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An Accuracy Comparison of the Positions of Cadastral Parcels According to ASHK with Orthophoto 2007-2015 and GNSS Measurements in Himare-Albania

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***Abstract* - This study presents a comparative analysis of the accuracy of cadastral parcel positions in Himare, utilizing different methods including the state cadastre agency (ASHK), orthophoto 2007-2015 data and Global Navigation Satellite System (GNSS) measurements. The cadastral parcel positions are crucial for land administration and management, making accuracy a paramount concern. Through a comprehensive examination, this research evaluates the positional accuracy of cadastral parcels by comparing ASHK data with orthophoto 2007-2015 imagery, as well as GNSS measurements. The study employs statistical analyses and spatial techniques to assess discrepancies and similarities among the different datasets. Findings from this research provide insights into the effectiveness and reliability of cadastral data sources in Himare, shedding light on potential discrepancies and areas for improvement in cadastral mapping and land management practices. Such insights are essential for enhancing the efficiency and accuracy of cadastral systems, thereby contributing to better-informed decision-making processes and sustainable land development in the region.**

Keywords: GNSS, ASHK, Orthophoto, Accuracy, Analysis, Cadastral Parcel, Boundary, Cadastral Surveying, ALBCORS.

I. INTRODUCTION

In the accurate delineation and positioning of cadastral parcels are fundamental components of land administration systems worldwide. Cadastral parcel positions serve as the cornerstone for land tenure, property taxation, land use planning, infrastructure development, and overall land management. Inaccuracies in cadastral parcel positions can lead to legal disputes, inefficiencies in land transactions, and challenges in sustainable land development. Hence, ensuring the precision and reliability of cadastral data is imperative for effective land governance. In the context of Himare, a coastal town located in the Vlore County of Albania, the accuracy of cadastral parcel positions holds significant importance due to the region's diverse landscape and ongoing development activities. Himare, known for its picturesque coastal areas and mountainous terrain, experiences varying land use patterns ranging from agricultural activities to tourism development. The accurate delineation and positioning of cadastral parcels in Himare are essential for supporting sustainable development initiatives, managing land resources efficiently, and resolving potential conflicts related to land ownership and usage. The state cadastre agency (ASHK) stands as one of the primary sources of cadastral data in Albania, providing valuable information on property boundaries and ownership rights. However, the accuracy of ASHK data may vary depending on factors such as survey methods, data collection techniques, and updates over time. As such, there arises a need to assess the accuracy of cadastral parcel positions derived from ASHK data and compare them with alternative sources to ensure their reliability and suitability for various land management applications. Orthophoto imagery, acquired through aerial or satellite-based remote sensing techniques, offers a complementary approach to cadastral mapping by providing high-resolution georeferenced images of the Earth's surface. In the case of Himare, 2007 and 2015 orthophoto imagery presents an opportunity to evaluate changes in land cover and land use dynamics while also serving as a reference dataset for assessing the accuracy of cadastral parcel positions. Additionally, Global Navigation Satellite System (GNSS) technology has emerged as a reliable means of capturing precise geospatial data, including the coordinates of cadastral parcel corners. GNSS measurements offer a direct and accurate method for ground-truthing cadastral boundaries and validating positional accuracy against other datasets such as ASHK and orthophoto imagery. Against this backdrop, this study aims to conduct a comprehensive accuracy comparison of the positions of cadastral parcels in Himare using ASHK data, orthophoto imagery from 2007 and 2015, and GNSS measurements. By analyzing the spatial discrepancies and similarities among these datasets, the research seeks to assess the reliability and precision of cadastral parcel positions in Himare and identify potential sources of inaccuracies. The findings of this study hold implications for improving cadastral mapping practices, enhancing land administration systems, and facilitating informed decision-making processes for sustainable land development in Himare and similar regions. In summary, the accuracy comparison of cadastral

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parcel positions in Himare serves as a critical endeavor to ensure the integrity and effectiveness of land administration systems, thereby contributing to the sustainable management of land resources and fostering socio-economic development in the region.

