Global Trends on Property Tax Management and Valuation Systems

Paul Bidanset, PhD Candidate

ADB-LX Corp Joint Workshop on Building National Spatial Data Infrastructure

31 October - 4 November 2022, Seoul, South Korea

Presenter Background

- Founder & Executive Director, Center for Appraisal Research and Technology (CART) → OpenAppraisal.org
- Adjunct Professor of Economics, Regent University, Virginia (USA)
- Previous:
  - Valuation Research Project Manager, IAAO
  - Research Fellow, Lincoln Institute of Land Policy (LILP)
  - CAMA Modeler/Statistician, City of Norfolk, Virginia's Assessor's Office
- AVM experience (building/implementing/quality control/staff training):
  - Romania
  - Moldova
  - Ukraine
  - Estonia
  - United Kingdom
  - United States (Chicago, Detroit, Milwaukee, Albuquerque, and more)

Goals of this Presentation

- Share best practices for land management and valuation software/computer systems

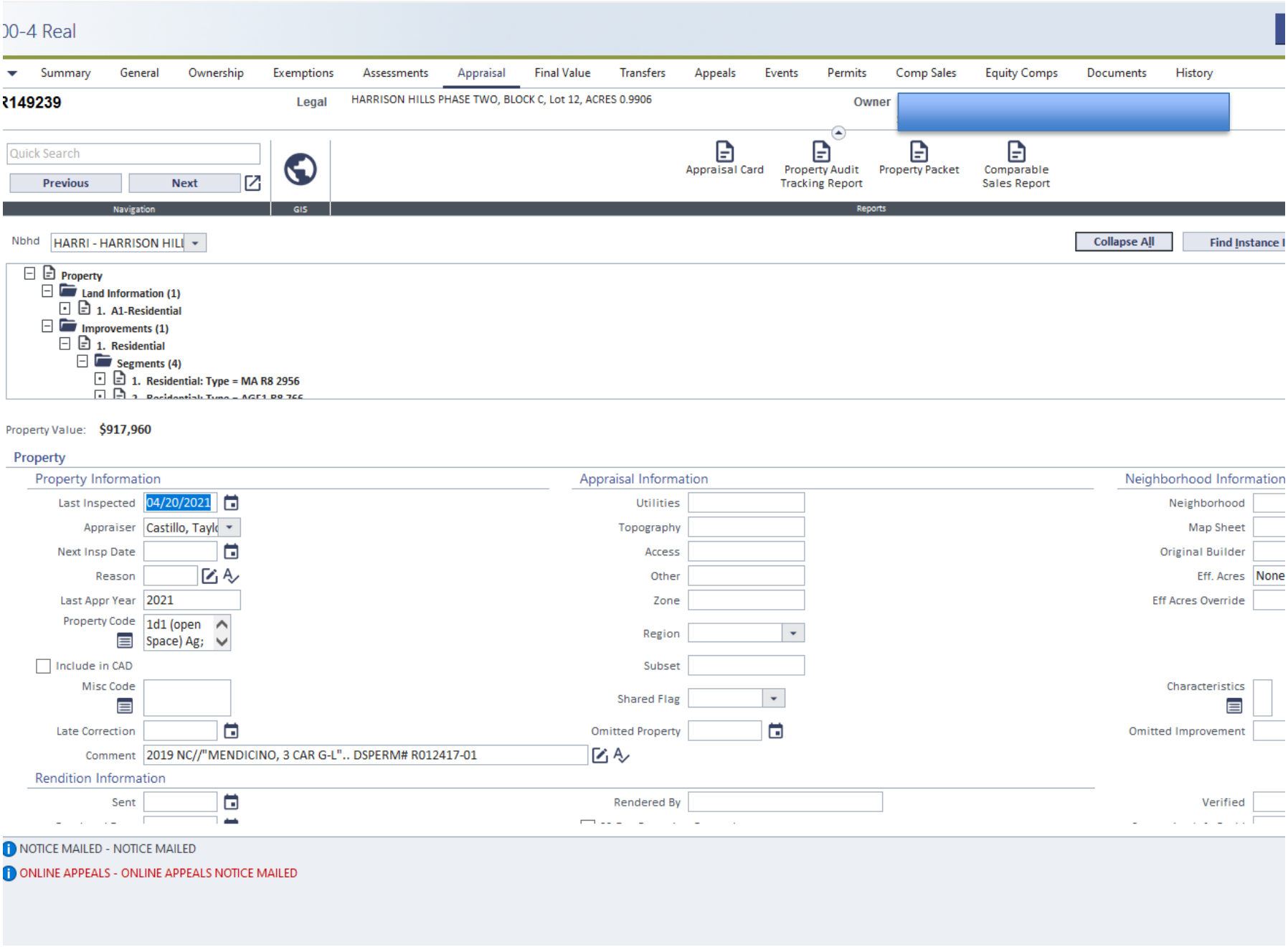
- Address requirements and functionality between
  - Cadastral data
  - Sales registries
  - Geographic information systems (GIS)
  - Mass valuation

- Highlight international examples

- Recommendations and roadmaps for successful implementation/technical reform.

What is a “CAMA System”?

- Computer-assisted Mass Appraisal
- Outdated terminology from the 60s & 70s
- Property management system ***with*** functionality for valuation (mass and single property)
- Asset Management:
  - Ownership information (names, address, purchase date, etc.)
  - Parcel boundaries & location (xy coordinates)
  - Current parcel characteristics
  - Tax/value history
  - Sales history (price, data, property characteristics)
  - Notes/special considerations


