

# Proposal for a new naming and dimensions of the topographic map/plan sheets of Albania

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**Abstract**— Since 1868 onwards, different institutes (Military Geographical Institute of Vienna, Austria; Military Geographical Institute of Florence, Italy; CNIGA-IK Moscow Institute; ex- Military Topographic Institute of Albania) have been built different geodetic bases for supporting of the mapping of the Albanian territory in different scales (1:75 000/50 000/25 000/10 000/5 000). The large-scale topographic maps used for various engineering projects. In different countries, the different dimensions of the sheets of topographic maps recommended. The purpose of this study is to propose new naming and dimensions of topographic maps of Albania.

**Keywords** — Naming/nomenclature, dimension, topographic map/plan, reference, GEOREF, MGRS.

## 1. INTRODUCTION

In different parts of the world, depending on the use of cartographic materials (plans and topographic maps), their dimensions are different. Map nomenclature is a map system, based on international or local agreements. A sheet of a map is the surface of a curved trapezoid, bounded by meridians and parallels with ellipsoidal latitude and longitude differences depending on projection and scale selected on an ellipsoid. The position of a map sheet on the ellipsoid is determined through the ellipsoidal coordinates of the vertices of the trapezoid, while its position on the projection coordinate system is determined through the orthogonal coordinates of its vertices.

## 2. MATERIALS AND METHODS

The naming of topographic maps and plans based on the international or local agreements. The naming in use, based on international agreements, such: (a) London naming of 1909, (b) GEOREF naming, (c) NIMA naming, as well as (d) the naming based on local agreements (e.g. ALB-2022).

(a) In general, the ordering and dimensioning of the maps of the territory of Albania (prepared by foreigners, before 1944, as well as the prepared maps by Albanian specialists (1945- and later) or different countries in the world based on the international agreement of London of 1909. For Albania, an exception to this agreement are the topographic plans of the scale 1: 5000, prepared by the Geographical Institute of Florence, Italy for small parts of our territory (1927-1939). The dimensions of these plans (90 x 60 cm) are used in the cadastral surveys of scale 1: 5000, carried out by the topographic sector of the former Ministry of Agriculture until 1955, as well as the topographic surveys carried out by the former enterprise Geology- Geodesy), until the early 1990's. Since after 1955 the topographic plans were created directly in the field through surveying, where

the work desk had the dimension 50 x 50 cm, their format was 42 x 37 cm.

Based on the London International Agreement of 1909, the 1: 1 000 000 scale map with spherical dimensions  $\Delta\varphi = 4^\circ$  and  $\Delta\lambda = 6^\circ$  has been accepted as the basic map for naming of all maps in other scales, which continues to remain in use for topographic maps of Albania even today. For the presentation of Albania in the topographical maps of scale 1: 200 000, 10 map sheets are needed, in the scale 1: 100 000, 25 map sheets are needed, in the scale 1: 50 000, 100 map sheets are needed and in the scale 1: 25 000, 400 map sheets are needed. Table 1 shows the topographical map/plan sheets according to the scales, the respective differences of latitudes and longitudes, the base maps from which they were obtained, the number of divisions of the base sheets, the names of the divisions and the naming of the maps or topographic plans.

However, in different parts of the world, the responsible institutions do not based on the London International Agreement of 1909, but on specific criteria (local agreements). For example, NIMA (National Imagery and Mapping Agency) recommends as the base map for naming of the all maps in other scales the map of scale 1 : 1 000 000 with spheroidal dimensions  $\Delta\varphi = 8^\circ$  and  $\Delta\lambda = 6^\circ$ .

Dimensioning of the topographic map/plan sheets based on several indicators and requirements that need to be considered:

- the way of collecting of field information, which will presented in the maps of a given scale.
- it is recommended to have a minimum number of map sheets to cover the territory of a country with maps.
- the size of the map sheet should not make it difficult to use in the office, field or travel conditions.
- the dimensions of the sheets should allow the presentation of logs or conventional signs of the most encountered elements on the ground.
- technology of compiling/ publishing map sheets.

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- reducing as much as possible of the cost of basic materials for the production of map sheets, etc.

The dimensions of the scale sheets 1:1000000 ( $\Delta\varphi= 4^\circ$ ,  $\Delta\lambda= 6^\circ$ ) at the equator are 44 x 67 cm, while for latitude  $\varphi= 40^\circ$  the dimensions are  $\approx 37 \times 43$  cm.