II. METHODS AND APPROACH

2.1 Study area

The area studied for the comparison of the positions of the cadastral parcels according to ASHK with 2007 and 2015 Orthophoto and with GNSS field surveys, is Himara.

Figure 1: Aerial photography of the selected urban area

2.2 Geodetic equipment used

The GNSS Sokkia GRX2 satellite receiver was used to perform the measurements the points.

https://eu.sokkia.com/sokkia-care-products/grx2-gnss-receiver

Figure 2: GNSS Sokkia GRX2

2.3 State Active Global Positioning Network (ALBCORS)

The State Active Global Positioning Network in the territory of the Republic of Albania is represented by the ALBCORS network, which has been implemented in the European Terrestrial Reference System ETRS89 (European Terrestrial Reference System 1989) and at the same time serves for the maintenance of this reference in our country territory. This network consists of 21 CORS stations built with concrete blocks, 6 CORS stations (roof type) and a control center located in the ASIG building.

Figure 3: Pillar Type

Figure 4: Roof Type

The State Active Global Positioning Network, ALBCORS, depending on the measurement method and ideal conditions of GNSS field surveys, guarantees to its users the following accuracy: The coordinates of the ALBCORS system provide these accuracies in the service:

Accuracy of RTK service: ±2 cm (2D); ±3 cm (3D)
Service accuracy (post-processing): ± 1cm (2D, 3D)

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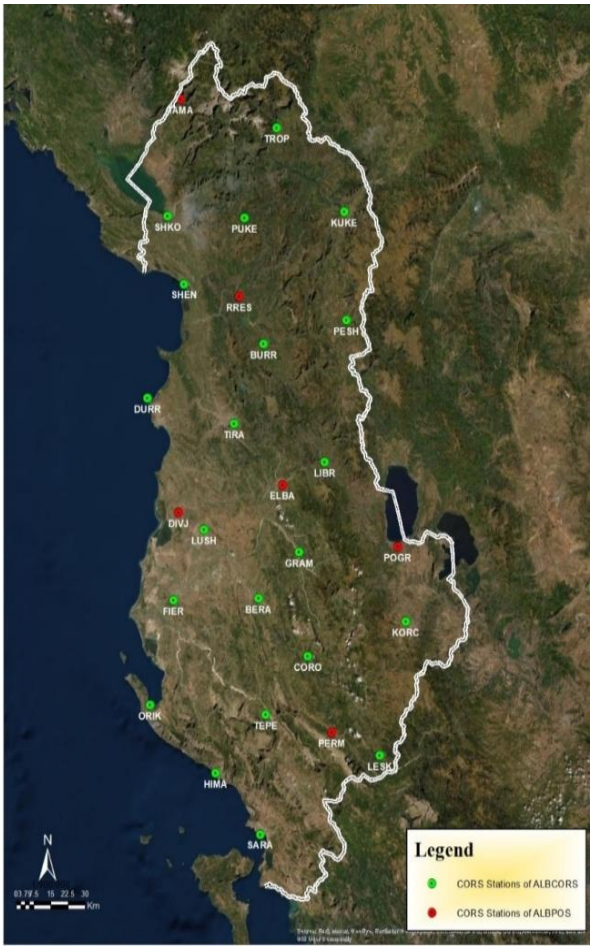

Figure 5: State Active Global Positioning Network, ALBCORS

2.4 Processing of measurements

Post-processing of static measurements was done with TBC (Trimble Business Center) version 5.2. The main stations of the ALBCORS system that were taken for the post-processing process are those that cover the area in which the points of the second order, that were taken in the study are located, such as: Vlora, Himara, Saranda.