00-4 Real
Summary
General
Ownership
Exemptions
Assessments
Appraisal
Final Value
Transfers
Appeals
Events
Permits
Comp Sales
Equity Comps
Documents
History
R149239
Legal
HARRISON HILLS PHASE TWO, BLOCK C, Lot 12, ACRES 0.9906
Owner
Quick Search
Previous
Next
Navigation
GIS
Appraisal Card
Property Audit Tracking Report
Property Packet
Comparable Sales Report
Reports
Nbhd
HARRI - HARRISON HILL
Collapse All
Find Instance
Property
Land Information (1)
1. A1-Residential
Improvements (1)
1. Residential
Segments (4)
1. Residential: Type = MA R8 2956
Property Value: $917,960
Property
Property Information
Last Inspected
04/20/2021
Appraiser
Castillo, Tayl
Next Insp Date
Reason
Last Appr Year
2021
Property Code
1d1 (open Space) Ag;
Include in CAD
Misc Code
Late Correction
Comment
2019 NC//"MENDICINO, 3 CAR G-L".. DSPERM# R012417-01
Rendition Information
Sent
Appraisal Information
Utilities
Topography
Access
Other
Zone
Region
Subset
Shared Flag
Omitted Property
Rendered By
Neighborhood Information
Neighborhood
Map Sheet
Original Builder
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None
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Characteristics
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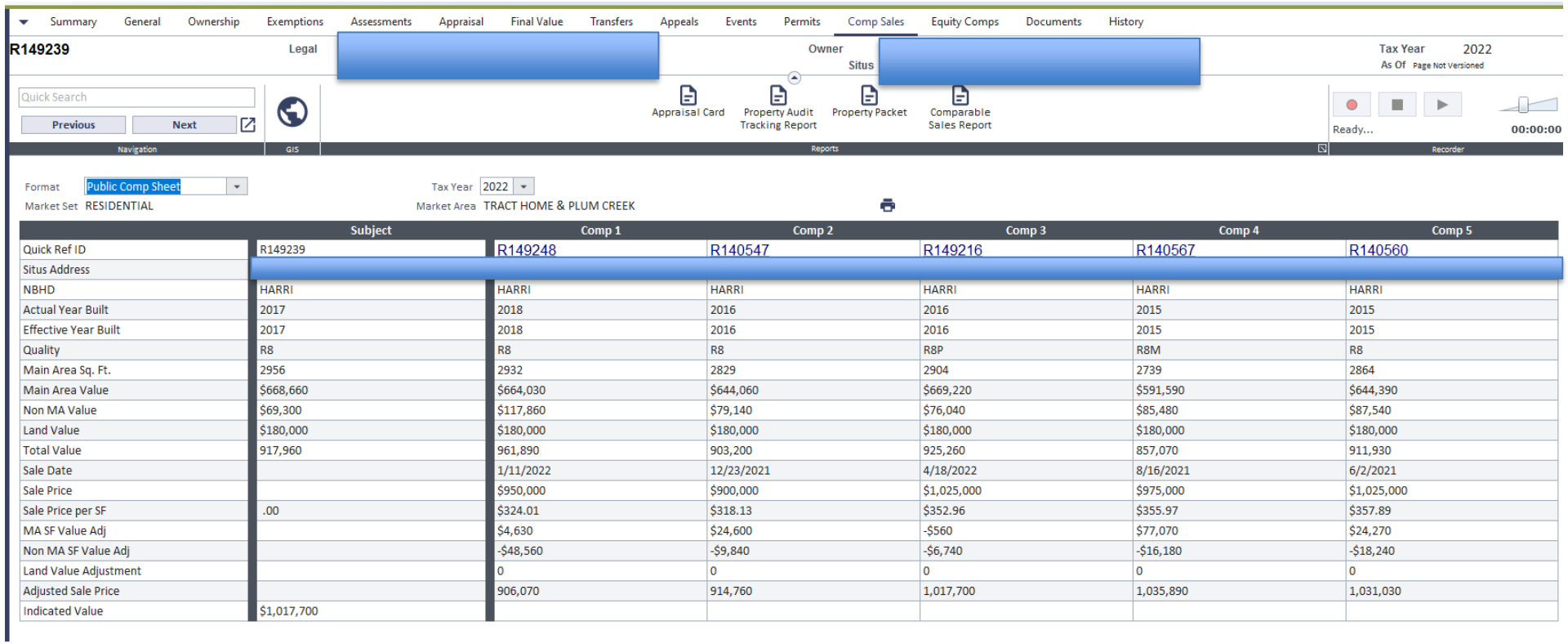
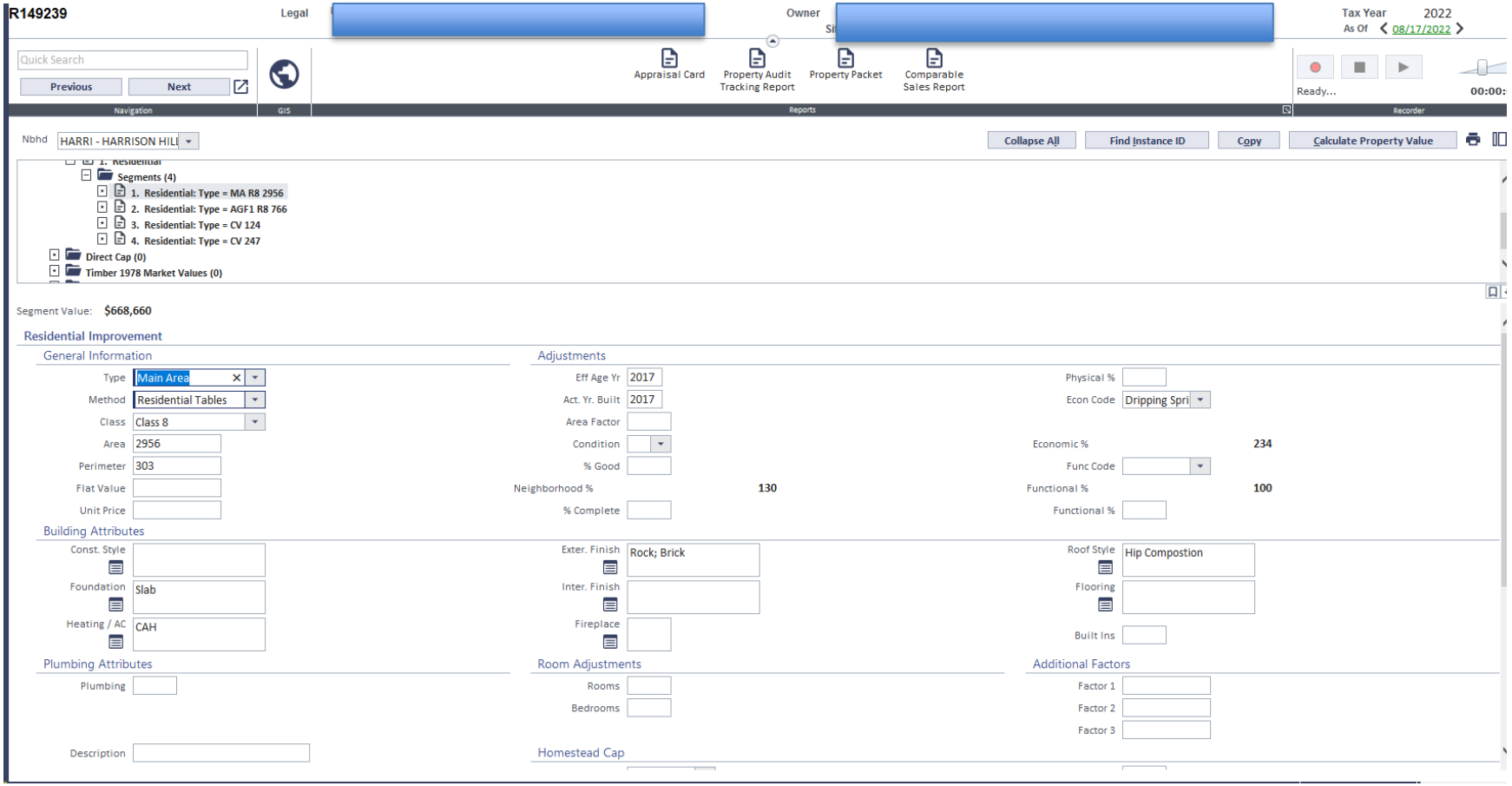
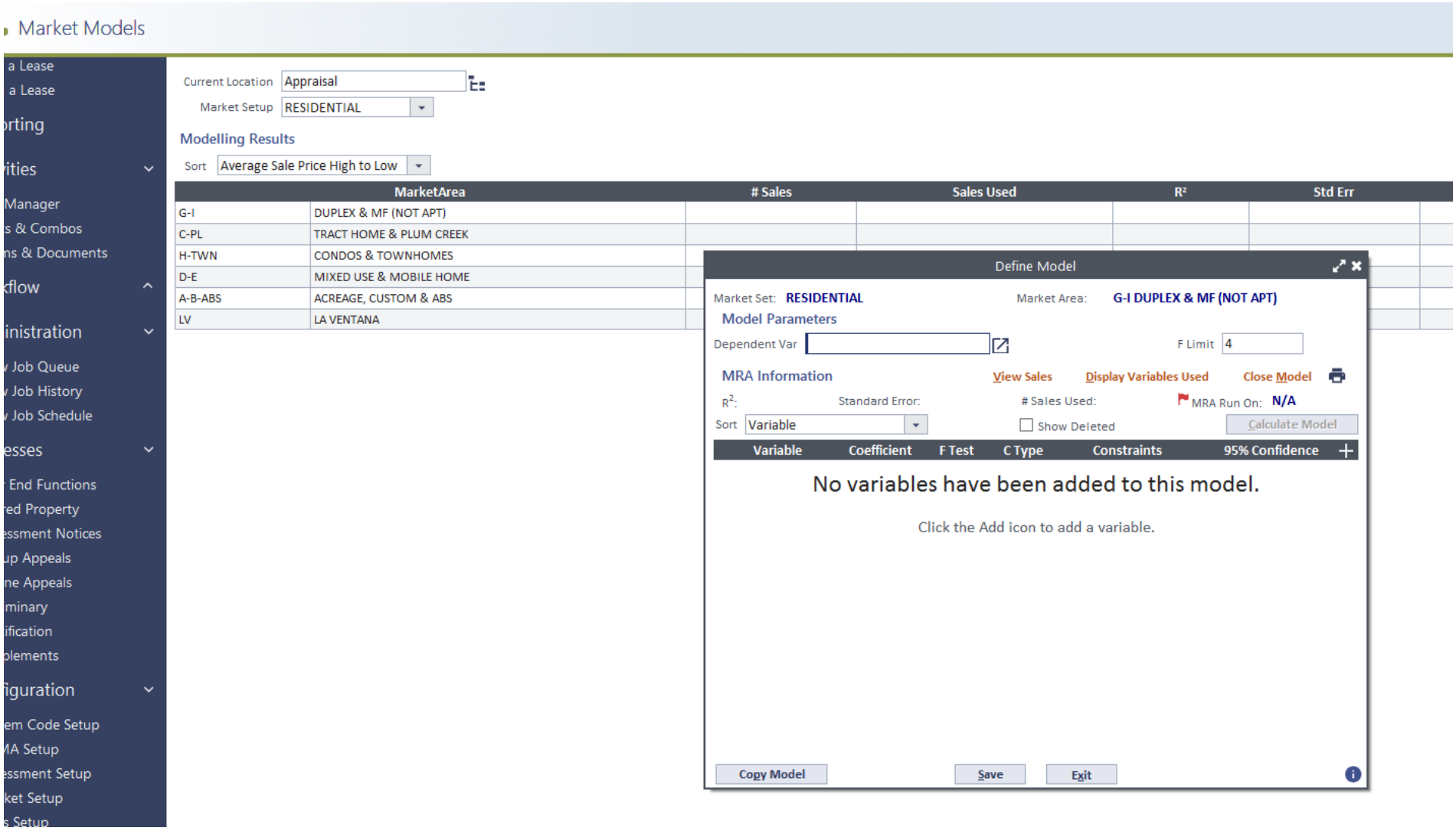
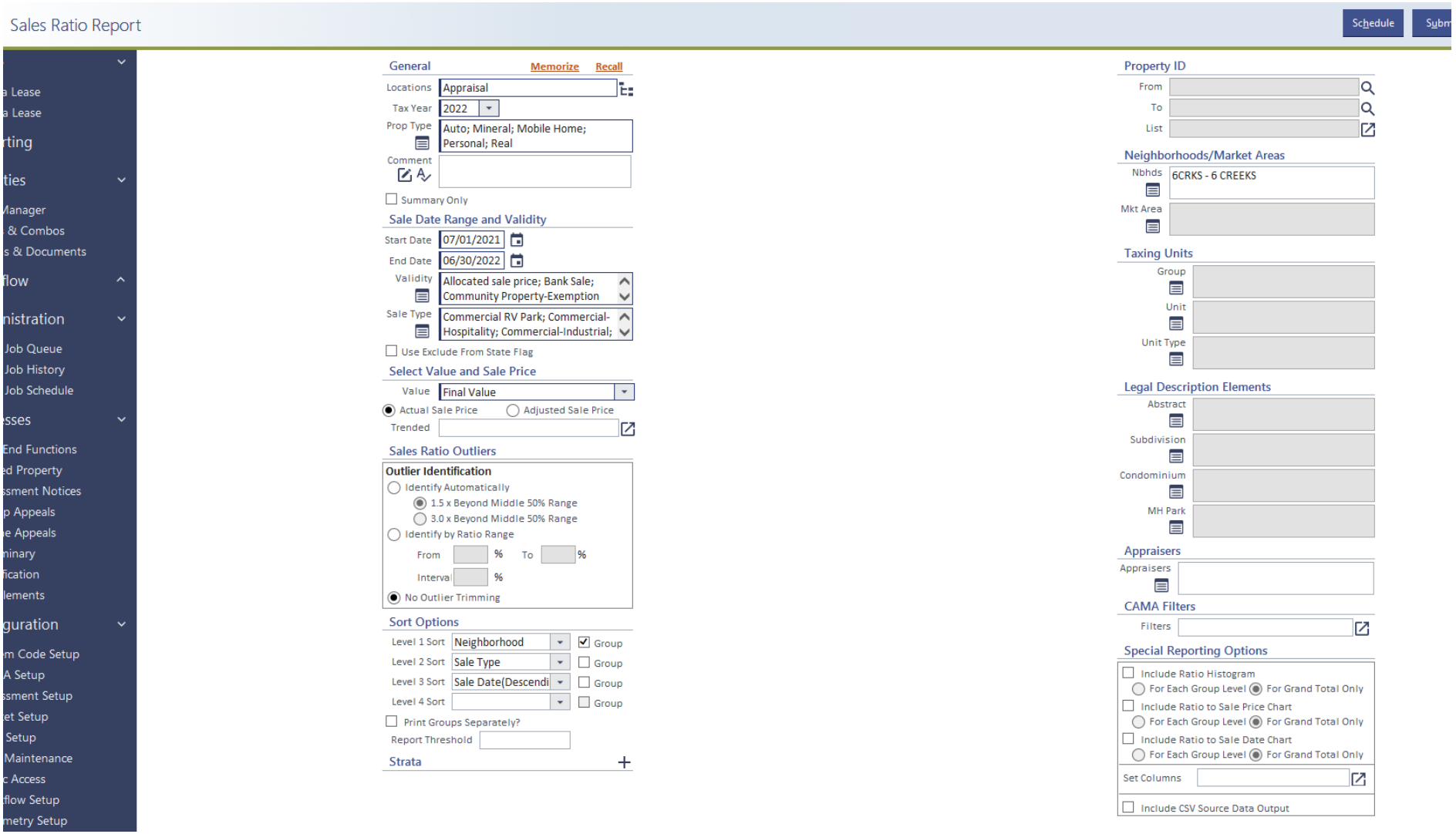
Verified
NOTICE MAILED - NOTICE MAILED
ONLINE APPEALS - ONLINE APPEALS NOTICE MAILED