TABLE 1: SUMMARY TABLE OF TOPOGRAPHIC MAPS/PLANS NAMING

Scale	Dimensions		Base map	No. of divisions	Naming of divisions	Naming of trapezoid
	$\Delta\varphi$	$\Delta\lambda$				
1: 1000000	4°	6°				K-34
1: 500000	2°	3°	1: 1000000	4	A, B, C, D	K-34-C
1: 300000	1°20'	2°	1: 1000000	9	I, II, III...IX	III-K-34
1: 200000	40'	1°	1: 1000000	36	I, II, ..., XXXVI	K-34-VI
1: 100000	20'	30'	1: 1000000	144	1, 2, 3..., 144	K-34-115
1: 50000	10'	15'	1: 100000	4	A, B, C, D	K-34-115-B
1: 25000	5'	7'30"	1: 50000	4	a, b, c, d	K-34-115-B-a
1: 10000	2'30"	3'45"	1: 25000	4	1, 2, 3, 4	K-34-115-B-a-2
1: 5000	1'15"	1'52".5	1: 100000	256	1, 2, 3..., 256	K-34-115-(18)
1: 2500	37".5	56".25	1: 5000	4	A, B, C, D	K-34-115-(18-A)
1: 2000	25"	37".5	1: 5000	9	a, b, c ... i	K-34-115-(18-e)
1: 1000	12".5	18".75	1: 2000	4	I, II, III, IV	K-34-115-(18-e-II)
1: 500	6".25	9".375	1: 2000	16	1, 2, 3..., 16	K-34-115-(18-e-6)

(b) The World Geographic Reference System (GEOREF) used when reporting areas for air defense and strategic air operations.

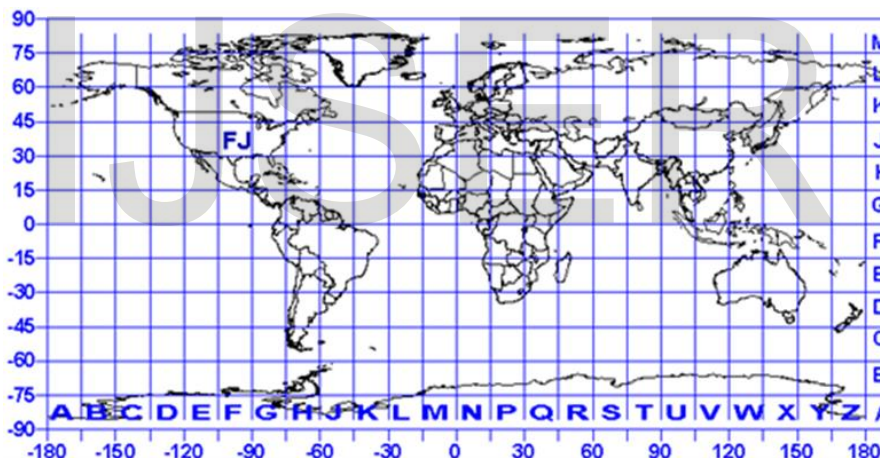


Fig. 1: The World Geographical Reference System 15° x 15° (GEOREF) [https://en.wikipedia.org/wiki/World\\_Geographic\\_Reference\\_System](https://en.wikipedia.org/wiki/World_Geographic_Reference_System)

In the GEOREF, the land surface divided into 288 squares with latitude 15° and longitude 15°, where letters and numbers (Figure 1) identify each square. From the west to the east (24 columns x 15°), the naming of the squares based on the capital letters from A to Z, excluding the letters I and O, while the naming of the squares (12 rows x 15°) from the south pole towards the north pole based on the capital letters A to M excluding the letter I. According to this logic, Albania is included in the sheet named PJ, between the geographical parallels  $\varphi= 45^\circ$  N,  $\varphi= 30^\circ$  S and between the geographical meridians  $\lambda= 15^\circ$  W,  $\lambda= 30^\circ$  E.