2.5 Coordinate transformation

Benchmark "BM" coordinates were transformed into:

- Projection: UTM
- Zone: 34(18°E-24°E-Northem Hemisphere)
- Datum or Elipsoid: WGS84
- Planar Units: Meters
- Parameters:
  Scale Factor 0.9996
  Central Meridian 21
  Origin Latitude 0
  False Easting (m) 500000
  False Northing (m) 0

Vector positioning (GCS Pulkovo 1942 to GCS WGS 1984). Through transformation all measurements will be in a single Coordinate System. The parameters of the transformation were calculated by the Geographical Institute of Florence in collaboration with the Institute of Geography and Military Infrastructure, relying on a campaign of measurements made in 2007-2008.

Table 1: Coordinates of the transformed base

Point	Albcors		Transformed State Geodetic Network		Differences	
	N	E	N	E	dN	dE
BM-Himara	4439836.280	392322.619	4439834.367	392323.043	1.914	-0.424
Point	**Albcors**		**Post-processed GNSS measurements (Online)**		**Differences**	
	N	**E**	**N**	**E**	**dN**	**dE**
BM-Himara	4439836.28	392322.619	4439836.347	392322.686	-0.06641	-0.06703
Point	**TBC**		**Post-processed GNSS measurements (Online)**		**Differences**	
	N	**E**	**N**	**E**	**dN**	**dE**
BM-Himara	4439836.323	392322.658	4439836.347	392322.686	-0.0244	-0.028
Point	**TBC**		**Albcors**		**Differences**	
	N	**E**	**N**	**E**	**dN**	**dE**
BM-Himara	4439836.323	392322.658	4439836.28	392322.619	0.043	0.039

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III. RESULTS AND DISCUSSIONS

Based on the list of points obtained from the field measurements, the following tables present the results of the comparison between the field measurement data and other data. The following shows the comparison between the different coordinates and the corresponding evaluation:

- Comparison between coordinates from GNSS surveys (GPS base and ALBCORS measurements).

Table 2: Coordinates of points

ID	CZ	N (Base GPS)	E (Base GPS)	N (Albcors)	E (Albcors)
1	Himare	4440061.911	392745.654	4440061.848	392745.734
2	Himare	4439998.094	392730.529	4439998.121	392730.526
3	Himare	4439980.641	392720.411	4439980.551	392720.367
4	Himare	4440009.333	392670.394	4440009.340	392670.384
5	Himare	4440011.054	392661.505	4440011.089	392661.548
6	Himare	4439985.431	392696.932	4439985.408	392696.880
7	Himare	4439992.158	392692.316	4439992.117	392692.364
8	Himare	4440007.221	392631.860	4440007.196	392631.792
9	Himare	4439807.444	393059.231	4439807.437	393059.201
10	Himare	4439937.523	393069.785	4439937.431	393069.718
11	Himare	4439926.581	393104.793	4439926.484	393104.700
12	Himare	4439870.553	393110.937	4439870.531	393110.882
13	Himare	4439748.433	393169.183	4439748.402	393169.161
14	Himare	4438984.406	394034.716	4438984.464	394034.583
15	Himare	4438927.300	394106.912	4438927.244	394106.891
16	Himare	4438943.957	394084.267	4438943.963	394084.186
17	Himare	4439822.007	392982.347	4439821.920	392982.319
18	Himare	4440016.972	392619.085	4440017.012	392619.078
19	Himare	4439303.237	393761.629	4439303.217	393761.599
20	Himare	4439201.589	393821.810	4439201.525	393821.676

Table 3: Coordinate Differences

ID	dN	dE	dL	ID	dN	dE	dL
1	0.063	-0.079	0.101	11	0.096	0.094	0.134
2	-0.027	0.004	0.028	12	0.021	0.056	0.060
3	0.089	0.045	0.100	13	0.031	0.023	0.038
4	-0.008	0.011	0.013	14	-0.058	0.134	0.146
5	-0.035	-0.042	0.055	15	0.055	0.022	0.060
6	0.022	0.053	0.057	16	-0.007	0.082	0.082
7	0.041	-0.047	0.062	17	0.087	0.029	0.091
8	0.024	0.069	0.073	18	-0.041	0.008	0.041
9	0.007	0.031	0.031	19	0.019	0.031	0.036
10	0.092	0.068	0.114	20	0.063	0.135	0.149