	Subject	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5
Quick Ref ID	R149239	R149248	R140547	R149216	R140567	R140560
Situs Address						
NBHD	HARRI	HARRI	HARRI	HARRI	HARRI	HARRI
Actual Year Built	2017	2018	2016	2016	2015	2015
Effective Year Built	2017	2018	2016	2016	2015	2015
Quality	R8	R8	R8	R8P	R8M	R8
Main Area Sq. Ft.	2956	2932	2829	2904	2739	2864
Main Area Value	$668,660	$664,030	$644,060	$669,220	$591,590	$644,390
Non MA Value	$69,300	$117,860	$79,140	$76,040	$85,480	$87,540
Land Value	$180,000	$180,000	$180,000	$180,000	$180,000	$180,000
Total Value	917,960	961,890	903,200	925,260	857,070	911,930
Sale Date		1/11/2022	12/23/2021	4/18/2022	8/16/2021	6/2/2021
Sale Price		$950,000	$900,000	$1,025,000	$975,000	$1,025,000
Sale Price per SF	.00	$324.01	$318.13	$352.96	$355.97	$357.89
MA SF Value Adj		$4,630	$24,600	-$560	$77,070	$24,270
Non MA SF Value Adj		-$48,560	-$9,840	-$6,740	-$16,180	-$18,240
Land Value Adjustment		0	0	0	0	0
Adjusted Sale Price		906,070	914,760	1,017,700	1,035,890	1,031,030
Indicated Value	$1,017,700					







Valuation Component

- Able to estimate market value for land and buildings (mass and single-property)
- Some capable of regression, others require back-end table editing of models (models created in other software such as R, Python, Excel, or SPSS)
- Should allow for data exports of sales (flatfile)
- Compatibility with relational databases (Access, SQL)
- Incorporation of spatial (GIS-driven) modeling and analysis

AVMs

- Typically based on algorithm of multiple regression analysis (MRA)
- First documented theory/application of AVM → G.C. Haas, 1922
- Gained popularity among governments in the late 60's and early 70's
- Leading technological methodology to valuation today
  - Increased accuracy, and fairness
  - Reduced bias and inefficiencies
- IAAO Standard on AVMs