Each of the squares 15° x 15° divided into 15 columns every 1° in the west-east direction and in 15 rows every 1° in the south-north direction, the naming based on the capital

letters from A to Q, letters I and O are excluded (Figure 2). The city of Tirana with geographical coordinates  $\varphi= 41^\circ 19'$  N and  $\lambda= 19^\circ 49'$  E is located in the square (map sheet) with the name PJ EM. Each of the squares 1° x 1° is divided into 60 columns every 1' in the west-east direction and in 15 rows every 1' in the south-north direction, the naming is based on the Arabic numbers 1 ÷ 60. Tirana point with geographical coordinates  $\varphi= 41^\circ 19'$  N and  $\lambda= 19^\circ 49'$  E is located in the square (map sheet) labeled PJ EM 50 20. Further, each of the squares 1' x 1' is divided into 10 columns every 6" in the west-east direction and in 100 rows each 0.6" in south-north direction, the label can be made every 4 letters and six numbers or every 4 letters and eight numbers.

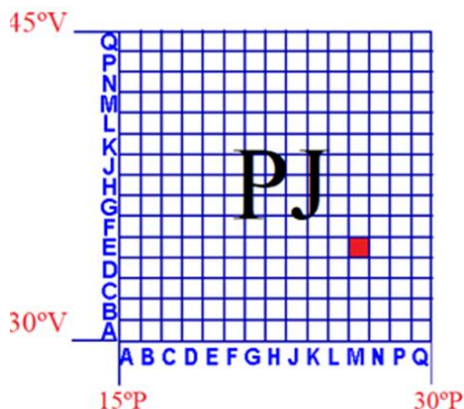


Fig. 2: The World Geographical Reference System 1° x 1° (GOREF) [https://en.wikipedia.org/wiki/World\\_Geographic\\_Reference\\_System](https://en.wikipedia.org/wiki/World_Geographic_Reference_System)

(c) The Military Grid Reference System (MGRS) (MGRS) is the coordinate standard system used by NATO for the position of points on Earth. MGRS is derived from squares system on the UTM (Universal Transversal Mercator) and UPS (Universal Polar Stereographic).

The land area between latitudes 84° N and 80° S is divided into 60 zones (columns) x 6° in the west-east direction starting from 180° West (with a few exceptions around Norway and Svalbard), the naming is based on the Arabic numbers 1 ÷ 60 and in 10 rows every 8° in the south-north

direction (except zone X, which is 12°), starting from the equator with  $\phi = 0^\circ$  N, the naming is based on the letters C to X, except the letter O (Figure 3).

Each square is identified by numbers and letters (Fig. 4), for example, the southern end of South America is 19F, Albania 34T.