- Comparison between coordinates from GNSS surveys (Base GPS and Orthophoto 2007)

Table 4: Coordinates of points

ID	CZ	N (Base GPS)	E (Base GPS)	N (Ortho 07)	E (Ortho 07)
1	Himare	4440061.911	392745.654	4440062.463	392746.191
2	Himare	4439998.094	392730.529	4439998.130	392730.792
3	Himare	4439980.641	392720.411	4439980.807	392720.657
4	Himare	4440009.333	392670.394	4440009.782	392671.282
5	Himare	4440011.054	392661.505	4440011.264	392662.974
6	Himare	4439985.431	392696.932	4439985.384	392697.047
7	Himare	4439992.158	392692.316	4439992.413	392692.438
8	Himare	4440007.221	392631.860	4440007.306	392631.850
9	Himare	4439807.444	393059.231	4439807.806	393059.810
10	Himare	4439937.523	393069.785	4439937.636	393069.851
11	Himare	4439926.581	393104.793	4439926.584	393105.074
12	Himare	4439870.553	393110.937	4439870.787	393111.363
13	Himare	4439748.433	393169.183	4439748.333	393169.575
14	Himare	4438984.406	394034.716	4438984.407	394035.203
15	Himare	4438927.300	394106.912	4438927.226	394107.351
16	Himare	4438943.957	394084.267	4438943.96	394084.754
17	Himare	4439822.007	392982.347	4439822.481	392981.880
18	Himare	4440016.972	392619.085	4440017.143	392619.698
19	Himare	4439303.237	393761.629	4439303.325	393761.969
20	Himare	4439201.589	393821.810	4439201.357	393821.962

Table 5: Coordinate Differences

ID	dN	dE	dL	ID	dN	dE	dL
1	-0.552	-0.536	0.770	11	-0.003	-0.281	0.281
2	-0.037	-0.263	0.265	12	-0.234	-0.426	0.486
3	-0.166	-0.246	0.297	13	0.100	-0.392	0.404
4	-0.450	-0.888	0.995	14	-0.002	-0.487	0.487
5	-0.210	-1.469	1.484	15	0.074	-0.439	0.445
6	0.047	-0.115	0.124	16	-0.003	-0.487	0.487
7	-0.256	-0.121	0.283	17	-0.474	0.467	0.666
8	-0.086	0.010	0.086	18	-0.171	-0.613	0.636
9	-0.362	-0.579	0.683	19	-0.089	-0.340	0.351
10	-0.114	-0.066	0.131	20	0.231	-0.152	0.277

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- Comparison between coordinates from GNSS surveys (GPS Base and HTR "Indicative Registration Map").
- Comparison between coordinates from HTR and Orthophoto 2007.

Table 6: Coordinates of points

ID	CZ	N (Base GPS)	E (Base GPS)	N (HTR)	E (HTR)
1	Himare	4440061.911	392745.6546	4440062.463	392746.191
2	Himare	4439998.094	392730.5296	4439998.13	392730.7925
3	Himare	4439980.641	392720.4116	4439980.616	392720.9219
4	Himare	4440009.333	392670.3946	4440009.521	392671.5231
5	Himare	4440011.054	392661.5056	4440011.186	392662.6785
6	Himare	4439985.431	392696.9326	4439985.384	392697.0473
7	Himare	4439992.158	392692.3166	4439992.413	392692.438
8	Himare	4440007.221	392631.8606	4440007.306	392631.8508
9	Himare	4439807.444	393059.2316	4439807.495	393059.9085
10	Himare	4439937.523	393069.7856	4439937.463	393069.9305
11	Himare	4439926.581	393104.7936	4439926.739	393105.1683
12	Himare	4439870.553	393110.9376	4439870.797	393111.1843
13	Himare	4439748.433	393169.1836	4439748.431	393169.4167
14	Himare	4438984.406	394034.7166	4438984.459	394035.2865
15	Himare	4438927.300	394106.9126	4438926.907	394107.6108
16	Himare	4438943.957	394084.2676	4438943.854	394084.8664
17	Himare	4439822.007	392982.3476	4439822.425	392981.7913
18	Himare	4440016.972	392619.0856	4440017.684	392619.510
19	Himare	4439303.237	393761.6296	4439303.727	393763.0423
20	Himare	4439201.589	393821.8106	4439202.341	393822.1462

