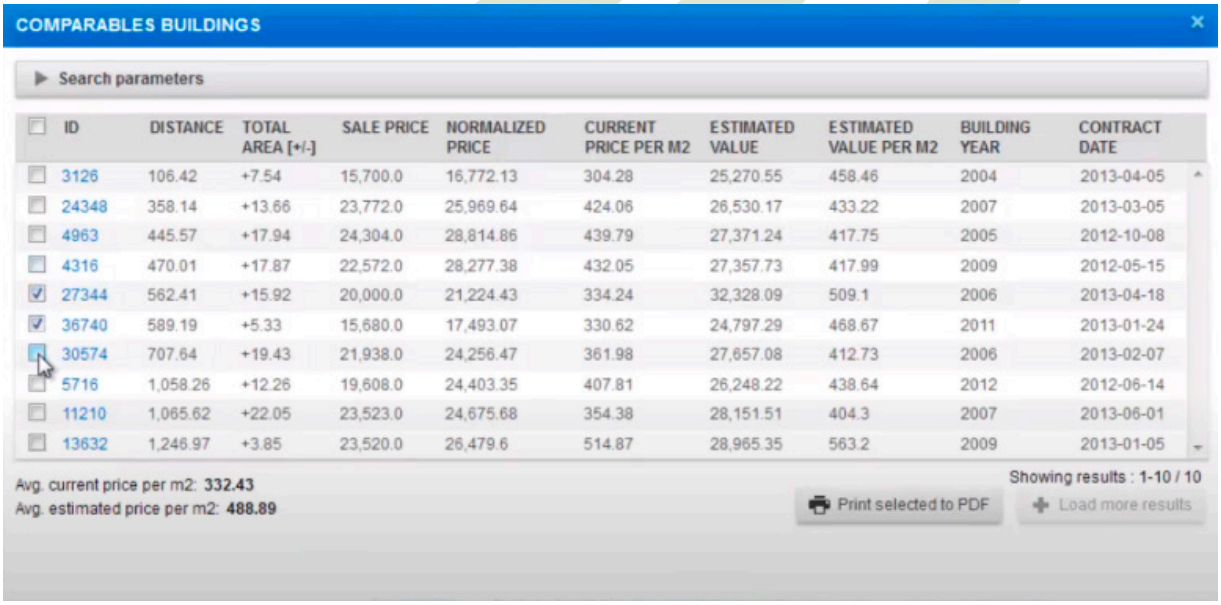

Figure 21: Step 3: Results of the search

7 FIELD DATA COLLECTION

Field data collection is a tool for mobile devices (Android OS-based), which enables efficient management and collection of field data. The application supports synchronization with geodatabases in real-time and is capable of operating in both network connected and disconnected environments.

The Mobile based field data collection system support allocation of tasks (packages) amongst valuers to achieve highest efficiency. The process of field work execution is optimized to reduce time required for the tasks to be performed. On-entry data validation and post-processing quality assurance procedures ensure that errors are found and eliminated.

Mobile based field data collection system supports the following workflow:

1. Prepare maps and services for off-line use with server-side application
   - Select area of interest and create field data collection package
   - Synchronize the data to a phone or tablet for off-line use
2. Download maps to your smartphone or tablet for offline use
3. Collect data
   - View and explore maps in the field
   - Select a feature by clicking a geometry on the map or search by attributes and select from the result list
   - Edit feature geometry or attribute data
   - Add related items to the selected feature (e.g. document such as pictures, videos, pdfs, etc.) or take a photo with the device you are using in the field (location and bearings are recorded)
4. Synchronize / upload collected data back to the server-side