Exmple AVM Output

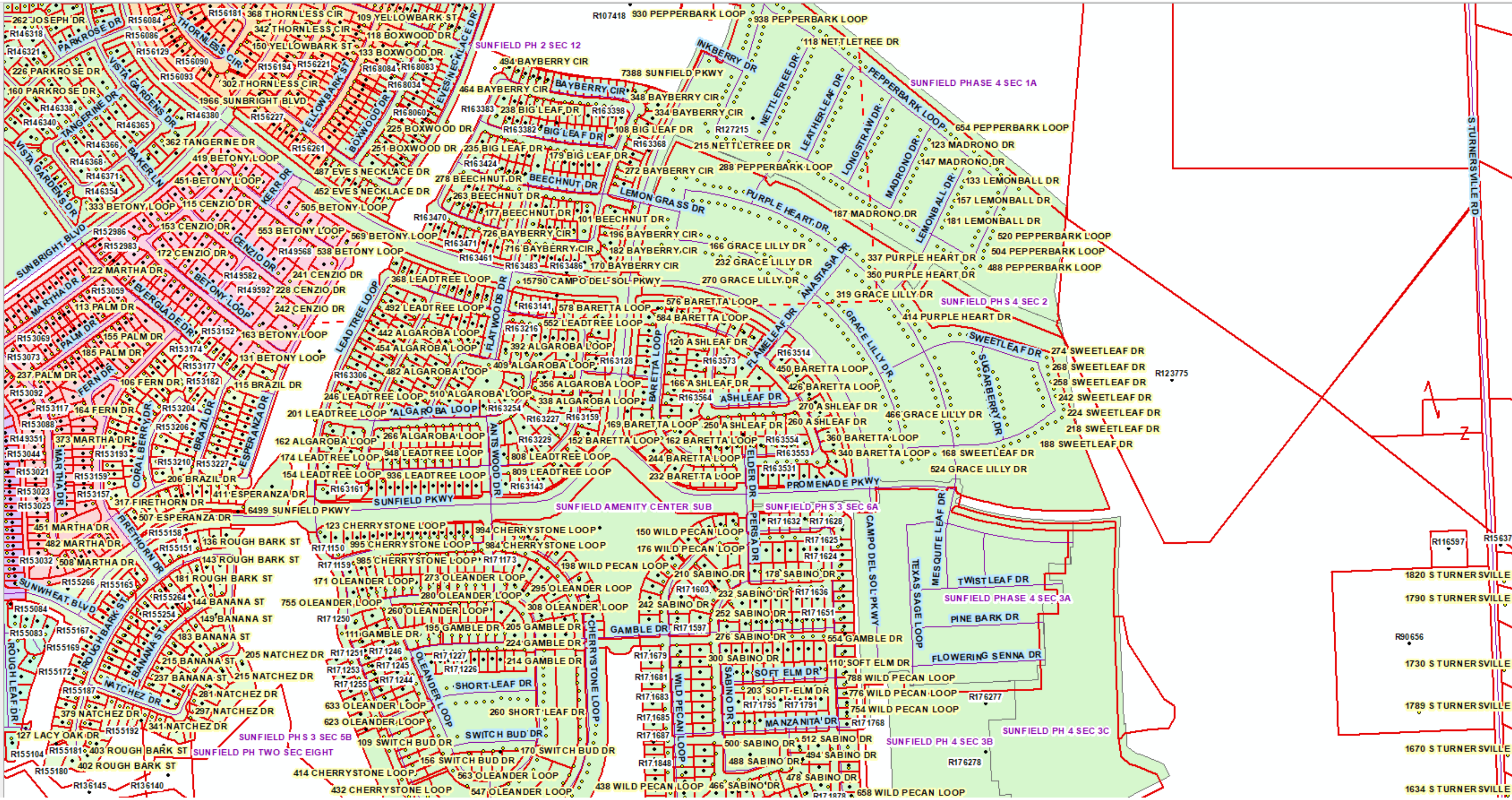
```
Coefficients:
                  Estimate       Std. Error t value             Pr(>|t|)
(Intercept)   310044.23657845   14247.81987956  21.761 < 0.0000000000000002 ***
totală          9184.02550827      95.65462001  96.012 < 0.0000000000000002 ***
Age            -2885.88212877     187.80733555 -15.366 < 0.0000000000000002 ***
Age2              10.34319737       2.31624162   4.466  0.00000803748824708 ***
Gaz_C          -15616.17104024   19224.00616626  -0.812              0.416615
peretiorE      125286.88354059   14001.84613454   8.948 < 0.0000000000000002 ***
top            -14950.90145110    5099.24249077  -2.932              0.003372 **
bottom          -2892.41635956    4988.42205009  -0.580              0.562039
Baia            45529.05392495   11206.38675815   4.063  0.00004870231005908 ***
Hînceşti      -170236.34587637   19569.34818428  -8.699 < 0.0000000000000002 ***
Cantemir      -325776.60226535   36279.76174348  -8.980 < 0.0000000000000002 ***
Criuleni      -248491.09718164   32001.38459303  -7.765  0.00000000000000861 ***
Briceni       -361038.35883807   28669.06033558 -12.593 < 0.0000000000000002 ***
Cimişlia      -316290.03971197   32766.16743906  -9.653 < 0.0000000000000002 ***
Teleneşti     -285912.45577838   29310.79433920  -9.755 < 0.0000000000000002 ***
Floreşti      -341762.60955426   39991.99318006  -8.546 < 0.0000000000000002 ***
Şoldăneşti    -401664.97449068   32769.16447066 -12.257 < 0.0000000000000002 ***
Taraclia      -484308.05867843   29257.63419801 -16.553 < 0.0000000000000002 ***
Basarabeasca  -507333.29923101   26155.83397101 -19.397 < 0.0000000000000002 ***
Leova         -365383.11318918   27844.57022025 -13.122 < 0.0000000000000002 ***
Donduşeni     -420342.05948832   26153.12820758 -16.072 < 0.0000000000000002 ***
Glodeni       -418233.52221924   22921.61522056 -18.246 < 0.0000000000000002 ***
ŞtefanVodă    -388799.47820790   25584.99407756 -15.196 < 0.0000000000000002 ***
AneniiNoi     -351211.45872578   20662.99217265 -16.997 < 0.0000000000000002 ***
Sîngerei      -350265.49413039   20321.99971855 -17.236 < 0.0000000000000002 ***
Străşeni      -249931.98195700   19302.05312910 -12.948 < 0.0000000000000002 ***
```