Table 7: Coordinate Differences

ID	dN	dE	dL	ID	dN	dE	dL
1	-0.552	-0.536	0.770	11	-0.159	-0.375	0.407
2	-0.037	-0.263	0.265	12	-0.245	-0.247	0.347
3	0.024	-0.510	0.511	13	0.001	-0.233	0.233
4	-0.189	-1.128	1.144	14	-0.053	-0.570	0.572
5	-0.133	-1.173	1.180	15	0.392	-0.698	0.801
6	0.047	-0.115	0.124	16	0.102	-0.599	0.607
7	-0.256	-0.121	0.283	17	-0.419	0.556	0.696
8	-0.086	0.010	0.086	18	-0.712	-0.424	0.829
9	-0.052	-0.677	0.679	19	-0.491	-1.413	1.495
10	0.060	-0.145	0.157	20	-0.752	-0.336	0.824

Table 8: Coordinates of points

ID	CZ	N (HTR)	E (HTR)	N (Ortho 07)	E (Ortho 07)
1	Himare	4440062.463	392746.191	4440062.463	392746.191
2	Himare	4439998.13	392730.792	4439998.130	392730.792
3	Himare	4439980.616	392720.921	4439980.807	392720.657
4	Himare	4440009.521	392671.523	4440009.782	392671.282
5	Himare	4440011.186	392662.678	4440011.264	392662.974
6	Himare	4439985.384	392697.047	4439985.384	392697.047
7	Himare	4439992.413	392692.438	4439992.413	392692.438
8	Himare	4440007.306	392631.850	4440007.306	392631.850
9	Himare	4439807.495	393059.908	4439807.806	393059.810
10	Himare	4439937.463	393069.930	4439937.636	393069.851
11	Himare	4439926.739	393105.168	4439926.584	393105.074
12	Himare	4439870.797	393111.184	4439870.787	393111.363
13	Himare	4439748.431	393169.416	4439748.333	393169.575
14	Himare	4438984.459	394035.286	4438984.407	394035.203
15	Himare	4438926.907	394107.610	4438927.226	394107.351
16	Himare	4438943.854	394084.866	4438943.960	394084.754
17	Himare	4439822.425	392981.791	4439822.481	392981.880
18	Himare	4440017.684	392619.510	4440017.143	392619.698
19	Himare	4439303.727	393763.042	4439303.325	393761.969
20	Himare	4439202.341	393822.146	4439201.357	393821.962

Table 9: Coordinate Differences

ID	dN	dE	dL	ID	dN	dE	dL
1	0.000	0.000	0.000	11	0.155	0.094	0.181
2	0.000	0.000	0.000	12	0.011	-0.180	0.180
3	-0.191	0.265	0.326	13	0.099	-0.159	0.187
4	-0.261	0.241	0.355	14	0.051	0.083	0.097
5	-0.077	-0.296	0.306	15	-0.318	0.259	0.410
6	0.000	0.000	0.000	16	-0.105	0.112	0.154
7	0.000	0.000	0.000	17	-0.056	-0.089	0.105
8	0.000	0.000	0.000	18	0.541	-0.188	0.573
9	-0.311	0.098	0.326	19	0.402	1.073	1.145
10	-0.173	0.079	0.190	20	0.984	0.184	1.001

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- Comparison between coordinates from GNSS surveys (Base GPS and Orthophoto 2015).