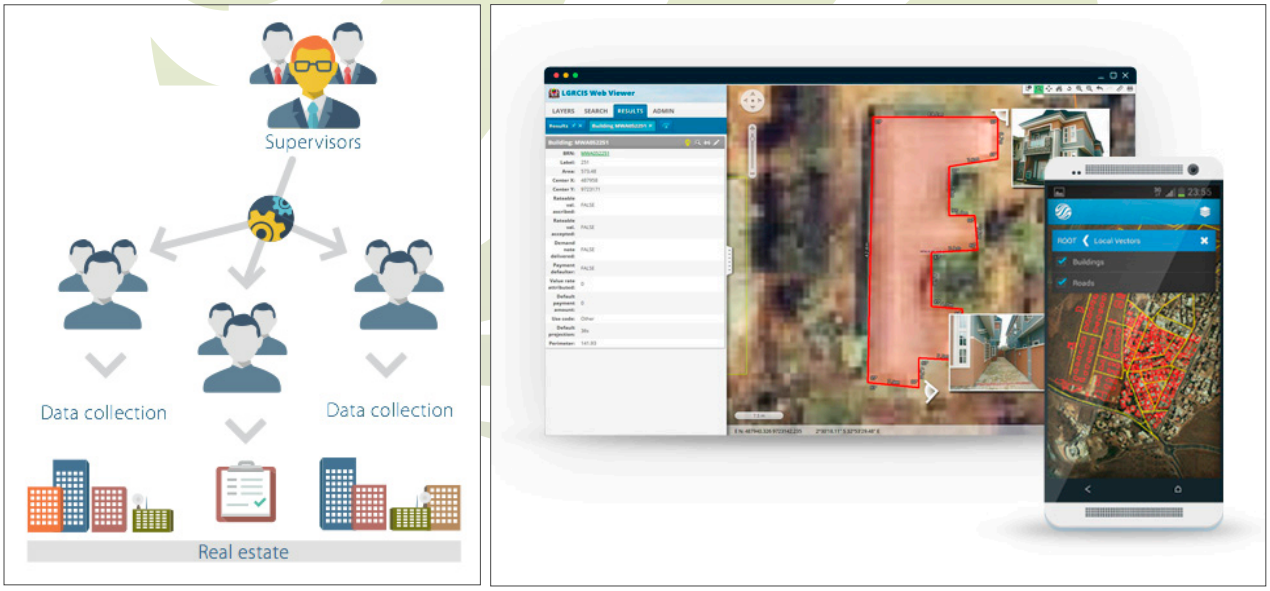

Figure 22: Mobile-based Field Data Collection system

8 REPORTING, PUBLICATION AND DOCUMENTATION

The Sinergise CAMA system supports a wide range of reporting, publication and documentation, which are crucial to the overall AVM functionality to explain and support the model results, as well as disseminate the information and allow comment and appeal (mass publication through a portal).

The database design permits different levels of information publication for different roles/ users, through textual, chart and geographic (map) basis.

The following reports can be generated:

- **Per property**: providing attribute values of a TO and its related TOs (for example, parcel-related building units), their assigned value(s). Generally, these reports are pre-formatted, in PDF format, merged with customer-specific reports, for example.
- **Per owner**: providing the list of owners real-estates and their assigned value(s), in PDF format. These reports may be, for instance, sent to the real-estate owners, informing them on the values of their real-estates after a mass valuation. Mass creation of reports is enabled.
- **For model:** model-related information (e.g. model description, model type, valuation function formula, valuation zones map, etc.) and quality statistics.
- **Data export:** users with appropriate user roles can export transactions, valuation results and selected TOs, allowing additional analyses in external statistical software.

The modular architecture of the system makes it possible to integrate with 3rd party document management systems if they are already in place.

9 DATA INTEGRATION

The Sinergise web-based system is designed to consume data sources as web-services, as long as they are supported by a Service level Agreement which covers provision, performance and documents/alerts any changes to content or format. Our solution fully supports bi-directional data sharing with other public service bodies. For example:

- All data entered by user via the Valuation application will be consumed as a data service by the database, supported by running a set of validation rules before commit and ensuring the referential integrity of the database.
- OSi supply of administrative boundaries and addresses will be used where possible for location and boundary details, using their REST and WMS services.
- Where an API is available, two types of documents can be streamed: submission documents and company printouts. These are useful in situations where the valuation office might wish to display the document for a submission or a company printout directly to an end-user in conjunction with routine API returns.
- Providing SOAP services for value to be accessed by other applications.

10 RELATED VIDEO DEMONSTRATIONS

Want to see more?

Check out video demonstrations of our products:

- Real-estate valuation models:
  http://www.youtube.com/watch?v=FPwPjwxdiow
- Real-estate Value Calculator:
  http://www.youtube.com/watch?v=FrkLPSU-yyg
- Establishment of Mass valuation in Azerbaijan:
  https://www.youtube.com/watch?v=OgefhszKOi0
- Automatic calculation of mass valuation models:
  https://www.youtube.com/watch?v=dzS5pCjb-8c
- Mobile-based Field Data Collection:
  https://www.youtube.com/watch?v=tZCiA3ty1QQ
- Real-estate Market Data:
  http://www.youtube.com/watch?v=QXtrzRoKm8g

SINERGISE LABORATORY
FOR GEOGRAPHICAL INFORMATION SYSTEMS,
LTD.
Cvetkova ulica 29
1000 Ljubljana, Slovenia

T: +386 (1) 320-61-50
F: +386 (1) 620-22-28
E: info@sinergise.com

Ljubljana, November 2021