Flatfile Example

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Sale_ID	Parcel_ID	Suburban	X_COR	Y_COR	*GEOCODE	Price	1920-1945	1946-1965	1966-1990	Post 1990	Size sqm	Beds	Baths	Storeys	PRIMARY_TH	POSTCODE	TOWNLAND
2	18770	3152737	1	332011	370724	3.32011E+11	2000000	0	0	0	0	313	5	2	2.5	MALONE PARK	BT9 6NJ	MALONE LOWER
3	6039	3147941	1	332968	370843	3.32968E+11	1850000	1	0	0	0	271	5	0	2	BROOMHILL PARK	BT9 5JB	MALONE LOWER
4	4067	3152769	1	332420	370467	3.3242E+11	1650000	1	0	0	0	426	6	2	2	MALONE PARK	BT9 6NL	MALONE LOWER
5	3018	3147939	1	332935	370847	3.32935E+11	1600000	1	0	0	0	330	6	1	2	BROOMHILL PARK	BT9 5JB	MALONE LOWER
6	8952	3152734	1	331921	370781	3.31921E+11	1550000	0	0	0	0	333	7	2	3	MALONE PARK	BT9 6NJ	MALONE LOWER
7	15444	3152763	1	332300	370547	3.323E+11	1550000	0	0	0	0	349	6	2	2.5	MALONE PARK	BT9 6NL	MALONE LOWER
8	276747	3245075	1	331163	368379	3.31163E+11	1500000	1	0	0	0	552	7	3	2.5	UPPER MALONE ROAD	BT17 9JZ	MALONE UPPER (MAIN PORTION)
9	186	3147940	1	333033	370868	3.33033E+11	1475000	1	0	0	0	375	6	1	2	BROOMHILL PARK	BT9 5JB	MALONE LOWER
10	207	3152728	1	331760	370964	3.3176E+11	1475000	0	0	0	0	372	5	2	2.5	MALONE PARK	BT9 6NH	MALONE LOWER
11	7157	3152775	1	332504	370425	3.32504E+11	1450000	0	0	0	0	352	4	2	2	MALONE PARK	BT9 6NN	MALONE LOWER
12	15500	3148590	1	332730	370167	3.3273E+11	1375000	1	0	0	0	494	5	1	2	NEWFORGE LANE	BT9 5NU	MALONE UPPER
13	9427	3152724	1	331906	370875	3.31906E+11	1345000	0	0	0	0	370	5	2	2	MALONE PARK	BT9 6NH	MALONE LOWER
14	154	3152771	1	332444	370451	3.32444E+11	1300000	1	0	0	0	424	6	3	2	MALONE PARK	BT9 6NN	MALONE LOWER
15	17172	3148130	1	332687	370524	3.32687E+11	1200000	0	0	0	0	288	5	2	2.5	DERAMORE PARK	BT9 5JW	MALONE UPPER
16	8989	3147938	1	332992	370879	3.32992E+11	1185000	1	0	0	0	557	6	1	2	BROOMHILL PARK	BT9 5JB	MALONE LOWER
17	1461	3146235	1	333524	371851	3.33524E+11	1150000	0	0	0	0	388	6	0	2	MOUNT PLEASANT	BT9 5DS	MALONE LOWER
18	2139	3152739	1	332036	370710	3.32036E+11	1150000	1	0	0	0	370	6	2	2.5	MALONE PARK	BT9 6NJ	MALONE LOWER
19	6406	3148242	1	332763	370348	3.32763E+11	1100000	1	0	0	0	340	4	1	2	DERAMORE PARK SOUTH	BT9 5JY	MALONE UPPER
20	6767	3151671	1	332760	371292	3.3276E+11	1100000	0	0	0	0	418	7	0	3	MARLBOROUGH PARK SOUTH	BT9 6HW	MALONE LOWER
21	12133	3152022	1	332233	370926	3.32233E+11	1100000	0	0	0	0	254	5	2	2	OSBORNE PARK	BT9 6JP	MALONE LOWER
22	13901	3244964	1	331018	368396	3.31018E+11	1060000	0	0	0	1	412	5	5	2	BRACKENWOOD LANE	BT17 9JJ	MALONE UPPER (MAIN PORTION)
23	16077	3245080	1	330982	368304	3.30982E+11	1050000	0	0	0	1	585	5	2	2	UPPER MALONE ROAD	BT17 9JZ	MALONE UPPER (MAIN PORTION)
24	2348	3148311	1	332632	370374	3.32632E+11	1050000	1	0	0	0	528	5	2	2	MALONE ROAD	BT9 5LJ	MALONE UPPER
25	6803	3150872	1	332758	371992	3.32758E+11	1025000	0	0	0	0	368	5	3	2	DERRYVOLGIE AVENUE	BT9 6FN	MALONE LOWER
26	19078	3152024	1	332254	370978	3.32254E+11	1025000	0	0	0	0	361	5	2	2	OSBORNE PARK	BT9 6JP	MALONE LOWER
27	2990	3152634	1	331930	370920	3.3193E+11	1000000	0	0	0	0	365	5	1	2.5	MYRTLEFIELD PARK	BT9 6NE	MALONE LOWER
28	13840	3154301	1	331873	369702	3.31873E+11	1000000	1	0	0	0	277	5	1	2	HARBERTON PARK	BT9 6TX	MALONE UPPER
29	270365	3146245	1	333588	371808	3.33588E+11	985000	0	0	0	0	299	6	0	2	MOUNT PLEASANT	BT9 5DS	MALONE LOWER
30	86	3148179	1	332850	370452	3.32851E+11	980000	0	0	0	0	387	6	1	2	DERAMORE PARK SOUTH	BT9 5JY	MALONE UPPER
31	10509	3151382	1	332637	371657	3.32637E+11	980000	1	0	0	0	286	5	3	2	CADOGAN PARK	BT9 6HG	MALONE LOWER
32	3823	3151100	1	332821	371729	3.32821E+11	975000	0	0	0	0	396	7	1	2.5	ADELAIDE PARK	BT9 6FY	MALONE LOWER
33	2586	3151405	1	332697	371636	3.32695E+11	970000	0	1	0	0	305	4	3	2	CADOGAN PARK	BT9 6HH	MALONE LOWER
34	6410	3147926	1	333116	370921	3.33116E+11	960000	1	0	0	0	296	5	1	2	BROOMHILL PARK	BT9 5JB	MALONE LOWER
35	19952	3152447	1	331934	371037	3.31934E+11	950000	0	0	0	0	200	4	0	2	MARYVILLE PARK	BT9 6LN	MALONE LOWER
36	11559	3152679	1	332250	370745	3.3225E+11	935000	1	0	0	0	262	5	1	2	MYRTLEFIELD PARK	BT9 6NF	MALONE LOWER
37	19743	3148315	1	332520	370086	3.3252E+11	930000	0	0	1	0	390	4	2	2	MALONE ROAD	BT9 5LN	MALONE UPPER
38	7605	3151381	1	332586	371724	3.32586E+11	925000	1	0	0	0	294	5	3	2	CADOGAN PARK	BT9 6HG	MALONE LOWER

GIS

- Location-based information database
- Data tied to geographic location
- Delineate and update parcel boundaries
- May be internal/part of system
- May also be external /other software (e.g. Esri's ArcGIS)
- Digital mapping layers → helpful in data collection, analysis, and appeals
- Valuation quality control
- Public information
- Government transparency

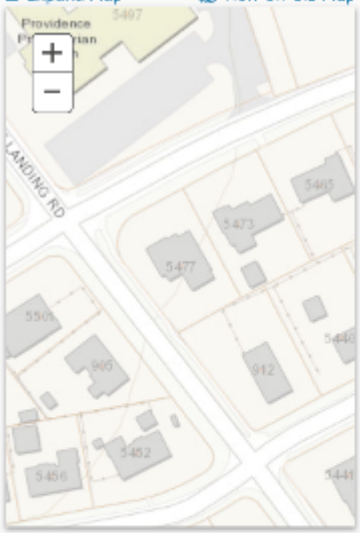


PROPERTIES OVERVIEW

A snapshot of properties within your search results

1 Residential Properties	
Improved	1
0 Commercial Properties	
0 Agriculture Properties	
0 Tax Exempt Properties	

Expand Map View On GIS Map



Back to Search Results

Print

PROPERTY DETAILS

5477 Old Providence Rd

LEGAL DESCRIPTION	Haven Heights Sec 1 Lot 14
GPIN (PARCEL ID)	14661480400000
SERVICE DISTRICT	D01 : D01

FY22/23 ASSESSMENT

LAND VALUE	$130,000
IMPROVEMENT VALUE	$172,500
TOTAL VALUE	$302,500

Land/Building Information | Sales History & Tax Information | City Services | Geospatial Information | Images | MORE

LAND INFORMATION

UNOFFICIAL ZONING DISTRICT	R10
PROPERTY CODE/CATEGORY	101 Residence
LAND USE	No
WATERSHED	Chesapeake Bay
PLATS (MAP BOOK/INSTRUMENT #)	Download
LAND SQUARE FOOTAGE	14,557.9 sq ft

Land/Building Information | Sales History & Tax Information | City Services | Geospatial Information | Images | MORE

LAND INFORMATION

UNOFFICIAL ZONING DISTRICT	R10
PROPERTY CODE/CATEGORY	101 Residence
LAND USE	No
WATERSHED	Chesapeake Bay
PLATS (MAP BOOK/INSTRUMENT #)	Download
LAND SQUARE FOOTAGE	14,557.9 sq ft