Table 10: Coordinates of points

ID	CZ	N (Base GPS)	E (Base GPS)	N (Ortho 15)	E (Ortho15)
1	Himare	4440061.911	392745.654	4440062.164	392745.824
2	Himare	4439998.094	392730.529	4439998.161	392730.635
3	Himare	4439980.641	392720.411	4439980.945	392720.616
4	Himare	4440009.333	392670.394	4440009.174	392670.136
5	Himare	4440011.054	392661.505	4440010.868	392661.419
6	Himare	4439985.431	392696.932	4439985.232	392696.833
7	Himare	4439992.158	392692.316	4439992.012	392692.270
8	Himare	4440007.221	392631.860	4440007.273	392631.801
9	Himare	4439807.444	393059.231	4439807.576	393059.172
10	Himare	4439937.523	393069.785	4439937.747	393069.673
11	Himare	4439926.581	393104.793	4439926.541	393104.720
12	Himare	4439870.553	393110.937	4439870.632	393110.878
13	Himare	4439748.433	393169.183	4439748.565	393169.097
14	Himare	4438984.406	394034.716	4438984.591	394034.749
15	Himare	4438927.300	394106.912	4438927.498	394106.826
16	Himare	4438943.957	394084.267	4438944.115	394084.247
17	Himare	4439822.007	392982.347	4439822.099	392982.632
18	Himare	4440016.972	392619.085	4440016.800	392618.999
19	Himare	4439303.237	393761.629	4439303.170	393761.702
20	Himare	4439201.589	393821.810	4439201.562	393822.042

Table 11: Coordinate Differences

ID	dN	dE	dL	ID	dN	dE	dL
1	-0.254	-0.170	0.305	11	0.040	0.073	0.083
2	-0.067	-0.106	0.125	12	-0.079	0.060	0.099
3	-0.304	-0.205	0.367	13	-0.132	0.086	0.158
4	0.159	0.258	0.303	14	-0.185	-0.033	0.188
5	0.185	0.086	0.204	15	-0.198	0.086	0.216
6	0.198	0.099	0.222	16	-0.159	0.020	0.160
7	0.146	0.046	0.153	17	-0.093	-0.284	0.299
8	-0.053	0.060	0.080	18	0.172	0.086	0.192
9	-0.132	0.060	0.145	19	0.066	-0.073	0.098
10	-0.225	0.112	0.251	20	0.026	-0.232	0.233

- Comparison between coordinates (Orthophoto 2015 and Orthophoto 2007).

Table 12: Coordinates of points

ID	CZ	N (Ortho 15)	E (Ortho 15)	N (Ortho 07)	E (Ortho 07)
1	Himare	4440062.164	392745.824	4440062.463	392746.191
2	Himare	4439998.161	392730.635	4439998.130	392730.792
3	Himare	4439980.945	392720.616	4439980.807	392720.657
4	Himare	4440009.174	392670.136	4440009.782	392671.282
5	Himare	4440010.868	392661.419	4440011.264	392662.974
6	Himare	4439985.232	392696.833	4439985.384	392697.047
7	Himare	4439992.012	392692.270	4439992.413	392692.438
8	Himare	4440007.273	392631.801	4440007.306	392631.850
9	Himare	4439807.576	393059.172	4439807.806	393059.810
10	Himare	4439937.747	393069.673	4439937.636	393069.851
11	Himare	4439926.541	393104.720	4439926.584	393105.074
12	Himare	4439870.632	393110.878	4439870.787	393111.363
13	Himare	4439748.565	393169.097	4439748.333	393169.575
14	Himare	4438984.591	394034.749	4438984.407	394035.203
15	Himare	4438927.498	394106.826	4438927.226	394107.351
16	Himare	4438944.115	394084.247	4438943.960	394084.754
17	Himare	4439822.099	392982.632	4439822.481	392981.880
18	Himare	4440016.800	392618.999	4440017.143	392619.698
19	Himare	4439303.170	393761.702	4439303.325	393761.969
20	Himare	4439201.562	393822.042	4439201.357	393821.962