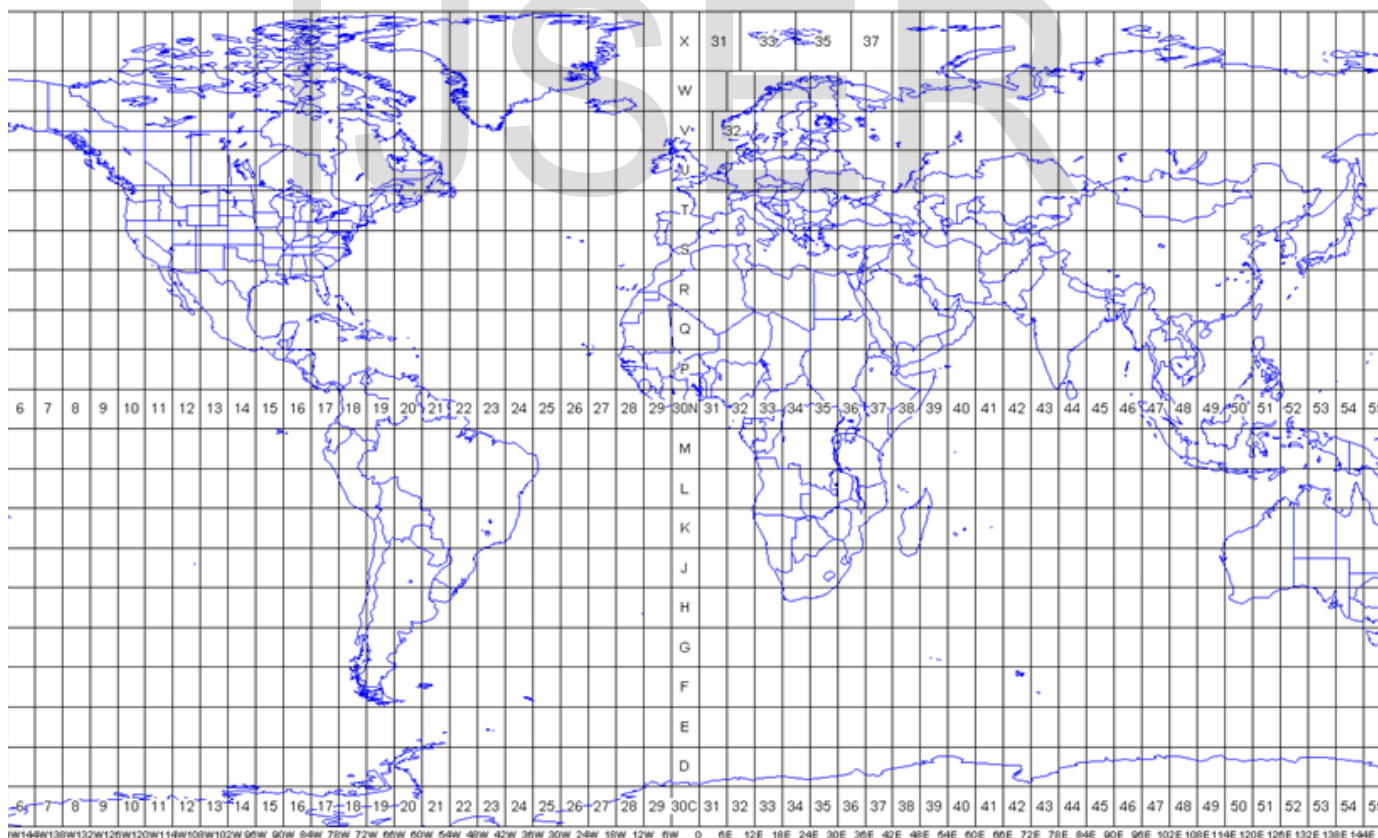


Fig. 3: The Military Grid Reference System (MGRS) [https://en.wikipedia.org/wiki/Military\\_Grid\\_Reference\\_System](https://en.wikipedia.org/wiki/Military_Grid_Reference_System)