BUILDING INFORMATION

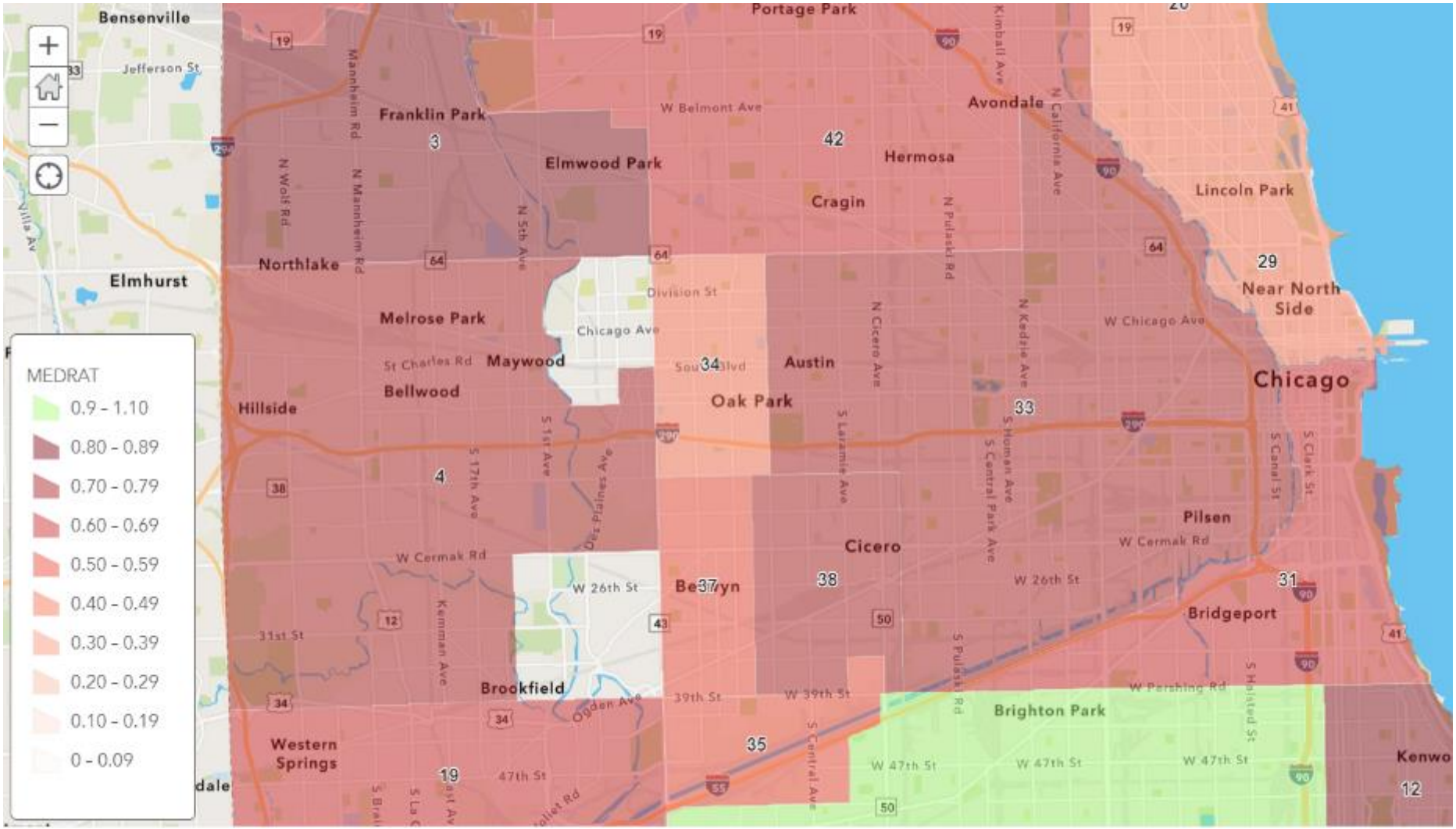
R01

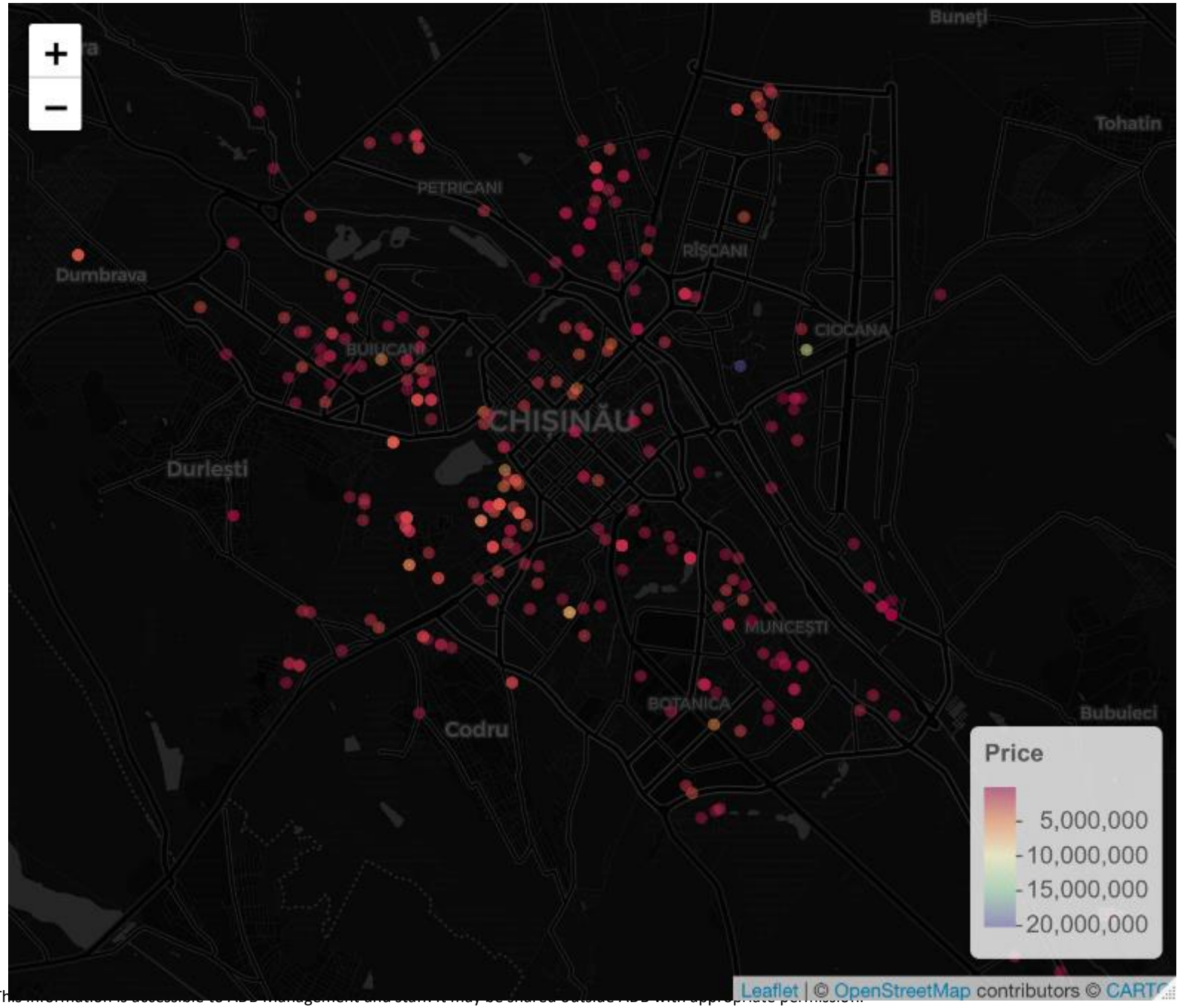
USE CODE	DESCRIPTION	ID #	CONSTRUCTED YR.	SIZE
ATTGAR	Attached Garage	G01	0	462 SF
DWELL	Dwelling	D	1961	2,111 SF

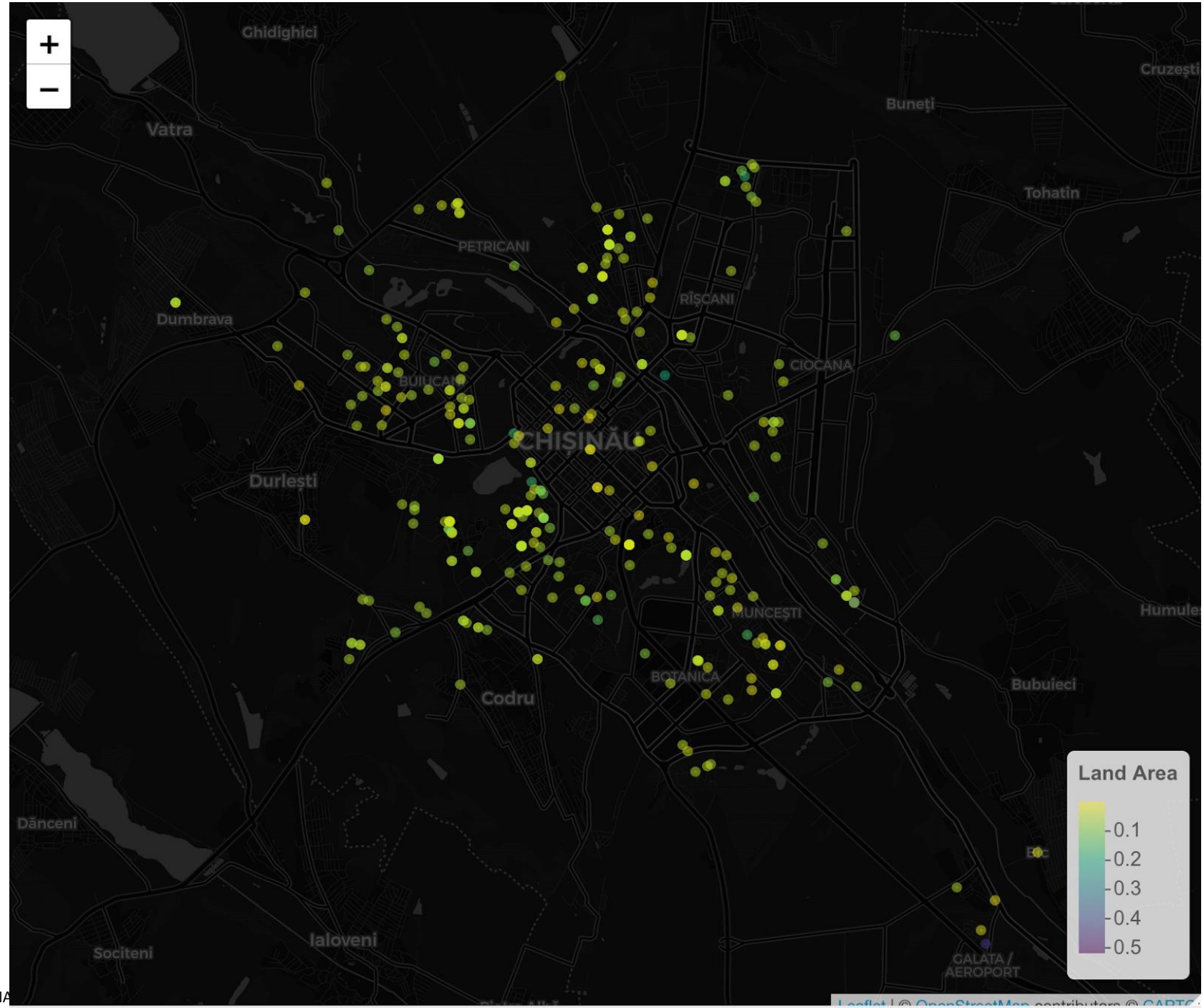
FLOORS	FINISHED AREA	DESCRIPTION
1.0	2,111 SF	
Total	2,111 SF	