Table 13: Coordinate Differences

ID	dN	dE	ID	dN	dE
1	-0.299	-0.367	11	-0.043	-0.354
2	0.031	-0.157	12	-0.155	-0.485
3	0.138	-0.041	13	0.232	-0.478
4	-0.608	-1.146	14	0.184	-0.454
5	-0.396	-1.555	15	0.272	-0.525
6	-0.152	-0.214	16	0.155	-0.507
7	-0.401	-0.168	17	-0.382	0.752
8	-0.033	-0.049	18	-0.343	-0.699
9	-0.230	-0.638	19	-0.155	-0.267
10	0.111	-0.178	20	0.205	0.080

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- Comparison between coordinates from HTR and Orthophoto 2015.

Table 14: Coordinates of points

ID	CZ	N (HTR)	E (HTR)	N (Ortho 15)	E (Ortho 15)
1	Himare	4440062.463	392746.191	4440062.164	392745.824
2	Himare	4439998.13	392730.792	4439998.161	392730.635
3	Himare	4439980.616	392720.921	4439980.945	392720.616
4	Himare	4440009.521	392671.523	4440009.174	392670.136
5	Himare	4440011.186	392662.678	4440010.868	392661.419
6	Himare	4439985.384	392697.047	4439985.232	392696.833
7	Himare	4439992.413	392692.438	4439992.012	392692.270
8	Himare	4440007.306	392631.850	4440007.273	392631.801
9	Himare	4439807.495	393059.908	4439807.576	393059.172
10	Himare	4439937.463	393069.930	4439937.747	393069.673
11	Himare	4439926.739	393105.168	4439926.541	393104.720
12	Himare	4439870.797	393111.184	4439870.632	393110.878
13	Himare	4439748.431	393169.416	4439748.565	393169.097
14	Himare	4438984.459	394035.286	4438984.591	394034.749
15	Himare	4438926.907	394107.610	4438927.498	394106.826
16	Himare	4438943.854	394084.866	4438944.115	394084.247
17	Himare	4439822.425	392981.791	4439822.099	392982.632
18	Himare	4440017.684	392619.510	4440016.800	392618.999
19	Himare	4439303.727	393763.042	4439303.170	393761.702
20	Himare	4439202.341	393822.146	4439201.562	393822.042

Table 15: Coordinate Differences

ID	dN	dE	ID	dN	dE
1	0.299	0.367	11	0.198	0.448
2	-0.031	0.157	12	0.165	0.306
3	-0.329	0.305	13	-0.134	0.319
4	0.347	1.387	14	-0.132	0.537
5	0.318	1.259	15	-0.591	0.784
6	0.152	0.214	16	-0.261	0.619
7	0.401	0.168	17	0.326	-0.841
8	0.033	0.049	18	0.884	0.511
9	-0.081	0.736	19	0.557	1.040
10	-0.284	0.257	20	0.779	0.104

IV. CONCLUSION

- The maximum difference between the measured coordinates "GPS base and ALBCORS measurements" is: dN = 0.096 m, dE = 0.135 m and dL = 0.149 m. The average avoidance in N and E is respectively: σ (N) = 0.054 m, σ (E) = 0.066 m.
- The maximum difference between the measured coordinates "Base GPS and Orthophoto 2007" is: dN = 0.474 m, dE = 0.487 m and dL = 0.770 m. The average avoidance in N and E is respectively: σ (N) = 0.249 m, σ (E) = 0.540 m.
- The maximum difference between the measured coordinates "Base GPS and HTR" is: dN = 0.712 m, dE = 1.413 m and dL = 1.149 m. The average avoidance in N and E is respectively: σ (N) = 0.338 m, σ (E) = 0.640 m.
- The maximum difference between the measured coordinates "HTR and Ortofoto 2007" is: dN = 0.984 m, dE = 1.073 m and dL = 1.145 m. The average avoidance in N and E is respectively: σ (N) = 0.308 m, σ (E) = 0.291 m.
- The maximum difference between the measured coordinates "Base GPS and Orthophoto 2015" is: dN = 0.198 m, dE = 0.258 m and dL = 0.367 m. The average avoidance in N and E is respectively: σ (N) = 0.165 m, σ (E) = 0.137 m.
- The maximum difference between the measured coordinates "Ortofoto 2015 and Orthofoto 2007" is: dN = 0.608 m, dE = 1.555 m. The average avoidance in N and E is respectively: σ (N) = 0.274 m, σ (E) = 0.601 m
- The maximum difference between the measured coordinates "HTR and Ortofoto 2015" is: dN = 0.779 m, dE = 1.040 m. The average avoidance in N and E is respectively: σ (N) = 0.284 m, σ (E) = 0.301 m
- In 20 measured points, the differences (dN, dE) vary accordingly according to the respective tables presented above.