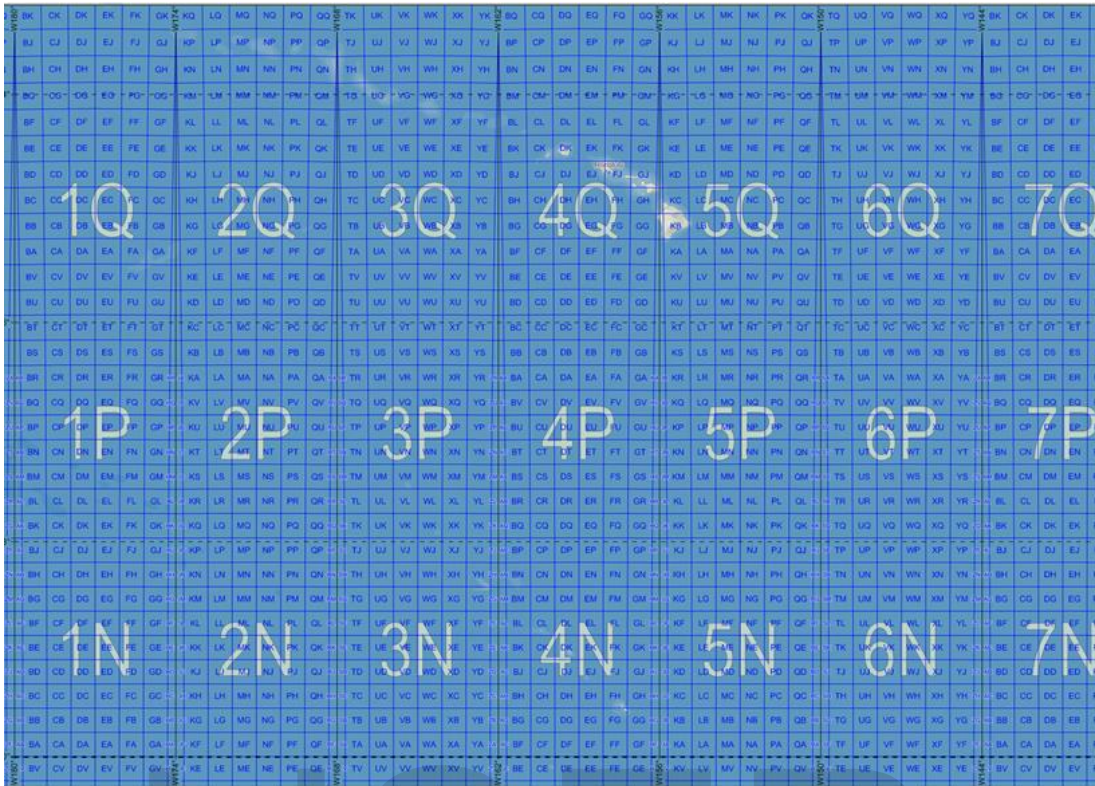


Fig. 4: The Military Grid Reference System (MGRS) [https://en.wikipedia.org/wiki/Military\\_Grid\\_Reference\\_System](https://en.wikipedia.org/wiki/Military_Grid_Reference_System)

To each of the trapezoids is attached a squares grid with 100 km length, where each square is labeled with two uppercase Latin letters (e.g. DK). The rows are named in a south-north direction with uppercase Latin letters A ÷ V (except letters I and O), a total of 20 letters starting at the equator and repeating. The second letter of the label indicates the row of squares.

The columns of squares are denoted by strings of uppercase Latin letters of A ÷ Z (except letters I and O), a total of 23 letters starting from the meridian  $\lambda = 180^\circ$  with east direction. In the arc near the equator, the columns of zone

UTM 1 have the letters A - H, the columns of zone UTM 2 have the letters J - R (except O), and the columns of zone UTM 3 have the letters S - Z. In zone 4, the letters of the column start from A, and so on. The first letter of the label indicates the column of squares.

(d) If for the scale 1:500 we accept the dimensions of the topographic plan 30 x 45 cm, the naming will be based on the numbers 1 ÷ 24 and the letters A ÷ Y (Table 2). A topographical plan sheet at the scale 1:2000 contains 16 sheets at the scale 1: 500 (Figure 5).

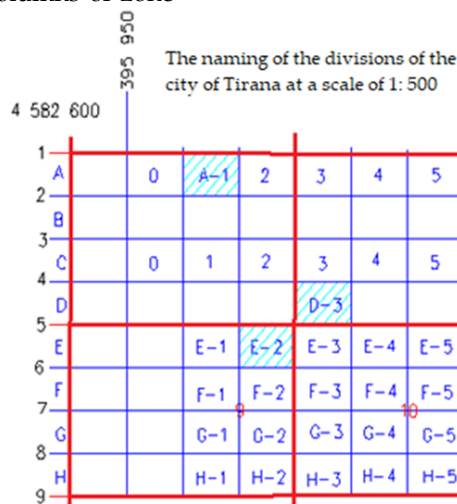


Fig. 5: Naming of divisions of the topographical plan at scale 1:500

TABLE 2: NAMING OF DIVISIONS OF THE TOPOGRAPHICAL PLAN AT SCALE 1:500 FROM THE SCALE 1:2000

Numbers	1	2	.....	22	23	24
Letters	A	B	.....	V	X	Y

### 3. RESULTS

Proposal of the new naming of the topographic maps/plans based on the base map at the scale 1:1 000 000 with dimensions  $\Delta\varphi = 6.5^\circ$ ,  $\Delta\lambda = 6^\circ$ :

- Tirana's point with geographical coordinates  $\varphi = 41^\circ 19' N$  and  $\lambda = 19^\circ 49' East$  is located on the map sheet at a scale of 1:1000000 with the label G - 34 (Table 3).
- The map sheet at the scale 1:500000 is obtained by dividing of the map sheet at the scale 1:1000000 into 4 sheets (2 x 2), the naming is G - 34 - A (Table 3).
- The map sheet at the scale 1:200000 is obtained by dividing of the map sheet at the scale 1:1000000 into 25 sheets (5 x 5), the naming is G - 34 - 12 (Table 3).
- The map sheet at the scale 1:100000 is obtained by dividing of the map sheet at the scale 1:1000000 into 100 sheets (10 x 10), the naming is G - 34 - 43 (Table 3).

- The map sheet at the scale 1:50000 is obtained by dividing of the map sheet at the scale 1:500000 into 100 sheets (10 x 10), the naming is G - 34 - A - 95 (Table 3).
- The map sheet at the scale 1:25000 is obtained by dividing of the map sheet at the scale 1:50000 into 4 sheets (2 x 2), the naming is G - 34 - A - 95 - a (Table 3).
- The map sheet at the scale 1:10000 is obtained by dividing of the map sheet at the scale 1:100000 into 100 sheets (10 x 10), the naming is G - 34 - 43 - 55 (Table 3).
- The map sheet at the scale 1:5000 is obtained by dividing of the map sheet at the scale 1:25000 scale in 4 sheets (2 x 2), the denomination is G - 34 - A - 95 - a - 4 (Table 3).