ROOM INFORMATION	
Bedrooms	3
Half Baths	1
Full Baths	2
Total Rooms	7

INTERIOR & EXTERIOR FEATURES	SIZE/COUNT
Concrete Patio	162
Conventional Canopy	162
Open Frame Porch	84
Fireplace	1






Ghidighici
Vatra
Buneți
Cruzești
Tohatin
PETRICANI
RÎȘCANI
Dumbrava
CIOCANA
BUIUCANI
CHIȘINĂU
Durlești
MUNCEȘTI
Humule
BOTANICA
Bubuieci
Codru
Dănceni
Ialoveni
Sociteni
GALATA / AEROPORT
Land Area
0.1
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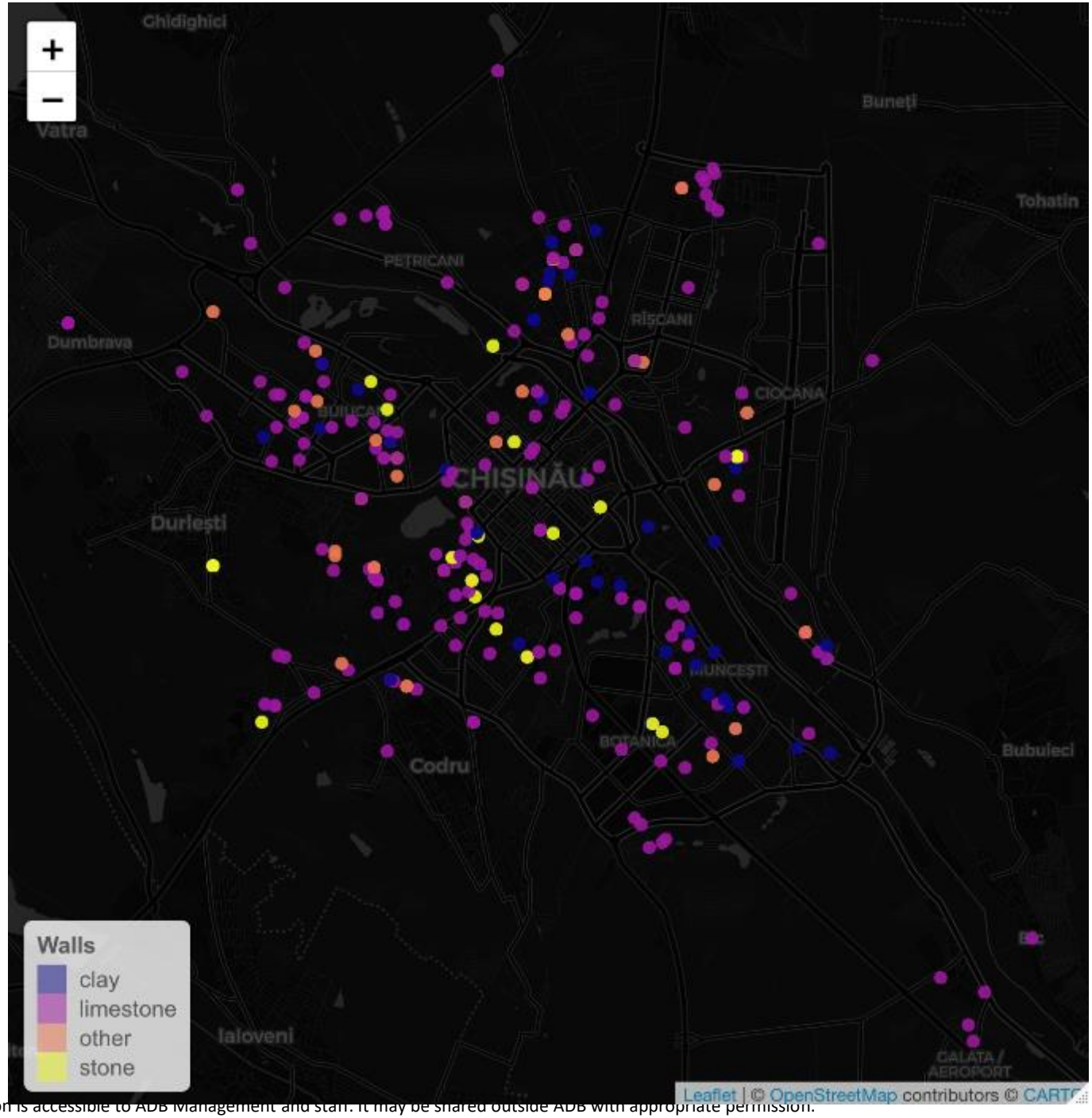
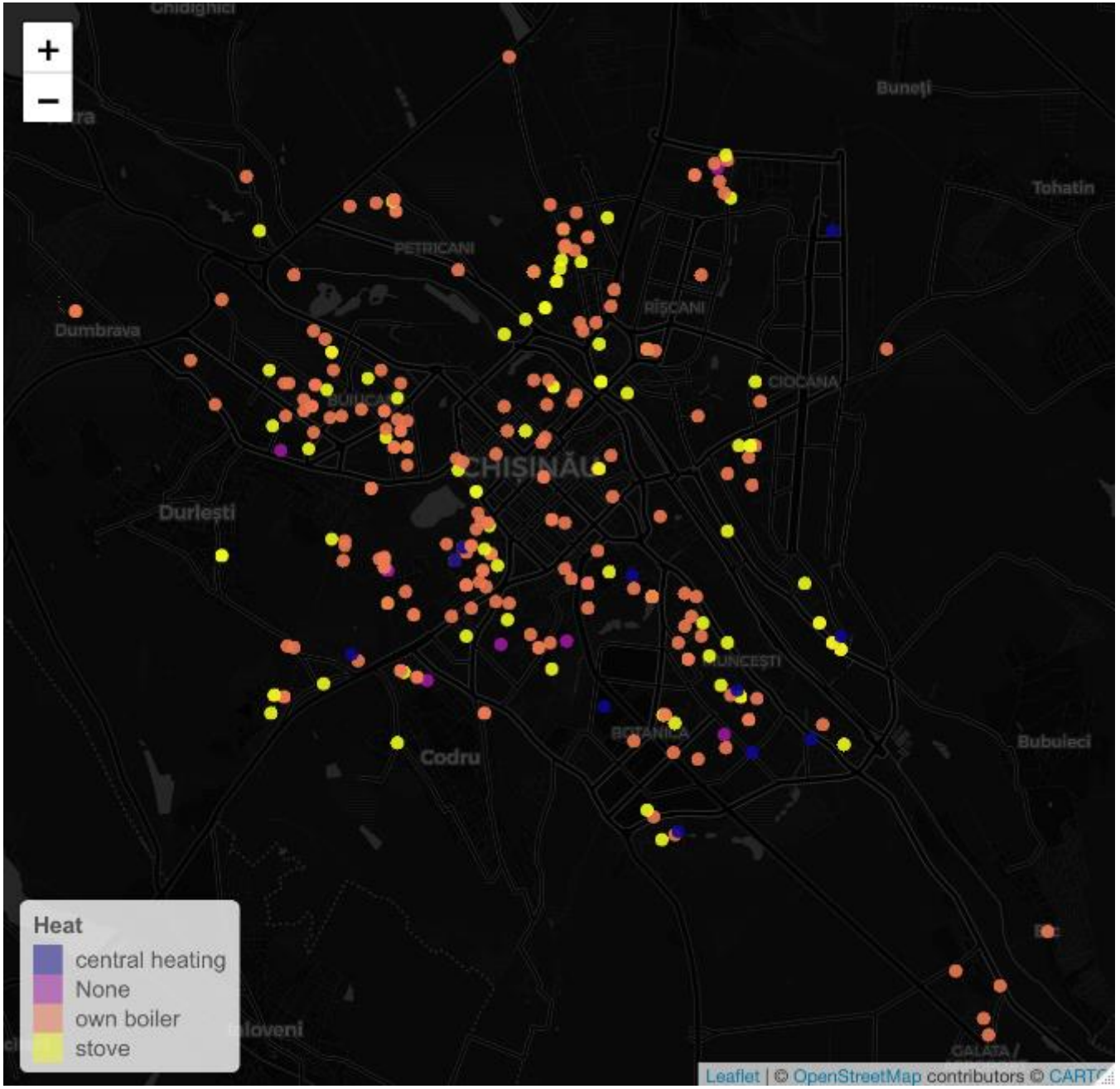
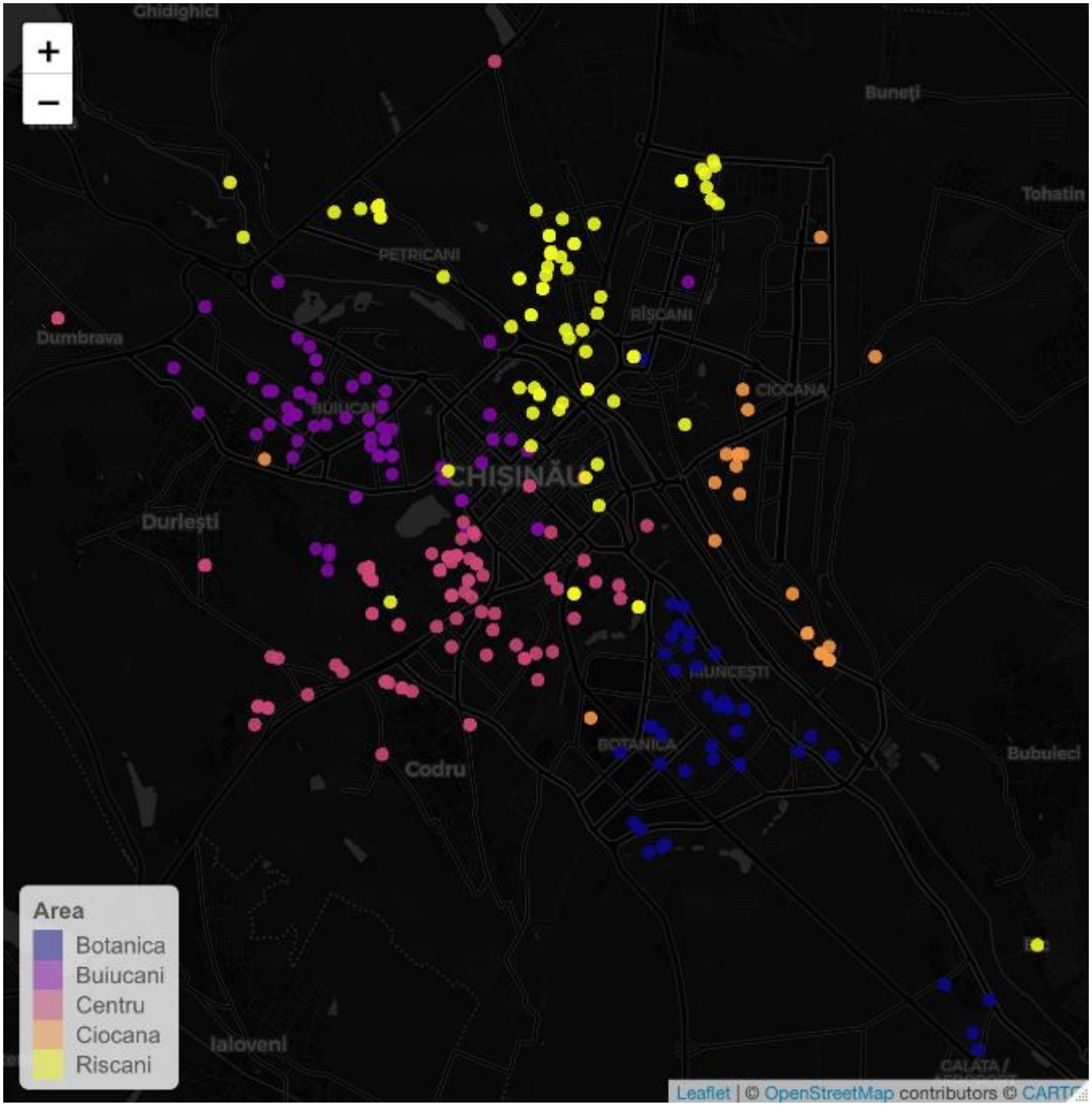
0.3
0.4
0.5