V. RECOMMENDATIONS

The maximum difference between the measured coordinates "GPS base and ALBCORS measurements" is: dN = 0.096 m, dE = 0.135 m and dL = 0.149 m. The average avoidance in N and E is respectively: σ (N) = 0.054 m, σ (E) = 0.066 m. Cadastral maps are essential to carry out the assessment functions (providing the assessor with the location of the parcel and information about it). Digital cadastral maps and systems are an integral part of a comprehensive assessment system, without which a complete picture of land interests, value and improvement is impossible.

A digital cadastral map system that can be used for many purposes should have the following components:

- A control geodetic grid, based on projection coordinates
- Planimetry of the cadastral plot, which would defines the boundaries of the real estate according to the laws in force
- Each parcel has a unique identifier
- Digital orthophoto

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- A computer system that links spatial data and parcel data attributes

The geodetic control network consists of fixed points on the surface of the earth, with specified accuracy and density depending on the scale of the map, population density, property value and expected life of the product. Based on the above conclusions and in accordance with the European Standards of creating multi-purpose cadastral maps, as one of the future tasks of ASHK, we recommend:

Recommendation 1: For centimetric accuracy, the use of GNSS (Global Navigation Satellite Systems) and RTK (Real Time Kinematic) technique is recommended.

Recommendation 2: Cadastral data, such as: under division, union or definition of parcel boundaries, must be based only on the concept of coordinates (N,E), determined through GNSS surveys or Total Station.

Aerial photographs have been for a long time an essential product for cadastral map development, but the resulting image is of greater value when all distortions have been removed. It can serve as a base map if it is connected to a geodetic control network.

Recommendation 3: Orthophoto should not be used in the construction of cadastral data, such as: under division, merge or determination of parcel boundaries.

REFERENCES

[1] Land Research Institute's Archive, Tirana, 1996: Bulletin No. 6.
[2] Geofoto SRL, 2007: Final technical report of aerial photography.
[3] Trimble Navigation Limited, September 2003; Real Time Kinematic Surveying, Training Guide, Part Number 33142 40.
[4] Nurçe B., Thesis, 2013: Study of the development of coordinative references of Albania.
[5] Standard on Digital Cadastral Maps and Parcel Identifiers, 2015; International Association of Assessing Officers (IAAO), https://www.iaao.org/media/standards/Standard_Digital_Cadastral_Maps_2015.pdf
[6] Tamrakar, Rabindra Man, (2013), Potential Use of GPS Technology for Cadastral Surveys in Nepal, Nepalese Journal on Geoinformatics, -12, 2070 (2013AD).
[7] Veersema, Adam, (2004), RTK-GPS for Cadastral Boundary Surveying in NSW, School of Surveying and Spatial Information Systems, The university of New South Wales.
[8] Lee, I. and Ge, L., (2006), The performance of RTK-GPS for surveying under challenging environmental conditions, Earth Planets Space.
[9] Öcalan, T. and Tunalioglu, N., (2010), Data communication for real-time positioning and navigation in global navigation satellite systems (GNSS)/continuously operating reference stations (CORS) networks, Scientific Research and Essays Vol. 5(18).

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