TABLE 3: PROPOSAL FOR SCALES, THE BASE TRAPEZOID, THE NUMBER OF DIVISIONS, THE NAMING OF DIVISIONS AND THE NAMING OF THE TRAPEZOID FOR ALBANIA.

No.	Map/plan scale	Dimensions		Base trapezoid	No. of divisions	Naming of divisions	Naming of the map/plan trapezoids
		$\Delta\varphi$	$\Delta\lambda$				
1	1 : 1 000 000	6° 30'	6° 00'	-	-	-	G - 34
2	1 : 500 000	3° 15'	3° 00'	1 : 1 000 000	2 x 2	A,B,C,D	G - 34 - A
3	1 : 200 000	1° 18'	1° 12'	1 : 1 000 000	5 x 5	1,2,3,....., 25	G - 34 - 12
4	1 : 100 000	39'	36'	1 : 1 000 000	10 x 10	1,2,3,....., 100	G - 34 - 43
5	1 : 50 000	19' 30"	18' 00"	1 : 500 000	10 x 10	1,2,3,....., 100	G - 34 - A - 95
6	1 : 25 000	9' 45"	9' 00"	1 : 50 000	2 x 2	a,b,c,d	G - 34 - A - 95 - a
7	1 : 10 000	3' 54"	3' 36"	1 : 100 000	10 x 10	1,2,3,....., 100	G - 34 - 43 - 55
8	1 : 5 000	1' 57"	1' 48"	1 : 25 000	2 x 2	1,2,3, 4	G - 34 - A - 95 - a - 4

### 4. CONCLUSIONS

New naming of the mathematical framework of the topographic maps/plans of Albania (1:1000000 ÷ 1:5000) has several advantages compared to the division of London 1909 in the following directions:

1. As the geometric dimensions of the map sheet increase, the land area included in a sheet will also increase (Table 4).

TABLE 4: THE DIMENSIONS OF MAP SHEETS ACCORDING LONDON AGREEMENT OF 1909 AND NEW NAMING

No.	Map/plan scale	Naming by London- 1909					New naming				
		aj	av	c	Area	No. of sheets	aj	av	c	Area	No. of sheets
		(cm)	(cm)	(cm)	(km2)		(cm)	(cm)	(cm)	(km2)	
1	1 : 1 000 000	48.12	51.24	44.43	220814	1	46.89	51.97	72.2	357309.4	1
2	1 : 500 000	49.71	51.24	44.42	56058.4	1	46.89	49.51	72.22	87059.27	1
3	1 : 200 000	42.28	42.69	37.01	6290.6	5	49.00	50.02	72.20	14299.89	2
4	1 : 100 000	40.99	41.21	37.03	1521.8	19	49.00	49.52	72.21	3556.82	8
5	1 : 50 000	40.99	41.10	37.03	379.95	76	49.26	49.52	72.20	891.48	33
6	1 : 25 000	41.05	41.10	37.03	95.10	303	49.26	49.38	72.20	222.58	130
7	1 : 10 000	51.37	51.41	46.28	23.78	1209	49.26	49.31	72.20	35.58	808
8	1 : 5 000	51.34	51.36	46.29	5.94	4840	49.28	49.31	72.20	8.89	3234

2. In the new naming, the Albania is included in a sheet at the scale 1:1,000,000 with the letter G, while according to the

London naming this territory extended in two sheets at the scale 1:1,000,000 (J, K).

3. Table 5 shows the number of map sheets at the scales 1:200,000÷1:5,000 according to the London naming of 1909 as well as the proposal of the new naming:

TAB. 5: NUMBER OF MAP SHEETS ACCORDING TO THE LONDON NAMING OF 1909 AND THE NEW NAMING

No.	Map/plan scale	No. of sheets according to		Decrease (in times)
		London naming of 1909	new naming	
1	1 : 200 000	5	2	2.5
2	1 : 100 000	19	8	2.4
3	1 : 50 000	76	33	2.3
4	1 : 25 000	303	130	2.3
5	1 : 10 000	1209	808	1.5
6	1 : 5 000	4840	3234	1.5

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