INTERNA



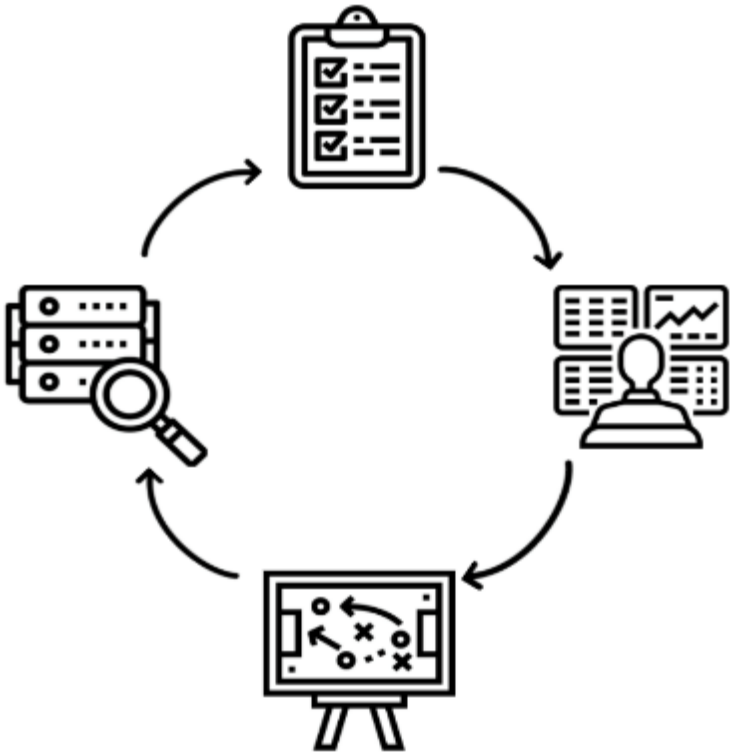




To Promote Valuation Accuracy & Equity:

Data Validation
Verify accuracy of data collected. Filter out data not reflective of market (e.g. distressed sales, family sales)

Data Collection
Collect sales prices, market rents, and property characteristic information.



Statistical Analysis
Inspect for patterns to locate and estimate potential inequities. Adjust values as needed and re-run.

Quality Control
Monitor for changes in the market.

Conclusions

- Land management and valuation software/computer systems → often referred to as "computer-assisted mass appraisal" or "CAMA" systems
- These are asset management systems that incorporate property valuation component (mass and single property)
- These valuation algorithms are referred to as "automated valuation models" or "AVMs"
- Should provide cross-functionality between:
  - Cadastral data (e.g. ownership records, property characteristics)
  - Sales registries (deed information including price, date, parties, and characteristics)
  - Geographic information systems (GIS) --> including
  - Mass valuation → table or regression-based AVMs
  - Database (e.g. SQL Server, MySQL, Access) with output features (flat-file)
- Should be used to for data collection, data validation, statistical analyses, quality control to promote valuation efficiencies, accuracy, and overall tax fairness.
- Use in conjunction with international valuation standards (IAAO, IVSC, etc.)

Thank You! Questions?

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